

# ORCHIDACEAE

兰科 lan ke

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Perennial, but sometimes short-lived, terrestrial, epiphytic, or lithophytic, autotrophic or rarely mycotrophic herbs (or rarely scrambling vines), with rhizomes, tubers, or rootstocks with mycorrhizal fungi in roots. Stems either sympodial or monopodial, usually leafy, but leaves sometimes reduced to bractlike scales, 1 or more internodes at base often swollen to form a “pseudobulb”; epiphytic species with aerial, photosynthesizing adventitious roots, often bearing 1 or more layers of dead cells (velamen). Leaves 1 to many, alternate or occasionally opposite, often distichous, sometimes terete or canaliculate, glabrous or very rarely hairy, frequently fleshy or leathery, base almost always sheathing, sometimes articulated, sometimes forming a false petiole, margin entire, apex often emarginate. Inflorescence basal, lateral, or terminal, erect to pendulous, racemose, spicate, subumbellate, or paniculate, 1- to many flowered, flowers rarely secund or distichously arranged. Flowers small to large, often quite showy, usually zygomorphic, very rarely ± actinomorphic, bisexual [very rarely monoecious and polymorphic], sessile or pedicellate, most often resupinate with pedicel and ovary twisted through 180°, occasionally not twisted or twisted through 360°. Ovary inferior, 1-locular, placentation parietal (or rarely 3-locular and placentation axile). Sepals usually free but sometimes variously adnate, median (dorsal) one often dissimilar to laterals, laterals sometimes adnate to a column foot to form a saccate, conic, or spurlike mentum. Petals free or rarely partly adnate to sepals, similar to sepals or not, often showy; lip entire, variously lobed or 2- or 3-partite, ornamented or not with calli, ridges, hair cushions, or crests, with or without a basal spur or nectary, margins entire to lacinate. Column short to long, with or without a basal foot, occasionally winged or with lobes or arms at apex or ventrally; anther mostly 1, less often 2 or 3, terminal or ventral on column, caplike or opening by longitudinal slits; pollen usually forming distinct pollinia, less often loose, pollinia 2, 4, 6, or 8, mealy, waxy, or horny, sectile or not, sessile or attached by stalks (caudicles or stipes) to 1 or 2 sticky viscidia; stigma 3-lobed, mid-lobe often modified to form a rostellum, other lobes either sunken on ventral surface of column behind anther or with 2 lobes porrect. Fruit a capsule, rarely berrylike, usually opening laterally by 3 or 6 slits. Seeds very numerous, dustlike, lacking endosperm, rarely winged.

About 800 genera and ca. 25,000 species (some estimates as high as 30,000 species): worldwide, except for Antarctica, most numerous in the humid tropics and subtropics; 194 genera (11 endemic, one introduced) and 1,388 species (491 endemic, one introduced) in five subfamilies in China.

Recent analyses of orchids incorporating data from DNA analyses have confirmed many aspects of the established classifications but have also provided some surprises for orchid taxonomists. First of all, the results have upheld the monophyly (evolutionary integrity, i.e., the group includes all the taxa derived from an ancestral species) of the orchid family, including the apostasioids and cyripedioids. They also suggest strongly that the orchids are an ancient group that evolved in the great southern continent of Gondwanaland before it split up to form the southern continents of Australia, Africa, and South America, the island of Madagascar, and the subcontinent of India. The subfamilies Apostasioideae, Cyripedioideae, and Orchidoideae (sensu Dressler, *Phylogeny Classific. Orchid Fam.* 1993) are all monophyletic. However, recent work clearly shows that *Vanilla* and its relatives form a separate and ancient clade (an evolutionary lineage including all the taxa derived from a single ancestral one) that deserves recognition as the subfamily Vanilloideae, that the Spiranthoideae nest within a more broadly defined Orchidoideae, and that Vandoideae are a specialized clade within a more broadly defined Epidendroideae.

A detailed new classification of the orchid family is currently being produced under the title *Genera Orchidacearum*, of which four of the six volumes have been published and a fifth is near completion (Pridgeon et al., *Gen. Orchid.* 1–4(1). 1999–2005). Even when this work is completed, such is the speed with which new information and techniques are being developed and published, it will almost certainly require revision. However, we now have the broad bones of a more robust and predictive classification of the family that will be more satisfactory than the presently widely used systems that are based mainly upon morphological characters.

The classification of the family is currently the subject of some debate, particularly the circumscription and the placement of certain tribes, subtribes, and genera. The classification of Chase et al. (in Dixon et al., *Orchid Conservation*, 69–89. 2003), elaborated in Pridgeon et al. (loc. cit.), which is strongly supported by recent molecular, embryological, and morphological analyses, is followed here. They recognize five subfamilies: Apostasioideae, Cyripedioideae, Vanilloideae, Orchidoideae, and Epidendroideae.

Lang Kaiyong, Chen Singchi, Luo Yibo & Zhu Guanghua. 1999. *Orchidaceae* (1). *In*: Lang Kaiyong, ed., *Fl. Reipubl. Popularis Sin.* 17: 1–499; Chen Singchi, Tsi Zhanhuo, Lang Kaiyong & Zhu Guanghua. 1999. *Orchidaceae* (2). *In*: Chen Singchi, ed., *Fl. Reipubl. Popularis Sin.* 18: 1–412; Tsi Zhanhuo, Chen Singchi, Luo Yibo & Zhu Guanghua. 1999. *Orchidaceae* (3). *In*: Tsi Zhanhuo, ed., *Fl. Reipubl. Popularis Sin.* 19: 1–437.

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### Glossary of botanical terms used in the Orchidaceae

Within the definitions, *italics* indicate terms that are defined in this glossary. Adapted from the glossary in Pridgeon, A. M. et al. (eds.). 1999–. *Genera Orchidacearum*, 1–. Oxford & New York: Oxford University Press.

- adventitious** – applied to roots that do not rise from the radicle but from the stem, etc.; also applied to embryolike structures in a seed that arise from outside the true embryo and often abort.
- androclinium* – see *clinandrium*.
- anther bed* – see *clinandrium*.
- anther canal** – narrow basal part of anther enclosing the *caudicle*.
- anther cap** – a lid formed from the dry outer wall of an anther.
- aseptate** – without a *septum*.
- auricle** – a small lobe or ear, applied to the *lip*; also a small lateral outgrowth on the anther.
- autotroph** (adjective **autotrophic**) – a plant that produces its own nutrition by means of photosynthesis, containing chlorophyll and hence green.
- bract** – a frequently leaflike organ (often very reduced or absent) subtending a flower, inflorescence, or partial inflorescence in its axil, sometimes brightly colored.
- bursicle** – a purselike or pouchlike structure enclosing the *viscidia*.
- calceolate** – slipper-shaped.
- callus** (plural **calli**) – a waxy, fleshy, or other protuberance, as on the *lip*.
- calyculus** – a small cup or circle of bractlike structures outside the *sepals*, e.g., in *Lecanorchis*.
- cataphyll** – a scalelike leaf, often referring to the first such leaves on a shoot.
- caudicle** – an extension of tissue derived from the anther and connecting the *pollinia* to the *stipe* or, in orchids without a *stipe*, directly to the *viscidium*.
- caudiculate** – with *caudicles*.
- claw** – the conspicuously narrowed base of an organ; in the orchids usually applied to the *lip*, but can also be applied to the *sepals* or *petals*.
- clinandrium** – the portion of the orchid *column* underneath the anther.
- column** – an organ of the orchid flower representing the fusion of filaments and style.
- column foot** – an extension at the base of the *column* in some orchids, to which the *lip* and sometimes the lateral *sepals* are attached.
- column wings** – distinct wings on the column of some orchids; these are not “column arms” or *stelia*.
- conduplicate** – folded together lengthwise with the adaxial surfaces facing each other (e.g., a leaf).
- disk** – usually in orchids the area between the lateral lobes in the basal half of the *lip*, the place where the *callus* is usually placed, or sometimes the removable part of the *rostellum* projection.
- dorsal sepal** – referring to the apparently upper *sepal* of a flower; in the majority of orchids this is actually the lower sepal because the flowers are *resupinate*.
- dropper** – a storage organ, primarily a swollen root, but with a bud and some stem structure at the base; it may push down into the soil and form a tuber, placing the plant lower in the soil.
- ecaudiculate** – without *caudicles*.
- elastoviscin** – a highly viscous product of the degeneration of a limited number of tapetal cells keeping pollen together in orchid *pollinia*.
- elaters** – spiral thickenings or hairs which help to disperse spores or seeds, often by hygroscopic action.
- epichile** – terminal lobe of a *lip* that is differentiated into a *hypochile*, sometimes a *mesochile*, and an *epichile*.
- epigeal, epigeous* – see *terrestrial*.
- epilithic* – see *lithophytic*.
- epiphyte** (adjective **epiphytic**) – a plant growing on another plant as its substrate, but not parasitic.
- equitant** – 2-ranked *conduplicate* leaves or bracts with overlapping, clasping bases.
- foliage leaf** – an ordinary, fully developed, and functioning leaf.
- gynandrium, gynostemium* – see *column*.
- gullet** – interior of a conical orchid flower, which the pollinator enters, as in most species of *Dendrobium*.
- hamulus** – a type of *stipe* representing the recurved apex of the *rostellum*.
- heteranthonous** – flowering from special shoots that do not produce *pseudobulbs* or *foliage leaves*.
- heteromycotroph** (adjective **heteromycotrophic**) – a plant that is a *mycotroph* as part of its method of nutrition, usually with inadequate photosynthesis and hence often not green; a facultative mycotroph.
- holomycotroph** (adjective **holomycotrophic**) – a plant that is a *mycotroph* as its sole method of nutrition, without chlorophyll and hence not green; an obligate mycotroph. This condition has often been erroneously referred to as *saprophytic*.
- hypochile** – basal lobe of a *lip* that is differentiated into a *hypochile*, sometimes a *mesochile*, and an *epichile*.
- hysteranthonous** – when an apical inflorescence is produced after the *pseudobulb* and leaves on the same shoot. The inflorescence develops on the top of a fully developed pseudobulb with a fully grown leaf or leaves.
- keiki** – in orchids, a distal vegetative branch of the main stem, which ultimately grows roots and separates.
- labellum* – see *lip*.
- lip** – the median, modified petal of an orchid flower.
- lithophyte** (adjective **lithophytic**) – a plant that grows on rock as its substrate.
- massula** (plural **massulae**) – a mass or packet of pollen grains in *sectile pollinia*.
- mentum** – a spurlike or chinlike extension of the flower composed of the variably united *column foot*, *lip*, and lateral *sepals*.
- mesochile** – the middle lobe of a *lip* that is differentiated into a *hypochile*, sometimes a *mesochile*, and an *epichile*.
- monopodium** (plural **monopodia**, adjective **monopodial**) – referring to a growth habit in which new leaves develop from the same meristem or growing point as all previous leaves; cf. *sympodial*.
- mycorrhiza** – the association of fungi and roots of higher plants, often termed a *symbiosis*.
- mycotroph** (adjective **mycotrophic**) – a plant that obtains part or all of its nutrition from organic substances provided by fungi. See also *heteromycotroph* and *holomycotroph*.
- naked pollinia** – *pollinia* of orchids that lack *caudicles* and other elements of the *pollinarium*.
- operculum* – see *anther cap*.
- palea** – flat or terete moveable appendages attached by a threadlike base, found on the *sepals* and *petals* of certain species of *Bulbophyllum*.
- peloric** – an unusual actinomorphic form of a flower that is normally zygomorphic.

- petal** – any of the whorl of flower parts generally just inside the *sepals*, usually colorful and showy.
- pollinarium** (plural **pollinaria**) – the functional unit of pollen transfer in orchid pollination, consisting of two or more *pollinia* (sometimes with *caudicles*), often a *stipe*, and a *viscidium*.
- pollinium** (plural **pollinia**) – a coherent mass of pollen grains.
- proteranthous** – when an inflorescence is produced before the *pseudobulb* and leaves on the same shoot. The inflorescence develops on the top of a vegetative shoot, of which the leaf or leaves and the terminal internode are not yet developed.
- protocorm** – the ephemeral structure resulting from the germinated orchid seed and from which the first true shoot and root differentiate.
- pseudobulb** – the variously thickened portion of an aerial orchid stem.
- pseudoindefinite** – (of orchids) denotes a stem that grows indefinitely although the plant retains the *sympodium* and produces new shoots at the base.
- pseudopollen** – a mealy, farinose, pollenlike deposit, e.g., on the *lip* in some orchids.
- pseudoraceme** – a specialized leafless apical portion of the stem bearing inflorescences.
- pseudoterminal** – when an inflorescence is apparently terminal, but is actually axillary on a very short terminal internode that is usually concealed by small *bracts*.
- resupinate** – with the pedicel twisted so that the *lip* is always in the same position (usually at the bottom of the flower) regardless of the position of the inflorescence.
- rhizome** – the indeterminate stem or system of stems of many plants, such as *sympodial* orchids, which successively give rise to new shoots and flowers, often horizontal or underground but sometimes appressed to branches or rocks.
- rostellum** – part of the median stigma lobe of orchid flowers.
- rostellum remnant** – the often cleft or 2-lobed part of the *rostellum* that remains after the *viscidium* has been removed by a pollinator.
- rupicolous* – see *lithophytic*.
- saprophyte** (adjective **saprophytic**) – deriving its nourishment, in whole or part, from decaying organic matter. Often used incorrectly for a *heteromycotroph* or *holomycotroph* that lacks chlorophyll. Fungi are true saprophytes.
- sectile** – referring to *pollinia* comprising several “packets” connected by *elastoviscin*.
- sepal** – any of the outermost whorl of lower parts, often as colorful and showy as the *petals* in orchids.
- septum** (plural **septa**, adjective **septate**) – a partition, e.g., in the *spur* of the *lip* of some orchids.
- sinker* – see *dropper*.
- spur** – a saccate or tubular extension of the *lip* (or other floral parts) in many orchids, often containing nectar.
- stelidium** (plural **stelidia**) – a discrete arm or projection borne on each side of the *column*, near the apex, middle, or base, often slender and elongated; e.g., in *Bulbophyllum* and *Dendrochilum*; usually interpreted as staminodia (sterile anthers).
- stipe** – a *pollinium* stalk derived from the *rostellum*.
- stipes* (plural *stipites*) – see *stipe*.
- superposed** – placed on top of each other or at opposite ends.
- symbiosis** – an ecological relationship between two different organisms in which both obtain mutual benefit.
- sympodium** (plural **sympodia**, adjective **sympodial**) – a discontinuous main axis, where the stem is made up of a series of superposed branches, these imitating a single main axis: each new shoot developing from an axillary bud on the previous shoot unit; stem, where growth is, continued not by the main stem but by lateral branches; prevalent in monocots; sympodial inflorescences include the dichasium, rhipidium, cincinnus, and false umbel.
- synanthous** – when *pseudobulb*, leaf, and apical inflorescence are produced together.
- synsepal** – a floral part formed by the partial or complete fusion of two or more *sepals*.
- tegula** – a *pollinium* stalk consisting of the modified epidermis of the *rostellum* and possibly also subtending layers of cells.
- terrestrial** – growing on the ground.
- tuberoid* – see *dropper*.
- velamen** – the spongy outer layer of an orchid root, consisting of dead cells at maturity.
- viscarium* – see *viscidium*.
- viscidium** (plural **viscidia**) – the sticky portion of the *rostellum*, which is often connected to *pollinia*.

## Figures

The following figures are provided to illustrate some of the terms defined in the glossary and to show examples of habit and morphology in the five subfamilies of the Orchidaceae. The figures were redrawn from previously published drawings by:

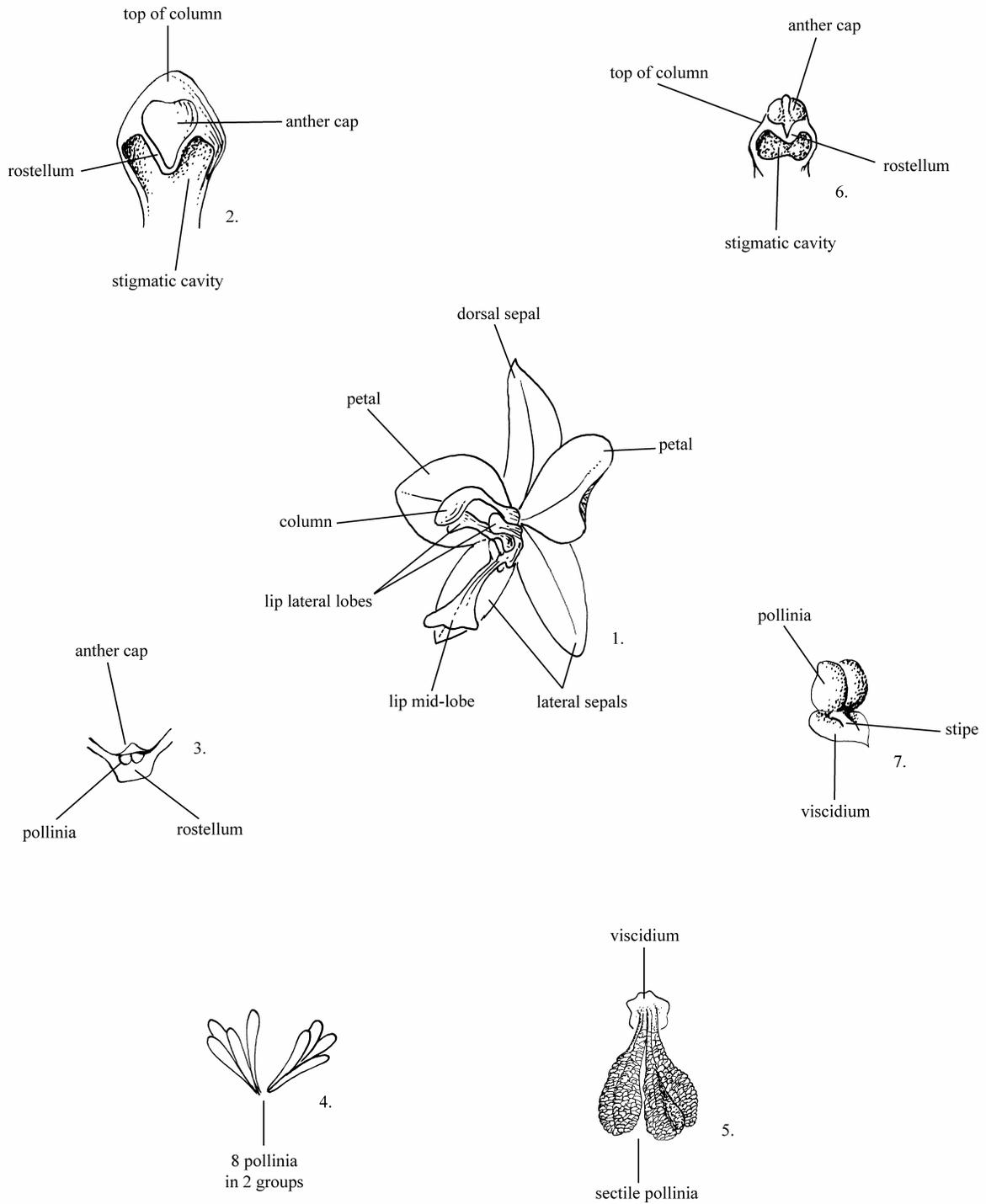
Eleanor Catherine *in*: Cribb, P. J. 1997. The Genus *Cypripedium*. Portland, Oregon: Timber Press. *Cypripedium yunnanense* (p. 200, fig. 30).

Judi Stone *in*: Pridgeon, A. M. et al. (eds.). 1999, 2003. Genera Orchidacearum, 1, 3. Oxford & New York: Oxford University Press. *Apostasia wallichii* (1: 100, fig. 2.1) and *Erythrorchis altissima* (3: 312, fig. 219.1).

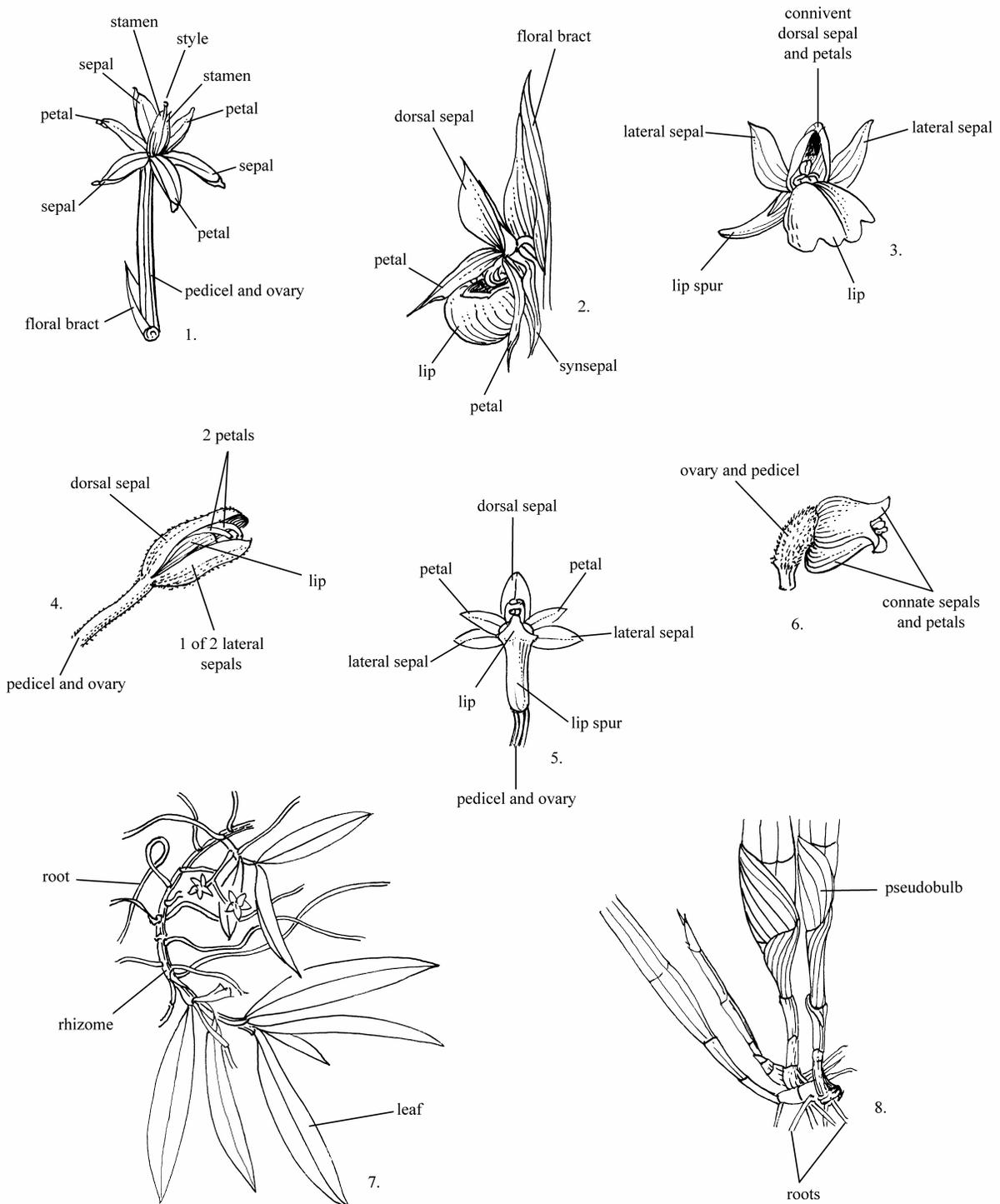
Susanna Stuart-Smith *in*: Pearce, N. R. & Cribb, P. J. 2002. The Orchids of Bhutan [Flora of Bhutan, 3(3)]. Edinburgh: Royal Botanic Garden Edinburgh and Royal Government of Bhutan. *Ponerorchis chusua* (p. 135, fig. 36, as *Chusua pauciflora*), *Cryptochilus luteus* (p. 366, fig. 88), *Cleistoroma linearilobatum* (p. 510, fig. 113), and *Diploprora championii* (p. 516, fig. 114).

Gunnar Seidenfaden and Povl Juul *in*: Seidenfaden, G. 1978. Orchid Genera in Thailand, 6. Dansk Botanisk Arkiv, 32(2). *Goodyera procera* (p. 24, fig. 8h).

Various artists, after Richard Eric Holttum *in*: Seidenfaden, G. & Wood, J. J. 1992. The Orchids of Peninsular Malaysia and Singapore. Fredensborg: Olsen & Olsen. *Spathoglottis plicata* (p. 15, fig. 2), *Vanda* ‘Miss Joaquim’ (p. 18, fig. 4), and *Dendrobium crumenatum* (p. 22, fig. 6).



**Figure 1.** 1–7. Flower structure in the Orchidaceae. 1–4. *Spathoglottis plicata*. 5. *Goodyera procera*. 6–7. *Vanda*.



**Figure 2.** 1–6. Examples of flowers in the five subfamilies of the Orchidaceae. —1. Apostasioideae (*Apostasia wallichii*). —2. Cyripedioideae (*Cyripedium yunnanense*). —3. Orchidoideae (*Ponerorchis chusua*). —4. Vanilloideae (*Erythrorchis altissima*). —5. Epidendroideae (*Cleisostoma linearilobatum*). —6. Epidendroideae (*Cryptochilus luteus*). 7–8. Monopodial and sympodial growth habit. —7. Monopodial (*Diploprora champinonii*). —8. Sympodial (*Dendrobium crumenatum*).



**Figure 3.** 1–3. Examples of plants in the subfamilies of the Orchidaceae. —1. Apostasioideae (*Apostasia wallichii*). —2. Cypripedioideae (*Cypripedium yunnanense*). —3. Orchidoideae (*Ponerorchis chusua*).



**Figure 4.** 1–6. Examples of plants in the subfamilies of the Orchidaceae. 1–2. Vanilloideae (*Erythrorchis altissima*). —1. Habit. —2. Capsules. 3. Epidendroideae (*Cleisostoma linearilobatum*). 4–6. Epidendroideae (*Cryptochilus luteus*). —4. Habit. —5. Inflorescence. —6. Inflorescence.

## Systematic list of subfamilies and genera

● Indicates endemic genera

**1. Apostasioideae (p. 20)**

1. *Apostasia*
2. *Neuwiedia*

**2. Cyprripedioideae (p. 22)**

3. *Cypripedium*
4. *Paphiopedilum*

**3. Orchidoideae (p. 45)**

5. *Goodyera*
6. *Hylophila*
7. *Ludisia*
8. *Herpysma*
9. *Erythrodes*
10. *Cheirostylis*
11. *Kuhlhasseltia*
12. *Myrmechis*
13. *Hetaeria*
14. *Rhomboda*
15. *Chamaegastrodia*
16. *Zeuxine*
17. *Vrydagzynea*
18. *Anoectochilus*
19. *Odontochilus*
20. *Spiranthes*
21. *Pelexia*
22. *Corybas*
23. *Stigmatodactylus*
24. *Cryptostylis*
25. *Microtis*
26. *Orchis*
27. *Galearis*
28. *Ponerorchis*
29. *Hemipilia*
30. *Brachycorythis*
31. *Platanthera*
32. *Dactylorhiza*
33. ● *Smithorchis*
34. *Diphylax*
35. *Herminium*
36. *Amitostigma*
37. *Neottianthe*
38. *Gymnadenia*
39. ● *Tsaiorchis*
40. *Pecteilis*
41. *Peristylus*
42. *Habenaria*
43. *Hemipiliopsis*
44. *Bhutanthera*
45. ● *Frigidorchis*
46. *Diplomeris*
47. *Androcorys*

48. ● *Porolabium*

49. *Disperis*
50. *Satyrium*

**4. Vanilloideae (p. 167)**

51. *Vanilla*
52. *Cyrtosia*
53. *Galeola*
54. *Erythrorchis*
55. *Lecanorchis*
56. *Pogonia*

**5. Epidendroideae (p. 174)**

57. *Cephalanthera*
58. ● *Tangtsinia*
59. *Aphyllorchis*
60. *Epipactis*
61. ● *Diplandrorchis*
62. *Holopogon*
63. *Neottia*
64. *Tropidia*
65. *Corymborkis*
66. *Nervilia*
67. *Gastrodia*
68. *Didymoplexis*
69. *Didymoplexiella*
70. *Didymoplexiopsis*
71. *Stereosandra*
72. *Epipogium*
73. *Bletilla*
74. *Yuania*
75. *Liparis*
76. ● *Ypsilorchis*
77. *Malaxis*
78. *Crepidium*
79. *Dienia*
80. *Oberonioides*
81. *Oberonia*
82. *Risleya*
83. *Oreorchis*
84. *Cremastra*
85. *Tipularia*
86. *Calypto*
87. ● *Changniemia*
88. *Corallorhiza*
89. *Eulophia*
90. *Geodorum*
91. *Cymbidium*
92. *Acriopsis*
93. *Nephelaphyllum*
94. *Tainia*

95. *Eriodes*

96. *Hancockia*
97. *Pachystoma*

98. *Spathoglottis*

99. *Cephalantheropsis*

100. *Phaius*

101. *Calanthe*

102. *Acanthephippium*

103. *Anthogonium*

104. *Collabium*

105. *Chrysoglossum*

106. *Diglyphosa*

107. *Arundina*

108. *Thunia*

109. *Coelogyne*

110. *Pleione*

111. *Panisea*

112. *Dendrochilum*

113. *Pholidota*

114. *Otochilus*

115. *Neogyna*

116. *Bulleyia*

117. ● *Ischnogyne*

118. *Polystachya*

119. *Eria*

120. *Campanulorchis*

121. *Conchidium*

122. *Mycaranthes*

123. *Cylindrolobus*

124. *Dendrolirium*

125. *Aeridostachya*

126. *Bryobium*

127. *Pinalia*

128. *Trichotosia*

129. *Oxystophyllum*

130. *Callostylis*

131. *Porpax*

132. *Ceratostylis*

133. *Cryptochilus*

134. *Agrostophyllum*

135. *Appendicula*

136. *Podochilus*

137. *Thelasis*

138. *Phreatia*

139. *Dendrobium*

140. *Flickingeria*

141. *Epigeneium*

142. *Bulbophyllum*

143. *Monomeria*

144. *Sunipia*

145. *Taeniophyllum*

146. *Sarcophyton*

147. *Micropera*

148. *Doritis*

149. ● *Nothodoritis*

150. *Vandopsis*

151. *Diploprora*

152. *Ornithochilus*

153. *Acampe*

154. *Renanthera*

155. *Schoenorchis*

157. *Cleisostomopsis*

158. *Trichoglottis*

159. *Staurochilus*

160. *Pomatocalpa*

161. *Pelatanthera*

162. *Sarcoglyphis*

163. *Cleisostoma*

164. *Stereochilus*

165. *Esmeralda*

166. *Hygrochilus*

167. *Arachnis*

168. *Thrixspermum*

169. *Chiloschista*

170. *Vanda*

171. *Rhynchostylis*

172. *Uncifera*

173. *Robiquetia*

174. *Saccolabiopsis*

175. *Papilionanthe*

176. *Phalaenopsis*

177. *Chamaeanthus*

178. *Neofinetia*

179. *Sedirea*

180. *Aerides*

181. *Pteroceras*

182. *Biermannia*

183. *Luisia*

184. ● *Haraella*

185. *Gastrochilus*

186. *Holcoglossum*

187. *Ascocentrum*

188. *Penkimia*

189. *Microtatorchis*

190. *Grosourdyia*

191. *Tuberolabium*

192. *Parapteroceras*

193. *Pennilabium*

194. *Malleola*

**Key to subfamilies**

- 1a. Stamens 2 or 3.
- 2a. Flower rotate or subregular; lateral sepals free; lip petal-like, sometimes rather broad; column fused only at base of filaments; anthers 2 or 3, erect above lip; stigma terminal ..... 1. Subfam. Apostasioideae (p. 20)
- 2b. Flower zygomorphic (bilaterally symmetrical); lateral sepals usually fused almost to apex; lip usually saccate or urceolate; column with 2 lateral anthers and a terminal usually shield-shaped staminode; stigma ventral, stalked ..... 2. Subfam. Cypripedioideae (p. 22)
- 1b. Stamen solitary.
- 3a. Plants usually terrestrial, growing from tubers or a horizontal fleshy rhizome; anther basifixed or not; pollinia segmented, comprising massulae, or mealy ..... 3. Subfam. Orchidoideae (p. 45)
- 3b. Plants usually epiphytic or lithophytic, rarely terrestrial or lianallike, growing from cylindrical stems or pseudobulbs, borne on woody or tough rhizomes; anther not basifixed; pollinia mealy or hard, often attached by a stalk to a sticky viscidium.
- 4a. Plants lianallike or terrestrial, often heteromycotrophic and lacking green leaves; stems cylindrical, never pseudobulbous; pollinia 2, powdery, as monads or tetrads, lacking a stipe and a distinct viscidium ..... 4. Subfam. Vanilloideae (p. 167)
- 4b. Plants epiphytic, lithophytic, or less commonly terrestrial, rarely heteromycotrophic; stems cylindrical to pseudobulbous; pollinia 2, 4, 6, or 8, usually hard, rarely sectile, often attached by 1 or 2 stipes to 1 or 2 distinct viscidia ..... 5. Subfam. Epidendroideae (p. 174)

**Key to genera**

- 1a. Fertile stamens 2 or 3, if 2, opposite to lateral petals; pollen not forming pollinia.
- 2a. Flowers actinomorphic or almost so; lip similar to petals, neither saccate nor urceolate (1. Subfam. Apostasioideae).
- 3a. Fertile stamens 2; inflorescence often  $\pm$  curved outward or pendulous, branched ..... 1. *Apostasia* (p. 20)
- 3b. Fertile stamens 3; inflorescence erect, unbranched ..... 2. *Neuwiedia* (p. 21)
- 2b. Flowers strongly zygomorphic; lip conspicuously saccate or urceolate, very different from petals (2. Subfam. Cypripedioideae).
- 4a. Leaves plicate, usually cauline, rarely 2 prostrate on substrate; perianth persistent when fruiting ..... 3. *Cypripedium* (p. 22)
- 4b. Leaves conduplicate, basal, 3 to many, distichous; perianth caducous when fruiting ..... 4. *Paphiopedilum* (p. 33)
- 1b. Fertile stamen 1, rarely 2, if 2, opposite to dorsal sepal and lip; pollen forming pollinia.
- 5a. Holomycotrophic plants, without chlorophyll ..... Key 2
- 5b. Autotrophic plants, with chlorophyll in leaves, stems, and/or roots.
- 6a. Pollinia soft or sectile; plants always terrestrial; leaves not articulated ..... Key 3 (p. 10)
- 6b. Pollinia waxy or bony, hard or relatively hard; plants mostly epiphytic, rarely terrestrial; leaves often articulated at base.
- 7a. Plants monopodial, without pseudobulbs or thickened stems, rhizomes, or tubers; pollinia bony, very hard, often attached by a common stipe to a viscidium ..... Key 4 (p. 13)
- 7b. Plants sympodial, mostly with pseudobulbs or thickened stems, rhizomes, or tubers; pollinia not very hard, usually without stipe ..... Key 5 (p. 15)

**Key 2: Holomycotrophic genera**

- 1a. Pollinia waxy or bony, hard or relatively hard.
- 2a. Pollinia 4–6.
- 3a. Plants with a slender, nearly cylindrical, straight rhizome; sepals 1–2 mm; lip unlobed ..... 82. *Risleya* (p. 245)
- 3b. Plants with a coralloid rhizome; sepals 4–10 mm; lip 3-lobed ..... 88. *Corallorhiza* (p. 252)
- 2b. Pollinia 8.
- 4a. Lip not saccate or spurred at base; leaves with neither long petiole nor pseudostem at base; column foot absent ..... 91. *Cymbidium* (p. 260)
- 4b. Lip saccate or spurred at base; leaves long petiolate, petioles often forming a pseudostem; column foot conspicuous ..... 89. *Eulophia* (p. 253)
- 1b. Pollinia soft or sectile.
- 5a. Plants scrambling vines; fruit a pod or a long capsule; seeds with thick testa, wingless or surrounded by  $\pm$  annular wing.
- 6a. Fruit fleshy, indehiscent; seeds wingless or with  $\pm$  annular wing narrower than seed itself ..... 52. *Cyrtosia* (p. 168)
- 6b. Fruit dry, dehiscent; seeds with broad wings, wider on one side than seed itself.
- 7a. Stem robust; rachis, ovary, and sepals all  $\pm$  covered with rust-colored hairs; column less than 1/2 as long as lip ..... 53. *Galeola* (p. 169)
- 7b. Stem rather slender; inflorescence and flowers glabrous; column more than 1/2 as long as lip ..... 54. *Erythrorchis* (p. 171)

- 5b. Plants erect terrestrial herbs; fruit a capsule; seeds without thick testa, with narrow, long wings at both ends,  $\pm$  fusiform.
- 8a. Sepals and petals  $\pm$  connate and forming a tube.
- 9a. Pollinia 2; sepals and petals united into perianth tube for almost complete length, with its apex 5-lobed, lip enclosed within perianth tube; stigma often at base of column ..... 67. *Gastrodia* (p. 201)
- 9b. Pollinia 4; sepals and petals united into perianth tube for up to 1/2 length, lip not enclosed; stigma almost at apex of column.
- 10a. Column wingless, with a short foot at base ..... 68. *Didymoplexis* (p. 205)
- 10b. Column with a pair of falcate wings, without a foot at base ..... 69. *Didymoplexiella* (p. 206)
- 8b. Sepals and petals free.
- 11a. Calyculus present between ovary and sepals ..... 55. *Lecanorchis* (p. 171)
- 11b. Calyculus lacking between ovary and sepals.
- 12a. Plants with spindle-shaped, coralloid, tuberlike, or cylindric, fleshy rhizomes, without clustered, fleshy roots; pollinarium with either caudicle or viscidium.
- 13a. Pollinia attached  $\pm$  directly to viscidium.
- 14a. Lip with a broad spur below middle; rhizome cylindric or coralloid, stout, fleshy, branched, with many scalelike sheaths ..... 74. *Yoania* (p. 210)
- 14b. Lip without any spur; rhizome moniliform ..... 70. *Didymoplexiopsis* (p. 207)
- 13b. Pollinia attached to viscidium by distinct caudicles.
- 15a. Rhizome cylindric, stemlike, decumbent; rostellum as long as anther ..... 15. *Chamaegastrodia* (p. 69)
- 15b. Rhizomes coralloid or tuberlike; rostellum shorter than anther.
- 16a. Lip spurless; anther with a slender filament; caudicle 1 ..... 71. *Stereosandra* (p. 207)
- 16b. Lip spurred; anther without a slender filament; caudicles 2 ..... 72. *Epipogium* (p. 207)
- 12b. Plants with shortened, relatively hard rhizomes and clustered, fleshy or fibrous roots; pollinarium with neither caudicle nor viscidium.
- 17a. Stigma terminal; rostellum absent.
- 18a. Fertile stamens 2 ..... 61. *Diplandrorchis* (p. 183)
- 18b. Fertile stamen 1 ..... 62. *Holopogon* (p. 183)
- 17b. Stigma lateral or rarely subterminal; rostellum present, usually above concave stigma.
- 19a. Lip deeply 2-lobed or very rarely long acuminate at apex; rostellum often as long as anther ..... 63. *Neottia* (p. 184)
- 19b. Lip neither deeply 2-lobed nor long acuminate at apex; rostellum conspicuously shorter than anther.
- 20a. Lip spurred or saccate at base, with longitudinal lamellae on mid-lobe ..... 57. *Cephalanthera* (p. 174)
- 20b. Lip neither spurred nor saccate, without longitudinal lamellae on mid-lobe ..... 59. *Aphyllorchis* (p. 177)

**Key 3: Subfams. Orchidoideae, some Vanilloideae, primitive Epidendroideae**

- 1a. Plants with conspicuous, long, climbing stems; fruit a pod or a long capsule; seeds with thick testa, wingless or surrounded by  $\pm$  annular wing ..... 51. *Vanilla* (p. 167)
- 1b. Plants not climbing, stems erect; fruit a capsule; seeds without thick testa, with narrow, long wings at both ends,  $\pm$  fusiform.
- 2a. Plants leafless at anthesis.
- 3a. Leaves many, often 7 or 8, oblong to elliptic, shortly petiolate; ovary and sepals pubescent ..... 21. *Pelexia* (p. 86)
- 3b. Leaf 1, broadly ovate to cordate, long petiolate; ovary and sepals glabrous ..... 66. *Nervilia* (p. 197)
- 2b. Plants with a leaf or leaves at anthesis.
- 4a. Leaves plicate, papery or thinly leathery.
- 5a. Leaves clustered on lower part to base of stem; pollinia 8, in 2 groups ..... 73. *Bletilla* (p. 209)
- 5b. Leaves spaced above middle of stem, or rarely clustered at its apex; pollinia 2 or 4.
- 6a. Inflorescence lateral or terminal; flowers densely arranged on a shortened inflorescence; rostellum long and erect; pollinarium with sectile pollinia, with caudicle and viscidium.
- 7a. Inflorescence unbranched; sepals less than 1 cm; basal part of lip wider than its apical part ..... 64. *Tropidia* (p. 195)
- 7b. Inflorescence branched; sepals more than 3 cm; apical part of lip wider than its basal part .... 65. *Corymborkis* (p. 197)
- 6b. Inflorescence terminal; flowers scattered on a long inflorescence; rostellum very small or nearly absent; pollinarium with granular pollinia, without caudicle and viscidium.
- 8a. Flowers actinomorphic, with lip similar to petals; stigma terminal ..... 58. *Tangtsinia* (p. 177)
- 8b. Flowers zygomorphic, with lip conspicuously different from petals; stigma lateral.
- 9a. Flowers concolorous, white or yellow; upper bracts small, not foliaceous, shorter than pedicel and ovary (except *C. damasonium*); lip 3-lobed, saccate or spurred at base ..... 57. *Cephalanthera* (p. 174)
- 9b. Flowers usually not concolorous, green, brown, purple, or yellow; upper bracts large, foliaceous, longer than pedicel and ovary; lip contracted in middle forming epichile and hypochile, neither spurred nor saccate at base, sometimes with concave hypochile ..... 60. *Epipactis* (p. 179)

- 4b. Leaves not plicate, herbaceous or membranous.
    - 10a. Leaves 2, inserted at or near middle of stem, opposite or subopposite ..... 63. *Neottia* (p. 184)
    - 10b. Leaves 1 or more than 2, or if 2, then either adpressed to ground or clearly alternate.
      - 11a. Pollinia granular, without separable massulae.
        - 12a. Leaves many, basal ..... 20. *Spiranthes* (p. 84)
        - 12b. Leaves 1 or 2, basal or cauline.
          - 13a. Leaves basal; flowers usually more than 10.
            - 14a. Leaves flat, 40–50 mm wide, with long, distinct petiole; plants with a few ± fleshy roots ..... 24. *Cryptostylis* (p. 88)
            - 14b. Leaves cylindric, 2–3 mm wide, without distinct petiole; plants with globose tubers ..... 25. *Microtis* (p. 89)
          - 13b. Leaves cauline; flowers 1 or 2(or 3).
            - 15a. Leaves elliptic to oblong-lanceolate, 3–8 cm, not reticulate-veined; plants without tubers ..... 56. *Pogonia* (p. 172)
            - 15b. Leaves ovate to cordate, less than 2 cm, reticulate-veined; plants with globose tubers.
              - 16a. Bracts not leaflike; lip with 2 spurs ..... 22. *Corybas* (p. 86)
              - 16b. Bracts leaflike; lip without any spur ..... 23. *Stigmatodactylus* (p. 88)
      - 11b. Pollinia sectile, with many separable massulae.
        - 17a. Anther connected to column by a narrow base, never completely connate to column, often narrowed and elongated toward apex, wholly withered or deciduous later; caudicle protruding from anther apex.
          - 18a. Stigma 1.
            - 19a. Lip separate from column, not divided into apical and basal parts, wholly cymbiform or pouchlike or basal half concave-saccate; sac or pouch not 2-lobed at apex.
              - 20a. Lip cymbiform or basal half concave-saccate; pollinia sessile ..... 5. *Goodyera* (p. 45)
              - 20b. Lip pouchlike; pollinia with a long caudicle ..... 6. *Hylophila* (p. 54)
            - 19b. Lip ± adnate to column at base, divided into apical and basal parts, base with a sac or spur shallowly 2-lobed at apex.
              - 21a. Column twisted; rostellum not forked to 2-lobed; lip saccate at base ..... 7. *Ludisia* (p. 55)
              - 21b. Column straight; rostellum forked to 2-lobed; lip spurred at base.
                - 22a. Spur 7–10 mm; lip with 1 lamella and 2 calli on disk ..... 8. *Herpysma* (p. 56)
                - 22b. Spur 1.5–4 mm; lip without lamella or callus on disk ..... 9. *Erythrodes* (p. 56)
          - 18b. Stigmas 2, lateral (except in *Odontochilus tortus*).
            - 23a. Sepals ± connate into a tube.
              - 24a. Sepals connate at or above middle forming a tube; column with 2 erect, armlike appendages ..... 10. *Cheirostylis* (p. 57)
              - 24b. Sepals connate below middle forming a tube; column without armlike appendages .... 11. *Kuhlhasseltia* (p. 63)
            - 23b. Sepals free.
              - 25a. Leaves 4–15 mm; inflorescence with 1 or 2(or 3) flowers ..... 12. *Myrmechis* (p. 63)
              - 25b. Leaves more than 20 mm; inflorescence usually with 3 to many flowers.
                - 26a. Flowers not resupinate, with lip at top, usually without a mesochile (mesochile present with involute margins in *H. anomala*) ..... 13. *Hetaeria* (p. 65)
                - 26b. Flowers resupinate, with lip at bottom (except a few species in *Anoectochilus* in which lip has a fimbriate or fimbriate-toothed mesochile).
                  - 27a. Lip with a cylindric or fusiform spur.
                    - 28a. Column lacking ventral wings; lip without a mesochile; lip hypochile containing 2 stalked glands ..... 17. *Vrydagzynea* (p. 76)
                    - 28b. Column with ventral wings; lip with an often toothed or pectinate mesochile; lip hypochile without stalked glands inside ..... 18. *Anoectochilus* (p. 76)
  - 27b. Lip lacking a spur.
    - 29a. Lip with a raised median keel ..... 14. *Rhomboda* (p. 67)
    - 29b. Lip lacking a raised median keel.
      - 30a. Stigma lobes stalked; lip with an elongate, involute mesochile; inflorescence 1- or 2-flowered ..... 12. *Myrmechis* (p. 63)
      - 30b. Stigma lobes not stalked; inflorescence several flowered.
        - 31a. Lip with an elongate mesochile with entire to lacerate flanges; column twisted; stigma lobes apical ..... 19. *Odontochilus* (p. 80)
        - 31b. Lip with a short mesochile, rarely with entire flanges; column not twisted; stigma lobes lateral ..... 16. *Zeuxine* (p. 71)
- 17b. Anther connate to column with its broad base or back, not narrowed toward apex, persistent; caudicle protruding from base of anther.
  - 32a. Lip uppermost, hooded, with 2 spurs ..... 50. *Satyrium* (p. 165)

- 32b. Lip usually lowermost, not hooded, with 1 or no spur.
- 33a. Lateral sepals  $\pm$  saccate or  $\pm$  spurlike near middle; anther not erect due to recurved column; lip erect, not spurred; leaves less than 2 cm ..... 49. *Disperis* (p. 164)
- 33b. Lateral sepals never saccate or spurlike near middle; anther erect; lip spreading or nodding, base often spurred; leaves often more than 2 cm.
- 34a. Lip with 2 pores toward base ..... 48. *Porolabium* (p. 164)
- 34b. Lip lacking pores.
- 35a. Connective broadly hooded; 2 anther locules widely separated ..... 47. *Androcorys* (p. 162)
- 35b. Connective not hooded; 2 anther locules close together.
- 36a. Stigma often 1 (rarely 2 in some *Platanthera* species).
- 37a. Viscidia hidden in a common bursicle.
- 38a. Rootstock of tubers, subglobose, ovoid, or ellipsoid, not divided ..... 26. *Orchis* (p. 90)
- 38b. Rootstock a creeping rhizome ..... 27. *Galearis* (p. 90)
- 37b. Viscidia naked or hidden in 2 separate bursicles.
- 39a. Stigma raised and thickened.
- 40a. Staminode with a stalk; rostellum absent; sepals and petals  $\pm$  connivent into a hood ..... 34. *Diphylax* (p. 117)
- 40b. Staminode sessile; rostellum small but distinct; sepals not connivent.
- 41a. Rostellum similar in appearance to stigma; flowers 2–3 mm wide, not resupinate, with lip at top ..... 33. *Smithorchis* (p. 117)
- 41b. Rostellum different in appearance from stigma; flowers 7–8 mm wide, resupinate, with lip at bottom.
- 42a. Flowers usually pink or purple, often spotted purple on lip, or green with a chestnut-brown lip; plants with palmate tubers; viscidia naked; lip without 2 small lobes at base ..... 32. *Dactylorhiza* (p. 114)
- 42b. Flowers white, cream-colored, yellow-green, or green; plants with fusiform tubers; viscidia enclosed in shell-like bursicles formed by rostellum margins; lip with 2 very small lobes at base ..... 31. *Platanthera* (p. 101)
- 39b. Stigma often neither raised nor thickened (except some *Platanthera* species with (1 or)2 stigmas).
- 43a. Tubers digitately or palmately lobed ..... 32. *Dactylorhiza* (p. 114)
- 43b. Tubers ovoid, ellipsoidal, or fusiform.
- 44a. Bracts leafy, leaves merging into floral bracts ..... 30. *Brachycorythis* (p. 100)
- 44b. Bracts distinctly smaller than leaves and not leaflike.
- 45a. Lip ligulate; flowers white, yellow-green, or green ..... 31. *Platanthera* (p. 101)
- 45b. Lip lobed, not ligulate; flowers often purple or pink.
- 46a. Anther locules parallel, connective obscure; lip lacking calli at mouth of spur ..... 28. *Ponerorchis* (p. 92)
- 46b. Anther locules divergent, with a broad connective; lip with 2 small calli at mouth of spur ..... 29. *Hemipilia* (p. 98)
- 36b. Stigmas 2, usually separate, conjoined in *Bhutanthera*.
- 47a. Tubers fusiform or tapering to a slender apex, sometimes digitately or palmately divided.
- 48a. Tubers palmately or digitately divided; flowers pink to purple; lip 3-lobed, often obscurely so ..... 38. *Gymnadenia* (p. 133)
- 48b. Tubers fusiform, not divided; flowers white, green, or yellow-green; lip ligulate ..... 31. *Platanthera* (p. 101)
- 47b. Tubers ovoid, ellipsoid, or somewhat cylindrical.
- 49a. Viscidia involute and hornlike; lip often spurless ..... 35. *Herminium* (p. 119)
- 49b. Viscidia not involute, sometimes slightly curved, but not hornlike; lip often spurred.
- 50a. Rostellum without distinct arms, beaklike or square to triangular.
- 51a. Rostellum beaklike, 1-toothed on either side; underground rhizomes cylindrical; viscidium hidden in a cavity formed by lip and column ..... 39. *Tsaiorchis* (p. 135)
- 51b. Rostellum square or triangular, toothless; underground tubers ellipsoid or palmate; viscidium naked.
- 52a. Raceme not secund; sepals completely separate from each other; leaf often 1 ..... 36. *Amitostigma* (p. 124)
- 52b. Raceme often secund; sepals connate for ca. 3/4 into a hood; leaves often 2–4 or more ..... 37. *Neottianthe* (p. 131)

- 50b. Rostellum with arms, neither beaklike nor square to triangular.
  - 53a. Viscidium hidden within a tubular fold at end of rostellum arm ..... 40. *Pecteilis* (p. 136)
  - 53b. Viscidium naked.
    - 54a. Rostellum arms very short; anther with 2 parallel locules; flowers small ..... 41. *Peristylus* (p. 137)
    - 54b. Rostellum arms long; anther with 2 usually divergent locules.
      - 55a. Stem, rachis, leaves, and ovary all spotted with purple; spur with a large mouth and globose apex ..... 43. *Hemipiliopsis* (p. 160)
      - 55b. Stem, rachis, leaves, and ovary not all spotted with purple; spur without a swollen globose apex and large mouth.
        - 56a. Inflorescence with 1(or 2) rather large flowers; petals 10–21 mm, much longer than sepals ..... 46. *Diplomeris* (p. 162)
        - 56b. Inflorescence with 1 or 2 very small flowers (4–5 mm in diam.) or 3 to many rather large flowers; petals smaller than sepals.
          - 57a. Inflorescence with 1 or 2 flowers; stigmas conjoined, pulvinate; tubers ovoid or globose ..... 44. *Bhutanthera* (p. 161)
          - 57b. Inflorescence usually with 3 to many flowers; stigmas separate, not pulvinate; tubers ellipsoid or oblong or gourd-shaped.
            - 58a. Seed fusiform with elongated testa cells, lacking any appendages; plants 8–75 cm tall; tubers ellipsoid or oblong ..... 42. *Habenaria* (p. 144)
            - 58b. Seed lacking elongated testa and with a baglike appendage on each side; plants 3–4 cm tall; tubers gourd-shaped ..... 45. *Frigidorchis* (p. 161)

**Key 4: Subfam. Epidendroideae: monopodial taxa**

- 1a. Plants with leaves reduced to inconspicuous scarious scales, roots containing chlorophyll, often ± flattened against substrate.
  - 2a. Scape or inflorescence erect, less than 2 cm, glabrous ..... 145. *Taeniophyllum* (p. 444)
  - 2b. Scape or inflorescence pendulous, more than 10 cm, densely hairy ..... 169. *Chiloschista* (p. 470)
- 1b. Plants with normal green leaves.
  - 3a. Pollinia 4, subglobose, separate from each other.
    - 4a. Terrestrial plants; lip 5-lobed; column foot to 6 mm ..... 148. *Doritis* (p. 445)
    - 4b. Epiphytic plants; lip ± 3-lobed; column foot absent or very short.
      - 5a. Stem very short, invisible; leaves all basal; lip with a sac at base of mid-lobe ..... 149. *Nothodoritis* (p. 446)
      - 5b. Stem elongate, 25–100 cm; leaves cauline; lip with a spur at base.
        - 6a. Inflorescence axillary; leaf blade linear, 1.5–1.8 cm wide ..... 146. *Sarcophyton* (p. 445)
        - 6b. Inflorescence often leaf-opposed; leaf blade lorate, 3–4.5 cm wide ..... 147. *Micropera* (p. 445)
  - 3b. Pollinia 2, sometimes each divided into 2 pieces, but then not subglobose.
    - 7a. Pollinia subglobose, not cleft, split, or porate.
      - 8a. Plants very small; leaves 0.5–1.5 cm; sepals and petals connate at base to form a tube ..... 189. *Microtatorchis* (p. 503)
      - 8b. Plants small to medium-sized; leaves 4–17 cm; sepals and petals free.
        - 9a. Column with a conspicuous foot.
          - 10a. Scape glabrous; stem 2–12 cm ..... 192. *Parapteroceras* (p. 505)
          - 10b. Scape densely minutely hispid; stem less than 1 cm ..... 190. *Grosourdyia* (p. 504)
        - 9b. Column without a foot.
          - 11a. Lateral lobes of lip large, apical margin serrate or fimbriate ..... 193. *Pennilabium* (p. 505)
          - 11b. Lateral lobes of lip inconspicuous, margin neither serrate nor fimbriate.
            - 12a. Rachis slender, never thickened and sulcate, never clavate; column hammer-shaped; stipe linear-spatulate, much broadened at apex ..... 194. *Malleola* (p. 506)
            - 12b. Rachis fleshy, sulcate, or sometimes clavate, few to many flowered, with a few or all flowers open simultaneously; column short and stout, not hammer-shaped; stipe linear, not broadened at apex ..... 191. *Tuberolabium* (p. 504)
    - 7b. Pollinia ± cleft, split, or porate, sometimes each completely divided into 2 pieces.
      - 13a. Each pollinium porate at apex.
        - 14a. Lip neither spurred nor saccate.
          - 15a. Leaves narrowly terete ..... 183. *Luisia* (p. 488)
          - 15b. Leaves not terete.
            - 16a. Inflorescence 0.5–1.5 cm; lip 3-lobed; column foot short but distinct ..... 182. *Biermannia* (p. 487)
            - 16b. Inflorescence 2–4 cm; lip contracted in middle; column foot absent ..... 184. *Haraella* (p. 491)
        - 14b. Lip spurred or saccate at base.

- 17a. Lip not 3-lobed, often contracted in middle and with a pouchlike or saccate hypochile, lacking lateral lobes ..... 185. *Gastrochilus* (p. 491)
- 17b. Lip 3-lobed, base with a distinct spur and 2 lateral lobes on both sides of its mouth.
- 18a. Lateral sepals wider than dorsal sepal, oblique; spur tapered toward apex; mid-lobe of lip 7–15 mm wide; pedicel and ovary 1.7–5 cm ..... 186. *Holcoglossum* (p. 499)
- 18b. Lateral sepals similar to dorsal sepal; spur cylindric, usually  $\pm$  dilated toward apex; mid-lobe of lip 1–4 mm wide; pedicel and ovary 0.6–1.5 cm.
- 19a. Lateral lobes of lip inserted beside entrance of spur; lip often with appendages at base; spur 5–15 mm; sepals and petals 4–9  $\times$  2–6 mm ..... 187. *Ascocentrum* (p. 502)
- 19b. Lateral lobes of lip inserted distally to spur on sides of mid-lobe; spur 2–2.3 mm; sepals and petals 2.5–3.5  $\times$  1.2–1.7 mm ..... 188. *Penkimia* (p. 503)
- 13b. Each pollinium cleft or split, or sometimes divided into 2 unequal halves.
- 20a. Each pollinium cleft or split.
- 21a. Column foot conspicuous.
- 22a. Leaves terete ..... 175. *Papilionanthe* (p. 477)
- 22b. Leaves flat.
- 23a. Lip spurless.
- 24a. Lip immovable ..... 176. *Phalaenopsis* (p. 478)
- 24b. Lip movable ..... 177. *Chamaeanthus* (p. 483)
- 23b. Lip spurred, spur spreading at a right angle to column foot.
- 25a. Lip spur often horn-shaped, curved; mid-lobe large, flat ..... 180. *Aerides* (p. 485)
- 25b. Lip spur usually oblong-cylindric, not curved; mid-lobe fleshy, strongly reduced ..... 181. *Pteroceras* (p. 486)
- 21b. Column foot absent or very inconspicuous.
- 26a. Lip movable ..... 179. *Sedirea* (p. 484)
- 26b. Lip immovable.
- 27a. Stipe broad, short, shorter or slightly longer than pollinia; viscidium usually suborbicular to transversely elliptic ..... 170. *Vanda* (p. 471)
- 27b. Stipe narrow, long, much longer than pollinia, usually widened toward apex; viscidium not as above.
- 28a. Plants large, with thick aerial roots; leaves 20–40 cm ..... 171. *Rhynchostylis* (p. 474)
- 28b. Plants medium-sized, without thick aerial roots; leaves 4–20 cm.
- 29a. Stipe linear, apex curving forward, sigmoid, rising behind and above pollinia, pollinia separated by a vertical lamella on stipe ..... 172. *Uncifera* (p. 475)
- 29b. Stipe not as above.
- 30a. Plants rather long stemmed, with distant leaves; spur of lip contracted in middle and then globose and circinate at apex, ornamented inside ..... 173. *Robiquetia* (p. 475)
- 30b. Plants very short stemmed (1–6 cm); spur of lip not as above, unornamented inside.
- 31a. Flowers minute (sepals 2–2.5 mm); inflorescence slender, laxly many flowered; mid-lobe of lip (when present) tiny, spur short, often saccate, not slender or slightly curved ..... 174. *Saccolabiopsis* (p. 476)
- 31b. Flowers larger (sepals 8–10 mm); inflorescence few flowered; mid-lobe of lip large, spreading horizontally, spur slender, cylindric, sometimes slightly curved ..... 178. *Neofinetia* (p. 483)
- 20b. Each pollinium completely divided into 2 unequal halves, halves never globose.
- 32a. Column foot conspicuous.
- 33a. Stem often elongate, 2–8 cm, with (4–)6–10 or more cauline leaves (except *T. eximium*); lip without any appendage between 2 lateral lobes or at base of mid-lobe adaxially ..... 168. *Thrixspermum* (p. 466)
- 33b. Stem short, often less than 1 cm, with 3–5 subbasal leaves; lip with 1 fleshy or forked appendage between 2 lateral lobes or at base of mid-lobe adaxially ..... 176. *Phalaenopsis* (p. 478)
- 32b. Column foot inconspicuous or absent.
- 34a. Lip movable.
- 35a. Both sepals and petals oblanceolate or narrowly spatulate, 5–6  $\times$  as long as wide ..... 167. *Arachnis* (p. 465)
- 35b. Both sepals and petals broadly obovate to obovate-elliptic, 2–3  $\times$  as long as wide.
- 36a. Stem 10–20 cm, with 3–5 leaves; sepals and petals marked with colored spots; viscidium small, suborbicular ..... 166. *Hygrochilus* (p. 465)
- 36b. Stem 20–70 cm, often with 6–8 leaves; sepals and petals marked with colored transverse stripes; viscidium large, saddlelike ..... 165. *Esmeralda* (p. 464)

- 34b. Lip immovable.
- 37a. Lip with neither spur nor sac at base, sometimes concave.
- 38a. Inflorescence 30–50 cm, much longer than leaves; flowers 5–6 cm in diam.; lip shorter than either sepals or petals ..... 150. *Vandopsis* (p. 446)
- 38b. Inflorescence 10–15 cm, shorter or slightly longer than leaves; flowers 1.5–2 cm in diam.; lip longer than either sepals or petals ..... 151. *Diploprora* (p. 447)
- 37b. Lip with a spur or sac at base.
- 39a. Spur of lip with a longitudinal (various in length) septum or ridge inside.
- 40a. Inflorescence ca. 1 cm, with 2–7 flowers; column with 2 linear and curved appendages on both sides toward apex ..... 161. *Pelatantheria* (p. 456)
- 40b. Inflorescence more than 3 cm, usually with more than 10 flowers; column without appendages as above.
- 41a. Rostellum very small; pollinia without caudicles; stipe various in shape but not long linear or curved ..... 163. *Cleisostoma* (p. 458)
- 41b. Rostellum large; pollinia with short but distinct caudicles; stipe long linear, ± curved.
- 42a. Leaves unequally and deeply bilobed at apex; stipe strongly curved ..... 162. *Sarcoglyphis* (p. 457)
- 42b. Leaves very minutely bilobed at apex; stipe slightly curved ..... 164. *Stereochilus* (p. 463)
- 39b. Spur of lip without septum or ridge inside.
- 43a. Spur with appendage (often ligulate) on inner wall.
- 44a. Leaves terete; spur with Y-shaped appendage on back wall ..... 157. *Cleisostomopsis* (p. 453)
- 44b. Leaves not terete; spur with tongue-shaped appendage on back wall.
- 45a. Spur with an erect, forked-tipped tongue in middle or near bottom of back wall; column not conspicuously toothed, glabrous ..... 160. *Pomatocalpa* (p. 455)
- 45b. Spur with a movable, hairy tongue in upper part of back wall; column toothed, hairy.
- 46a. Inflorescence 0.5–1(–1.5) cm, much shorter than leaves, densely several flowered or reduced to a single flower ..... 158. *Trichoglottis* (p. 453)
- 46b. Inflorescence 5–45 cm, nearly as long as or much longer than leaves, sparsely several to many flowered ..... 159. *Staurochilus* (p. 454)
- 43b. Spur usually without appendage on inner wall.
- 47a. Flowers not resupinate, with lip at top ..... 153. *Acampe* (p. 449)
- 47b. Flowers resupinate, with lip at bottom.
- 48a. Lip clawed basally, with a spur in apical half of claw; spur far from ovary; mid-lobe erose-crested or fimbriate along margins; column with a very short foot ..... 152. *Ornithochilus* (p. 448)
- 48b. Lip not clawed at base, spurred at base; spur close to ovary; mid-lobe entire; column footless.
- 49a. Flowers 3–5 cm in diam.; lip much smaller than petals, almost 1/10 as long as petals ..... 155. *Renanthera* (p. 451)
- 49b. Flowers less than 1 cm in diam.; lip nearly as large as petals.
- 50a. Lip with a fleshy transverse appendage at base of mid-lobe over entrance to spur ..... 154. *Smitinandia* (p. 450)
- 50b. Lip without a fleshy transverse appendage over entrance to spur ..... 156. *Schoenorchis* (p. 452)

**Key 5: Subfam. Epidendroideae p.p.: sympodial taxa**

- 1a. Lateral sepals connate into a synsepal; inflorescence branched ..... 92. *Acriopsis* (p. 280)
- 1b. Lateral sepals free or forming a tube with dorsal sepal, if connate into a synsepal; inflorescence unbranched.
- 2a. Pollinia 2.
- 3a. Stems each with a single leaf.
- 4a. Lip clawed at base; mentum spurlike, cylindric, 4–6 mm ..... 104. *Collabium* (p. 311)
- 4b. Lip not clawed at base; mentum not as above.
- 5a. Lip 3-lobed; mentum distinct, conic, ca. 2 mm ..... 105. *Chrysoglossum* (p. 313)
- 5b. Lip unlobed; mentum indistinct ..... 106. *Diglyphosa* (p. 314)
- 3b. Stems each with 2 to many leaves.
- 6a. Lip not saccate or spurred at base; leaves with neither long petiole nor pseudostem at base; if mycotrophic, without column foot ..... 91. *Cymbidium* (p. 260)
- 6b. Lip saccate or spurred at base; leaves long petiolate; petioles often forming a pseudostem; if mycotrophic, column foot conspicuous.

- 7a. Inflorescence erect; anther cap with 2 dark projections; lip conspicuously 3-lobed ..... 89. *Eulophia* (p. 253)
- 7b. Inflorescence nodding; anther cap without projections as above; lip often unlobed or inconspicuously 3-lobed ..... 90. *Geodorum* (p. 258)
- 2b. Pollinia 4–8.
- 8a. Pollinia 8.
- 9a. Inflorescence globose, densely flowered; sepals 4–5 mm ..... 134. *Agrostophyllum* (p. 362)
- 9b. Inflorescence racemose or reduced to a single flower; sepals (8–)10–70 mm.
- 10a. Inflorescences and often stems, leaves, and leaf sheaths ± covered with reddish brown, or rarely white, hispid hairs; leaves never fleshy and subterete ..... 128. *Trichotosia* (p. 357)
- 10b. Inflorescences, stems, and leaves glabrous or rarely bearing white or black hairs; leaves sometimes fleshy and subterete.
- 11a. Pollinia connected by a common stipe to viscidium.
- 12a. Column foot absent; mentum absent; anther beaked at apex ..... 137. *Thelasia* (p. 365)
- 12b. Column foot conspicuous; mentum present; anther obtuse at apex ..... 138. *Phreatia* (p. 366)
- 11b. Pollinia often sessile, directly attached to viscidium or sticky substance (sometimes viscidium and sticky substance absent), rarely each pollinium with a separate stipe.
- 13a. Column without a conspicuous foot.
- 14a. Pseudobulbs petiole-like, slender, 1.5–2.5 mm in diam.
- 15a. Inflorescence racemose, with several flowers; flowers not resupinate; lip superior, base shortly spurred ..... 93. *Nephelaphyllum* (p. 280)
- 15b. Inflorescence reduced to a single flower; flower resupinate; lip inferior, spurless ..... 96. *Hancockia* (p. 286)
- 14b. Pseudobulbs absent or much thicker, never petiole-like.
- 16a. Pseudobulbs subglobose to ovoid-globose, rarely ovoid-conic, with 1–5 terminal leaves; viscidium triangular ..... 98. *Spathoglottis* (p. 287)
- 16b. Pseudobulbs cylindric to conic, very rarely subglobose, sometimes absent or replaced by long stems, with several to many basal or lateral leaves; viscidium absent or if present then not triangular.
- 17a. Stems 1-leaved; leaves terete or dorsiventrally flattened; lip mid-lobe swollen, bulbous ..... 132. *Ceratoslylis* (p. 360)
- 17b. Stems few to many leaved; leaves and lip without above combination of characters.
- 18a. Stems short, entirely enclosed by imbricate leaf sheaths; inflorescence a densely flowered raceme with small bracts ..... 138. *Phreatia* (p. 366)
- 18b. Stems elongate, leafy throughout entire length.
- 19a. Inflorescence axillary, few flowered, glabrous ..... 123. *Cylindrolobus* (p. 349)
- 19b. Inflorescence terminal or subterminal, few to densely many flowered, glabrous to densely stellate-hairy.
- 20a. Inflorescence densely covered with short stellate hairs, usually densely many flowered; lip callus bipartite, farinose, with a powdery median ridge that usually ends in a protruding globose apical callus ..... 122. *Mycaranthes* (p. 348)
- 20b. Inflorescence glabrous or nearly so, few to many flowered; lip without above combination of characters.
- 21a. Stem terete, with more than 10 leaves along lower to upper part.
- 22a. Leaves not deciduous after anthesis; lip spurless ..... 107. *Arundina* (p. 314)
- 22b. Leaves deciduous after anthesis; lip spurred at base ..... 108. *Thunia* (p. 315)
- 21b. Stem, if present, with 2–6(–8) leaves above middle.
- 23a. Stigma usually subterminal; lip neither spurred nor saccate at base, vesiculate on mid-lobe or disk ..... 99. *Cephalantheropsis* (p. 288)
- 23b. Stigma lateral; lip often spurred or saccate, very rarely spurless, not vesiculate on mid-lobe or disk.
- 24a. Pseudobulbs subglobose to ovoid-globose, rarely ovoid-conic, with 1–5 terminal leaves; viscidium triangular ..... 98. *Spathoglottis* (p. 287)
- 24b. Pseudobulbs cylindric to conic, very rarely subglobose, sometimes absent or replaced by long stems, with several to many basal or lateral leaves; viscidium absent or if present then not triangular.
- 25a. Plants usually rather tall, with conic, ovoid, or subcylindric, long pseudobulbs or elongate stem; leaves sparsely growing on upper part of stem or toward apex of pseudobulb; lip often completely separate from column wings ..... 100. *Phaius* (p. 290)

- 25b. Plants smaller, without or with small, mostly ovoid pseudobulbs; leaves subbasal; lip often  $\pm$  connate along basal margins with column wings ..... 101. *Calanthe* (p. 292)
- 13b. Column with a conspicuous foot.
- 26a. Scape or inflorescence arising from upper part to apex of stem or pseudobulbs.
- 27a. Sepals connate into a cylindric or nearly urceolate tube.
- 28a. Inflorescence 4–10 cm, with 10–40 flowers; leaves 5–40 cm; pseudobulb not reticulate ..... 133. *Cryptochilus* (p. 361)
- 28b. Inflorescence very short, with 1 or 2 flowers; leaves 1.5–2.5 cm; pseudobulb surface reticulate ..... 131. *Porpax* (p. 360)
- 27b. Sepals free or only lateral sepals connate at base to column, never forming a tube.
- 29a. Stem with 1 distinct internode only.
- 30a. Leaves convolute; pseudobulbs conic, 2-leaved; inflorescence many flowered; flowers stellate ..... 119. *Eria* (p. 343)
- 30b. Leaves conduplicate, sometimes terete; inflorescence 1–6-flowered; flowers not stellate.
- 31a. Sepals densely tomentose abaxially ..... 120. *Campanulorchis* (p. 346)
- 31b. Sepals glabrous abaxially ..... 121. *Conchidium* (p. 346)
- 29b. Stem usually with several internodes.
- 32a. Leaves terete, fleshy; inflorescence synanthous, 1-flowered; flower relatively large, outer surface of sepals woolly ..... 122. *Mycaranthes* (p. 348)
- 32b. Leaves dorsiventrally flattened.
- 33a. Column with 2 erect, armlike appendages at apex; stem not swollen to form a pseudobulb; leaf 1 ..... 132. *Ceratosstylis* (p. 360)
- 33b. Column without armlike appendages at apex; stem often swollen to form a pseudobulb; leaves 2 to many in taxa lacking pseudobulb.
- 34a. Lip convex, entire, articulate to column foot and mobile; inflorescence never bottle-brush-like; column foot at right angle to column, bearing a fleshy cushion ..... 130. *Callostylis* (p. 359)
- 34b. Lip not convex, 3-lobed or obscurely 3-lobed, if entire, then inflorescence bottle-brush-like, fixed to apex of column foot, lacking a fleshy cushion.
- 35a. Floral bracts large, ca. 8 cm, bright orange; inflorescence bearing a few medium-sized resupinate flowers; rhizome stout; pseudobulbs short ..... 124. *Dendrolirium* (p. 350)
- 35b. Floral bracts smaller, not bright orange.
- 36a. Inflorescence densely flowered, bottle-brush-like; flowers small, not resupinate or ovary only slightly twisted ..... 125. *Aeridostachya* (p. 351)
- 36b. Inflorescence not as above; flowers resupinate or not.
- 37a. Pseudobulbs usually less than 1/4 as long as leaves, borne sequentially on a stout rhizome; leaves 2 or 3, apical or subapical on pseudobulb ..... 126. *Bryobium* (p. 352)
- 37b. Pseudobulbs usually 1/2 or more as long as leaves, clustered, not noticeably arranged along rhizome; leaves 2–6 along upper part of stem .... 127. *Pinalia* (p. 352)
- 26b. Scape or inflorescence arising from middle to base of pseudobulbs or from rhizome.
- 38a. Pseudobulbs noded in middle; sepals connate into a tube; column foot conspicuously longer than column, curved upward ..... 102. *Acanthephippium* (p. 309)
- 38b. Pseudobulbs not noded at least in middle; sepals completely free; column foot usually shorter than or as long as column, spreading horizontally.
- 39a. Plants leafless at anthesis, with neither pseudobulb nor conspicuous stem; rhizome fleshy, usually geniculate ..... 97. *Pachystoma* (p. 286)
- 39b. Plants with leaves at anthesis.
- 40a. Leaf 1, petiolate or with a petiole-like pseudobulb at base; petiole similar to pseudobulb.
- 41a. Base of leaf blade often cuneate (only *T. longiscapa* and *T. emeiensis* subrounded); petiole distinguishable from pseudobulb ..... 94. *Tainia* (p. 281)
- 41b. Base of leaf blade cordate or subrounded; petiole pseudobulb-like.
- 42a. Flowers not resupinate, with lip at top; spur short ..... 93. *Nephelaphyllum* (p. 280)
- 42b. Flowers resupinate, with lip at bottom, spurless or long spurred.
- 43a. Lip with a slender spur; column without foot; lateral sepals not forming a mentum at base ..... 96. *Hancockia* (p. 286)
- 43b. Lip spurless; column with a long and curved foot; lateral sepals adnate to column foot forming a broad mentum at base ..... 94. *Tainia* (p. 281)

- 40b. Leaves 2 to many (*Spathoglottis* occasionally with 1 leaf), petiolate; petiole quite different from pseudobulb, sometimes overlapping to form a pseudostem.
- 44a. Lip movable, on a long column foot ..... 95. *Eriodes* (p. 285)
- 44b. Lip immovable; column without a foot (except *Calanthe labrosa*).
- 45a. Leaves linear-lanceolate or lanceolate; pseudobulb  $\pm$  globose; mid-lobe of lip with a claw and 2 thickened appendages ..... 98. *Spathoglottis* (p. 287)
- 45b. Leaves elliptic or elliptic-lanceolate, if linear or linear-lanceolate, without globose pseudobulb; mid-lobe of lip without a claw.
- 46a. Lip with neither spur nor sac; mid-lobe with many vesiculate appendages ..... 99. *Cephalantheropsis* (p. 288)
- 46b. Lip often spurred, rarely spurless; mid-lobe without vesiculate appendages.
- 47a. Plants rather small; leaves subbasal; lip  $\pm$  connate at base with lateral wings of column to form a tube (except *C. labrosa* and *C. actinomorpha*); column often short ..... 101. *Calanthe* (p. 292)
- 47b. Plants much taller; leaves sparsely growing on a long stemlike pseudobulb or densely growing toward apex of a large pseudobulb; lip often completely separate from column wings; column long and stout ..... 100. *Phaius* (p. 290)
- 8b. Pollinia 4–6.
- 48a. Sepals partly connate at base into a calyx tube and almost at right angle to ovary ..... 103. *Anthogonium* (p. 311)
- 48b. Sepals free and/or not at right angle to ovary.
- 49a. Column with a conspicuous foot; mentum clearly visible.
- 50a. Inflorescence arising from base of pseudobulbs or from rhizome.
- 51a. Pollinarium with neither viscidium nor stipe ..... 142. *Bulbophyllum* (p. 404)
- 51b. Pollinarium with both viscidium and stipe.
- 52a. Lateral sepals densely hispid adaxially ..... 143. *Monomeria* (p. 440)
- 52b. Lateral sepals glabrous.
- 53a. Pollinarium with a single, undivided stipe with a common viscidium ..... 142. *Bulbophyllum* (p. 404)
- 53b. Pollinarium either with a single, y-shaped stipe with a single viscidium, or with 2 stipes each with a viscidium ..... 144. *Sunipia* (p. 440)
- 50b. Inflorescence arising from upper part of stem or pseudobulbs.
- 54a. Pollinarium with neither caudicle nor viscidium; stems fleshy or with internodes enlarged to form pseudobulbs, sometimes bamboolike or bamboo-shoot-like toward end, or covered completely by fleshy bases of laterally compressed leaves.
- 55a. Plants with many 1-noded pseudobulbs along a rhizome ..... 141. *Epigeneium* (p. 400)
- 55b. Plants with 1- to many-noded or pseudobulb-like stems.
- 56a. Stems not superposed; either (1) rhizomatous, (2) erect and many noded, (3) erect and 1-noded or several noded from a many-noded rhizome, or (4) rhizome absent, new stems of many nodes arising from base of old ones; leaves 1 to many; flowers long-lived or ephemeral ..... 139. *Dendrobium* (p. 367)
- 56b. Stems superposed, non-rhizomatous part of shoot consisting of several quite long thin internodes, uppermost pseudobulbous and 1-leaved; flowers always ephemeral ..... 140. *Flickingeria* (p. 397)
- 54b. Pollinarium with both caudicle and viscidium; stems without above combination of characters, occasionally cormlike at base.
- 57a. Leaves several, subbasal; stem less than 1 cm ..... 118. *Polystachya* (p. 342)
- 57b. Leaves many, densely and distichously arranged throughout stem; stem usually more than 5 cm.
- 58a. Leaves equitant, shoots iridiform; lip with a conic subapical wart below ..... 129. *Oxystophyllum* (p. 358)
- 58b. Leaves not equitant, often twisted at base so as to be in one plane; lip without such a wart.
- 59a. Pollinia 6 ..... 135. *Appendicula* (p. 363)
- 59b. Pollinia 4 ..... 136. *Podochilus* (p. 365)
- 49b. Column without a conspicuous foot; mentum absent.
- 60a. Plants with a long stem; leaves cauline ..... 108. *Thunia* (p. 315)
- 60b. Plants without a long stem; leaves basal or at apex of pseudobulbs.
- 61a. Leaves laterally compressed or sometimes cylindric ..... 81. *Oberonia* (p. 236)
- 61b. Leaves flat, not as above.

- 62a. Terrestrial plants, without green naked pseudobulbs.
- 63a. Plants without underground pseudobulbs, sometimes with stem fleshy or stemlike pseudobulbs basally; pollinarium without caudicle, stipe, or viscidium.
- 64a. Column rather long, arching; flowers resupinate ..... 75. *Liparis* (p. 211)
- 64b. Column often very short, erect; flowers often not resupinate, with lip at top; always terrestrial.
- 65a. Leaf 1 or 2, lacking prominent veins ..... 77. *Malaxis* (p. 229)
- 65b. Leaves 2 or more, with prominent veins.
- 66a. Column lacking fingerlike projections on each side of anther; anther connective broad with locules well separated; lip with lateral lobes enfolding column ..... 80. *Oberonioides* (p. 235)
- 66b. Column with fingerlike projections on either side; anther connective narrow.
- 67a. Lip entire to obscurely lobed, often with a denticulate margin, without transverse callus at base ..... 78. *Crepidium* (p. 229)
- 67b. Lip prominently 3-lobed, with a transverse callus at base ..... 79. *Dienia* (p. 234)
- 63b. Plants with underground pseudobulbs; pollinarium with conspicuous stipe or viscidium (except *Tipularia*).
- 68a. Plants with a single flower.
- 69a. Sepals shorter than 2 cm; lip with a horizontally spreading sac ..... 86. *Calypso* (p. 251)
- 69b. Sepals longer than 2.5 cm; lip with an incurved spur ..... 87. *Changnienia* (p. 252)
- 68b. Plants with many flowers.
- 70a. Lip with a cylindrical spur at base; spur conspicuously longer than pedicel and ovary ..... 85. *Tipularia* (p. 250)
- 70b. Lip spurless or with a spur conspicuously shorter than pedicel and ovary.
- 71a. Flowers pendulous; sepals 1.7–3 cm ..... 84. *Cremastra* (p. 249)
- 71b. Flowers not pendulous; sepals 1.5–11 mm.
- 72a. Lip saccate or shortly spurred at base; pollinarium without a distinct stipe ..... 85. *Tipularia* (p. 250)
- 72b. Lip neither saccate nor shortly spurred at base; pollinarium with a slender stipe ..... 83. *Oreorchis* (p. 245)
- 62b. Epiphytic plants, with green naked pseudobulbs.
- 73a. Leaves membranous or papery; lip unlobed, without concave or saccate base.
- 74a. Petals not Y-shaped; pollinia 4, without distinct caudicles ..... 75. *Liparis* (p. 211)
- 74b. Petals deeply 2-lobed,  $\pm$  Y-shaped; pollinia 2, each with caudicle ..... 76. *Ypsilorchis* (p. 228)
- 73b. Leaves thickly leathery; lip, if unlobed, with concave or saccate base.
- 75a. Sepals concave and saccate at base ..... 115. *Neogyne* (p. 341)
- 75b. Sepals not concave or saccate at base.
- 76a. Lip spurred.
- 77a. Pseudobulbs each with 2 leaves at apex; flowers many, on pendulous raceme; spur curved upward ..... 116. *Bulleyia* (p. 341)
- 77b. Pseudobulbs each with 1 leaf at apex; flower solitary, not pendulous; spur straight ..... 117. *Ischnogyne* (p. 342)
- 76b. Lip spurless, sometimes saccate at base.
- 78a. Lip concave-saccate at base.
- 79a. Column thick and short, usually shorter than lip ..... 113. *Pholidota* (p. 335)
- 79b. Column slender, usually nearly as long as lip ..... 114. *Otochilus* (p. 339)
- 78b. Lip not or only slightly concave, but never saccate, at base.
- 80a. Lip sigmoidally curved at base ..... 111. *Panisea* (p. 333)
- 80b. Lip not sigmoidally curved at base.
- 81a. Raceme with 20–30 flowers; flowers ca. 1 cm in diam.; column with 2 armlike appendages on both sides ..... 112. *Dendrochilum* (p. 334)
- 81b. Raceme often with several flowers or reduced to a single flower; flowers more than 3 cm in diam.; column without armlike appendages.
- 82a. Plants with persistent leaves alive for more than 1 year, present at anthesis; flowers often more than 2, white, yellow, green, or brown, lacking reddish spots on lip ..... 109. *Coelogyne* (p. 315)
- 82b. Leaves annually deciduous, absent or very young at anthesis; flower solitary, rarely 2, usually pink to purple, rarely yellow or white, with reddish spots on lip ..... 110. *Pleione* (p. 325)

## 1. Subfam. APOSTASIOIDEAE

拟兰亚科 ni lan ya ke

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Small to medium-sized terrestrial herbs with woody bases. Roots elongate, fibrous, aerial then branched in soil, sometimes bearing root-nodules; rhizome scaly or absent. Shoots branched or unbranched, erect, leafy. Leaves spirally arranged, leathery, plicate, spreading or suberect, green. Inflorescences terminal, racemose, few to many flowered; bracts persistent. Flowers almost regular but usually slightly zygomorphic, concolorous; pedicel obscure to short, twisted or not, with a torus; ovary 3-locular. Sepals spreading, entire, cuspidate, with thickened midribs. Petals free, cuspidate; lip similar to petals or slightly broader. Column short, straight to curved, style fused to base of filaments only; anthers 2 or 3, with 2 equal or unequal thecae each 2-locular; pollen powdery, not forming pollinia; staminode present or absent; style free in upper part, cylindrical, fleshy; stigma terminal, rounded to 2- or 3-lobed. Fruit capsular or berrylike, disintegrating into 3 valves. Seeds ovoid to ellipsoidal with a terminal appendage.

Two genera and ca. 17 species: confined to tropical Asia from China across to the Solomon Islands and the Philippines; two genera and four species (one endemic) in China.

### 1. APOSTASIA Blume, Bijdr. 423. 1825.

拟兰属 ni lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Adactylus* (Endlicher) Rolfe; *Apostasia* [unranked] *Adactylus* Endlicher; *Niemeyera* F. Mueller (1867), not F. Mueller (1870).

Herbs, erect, glabrous. Rhizome scaly, producing a few proplike roots; roots sometimes bearing tubers. Stem simple or branched, rather slender, leafy. Leaves clustered or well spaced, plicate, usually recurved along margins, forming a tubular awn at apex, base contracted and then dilating and amplexicaul. Inflorescences terminal or subterminal, often arching or sometimes pendulous, usually branched; floral bracts relatively small. Flowers erect, not resupinate, almost actinomorphic; ovary 3-locular, slender, not distinct from pedicel. Sepals similar, cymbiform, slightly fleshy. Petals similar, yellow to white, cymbiform; lip similar to petals though sometimes slightly larger. Column erect or curved, with 2 fertile stamens, with or without a central staminode; anthers clasping style, with 2 locules of subequal to distinctly unequal length; filaments usually short, adnate to style; staminode (if present) opposite to dorsal sepal; pollen not cohering to form pollinia; style cylindrical; stigma terminal, capitate. Fruit a capsule, narrowly cylindrical, shallowly longitudinally 3-ribbed. Seeds black at maturity, with a rigid testa.

About seven species: NE India, Nepal, and Bhutan, north to S Japan, through SE Asia to New Guinea and N Australia; three species (one endemic) in China.

- 1a. Sepals 6–9 mm; anthers 4–5 mm; column with 2 quadrate projecting wings below staminode ..... 1. *A. odorata*  
1b. Sepals 4–6 mm; anthers 1.5–2.8 mm; column lacking wings.  
2a. Stem simple; leaves linear, 10–18 cm; inflorescence many flowered ..... 2. *A. wallichii*  
2b. Stem branched; leaves ovate to ovate-lanceolate, 1.4–2.6 cm; inflorescence 1–4-flowered ..... 3. *A. ramifera*

#### 1. *Apostasia odorata* Blume, Bijdr. 423. 1825.

拟兰 ni lan

*Apostasia platystylis* J. J. Smith; *A. selebica* J. J. Smith; *A. thorelii* Gagnepain.

Plants 15–40(–50) cm tall. Rhizome elongate; roots proplike, 1–3 mm in diam. Stem erect or prostrate toward base, usually not branched, with several tubular sheaths toward base. Leaves many; blade lanceolate to linear-lanceolate, 6–18 × 0.7–1.9 cm, apex with an awn 3–11 mm; petiole-like base 1–2 cm. Inflorescence terminal, often nodding, conic, with 1–3 lateral branches, usually more than 10-flowered; floral bracts ovate to ovate-lanceolate, 4–9 mm. Flowers ca. 1 cm in diam.; ovary and pedicel 15–22 mm. Sepals pale yellow, narrowly oblong, 6–9 × 1.5–2.4 mm, 3-veined, margin crisped, apex shortly mucronate. Petals similar to sepals but with thickened midvein, pale yellow; lip similar to petals, ca. 10 × 2.5 mm. Column ventrally with 2 projecting wings below staminode; wings

quadrate, ca. 0.7 mm, longitudinally sulcate; filaments ca. 1 mm; anthers sublinear, 4–5 mm, base sagittate, apex apiculate, with locules unequal in length; staminode subcylindrical, slightly shorter than style, adnate to style for most of its length though distal ca. 1 mm free; style 5–6 mm, extending slightly beyond anthers, apex with slightly dilated stigma. Capsule cylindrical, 15–20 × 2–3 mm. Fl. May–Jun, fr. Jun–Jul.

Forests; ca. 700 m. N and S Guangdong (Wengyuan, Zengcheng), SW Guangxi (Longzhou), Hainan, S Yunnan (Mengla, Simao) [Cambodia, India, Indonesia, Laos, Malaysia, Thailand, Vietnam].

#### 2. *Apostasia wallichii* R. Brown in Wallich, Pl. Asiat. Rar. 1: 75. 1830.

剑叶拟兰 jian ye ni lan

*Apostasia alba* Rolfe; *A. curvata* J. J. Smith; *A. gracilis* Rolfe; *A. lucida* Blume ex Siebe; *A. papuana* Schlechter; *A. stylioides* (F. Mueller) H. G. Reichenbach; *Niemeyera stylioides* F. Mueller.

Plants ca. 40 cm tall. Rhizome short; roots proplike, 1.5–2.5 mm in diam. Stem suberect or prostrate toward base, not branched, with several tubular sheaths at base; sheaths to 1 cm, several veined. Leaves many, often clustered toward base of stem; blade linear to sublinear, 10–15(–18) × 0.7–1.2 cm, apex acuminate and with an awn 2–20 mm; petiole-like base 1–4 cm. Inflorescence arising from distal leaf axils, recurved, pendulous, or suberect, racemose or with a few lateral branches, 4–7 cm, many flowered; floral bracts lanceolate, 3–4 mm. Flowers 0.7–1 cm in diam.; pedicel and ovary 13–18 mm. Sepals yellow, linear to narrowly oblong-lanceolate, 4–6 × ca. 1.2 mm, 3–5-veined, apex mucronate. Petals similar to sepals, yellow; lip similar to petals but usually slightly broader. Column lacking wings; filaments ca. 0.5 mm; anthers narrowly ovoid, 1.5–2.5 mm, base sagittate; staminode subcylindric, adnate to style for most of its length though distal ca. 0.5 mm free; style ca. 3.5 mm, extending slightly beyond anthers, apex with slightly dilated stigma. Capsule cylindrical, 12–25 × 1.4–2 mm. Fl. Aug.

Tropical forests, crevices, along streams; ca. 1000 m. Hainan, SW Yunnan (Yingjiang) [Bangladesh, Cambodia, India, Indonesia, S Japan, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

## 2. NEUWIEDIA Blume, Nov. Pl. Expos. 12. 1833.

三蕊兰属 san rui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, erect. Rhizome usually retrorse, with several stout aerial roots. Stem often stiff and woody at base, not branched. Leaves several to many, plicate, basally contracted into a clasping, petiole-like stalk. Inflorescence erect, terminal, racemose, not branched; peduncle with several foliaceous sterile bracts; floral bracts relatively large, green. Flowers resupinate, almost actinomorphic, not opening widely; ovary 3-locular, distinct from pedicel. Sepals and petals often connivent. Sepals similar or lateral ones slightly oblique, fleshy. Petals similar; lip usually slightly different in shape and larger than petals. Column straight, often short, with 3 fertile stamens; central stamen often shorter than lateral ones; lateral stamens often with locules unequal in length; anthers free but filaments connate at base and adnate to style for much of their length; pollen not cohering to form pollinia; style narrowly cylindrical, apex with slightly dilated stigma. Fruit either a berry or a dry capsule dehiscent at maturity. Seeds black, with rigid testa, sometimes with dilated elongate appendages at both ends.

About ten species: from S China through SE Asia and New Guinea to the SW Pacific islands; one species in China.

**1. *Neuwiedia singaporeana*** (Wallich ex Baker) Rolfe, Bull. Misc. Inform. Kew 1907: 412. 1907.

三蕊兰 san rui lan

*Tupistra singaporeana* Wallich ex Baker, J. Linn. Soc., Bot. 14: 581. 1874; *Neuwiedia balansae* Baillon ex Gagnepain; *N. curtisii* Rolfe; *N. zollingeri* H. G. Reichenbach var. *singaporeana* (Wallich ex Baker) de Vogel.

Plants 40–50 cm tall. Rhizome ca. 10 cm, 1–1.5 cm in diam., nodes with slightly lignified proplike roots. Stem short. Leaves many, nearly tufted toward base of stem; blade lanceolate to oblong-lanceolate, 25–40 × 3–6 cm, abaxially with conspicuous convex veins, margin membranous, apex long acuminate; petiole-like base 5–10 cm. Rachis 6–8 cm, 10–75-flowered, glandular pubescent; floral bracts ovate to ovate-lanceo-

**3. *Apostasia ramifera*** S. C. Chen & K. Y. Lang, Acta Phytotax. Sin. 24: 349. 1986.

多枝拟兰 duo zhi ni lan

Plants ca. 13 cm tall. Rhizome elongate. Stem suberect or prostrate toward base, branched, with several tubular sheaths at base; branches 1–3 cm. Leaves many, spaced along stem; blade ovate to ovate-lanceolate, 1.4–2.6 × 0.4–0.8(–1.2) cm, apex with an awn 1–2 mm; petiole-like base 0.7–1.5 cm. Inflorescence arising from leaf axils near apex of stem and branches, arching or pendulous, racemose, 1–2 cm, 1–4-flowered; floral bracts ovate to lanceolate, 2–4 mm, 3–5-veined. Flowers small, ca. 0.5 cm in diam.; ovary and pedicel 8–11 mm. Sepals spreading, oblong, 4–5 × ca. 1 mm, 3-veined, margin undulate, apex shortly mucronate. Petals similar to sepals but slightly shorter and broader, yellow; lip similar to petals. Column lacking wings but ventrally dilated and with 2 ridges below staminode; filaments ca. 0.5 mm; anthers narrowly ovoid, 2.5–2.8 mm, base sagittate, extending slightly beyond style; staminode slightly shorter than style, adnate to style for almost its entire length; style ca. 3 mm, apex with slightly dilated stigma. Capsule not known. Fl. May, fr. Jun.

• Dense forests. SW Hainan.

late, 1–1.5 cm, outer surface glandular pubescent especially on veins. Flowers with ovary elliptic, sparsely glandular pubescent. Sepals white or buff-ochre, oblong to narrowly elliptic, 15–18 × ca. 4 mm, outer surface glandular pubescent, apex aristate; dorsal sepal usually slightly smaller than lateral sepals. Petals greenish white, obovate to broadly cuneate-obovate, ca. 16 × 5–6 mm, outer surface glandular pubescent especially on midvein, apex mucronate; lip similar to petals but with a thickened midvein. Column suberect; anthers linear, 5–6 mm, with 2 unequal locules at base; central stamen with a long, slender, costate filament ca. 8 mm; lateral stamen with flat, costate filaments, ca. 3.5 × 0.7 mm; style ca. 7 mm. Fruit orange to red. Fl. May–Jun.

Forests; ca. 500 m. Hainan (Baoting, Ding'an), Hong Kong, SE Yunnan (Hekou) [Indonesia, Malaysia, Singapore, Thailand, Vietnam].

## 2. Subfam. CYPRIPEIDIOIDEAE

杓兰亚科 shao lan ya ke

Chen Xinqi (陈心启 Chen Sing-chi), Liu Zhongjian (刘仲健); Phillip J. Cribb

Small to large terrestrial, lithophytic, or rarely epiphytic herbs. Roots elongate, fibrous; rhizome short to elongate. Stems unbranched, obscure to long, erect, leafy. Leaves distichous, 1 to many, plicate or conduplicate, spreading or suberect, green, rarely checkered or tessellated with dark and lighter green or spotted with blackish maroon adaxially, thinly textured, fleshy, or leathery, glabrous or variously pubescent, entire. Inflorescence terminal, 1- to several flowered; rachis hairy, glandular, or glabrous; bracts conduplicate. Flowers usually showy; pedicel obscure to short; ovary 1-locular or 3-locular, glabrous or hairy, lacking an abscission layer. Dorsal sepal erect or hooded over lip, ovate, obovate, or elliptic, obtuse, acute, or acuminate, glabrous or pubescent on outer surface, sometimes pubescent within at base; lateral sepals usually fused to form a concave synsepal  $\pm$  similar to dorsal sepal, rarely free to base (in *Cypripedium plectrochilum*). Petals free, spreading or pendulous, spiraling or not, elliptic, ovate, linear, or oblanceolate, glabrous or rarely pubescent on outer surface, usually ciliate on margins, sometimes warty on margins; lip deeply pouched, slipper-shaped or urn-shaped, with or more rarely without  $\pm$  pronounced incurved side lobes sometimes reduced to auricles, hairy within especially on lower surface, sometimes spotted within, glabrous or hairy on outer surface; front margin incurved or not, sometimes with short marginal horns; side lobes sometimes warty. Column short, stalked, porrect; anthers 2, 2-locular, borne on short obtuse to acute filaments; pollen powdery or viscid; staminode terminal, sessile or shortly stalked, often shield-shaped, transversely reniform, oblong, ovate, obcordate, or linear, flat, convex or longitudinally conduplicate, glabrous to papillose or finely pubescent; stigma stalked or sessile, dependent, convex, 3-partite,  $\pm$  papillose. Capsule erect to pendulous, 3-ribbed, cylindrical to almost ellipsoidal, sometimes beaked at apex. Seeds ellipsoidal with a thin testa.

Five genera and ca. 180 species: widespread in the temperate regions of Eurasia and North America, the tropical Americas south to Brazil and Bolivia, and tropical SE Asia to the Philippines, New Guinea, and the Solomon Islands; two genera and 63 species (27 endemic) in China.

China is a center of diversity for the genera *Cypripedium* and *Paphiopedilum*.

## 3. CYPRIPEDIUM Linnaeus, Sp. Pl. 2: 951. 1753.

杓兰属 shao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb

*Arietinum* L. C. Beck; *Calceolus* Miller; *Criosanthes* Rafinesque; *Fissipes* Small; *Hypodema* Reichenbach; *Sacodon* Rafinesque.

Herbs, with short or long rhizomes and many thickened fibrous roots. Stem erect, elongate or short, clustered or well spaced, often with several sheaths at base. Leaves 1 to several, alternate to opposite, sometimes prostrate on substrate, sheathing and amplexicaul at base; blade adaxially green or sometimes marked with black-purple spots, often elliptic to ovate, rarely cordate or flabellate, with parallel, radiating, or 3–5 prominent veins. Inflorescence terminal, with a solitary flower or rarely many flowers; floral bracts often leaflike, usually smaller than leaves, rarely absent; ovary 1-locular. Flowers usually large and showy. Dorsal sepal erect or hooded over lip; lateral sepals usually united to form a synsepal, but free in *Cypripedium plectrochilum*. Petals spreading horizontally, at an angle below horizontal, or enfolding sides of lip, sometimes spirally twisted; lip deeply pouched and inflated, subglobose or ellipsoid, with incurved lateral lobes and usually also apical margin, hairy within on bottom. Column short, with 2 lateral fertile stamens, a terminal staminode above, and a stigma below; anthers 2-locular, with very short filaments; pollen powdery or glutinous; staminodes often elliptic to ovate, very rarely ligulate or linear, base stalked or not; stigma  $\pm$  papillose, inconspicuously 3-lobed. Fruit a capsule.

About 50 species: N temperate zone, mainly in temperate Asia and North America, extending south to the Himalayan regions and Central America; 36 species (25 endemic) in China.

1a. Leaves 3 or more, glabrous or hairy.

2a. Staminodes subligulate to linear-oblong, conspicuously narrower than stigma.

3a. Plants more than 100 cm tall, with 9 or 10 leaves; inflorescence with many flowers; flowers yellow with purple spots on lip ..... 1. *C. subtropicum*

3b. Plants 10–20 cm tall, with 2 or 3 leaves; inflorescence reduced to 1 or 2 flowers; flowers white with purple spots on lip ..... 2. *C. wardii*

2b. Staminodes usually elliptic to ovate, ca. as wide as or wider than stigma.

4a. Flowers with 2 lateral sepals completely separate; lip obconic, pointed at apex, pubescent around mouth ..... 19. *C. plectrochilum*

4b. Flowers with 2 lateral sepals connate to different degrees into 1 synsepal; lip never obconic, glabrous around mouth.

- 5a. Petals shorter than dorsal sepal, suboblong, apex obtuse; flowers yellow, sometimes with red spots ..... 3. *C. flavum*
- 5b. Petals usually longer than dorsal sepal, attenuate toward apex, apex acute or acuminate; flowers variously colored.
- 6a. Ovary pubescent or glabrous, never glandular hairy; flowers pink, red, purple, or dark purple, rarely white.
- 7a. Ovary densely hairy or villous.
- 8a. Stem densely villous, especially in upper part; dorsal sepal 4–5.5 cm; lip with a smooth rim ..... 17. *C. franchetii*
- 8b. Stem sparsely pubescent; dorsal sepal 2.4–2.7 cm; lip with a toothed rim ..... 18. *C. himalaicum*
- 7b. Ovary glabrous, sparsely hairy or hairy only along ribs.
- 9a. Lip 2.2–3.2 cm; petals 2.2–3.2 cm.
- 10a. Ovary glabrous or slightly pubescent in upper half; synsepal much narrower than dorsal sepal; flowers usually pink to purplish red ..... 12. *C. yunnanense*
- 10b. Ovary pubescent at least along ribs; synsepal slightly narrower than dorsal sepal; flowers purple-red ..... 13. *C. taibaiense*
- 9b. Lip 3.5–6 cm; petals 3.5–6.5 cm.
- 11a. Flowers red, pink, or occasionally white, not becoming dark purple when dried; petals with inconspicuous veins; staminodes not carinate abaxially ..... 11. *C. macranthos*
- 11b. Flowers dark purple to deep red, becoming dark purple when dried; petals with very conspicuous veins; staminodes carinate abaxially.
- 12a. Lip with a white-margined rim to its mouth, lacking translucent “windows” on back ..... 15. *C. tibeticum*
- 12b. Lip without a white-margined rim to its mouth, with translucent “windows” on back ..... 16. *C. calcicola*
- 6b. Ovary glandular pubescent; flowers yellow, green, or white, sometimes with maroon sepals and petals or purple-veined sepals and petals.
- 13a. Staminodes not stalked at base; petals usually nearly as long as lip, mostly not twisted; flower usually solitary.
- 14a. Flowers greenish yellow; sepals and petals without maroon stripes or spots, glabrous abaxially; mouth of lip not grooved-toothed along margin ..... 14. *C. ludlowii*
- 14b. Flowers greenish yellow to yellow, marked with maroon stripes or spots on sepals and petals; mouth of lip slightly edged by teeth or grooved-toothed along margin.
- 15a. Lip 5–7 cm; staminode 1.5–2 cm ..... 9. *C. fasciolatum*
- 15b. Lip 1.6–4 cm; staminode 6–10 mm ..... 10. *C. farreri*
- 13b. Staminodes stalked at base; petals longer than lip, often twisted; flowers 1–3.
- 16a. Lip pure white; sepals green ..... 8. *C. cordigerum*
- 16b. Lip not pure white; sepals maroon, yellow, or green, sometimes veined with purple.
- 17a. Sepals and petals maroon, quite different in color from yellow lip ..... 4. *C. calceolus*
- 17b. Sepals and petals similar in color to lip.
- 18a. Flowers bronze-brown to purplish brown ..... 7. *C. shanxiense*
- 18b. Flowers green or yellow.
- 19a. Flowers often 2 or 3, greenish to green; petals nearly 2 × as long as lip ..... 5. *C. henryi*
- 19b. Flowers often solitary, yellowish to yellow; petals not 2 × as long as lip; lip sometimes red spotted ..... 6. *C. segawae*
- 1b. Leaves 1 or 2, in former case, bract subtending flower leaflike.
- 20a. Leaves 2, subopposite, quite distinct in size from bract subtending flower; leaves never spotted with blackish purple; pedicel not elongating after fertilization of flower.
- 21a. Leaves fan-shaped, with many radiating veins ending at margin of apical half.
- 22a. Stem below leaves brown tomentose; sepals and petals greenish yellow; lip strongly grooved-margined around mouth ..... 20. *C. japonicum*
- 22b. Stem below leaves glabrous or puberulent; sepals and petals whitish or pinkish; lip slightly grooved-margined around mouth ..... 21. *C. formosanum*
- 21b. Leaves cordate to elliptic, with subparallel, arcuate, or 3–5 prominent veins ending at their apex.
- 23a. Leaves alternate; rhizome slender, elongate; petals usually subspatulate or pandurate, rounded at apex; lip pitcher-shaped, without an incurved apical margin ..... 22. *C. guttatum*
- 23b. Leaves ± opposite; stems clustered; lip with incurved margin.
- 24a. Peduncle (above leaves) and ovary glabrous ..... 23. *C. debile*
- 24b. Peduncle (above leaves) and ovary hairy.

- 25a. Flowers plum-purple; stem below leaves glabrous; leaves not ciliate; dorsal sepal lanceolate, 3–4 mm wide ..... 24. *C. palangshanense*
- 25b. Flowers green, sometimes marked with purple; stem below leaves densely villous; leaves ciliate; dorsal sepal elliptic-ovate, 6–10 mm wide ..... 25. *C. elegans*
- 20b. Leaf solitary, often prostrate on ground; bract leaflike and also often prostrate; both sometimes spotted with blackish purple; pedicel elongating after fertilization of flower.
- 26a. Leaf blade 2.5–6 cm wide; plants with slender rhizomes underground.
- 27a. Leaves with dark purple or black spots adaxially ..... 28. *C. Forrestii*
- 27b. Leaves without dark purple or black spots.
- 28a. Sepals glabrous ..... 26. *C. bardolphianum*
- 28b. Sepals densely villous abaxially ..... 27. *C. micranthum*
- 26b. Leaf blade 6.5–16 cm wide; plants with stout and short rhizomes underground.
- 29a. Stem to 10 cm; leaf and bract not prostrate on substrate; staminode wider than long ..... 36. *C. wumengense*
- 29b. Stem 2.5–7 cm; leaf and bract prostrate on substrate; staminode longer than wide.
- 30a. Petals glabrous abaxially ..... 30. *C. sichuanense*
- 30b. Petals  $\pm$  hairy abaxially.
- 31a. Petals nearly  $2 \times$  as long as lip ..... 33. *C. lentiginosum*
- 31b. Petals shorter, ca. as long as or longer than, but not  $2 \times$  as long as, lip.
- 32a. Petals densely white villous on upper side of abaxial surface, densely marked with small maroon spots ..... 35. *C. fargesii*
- 32b. Petals  $\pm$  pubescent or purple hairy on upper side of abaxial surface, marked with maroon spots or stripes.
- 33a. Dorsal sepal yellowish, distinctly marked with longitudinal maroon stripes, shortly hairy on abaxial veins ..... 29. *C. margaritaceum*
- 33b. Dorsal sepal liver-colored or greenish, without longitudinal maroon stripes, glabrous abaxially.
- 34a. Dorsal sepal yellowish green; petals 2.4–2.8 cm wide, ca. as long as or slightly longer than lip ..... 31. *C. dawuishanense*
- 34b. Dorsal sepal liver-colored; petals 1.4–2.1 cm wide, obviously longer than lip.
- 35a. Leaf blade not similar in color to petals and lip; dorsal sepal 3.8–6 cm wide ..... 32. *C. lichiangense*
- 35b. Leaf blade often similar in color to petals and lip; dorsal sepal 2.5–2.8 cm wide ..... 34. *C. malipoense*

**1. *Cypripedium subtropicum*** S. C. Chen & K. Y. Lang, Acta Phytotax. Sin. 24: 317. 1986.

暖地杓兰 nuan di shao lan

Plants to 1.5 m tall, with a stout, rather short rhizome 2–3 mm in diam. Stem erect, ca. 1 cm in diam., pubescent, with several sheaths at base and 9 or 10 leaves above; sheaths 2.5–9.5 cm, pubescent. Leaf blade elliptic-oblong to elliptic-lanceolate, 21–33  $\times$  7.7–10.5 cm, abaxially pubescent, base contracted into petiole, margin  $\pm$  ciliate, apex acuminate; petiole 1–2 cm. Inflorescence terminal, racemose, 7-flowered; peduncle ca. 21 cm; rachis ca. 15 cm, with reddish hairs; floral bracts  $\pm$  reflexed, linear-lanceolate, 1–2.8  $\times$  0.2–0.3 cm, with reddish hairs; pedicel and ovary ca. 4.5 cm, densely glandular hairy and brownish pilose. Flowers yellow, with purple spots on lip. Dorsal sepal ovate-elliptic, 3.5–3.9  $\times$  2.2–2.5 cm, abaxially with reddish hairs, apex cuspidate-acuminate; synsepal broadly ovate-elliptic, slightly wider than dorsal sepal, abaxially also hairy, apex shallowly 2-lobed. Petals suboblong-ovate, 3–3.6  $\times$  9–11 mm, reddish hairy on adaxial veins and abaxial surface; lip deeply pouched, obovoid-ellipsoid, 4–4.6 cm, ca. 3 cm in diam., glabrous on outer surface, hairy toward inner base. Staminode subligulate, ca. 5  $\times$  1.5 mm, base stalked, apex obtuse, slightly upcurved. Fl. Jul.

• *Alnus* forests; ca. 1400 m. SE Xizang (Médog).

**2. *Cypripedium wardii*** Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 128. 1913.

宽口杓兰 kuan kou shao lan

*Cypripedium guttatum* Swartz var. *wardii* (Rolfe) P. Taylor.

Plants 10–20 cm tall. Rhizome 3–6 cm  $\times$  2–5 mm. Stem erect, rather slender, pubescent, with several sheaths at base and 2 or 3(or 4) leaves above. Leaf blade elliptic to elliptic-lanceolate, 4.5–10  $\times$  2.5–3.5 cm, both surfaces pubescent especially on veins, ciliate, base contracted and sheathing, apex acute or subacuminate. Inflorescence terminal, 1- or 2-flowered; peduncle slender, pubescent; floral bracts foliaceous, ovate-lanceolate, 1.5–2.7 cm, pubescent and ciliate; pedicel and ovary 1–1.2 cm, densely pubescent. Flowers small, white or creamy white with purple spots on inside of lip and around its mouth. Dorsal sepal elliptic or ovate-elliptic, 14–17  $\times$  8–10 mm, abaxially sparsely pubescent, apex obtuse or subacute; synsepal broadly elliptic, slightly shorter than dorsal sepal, abaxially pubescent, apex shallowly 2-lobed. Petals subovate-rhombic or ovate-oblong, 9–12  $\times$  ca. 6 mm, apex obtuse; lip deeply pouched, subobovoid-globose, 1.2–1.6 cm, with a broad mouth. Staminode

narrowly ligulate to linear-oblong, 1–3 × 1–2.5 mm, narrower than stigma. Fl. Jun–Jul.

• Dense forests, limestone cliffs, rocks by streams; 2500–3500 m. W Sichuan (Dadu He valley), SE Xizang (Zayü), NW Yunnan (Dêqên).

**3. *Cypripedium flavum*** P. F. Hunt & Summerhayes, Kew Bull. 20: 51. 1966.

黄花杓兰 huang hua shao lan

*Cypripedium luteum* Franchet.

Plants often 30–50 cm tall, with a stout, usually rather short rhizome. Stem erect, densely pubescent, especially near upper nodes, with several sheaths at base and 3–6 leaves above. Leaves well spaced; blade elliptic to elliptic-lanceolate, 10–16 × 4–8 cm, both surfaces pubescent, shortly ciliate, apex acute or acuminate. Inflorescence terminal, 1- or rarely 2-flowered; peduncle pubescent; floral bracts foliaceous, elliptic-lanceolate, 4–8 × 1.8–2.3 cm, pubescent; pedicel and ovary 2.5–4 cm, densely rusty hairy. Flowers yellow, sometimes tinged or flushed with red, occasionally with maroon spots on lip. Dorsal sepal elliptic to broadly elliptic, 3–3.5 × 1.5–3 cm, abaxial midvein and base sparsely puberulent, shortly ciliate, apex obtuse; synsepal broadly elliptic, 2–3 × 1.5–2.5 cm, subglabrous, apex nearly unlobed. Petals oblong to oblong-lanceolate, slightly oblique, 2.5–3.5 × 1–1.5 cm, adaxially pubescent toward base, shortly ciliate, apex obtuse; lip deeply pouched, globose-ellipsoid, 3–4.5 cm. Staminode orbicular or broadly elliptic, 6–7 × ca. 5 mm, abaxially slightly keeled, adaxially with conspicuous reticulate veins, subsessile and ± auriculate. Capsule narrowly obovoid, 3.5–4.5 cm, hairy. Fl. and fr. Jun–Sep.  $2n = 20^*$ .

• Forests, forest margins, thickets, stony places on grasslands; 1800–3500 m. S Gansu, W Hubei (Fangxian), Sichuan, SE Xizang, NW Yunnan.

**4. *Cypripedium calceolus*** Linnaeus, Sp. Pl. 2: 951. 1753.

杓兰 shao lan

Plants 20–45 cm tall, with a somewhat stout rhizome. Stem erect, with glandular hairs, with several sheaths at base and 3 or 4 leaves above middle. Leaf blade elliptic or ovate-elliptic, rarely ovate-lanceolate, 7–16 × 4–7 cm, abaxially sparsely pubescent especially on veins and toward base, minutely ciliate, apex acute or shortly acuminate. Inflorescence terminal, usually 1- or 2-flowered; floral bracts foliaceous, elliptic-lanceolate or ovate-lanceolate, 4–6(–10) × 1.5–4 cm; pedicel and ovary ca. 3 cm, with short glandular hairs. Flowers with maroon sepals and petals and yellow lip. Dorsal sepal ovate or ovate-lanceolate, 2.5–5 × 0.8–1.5 cm, abaxial midvein sparsely pubescent, apex acuminate or cuspidate-acuminate; synsepal similar to dorsal sepal, apex shallowly 2-lobed. Petals twisted, linear or linear-lanceolate, 3–5 × 0.4–0.6 cm, pubescent toward adaxial base and on abaxial veins; lip deeply pouched, ellipsoid, 3–4 × 2–3 cm, outside glabrous, inner bottom hairy; incurved lateral lobes 3–4 mm wide. Staminode suboblong-elliptic, 7–10 × 5–7 mm, abaxially carinate, base with a stalk ca. 1 mm, apex obtuse. Fl. Jun–Jul.  $2n = 20$ .

Rocky places in forests, forest margins, grasslands; 500–1000 m.

Heilongjiang, E Jilin, Liaoning, NE Nei Mongol [Japan, Korea, Russia; Europe].

**5. *Cypripedium henryi*** Rolfe, Bull. Misc. Inform. Kew 1892: 211. 1892.

绿花杓兰 lü hua shao lan

*Cypripedium chinense* Franchet.

Plants 30–60 cm tall, with a rather stout rhizome. Stem erect, pubescent, with several sheaths at base and 4 or 5 leaves above. Leaf blade elliptic to ovate-lanceolate, 10–18 × 6–8 cm, glabrous or pubescent near abaxial base, apex acuminate. Inflorescence terminal, usually 2- or 3-flowered; floral bracts foliaceous, ovate-lanceolate or lanceolate, 4–10 × 1–3 cm, glabrous or occasionally pubescent on abaxial veins, apex cuspidate-acuminate; pedicel and ovary 2.5–4 cm, densely white glandular hairy. Flowers green to greenish. Dorsal sepal ovate-lanceolate, 3.5–4.5 × 1–1.5 cm, slightly pubescent on abaxial veins especially toward base, apex acuminate; synsepal similar to dorsal sepal, apex shallowly 2-lobed. Petals usually slightly twisted, linear-lanceolate, 4–5 × 0.5–0.7 cm, pubescent toward adaxial base and on abaxial veins, apex acuminate; lip deeply pouched, ellipsoid, ca. 2 cm, ca. 1.5 cm in diam., outside glabrous, inner bottom hairy. Staminode elliptic or ovate-elliptic, 6–7 × 3–4 mm, abaxially carinate, base with a stalk 2–3 mm. Capsule sub-ellipsoid or narrowly ellipsoid, to 3.5 × 1.2 cm, hairy. Fl. Apr–May, fr. Jul–Sep.  $2n = 22^*$ .

• Humus-rich places in open forests, at forest margins, or on scrubby slopes; 800–2800 m. S Gansu, Guizhou, W Hubei, S Shaanxi, S Shanxi, Sichuan, NW to SE Yunnan.

**6. *Cypripedium segawae*** Masamune, Trans. Nat. Hist. Soc. Formosa 23: 209. 1933 [“*segawai*”].

宝岛杓兰 bao dao shao lan

*Cypripedium guttatum* Swartz var. *segawae* (Masamune) S. S. Ying; *C. reginae* T. Walter var. *segawae* (Masamune) S. S. Ying.

Plants with a short, creeping rhizome. Stem erect, with glandular hairs, with 1 or 2 sheaths at base and 3 or 4 leaves above. Leaf blade elliptic to elliptic-lanceolate, 5–10 × 1.5–3 cm, both surfaces pubescent, apex subacute. Inflorescence terminal, with 1 flower; peduncle slender, with glandular hairs; floral bracts foliaceous, lanceolate, 2.5–3.5 cm. Flower yellowish to yellow, rarely with small red spots on lip, 5–6 cm in diam. Dorsal sepal ovate-lanceolate, 2–4 × 0.8–1.4 cm, glabrous, apex acuminate; synsepal ovate, 2–3.5 × 1–1.5 cm, glabrous, apex shallowly 2-lobed. Petals not twisted, linear-lanceolate, 2.3–4 × 0.6–0.8 cm, densely pubescent at adaxial base, apex acuminate; lip deeply pouched, subglobose, 2–2.5 × ca. 1.7 cm, with a small mouth often toothed margined. Staminode oblong, 6–7 mm, base with a stalk 1–2 mm. Fl. Mar–Apr.  $2n = 20^*$ .

• Forests, alpine grassy slopes; 1300–3000 m. NE Taiwan.

**7. *Cypripedium shanxiense*** S. C. Chen, Acta Phytotax. Sin. 21: 343. 1983.

山西杓兰 shan xi shao lan

Plants 40–55 cm tall, with a rather stout, creeping rhizome. Stem erect, pubescent and glandular hairy, with several sheaths at base and 3 or 4 leaves above. Leaf blade elliptic to ovate-lanceolate, 7–15 × 4–8 cm, sometimes hairy toward abaxial base and on veins on both surfaces, ciliate, apex acuminate. Inflorescence terminal, 2-flowered, rarely 1- or 3-flowered; peduncle and rachis pubescent and glandular hairy; floral bracts foliaceous, 5.5–10 × 1–3 cm, both surfaces pubescent on veins; pedicel and ovary 2.5–3 cm, densely glandular hairy and pubescent. Flowers ochre-brown to purplish brown, with darker venation; lip often spotted with dark brown; staminode white with a few purplish brown spots. Dorsal sepal lanceolate or ovate-lanceolate, 2.5–3.5 × ca. 1 cm, abaxially often hairy, apex cuspidate-acuminate; synsepal similar to dorsal sepal, apex deeply 2-lobed. Petals not twisted or slightly twisted, narrowly lanceolate or linear, 2.7–3.5 × 0.4–0.5 cm, apex acuminate; lip deeply pouched, subglobose to ellipsoid, 1.6–2 × ca. 1.3 cm, outside glabrous, inner bottom hairy. Staminode oblong-elliptic, 7–9 × 3.5–5 mm, base with a short but distinct stalk. Capsule subspindle-shaped or narrowly ellipsoid, 3–4 × ca. 1 cm, with sparse glandular hairs or glabrous. Fl. and fr. May–Aug.  $2n = 20$ .

Forests, grassy slopes; 1000–2500 m. S Gansu, W Hebei, S Nei Mongol, E Qinghai, Shanxi, NW Sichuan [N Japan, SE Russia].

**8. *Cypripedium cordigerum*** D. Don, Prodr. Fl. Nepal. 37. 1825.

白唇杓兰 bai chun shao lan

Plants 25–50 cm tall, with a short, stout rhizome. Stem erect, usually pubescent or glandular hairy, especially toward upper part, with several sheaths at base and 2–5 leaves above. Leaf blade elliptic or broadly elliptic, 10–15 × 4–10 cm, sparsely ciliate, apex acute or acuminate. Inflorescence terminal, 1- or rarely 2-flowered; peduncle ± with glandular hairs; floral bracts foliaceous, elliptic to lanceolate, 6–9 × 2–4 cm, pubescent on abaxial veins, apex acuminate; pedicel and ovary 2–4 cm, with dense glandular hairs. Flowers 9–10 cm in diam., usually with pale green to yellowish green sepals and petals and white lip; staminode often yellow spotted with red. Dorsal sepal broadly ovate, 2.5–3 × ca. 1.5 cm, adaxial base and abaxial surface pubescent, apex acuminate; synsepal elliptic-ovate, slightly narrower than dorsal sepal, abaxially pubescent, apex shallowly 2-lobed. Petals not twisted, linear-lanceolate, 2.5–3.5 × 0.7–0.9 cm, adaxial base pubescent, apex acuminate; lip deeply pouched, ellipsoid, dorsiventrally flattened, 2.5–3.5 cm, with a small mouth, outer surface glabrous, inner bottom hairy. Staminode suboblong, ca. 10 × 5 mm, base with a short stalk. Fl. Jun–Aug.  $2n = 20$ .

*Pinus* forests, grasslands; 3000–3400 m. S Xizang (Yadong) [Bhutan, India, Kashmir, Nepal, Pakistan].

**9. *Cypripedium fasciolatum*** Franchet, J. Bot. (Morot) 8: 232. 1894.

大叶杓兰 da ye shao lan

*Cypripedium langrhoa* Gattefosse ex Constantin; *C. wilsonii* Rolfe.

Plants 30–45 cm tall, with a stout, short rhizome. Stem erect, glabrous or pubescent near upper nodes, with several

sheaths at base and 3 or 4 leaves above. Leaf blade elliptic or broadly elliptic, 15–20 × 6–12 cm, both surfaces glabrous, ciliate, apex shortly acuminate. Inflorescence terminal, 1- or rarely 2-flowered; peduncle pubescent in upper part; floral bracts foliaceous, elliptic or ovate, 7–10 × 3–6.5 cm, abaxial veins occasionally pubescent toward base, apex acuminate; pedicel and ovary 1.5–3 cm, with dense reddish brown glandular hairs. Flowers fragrant, large, to 12 cm in diam., pale to lemon-yellow, with maroon longitudinal stripes on sepals and petals. Dorsal sepal ovate-elliptic or ovate, 5–6 × 2.8–3.5 cm, abaxial veins slightly puberulent, margin sometimes slightly undulate, apex acuminate; synsepal similar to dorsal sepal, 5–6 × 2–2.5 cm, apex shallowly 2-lobed. Petals linear-lanceolate or broadly linear, 5.5–8 × 0.8–1.5 cm, pubescent toward adaxial base and on abaxial veins, apex acuminate; lip often ± ascending, deeply pouched, subglobose, 5–7 cm, mouth often slightly edged by teeth, outer surface glabrous, inner bottom hairy. Staminode ovate-elliptic, 1.5–2 × ca. 1 cm, abaxially carinate, base slightly auriculate, margin slightly incurved. Fl. Apr–Jun.

• Open forests, scrubby slopes, grasslands; 1600–2900 m. Chongqing, W Hubei, SW Sichuan.

**10. *Cypripedium farreri*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 102. 1916.

华西杓兰 hua xi shao lan

*Cypripedium cheniae* Torelli.

Plants 20–30 cm tall, with a stout, short rhizome. Stem erect, nearly glabrous, with several sheaths at base and often 2 leaves above. Leaf blade elliptic or ovate-elliptic, 6–9 × 2.5–3.5 cm, glabrous, minutely ciliate, apex acute or shortly acuminate. Inflorescence terminal, with 1 flower; peduncle pubescent toward apex; floral bracts foliaceous, narrowly ovate-elliptic or ovate, 3.5–5 × 1–1.5 cm, glabrous, apex acuminate; pedicel and ovary ca. 2.5 cm, slightly glandular hairy. Flower fragrant; sepals and petals greenish yellow, marked with maroon longitudinal stripes or also spots; lip waxy yellow, with maroon spots inside. Dorsal sepal ovate or ovate-elliptic, 3–3.5 × ca. 1.5 cm, abaxially sparsely shortly hairy on veins, apex acuminate; synsepal ovate-lanceolate, ca. as long as dorsal sepal, ca. 1.1 cm wide, abaxially slightly puberulent, apex shallowly 2-lobed. Petals lanceolate, 3–4 × 0.6–0.7 cm, pubescent toward adaxial base and on abaxial midvein, apex acuminate; lip deeply pouched, urceolate, 2.5–3.3 × 1.5–2 cm, with a dilated mouth grooved-toothed along margin. Staminode suboblong-ovate, ca. 10 × 5 mm, base subsessile. Fl. Jun.

• Stony grasslands, shaded cliffs in open forests; 2600–3400 m. S Gansu, Guizhou, NW and W Sichuan, NW Yunnan.

“*Cypripedium zhongdianense*” (Z. D. Fang, Wild Fl. Hengdian Mts. 209. 1993) belongs here but was not validly published because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

*Cypripedium ×wenqingiae* Perner (Orchidee (Hamburg) 49: 201. 1998), described from Wenchuan, Sichuan, is a natural hybrid between *C. farreri* and *C. tibeticum*.

**11. *Cypripedium macranthos*** Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 251. 1800 [“*macranthon*”].

大花杓兰 da hua shao lan

*Cypripedium macranthos* f. *albiflorum* (Makino) Ohwi; *C. macranthos* var. *albiflorum* Makino; *C. macranthos* var. *taiwanianum* F. Maekawa; *C. speciosum* Rolfe; *C. taiwanianum* Masamune; *Sacodon macranthos* (Swartz) Rafinesque.

Plants 25–50 cm tall, with a stout, short rhizome. Stem erect, slightly pubescent or glabrescent, with several sheaths at base and 3 or 4 leaves above. Leaf blade elliptic or elliptic-ovate, 10–15 × 6–8 cm, slightly pubescent or glabrescent on veins on both surfaces, minutely ciliate, apex acuminate or subacute. Inflorescence terminal, 1- or rarely 2-flowered; peduncle pubescent or glabrous; floral bracts foliaceous, elliptic or rarely elliptic-lanceolate, 7–9 × 4–6 cm, both surfaces often puberulent on veins, apex shortly acuminate; pedicel and ovary 3–3.5 cm, glabrous. Flowers large, red or pink, usually with darker stripes, very rarely white. Dorsal sepal broadly ovate-elliptic or ovate-elliptic, 4–5 × 2.5–3 cm, glabrous, apex acuminate; synsepal ovate, 3–4 × 1.5–2 cm, apex shallowly 2-lobed. Petals not twisted, lanceolate, 4.5–6 × 1.5–2.5 cm, villous toward adaxial base, apex acuminate; lip deeply pouched, subglobose or ellipsoid, 4.5–5.5 cm, with a small mouth ca. 1.5 cm in diam., inner bottom hairy. Staminode ovate-oblong, 10–14 × 7–8 mm, abaxially not carinate, base sessile. Capsule narrowly ellipsoid, ca. 4 cm, glabrous. Fl. Jun–Jul, fr. Aug–Sep.  $2n = 20, 21, 30$ .

Humus-rich soils and well-drained places in forests, forest margins, grassy slopes; 400–2400 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shandong, Taiwan [Japan, Korea, Russia].

*Cypripedium* × *ventricosum* Swartz (Kongl. Vetensk. Acad. Nya Handl. 21: 251. 1800), a natural hybrid between *C. macranthos* and *C. calceolus*, was reported to be found in Heilongjiang and Nei Mongol.

**12. *Cypripedium yunnanense*** Franchet, J. Bot. (Morot) 8: 231. 1894.

云南杓兰 yun nan shao lan

*Cypripedium amesianum* Schlechter.

Plants 20–37 cm tall, with a stout, short rhizome. Stem erect, glabrous or sparsely pubescent in upper part especially near nodes, with several sheaths at base and 3 or 4 leaves above. Leaf blade elliptic or elliptic-lanceolate, 6–14 × 1–3.5 cm, abaxially puberulent especially on veins, adaxially glabrous or sparsely puberulent, apex acuminate. Inflorescence terminal, with 1 flower; peduncle sparsely pubescent in upper part; floral bracts foliaceous, ovate-elliptic or ovate-lanceolate, 4–6 × ca. 1.5 cm, both surfaces sparsely pubescent, apex acute or acuminate; pedicel and ovary 2–3.5 cm, glabrous or upper part slightly hairy. Flower 4–6 cm in diam., pink, purplish red, or occasionally off-white, with darker veins; staminode white with a purple stripe centrally. Dorsal sepal ovate-elliptic, 2.2–3.2 × 1.2–1.6 cm, apex acuminate; synsepal elliptic-lanceolate, 2.2–3.2 × 0.8–1 cm, apex shallowly 2-lobed. Petals slightly twisted or not, lanceolate, 2.2–3.2 × 0.7–0.8 cm, adaxial base hairy, apex acuminate; lip deeply pouched, ellipsoid, 2.2–3.2 × 1.5–1.8 cm, with a paler rim to its mouth, outer surface glabrous, inner bottom hairy. Staminode elliptic or ovate, 6–7 × 3–4 mm, base subsessile. Fl. May.

• *Pinus* forests, thickets, grassy slopes; 2700–3800 m. SW and W Sichuan, SE Xizang, NW Yunnan.

**13. *Cypripedium taibaiense*** G. H. Zhu & S. C. Chen, Novon 9: 454. 1999.

太白杓兰 tai bai shao lan

Plants 13–15(–24) cm tall. Rhizome 4–5 cm, stout, 4–5 mm in diam. Stem erect, glabrous, with 2 or 3 sheaths at base and 3 or 4 leaves above. Leaf blade elliptic or elliptic-lanceolate, 4.5–11 × 2.8–3.5 cm, abaxially minutely pubescent or glabrescent, adaxially glabrous, ciliate, apex acuminate or subacute. Inflorescence terminal, 1-flowered; peduncle minutely pubescent; floral bracts narrowly elliptic or ovate-lanceolate, 6–6.5 cm, both surfaces minutely pubescent or adaxially glabrescent; pedicel and ovary 1.7–2 cm, pubescent at least along ribs. Flower purple-red, 4–4.5 cm in diam. Dorsal sepal elliptic-ovate, 2.2–3 × 1.3–1.5 cm, glabrous, apex acuminate; synsepal ovate-elliptic to narrowly elliptic, 2.2–2.8 × 1–1.2 cm, glabrous, bifid at apex. Petals lanceolate, 2.6–3 × 0.7–0.9 cm, villous in basal half adaxially; lip deeply pouched, obovoid-subglobose, 2.5–3 × 1.5–2 cm, outer surface glabrous, inner bottom hairy. Staminode oblong, 10–11 × 5–6 mm, with a longitudinal groove centrally, carinate abaxially, mucronate at apex. Fl. Jun–Jul.

• Grassy slopes; 2600–3300 m. S Shaanxi (Taibai Shan).

**14. *Cypripedium ludlowii*** P. J. Cribb, Gen. *Cypripedium*, 204. 1997.

波密杓兰 bo mi shao lan

Plants 25–38 cm tall. Stem erect, glabrous, with several sheaths at base and 3 leaves above. Leaf blade elliptic-ovate or elliptic, 6–13 × 3.6–7.5 cm, both surfaces sparsely pubescent on veins, occasionally with glandular hairs toward apex and base, apex acuminate or acute. Inflorescence terminal, with 1 flower; floral bracts ovate or ovate-elliptic, 6–8 × 3–4 cm, sparsely pubescent, apex acuminate or acute; pedicel and ovary 3.5–4.1 cm, occasionally with glandular hairs toward apex. Flower greenish yellow. Dorsal sepal ovate-elliptic, 3.3–3.8 × 1.5–1.7 cm, apex acuminate; synsepal ovate to lanceolate, 3.3–3.8 × 1.2–1.5 cm, apex shallowly 2-lobed. Petals not twisted, obliquely lanceolate, 3–4 × 0.9–1.2 cm, adaxial base pubescent, margin slightly undulate, apex acuminate; lip pouched, sub-ellipsoid, 3–3.6 cm, inner bottom hairy; incurved lateral lobes to 1 cm wide. Staminode subovate-oblong, ca. 1 cm, with a longitudinal groove centrally, glabrous. Fl. unknown.

• Moist places in forests; ca. 4300 m. SE Xizang (Bomi).

**15. *Cypripedium tibeticum*** King ex Rolfe, J. Linn. Soc., Bot. 29: 320. 1892.

西藏杓兰 xi zang shao lan

*Cypripedium compactum* Schlechter; *C. corrugatum* Franchet; *C. corrugatum* var. *obesum* Franchet; *C. lanuginosum* Schlechter; *C. macranthos* Swartz var. *tibeticum* (King ex Rolfe) Kraenzlin.

Plants 15–35 cm tall, with a stout, rather short rhizome. Stem erect, glabrous or pubescent near upper nodes, with several sheaths at base and 3 or rarely 2 or 4 leaves above. Leaf blade elliptic, ovate-elliptic, or broadly elliptic, 8–16 × 3–9 cm,

glabrous or sparsely puberulent, minutely ciliate, apex acute, acuminate, or obtuse. Inflorescence terminal, with 1 flower, usually appearing before full development of leaves; floral bracts foliaceous, elliptic to ovate-lanceolate, 6–11 × 2–5 cm, apex acute or acuminate; pedicel and ovary 2–3 cm, glabrous or occasionally slightly pubescent toward apex. Flower large, nodding; sepals and petals white or yellow, boldly striped with purple to deep maroon; lip purple or dark maroon, usually with a white-margined rim. Dorsal sepal elliptic or ovate-elliptic, 3–6 × 2.5–4 cm, abaxially glabrous or occasionally sparsely puberulent, ± minutely ciliate, apex acuminate, acute, or mucronulate; synsepal similar to dorsal sepal, but slightly shorter and narrower, apex shallowly 2-lobed. Petals lanceolate or oblong-lanceolate, 3.5–6.5 × 1.5–2.5 cm, with very conspicuous veins, densely pubescent toward adaxial base, sparsely minutely ciliate, apex acuminate or acute; lip deeply pouched, subglobose to ellipsoid, 4–6 × 4–5.5 cm, outer surface often wrinkled, inner bottom hairy. Staminode ovate-oblong, 1.5–2 × 0.8–1.2 cm, abaxially ± keeled, base subsessile. Fl. May–Aug.  $2n = 20$ .

Sparse forests, forest margins, scrubby slopes, grassy slopes, stony places; 2300–4200 m. S Gansu, W Guizhou, W Sichuan, E and S Xizang, W Yunnan [Bhutan, India (Sikkim)].

*Cypripedium froschii* Perner (Orchidee Beih., Deutsch. Orchid. Ges. 6: 10. 1999), collected from Lijiang, Yunnan, appears to be a natural hybrid between *C. tibeticum* and *C. yunnanense*, both of which are native to Lijiang. Its flower is similar to that of *C. yunnanense* but much larger.

**16. *Cypripedium calcicola*** Schlechter, Acta Horti Gothob. 1: 129. 1924 [*“calcicolum”*].

褐花杓兰 he hua shao lan

*Cypripedium smithii* Schlechter.

Plants 15–45 cm tall, with a stout, rather short rhizome. Stem erect, usually glabrous, with several sheaths at base and 3 or 4 leaves above. Leaf blade elliptic, 5–16.5 × 4–5.5 cm, subglabrous, minutely ciliate, apex acuminate or acute. Inflorescence terminal, with 1 flower; peduncle pubescent; floral bracts foliaceous, ovate-lanceolate, to 9.5 × 2–2.5 cm; pedicel and ovary 3–3.5 cm, sparsely hairy. Flower deep purple; lip with translucent “windows” on back, without a white-margined rim to its mouth. Dorsal sepal elliptic-ovate, 3.5–5 × 1.9–2.2 cm, apex acuminate; synsepal elliptic-lanceolate, 3.2–4.2 × 1.5–2 cm, apex shallowly 2-lobed. Petals ovate-lanceolate, 4.4–5.2 × 0.8–0.9 cm, with very conspicuous veins, adaxial base pubescent, apex acuminate; lip deeply pouched, ellipsoid, 3.5–4.2 × 2.5–2.8 cm, inner bottom hairy. Staminode suboblong, 1.3–1.5 × ca. 1 cm, base subsessile. Fl. Jun–Jul.

• Forests, forest margins, thickets, grassy slopes or stony places along streambanks; 2600–3900 m. W Sichuan, NW Yunnan.

**17. *Cypripedium franchetii*** E. H. Wilson, Horticulture 16: 145. 1912.

毛杓兰 mao shao lan

*Cypripedium macranthos* Swartz var. *villosum* Handel-Mazzetti; *C. pulchrum* Ames & Schlechter; *C. rubronerve* Cavestro.

Plants 20–35 cm tall, with a stout, rather short rhizome.

Stem erect, densely villous especially toward upper part, with several sheaths at base and 3–5 leaves above. Leaf blade elliptic or ovate-elliptic, 10–16 × 4–6.5 cm, both surfaces sparsely pubescent on veins, minutely ciliate, apex acute or shortly acuminate. Inflorescence terminal, with 1 flower; peduncle densely villous; floral bracts foliaceous, elliptic or elliptic-lanceolate, 6–8(–12) × 2–3.5 cm, both surfaces sparsely hairy, minutely ciliate, apex acuminate or shortly acuminate; pedicel and ovary 4–4.5 cm, densely villous. Flower purplish red to pink, with darker veins. Dorsal sepal elliptic-ovate or ovate, 4–5.5 × 2.5–3 cm, abaxially sparsely pubescent on veins, minutely ciliate, apex acuminate or shortly acuminate; synsepal elliptic-lanceolate, 3.5–4 × 1.5–2.5 cm, abaxially pubescent on veins, minutely ciliate, apex shallowly 2-lobed. Petals lanceolate, 5–6 × 1–1.5 cm, villous toward adaxial base, apex acuminate; lip deeply pouched, ellipsoid or subglobose, 4–5.5 × 3–4 cm. Staminode ovate-sagittate to ovate, 10–15 × 7–9 mm, abaxially slightly carinate, base auriculate, subsessile or with a very short stalk at base. Fl. May–Jul.

• Humus-rich and well-drained places in open forests, scrubby or wet grassy slopes; 1500–3700 m. Chongqing, S Gansu, W Henan, W Hubei, S Shaanxi, S Shanxi, NW Sichuan.

**18. *Cypripedium himalaicum*** Rolfe, J. Linn. Soc., Bot. 29: 319. 1892.

高山杓兰 gao shan shao lan

*Cypripedium macranthos* Swartz var. *himalaicum* (Rolfe) Kraenzlin.

Plants 25–28 cm tall, with a relatively slender rhizome. Stem erect, sparsely pubescent, with several sheaths at base and 3 leaves above. Leaf blade oblong-elliptic to broadly elliptic, 5–10 × 2.5–4 cm, both surfaces glabrous or slightly hairy, ciliate, apex acute. Inflorescence terminal, with 1 flower; peduncle ± pubescent, especially in upper part; floral bracts foliaceous, narrowly elliptic to narrowly elliptic-lanceolate, 3–5 × 0.6–1.2 cm, abaxial veins ± hairy, apex acuminate; pedicel and ovary 1.8–2.2 cm, densely pubescent. Flowers fragrant, whitish or greenish yellow, densely marked with purplish brown longitudinal stripes. Dorsal sepal broadly elliptic or broadly ovate, 2.4–2.7 × 1.8–2.1 cm, slightly concave, apex acute; synsepal narrowly oblong or oblong-lanceolate, 1.8–2.2 × 1.1–1.2 cm, concave, apex shallowly 2-lobed. Petals narrowly oblong or linear-lanceolate, 2.3–3.4 × 0.6–0.7 cm, villous toward adaxial base, apex acute; lip deeply pouched, slightly bilaterally compressed, subellipsoid, 2.3–2.8 cm, with a small mouth and a toothed margin around it, inner bottom hairy. Staminode broadly ovate-cordate, ca. 7 × 5–6 mm, base with a very short stalk. Fl. Jun–Jul.  $2n = 20$ .

Grasslands in forests, forest margins, open rocky slopes; 3600–4000 m. S and SE Xizang [Bhutan, N India, Nepal].

**19. *Cypripedium plectrochilum*** Franchet, Bull. Soc. Bot. France 32: 27. 1885.

离萼杓兰 li e shao lan

*Cypripedium arietinum* Franchet (1885), not R. Brown (1813).

Plants 12–30 cm tall, with a stout, rather short rhizome. Stem erect, pubescent, with several sheaths at base and 3 or rarely 2 or 4 leaves above. Leaf blade elliptic to narrowly elliptic-lanceolate, 4.5–6 × 1–3.5 cm, abaxial veins occasionally puberulent, adaxially subglabrous, apex acute or shortly acuminate. Inflorescence terminal, with 1 flower; peduncle slender, pubescent; floral bracts foliaceous, elliptic-lanceolate or lanceolate, 2–3 × 0.7–0.8 cm, slightly ciliate, apex acuminate or acute; pedicel and ovary 1.5–2.5 cm, densely pubescent. Flowers relatively small; sepals and petals chocolate-brown or greenish brown, petals usually with a white margin; lip and staminode white, tinged with pink. Dorsal sepal ovate-lanceolate, 1.6–1.8 × 0.7–0.8 cm, slightly hairy at base, minutely ciliate, apex acute; lateral sepals free, linear-lanceolate, 1.6–1.8 × 0.2–0.3 cm, slightly hairy at base, apex acuminate or acute. Petals linear, 1.6–2.1 × 0.1–0.2 cm, pubescent toward adaxial base; lip deeply pouched, obconic, slightly oblique, 1.6–2.4 × ca. 1 cm, pubescent around mouth, inner bottom hairy, obtusely tipped. Staminode obovate or square-obovate, 5–6 mm, abaxially carinate, with a very short stalk at base. Capsule narrowly ellipsoid, ca. 2 cm × 5–6 mm, ridged, sparsely pubescent along ridges. Fl. Apr–Jun, fr. Jul.  $2n = 20$ .

Forests, forest margins, thickets, stony and grassy slopes; 2000–3600 m. W Hubei, W Sichuan, SE Xizang, C and NW Yunnan [Myanmar].

**20. *Cypripedium japonicum*** Thunberg in Murray, Syst. Veg., ed. 14, 817. 1784.

扇脉杓兰 shan mai shao lan

*Cypripedium cathayanum* S. S. Chien.

Plants 35–55 cm tall, with a relatively slender, creeping rhizome 3–4 mm in diam. Stem erect, brown tomentose, with several sheaths in lower part and 2 subopposite or rarely 3 nearly alternate leaves near middle. Leaf blade flabellate, 10–16 × 10–21 cm, both surfaces hairy toward base, with many radiating veins reaching margin of apical half, base subcuneate, margin undulate, minutely ciliate. Inflorescence terminal, with 1 flower; peduncle brown tomentose; floral bracts foliaceous, rhombic or ovate-lanceolate, 2.5–5 × 1–2(–3) cm, glabrous, minutely ciliate; pedicel and ovary 2–3 cm, densely hairy. Flowers pendulous; sepals and petals greenish yellow, base ± spotted with purple; lip yellowish pink to whitish, ± marked with purplish red spots and stripes. Dorsal sepal narrowly elliptic or narrowly elliptic-lanceolate, 4.5–5.5 × 1.5–2 cm, glabrous, apex acuminate; synsepal similar to dorsal sepal, 4–5 × 1.5–2.5 cm, apex shallowly 2-lobed. Petals obliquely lanceolate, 4–5 × 1–1.2 cm, villous toward adaxial base, apex acuminate; lip pendulous, pouched, subellipsoid or obovoid, 4–5 × 3–3.5 cm, strongly grooved-margined around mouth. Staminode elliptic, ca. 10 × 6–7 mm, base shortly auriculate. Capsule subfusiform, 4.5–5 × ca. 1.2 cm, sparsely puberulent. Fl. Apr–May, fr. Jun–Oct.  $2n = 20$ .

Moist and humus-rich soils in forests, thickets, forest margins, shaded slopes; 1000–2000 m. Anhui, S Gansu, Guizhou, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Zhejiang [Japan].

**21. *Cypripedium formosanum*** Hayata, Icon. Pl. Formosan. 6: 66. 1916.

台湾杓兰 tai wan shao lan

*Cypripedium japonicum* Thunberg var. *formosanum* (Hayata) S. S. Ying.

Plants 30–40 cm tall, with a relatively slender, creeping, often branched rhizome. Stem erect, glabrous or puberulent, with several sheaths in lower part and 2 subopposite leaves above. Leaf blade flabellate, 10–13 × 8–11 cm, both surfaces sparsely puberulent or adaxial surface glabrous, with many radiating veins reaching margin of apical half, base cuneate, margin undulate, minutely ciliate, apex mucronate. Inflorescence terminal, with 1 flower; peduncle nearly glabrous or sparsely pubescent; floral bracts foliaceous, ovate-lanceolate, 2.2–3 × 1–1.2 cm, sparsely puberulent, apex acute; pedicel and ovary 1.8–2 cm, densely pubescent. Flowers pendulous, white or pinkish; sepals and petals spotted with purplish red at base; lip ± with purplish red short stripes and spots. Dorsal sepal often curving forward over lip, narrowly ovate or ovate-lanceolate, 4.5–5 × 1.6–2 cm, slightly pubescent toward base, apex acute or shortly acuminate; synsepal elliptic-ovate, 4.5–5 × 2.5–3 cm, slightly hairy toward base, apex shallowly 2-lobed. Petals oblong-lanceolate, 4.5–5 × 1.2–1.8 cm, adaxial base villous, apex acuminate or acute; lip pendulous, pouched, obovoid or ellipsoid, 4–6 × 3.5–4 cm, slightly grooved-margined around mouth, inner bottom hairy. Staminode ovate-triangular or ovate-sagittate, ca. 10 × 6–7 mm. Fl. Apr–May.  $2n = 20^*$ ,  $30^*$ .

• Forests, thickets; 2400–3000 m. Taiwan.

**22. *Cypripedium guttatum*** Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 251. 1800.

紫点杓兰 zi dian shao lan

*Cypripedium bouffordianum* Yong H. Zhang & H. Sun; *C. orientale* Sprengel.

Plants 15–25 cm tall, with a slender, creeping rhizome. Stem erect, pubescent and glandular hairy, with several sheaths at base and 2 or rarely 3 leaves above. Leaves subopposite or occasionally alternate, at or above middle of plant; blade often turning black or blackish when dried, elliptic, ovate, or ovate-lanceolate, 5–12 × 2.5–4.5(–6) cm, abaxial veins sparsely pubescent or subglabrous, apex acute or acuminate. Inflorescence terminal, with 1 flower; peduncle densely pubescent and glandular hairy; floral bracts foliaceous, ovate-lanceolate, usually 1.5–3 cm, minutely ciliate, apex acute or acuminate; pedicel and ovary 1–1.5 cm, with glandular hairs. Flower white with purplish red or brownish red markings. Dorsal sepal ovate-elliptic or broadly ovate-elliptic, 1.5–2.2 × 1.2–1.6 cm, often sparsely puberulent toward abaxial base, apex acute or shortly acuminate; synsepal narrowly elliptic, 1.2–1.8 × 0.5–0.6 cm, apex shallowly 2-lobed. Petals often subspatulate or pandurate, 1.3–1.8 × 0.5–0.7 cm, hairy toward adaxial base, apex often slightly dilated and rounded; lip deeply pouched, pitcher-shaped, ca. 1.5 × 1.5 cm, lacking an incurved apical margin, with a broad mouth, inner bottom hairy. Staminode ovate-elliptic, 4–5 × 2.5–3 mm, abaxially broadly keeled, adaxially minutely longitudinally ridged, apex emarginate or subtruncate. Capsule pendulous, nearly narrowly ellipsoid, ca. 2.5 cm × 8–10 mm, puberulent. Fl. May–Jul, fr. Aug–Sep.  $2n = 20$ ,  $30$ .

Forests, thickets, grasslands; 500–4000 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Xizang, NW Yunnan [Bhutan, Korea, Russia (Far East, Siberia); Europe, North America].

*Cypripedium bouffordianum* is evidently an albino form of *C. guttatum*. It is very similar in habit and flower structure to *C. guttatum* but lacks any purple-red or brown-red markings on the flower.

*Cypripedium yatabeanum* Makino (Bot. Mag. (Tokyo) 13: 91. 1899; *C. guttatum* subsp. *yatabeanum* (Makino) Hultén) was described from Japan and later reported from Heilongjiang and Jilin by P. Y. Fu and S. Z. Liu (in P. Y. Fu, Clavis Pl. Chinae Bor.-Orient., ed. 2, 895. 1995). It differs from *C. guttatum* by having dark brown spots on sepals, petals, and lip, and a larger lip more than 2 cm. However, the present authors are unaware of any Chinese specimens.

**23. *Cypripedium debile*** H. G. Reichenbach, Xenia Orchid. 2: 223. 1874.

对叶杓兰 *dui ye shao lan*

*Cypripedium cardiophyllum* Franchet & Savatier.

Plants 10–30 cm tall, with a rather short rhizome. Stem erect, slender, glabrous, with 2 or 3 tubular sheaths at base and 2 leaves at apex. Leaves spreading horizontally, opposite or subopposite; blade broadly ovate, triangular-ovate, or cordate, 2.5–7 × 2.5–7 cm, herbaceous, glabrous, minutely ciliate, with 3–5 palmate veins and inconspicuous reticulate veinlets, base subcordate or broadly cuneate, apex acute or shortly acuminate. Inflorescence terminal, pendulous, with 1 flower; peduncle arching, usually 2–5 cm, slender, glabrous; floral bracts linear, 1.5–3 cm, glabrous; pedicel and ovary 8–14 mm, glabrous. Flower small, often hidden under leaves; sepals and petals pale green or yellowish green, with maroon spots or markings at base; lip white with maroon spots inside and sometimes stripes toward its mouth. Dorsal sepal narrowly ovate-lanceolate, 1–2 × 0.5–0.7 cm, glabrous, apex acuminate; synsepal similar to dorsal sepal, often slightly smaller, apex nearly unlobed. Petals lanceolate, 1–2 × 0.3–0.5 cm, apex acute, often ± enfolding lip; lip deeply pouched, subellipsoid, 1–1.5 cm, with a broad mouth, inner bottom hairy. Staminode orbicular to ovate, 1–2 mm. Capsule narrowly ellipsoid, 1–1.8 cm × 5–6 mm. Fl. May–Jul, fr. Aug–Sep.  $2n = 20$ .

Humus- and litter-rich places in forests, grassy slopes; 1000–3400 m. Chongqing, S Gansu, W Hubei, W Sichuan, N Taiwan [Japan].

**24. *Cypripedium palangshanense*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 1. 1936.

巴郎山杓兰 *ba lang shan shao lan*

Plants 8–13 cm tall, with a slender, creeping rhizome. Stem erect, glabrous, mostly enclosed in several sheaths at base and 2 leaves at apex. Leaves spreading horizontally, opposite or subopposite; blade orbicular or nearly broadly elliptic, 4–6 × 4–5 cm, herbaceous, glabrous, with 5–7 prominent veins, not ciliate, apex acute or obtuse. Inflorescence terminal, suberect, with 1 flower; peduncle slender, pubescent; floral bracts lanceolate, 1.2–1.6 × 0.3–0.4 cm, glabrous, apex acute; pedicel and ovary 4–8 mm, with dense, short glandular hairs. Flower pendulous, brown-purple to purplish red. Dorsal sepal lanceolate, 1.4–1.8 × 0.3–0.4 cm, glabrous or pubescent at abaxial base;

synsepal ovate-lanceolate, 1.5–1.7 × 0.5–0.6 cm, apex shallowly 2-lobed. Petals obliquely lanceolate, 1.2–1.6 × 0.4–0.5 cm, slightly hairy toward abaxial base, apex acuminate; lip pouched, subglobose, ca. 1 cm, with a rather broad, rounded mouth. Staminode ovate-lanceolate, ca. 3 mm. Fl. Jun.

• Forests, thickets; 2200–2700 m. Chongqing, C and SW Sichuan.

**25. *Cypripedium elegans*** H. G. Reichenbach, Flora 69: 561. 1886.

雅致杓兰 *ya zhi shao lan*

Plants 10–15 cm tall, with a slender, creeping rhizome. Stem erect, densely villous, with 2 tubular sheaths at base and 2 leaves at apex. Leaves spreading horizontally, opposite or subopposite; blade ovate or broadly ovate, 4–5 × 3–3.5 cm, herbaceous, both surfaces sparsely pubescent or rarely glabrous, long ciliate, with 3(–5) prominent veins raised abaxially, apex obtuse. Inflorescence terminal, suberect, with 1 flower; peduncle 2–4 cm, villous; floral bracts ovate, 1.5–2 × 0.6–0.8 cm, slightly shortly hairy; pedicel and ovary 4–5 mm, hairy along longitudinal ridges. Flower small; sepals and petals yellowish green, adaxially with purplish red stripes; lip yellowish green to nearly white, with 3 purplish red warty stripes at front. Dorsal sepal elliptic-ovate, 1.5–2 × 0.6–1 cm, glabrous, apex acute; synsepal similar to dorsal sepal, apex shallowly 2-lobed. Petals lanceolate, 1.5–2 × 0.4–0.5 cm, glabrous, apex subacute; lip pouched, subglobose, ca. 1 cm, often upturned at apex with its mouth hidden. Staminode transversely elliptic, small, ca. 1.5 × 2 mm, base with a short stalk. Fl. May–Jul.

Humus-rich soils in forests, forest margins, thickets; 3600–3700 m. S and SE Xizang, NW Yunnan [Bhutan, N India, Nepal].

**26. *Cypripedium bardolphianum*** W. W. Smith & Farrer, Notes Roy. Bot. Gard. Edinburgh 9: 101. 1916.

无苞杓兰 *wu bao shao lan*

*Cypripedium nutans* Schlechter.

Plants 8–12 cm tall, with a slender, creeping rhizome. Stem erect, relatively short, 2–3 cm, glabrous, covered by 2 sheaths, with a subopposite leaf and bract at apex. Leaf and bract spreading horizontally or ascending; blade elliptic, 6–7 × 2.5–3 cm, subglabrous, apex obtuse or subacute. Inflorescence terminal, erect, 7–9 cm, with 1 flower, ebracteate; pedicel glabrous, continuously elongating at fruiting; ovary ca. 1 cm, with 3 longitudinal ridges often sparsely pubescent. Flower small; sepals and petals pale green or reddish with brown stripes; lip golden yellow ± with brown markings. Dorsal sepal elliptic or ovate-elliptic, 1.5–2 × 0.7–0.9 cm, glabrous, apex acute; synsepal similar to dorsal sepal, 1.4–1.8 × 0.7–0.9 cm, apex shallowly 2-lobed. Petals oblong-lanceolate, oblique, 1.5–1.8 × 0.5–0.6 cm, glabrous, apex acute, often ± enfolding lip; lip pouched, slightly dorsiventrally compressed, 1.2–1.5 cm, tuberculate on front surface toward mouth. Staminode broadly elliptic-oblong, ca. 6 × 4 mm, minutely papillate. Capsule ellipsoid-oblong, 1.5–1.7 × ca. 1 cm, glabrous. Fl. Jun–Jul, fr. Aug.

• Humus-rich and rocky or moist and mossy places on woody and scrubby slopes, at forest margins, or in open forests, often forming large colonies; 2300–3900 m. S Gansu, W Sichuan, SE Xizang.

**27. *Cypripedium micranthum*** Franchet, J. Bot. (Morot) 8: 265. 1894.

小花杓兰 xiao hua shao lan

Plants 8–10 cm tall, with a slender, creeping rhizome. Stem erect, 2–6 cm, glabrous, with 2 or 3 sheaths at base and a subopposite leaf and bract. Leaf and bract spreading horizontally or nearly prostrate on substrate; blade elliptic or obovate-elliptic, 7–9 × 3.5–6 cm, glabrous, apex mucronate. Inflorescence terminal, erect, with 1 flower, ebracteate; pedicel 2–5 cm, continuously elongating at fruiting, densely reddish villous; ovary 5–6 mm, densely reddish villous. Flower small, with blackish purple spots and short stripes on sepals and petals and red spots and stripes on lip and tinged with white around its mouth. Dorsal sepal ovate, 1.2–1.7 × 0.8–1 cm, concave, abaxially densely purple villous, apex acute or mucronate; synsepal elliptic, 1–1.3 × 0.8–0.9 cm, abaxially villous, apex shallowly 2-lobed. Petals ovate-elliptic, 1.3–1.4 × 0.5–0.8 cm, glabrous, apex acute; lip pouched, conspicuously dorsiventrally compressed, subellipsoid, ca. 1 cm, papillate on front surface. Staminode broadly orbicular or subsquare, ca. 3 mm, base slightly auriculate. Fl. May–Jun.

- Forests; 2000–2500 m. Chongqing, NW and SW Sichuan.

**28. *Cypripedium forrestii*** P. J. Cribb, Quart. Bull. Alpine Gard. Soc. Gr. Brit. 60: 172. 1992.

玉龙杓兰 yu long shao lan

*Cypripedium bardolphianum* W. W. Smith & Farrer var. *zhongdianense* S. C. Chen.

Plants 3–5 cm tall, with a slender, creeping rhizome. Stem erect, 1.5–3 cm, covered by 2 conic sheaths, with a subopposite leaf and bract. Leaf and bract spreading horizontally or nearly prostrate on substrate; blade adaxially green, usually heavily marked with dark purple or black spots, rarely unspotted, elliptic or elliptic-ovate, 5–6.5 × 2.5–3.6 cm, apex mucronate. Inflorescence terminal, with 1 flower, ebracteate; pedicel 1.7–2.5 cm, villous; ovary 0.8–1 cm, villous. Flower small, dull yellow, finely spotted with maroon. Dorsal sepal ovate, 2.2–2.4 × 1.4–1.5 cm, abaxial midvein hairy, apex mucronate; synsepal ovate-elliptic, 1.8–1.9 × 0.8–1 cm, abaxial veins slightly hairy, apex shallowly 2-lobed and slightly recurved. Petals obliquely ovate, ± enfolding lip, 1.5–1.8 × 0.5–0.6 cm, apex acute; lip pouched, dorsiventrally compressed, subglobose, ca. 1 cm, outer surface papillose. Staminode oblong, ca. 3.5 × 3 mm, adaxially papillate, apex obtuse. Fl. Jun.

- *Pinus* forests, scrubby slopes, open forests; ca. 3500 m. NW Yunnan.

**29. *Cypripedium margaritaceum*** Franchet, Bull. Soc. Philom. Paris, sér. 7, 12: 141. 1888.

斑叶杓兰 ban ye shao lan

*Cypripedium daliense* S. C. Chen & J. L. Wu.

Plants 7–11 cm tall, with a stout rhizome. Stem erect, usually 2–5 cm, glabrous, covered by 2 sheaths, with a subopposite leaf and bract prostrate on substrate. Leaf blade dark green with blackish purple spots, broadly ovate to orbicular,

10–15 × 7–13 cm, apex obtuse or mucronate. Inflorescence terminal, with 1 flower, ebracteate; pedicel 4–6 cm, glabrous; ovary 1–1.5 cm, 3-ribbed; ribs sparsely pubescent. Flower yellow, marked with maroon longitudinal stripes on sepals and petals and spots on lip; staminode dark maroon. Dorsal sepal broadly ovate, 3–4 × 2.5–3.5 cm, shortly hairy on abaxial veins, papillate-ciliate, apex obtuse or mucronate; synsepal elliptic-ovate, slightly shorter than dorsal sepal, 2–2.5 cm wide, papillate-ciliate, apex obtuse and bidentate. Petals obliquely oblong-lanceolate, curved forward, enfolding lip, 3–4 × 1.5–2 cm, shortly hairy on abaxial veins, apex acute; lip pouched, subellipsoid, dorsiventrally flattened, 2.5–3 cm, tuberculate on front surface. Staminode orbicular to subsquare, ca. 1 cm, adaxially papillate. Fl. May–Jul.

- Grassy slopes, open forests; 2500–3600 m. SW Sichuan, NW Yunnan.

**30. *Cypripedium sichuanense*** Perner, Orchidee (Hamburg) 53: 89. 2002.

四川杓兰 si chuan shao lan

Plants 10–12 cm tall, with a stout, sometimes branched rhizome. Stem 3–3.6 cm, glabrous, covered by a sheath, apex with a subopposite leaf and bract prostrate on substrate. Leaf blade green spotted with dark red-brown, broadly elliptic to suborbicular, 11.5–13.5 × 9.5–12 cm. Inflorescence terminal, 1-flowered, ebracteate; pedicel ca. 5.5 cm, glabrous; ovary ca. 1.7 cm, glabrous. Flower yellow to greenish yellow, ca. 4.5 cm in diam.; dorsal sepal spotted with maroon on adaxial veins and whole abaxial surface; synsepal with fewer maroon spots; petals and lip marked with maroon spots and stripes; staminode dark maroon. Dorsal sepal ovate-lanceolate, ca. 3.7 × 2.8 cm, both surfaces glabrous, ciliate, apex acute; synsepal similar to dorsal sepal, bidentate at apex. Petals curved forward, enfolding lip, oblong-lanceolate, ca. 4.3 × 1.6 cm, glabrous, apex acuminate; lip pouched, dorsiventrally flattened, ca. 2.6 × 1.6 cm, maroon spots at front usually wartlike. Staminode shortly trullate, ca. 10 × 9 mm, distinctly auriculate at base, obtuse. Fl. Jun–Jul.

- Humus-rich soils in bamboo and deciduous thickets. NC Sichuan (Wenchuan).

**31. *Cypripedium daweishanense*** (S. C. Chen & Z. J. Liu) S. C. Chen & Z. J. Liu, J. Wuhan Bot. Res. 23: 233. 2005.

大围山杓兰 da wei shan shao lan

*Cypripedium lichiangense* S. C. Chen & P. J. Cribb var. *daweishanense* S. C. Chen & Z. J. Liu, Acta Bot. Yunnan. 26: 384. 2004.

Plants 10–15 cm tall, with a stout rhizome. Stem 5–8 cm, glabrous, covered by a sheath, apex with a subopposite leaf and bract prostrate on substrate. Leaf blade grayish green or green heavily spotted with purple-brown, suborbicular or broadly elliptic, 15–17 × 11–14 cm. Inflorescence terminal, 1-flowered, ebracteate; pedicel 5–7 cm, glabrous; ovary 2–2.5 cm, glabrous. Flower rather large; dorsal sepal yellowish green, very sparsely spotted with maroon; synsepal yellowish, tinged with grayish green, sparsely spotted with maroon; petals yellowish, densely spotted with maroon; lip yellowish spotted with maroon especially around mouth; staminode yellowish heavily spotted with

maroon. Dorsal sepal ovate or broadly ovate, 4–5 × 3–4 cm, both surfaces glabrous, ciliate; synsepal lanceolate, 4–5 × 1.5–1.8 cm. Petals curved forward, enfolding lip, elliptic-oblong, 4.2–4.7 × 2.4–2.8(–3.4) cm, abaxially pubescent on upper side, ciliate along apical margin; lip pouched, slightly dorsiventrally flattened, 3.8–4.5 × 3–3.5 cm, ± papillate on front surface. Staminode tongue-shaped, 17–20 × ca. 5 mm, adaxially puberulent. Fl. May–Jun.

- Wet but well-drained and humus-rich soils in thickets; ca. 2300 m. SE Yunnan (Pingbian).

**32. *Cypripedium lichiangense*** S. C. Chen & P. J. Cribb, *Orchid Rev.* 102: 321. 1994.

丽江杓兰 li jiang shao lan

Plants 7–14 cm tall, with a stout, rather short rhizome. Stem erect, 3–7 cm, covered by 2 tubular sheaths, apex with a subopposite leaf and bract prostrate on substrate. Leaf blade dark green, marked with purplish black spots, ovate or obovate to orbicular, 8.5–19 × 7–16 cm, margin sometimes purplish, apex obtuse or mucronate. Inflorescence terminal, with 1 flower, ebracteate; pedicel 4–7 cm, glabrous; ovary 1.2–1.8 cm, glabrous. Flower rather large; sepals and staminode liver-colored; petals and lip yellow spotted with maroon. Dorsal sepal ovate or broadly ovate, 4.2–7 × 3.8–6 cm, both surfaces glabrous, ciliate, apex acute; synsepal elliptic, 3.5–5.6 × 2–3.6 cm, ciliate, with 2 teeth at apex. Petals incurved forward, enfolding lip, obliquely oblong, 4–6.5 × 1.4–2.1 cm, abaxially pubescent on upper side, ciliate, apex acute; lip pouched, subellipsoid, dorsiventrally flattened, 3.3–4 cm, papillate on front surface. Staminode suboblong, 1.3–1.5 cm, adaxially papillate. Fl. May–Jul.

- Sparse thickets, open forests; 2600–3500 m. SW Sichuan, NW Yunnan.

**33. *Cypripedium lentiginosum*** P. J. Cribb & S. C. Chen, *Quart. Bull. Alpine Gard. Soc. Gr. Brit.* 67: 155. 1999.

长瓣杓兰 chang ban shao lan

*Cypripedium lichiangense* S. C. Chen & P. J. Cribb subsp. *lentiginosum* (P. J. Cribb & S. C. Chen) Eccarius.

Plants 7–11 cm tall, with a stout, creeping rhizome. Stem erect, 3–7 cm, covered by 2 tubular sheaths, apex with a subopposite leaf and bract prostrate on substrate. Leaf blade dark green, heavily spotted with black, sometimes with a purplish margin, ovate, obovate, or suborbicular, ca. 16 × 14 cm. Inflorescence terminal, 1-flowered, ebracteate; pedicel 3–4 cm, glabrous; ovary ca. 1.6 cm, glabrous. Dorsal sepal and synsepal liver-colored; petals and lip off-white, creamy white, or yellowish, marked with maroon spots; staminode liver-colored. Dorsal sepal elliptic-ovate, ca. 6 × 2.5–3 cm, subglabrous, apex acute; synsepal lanceolate, ca. 5 × 1 cm, ciliate, apex acute. Petals incurved forward, enfolding lip, obliquely oblong-lanceolate, ca. 6.2 × 1.9 cm, concave, abaxially pubescent on upper side, sparsely ciliate, apex acuminate; lip pouched, dorsiventrally flattened, ca. 3 × 2.5 cm, minutely papillate on front surface. Staminode trullate, ca. 1 cm, papillose toward adaxial apex, rounded at apex. Fl. May.

- Steep rocky limestone boulders just below ridges in thickets or open forests; 2100–2200 m. SE Yunnan (Malipo).

**34. *Cypripedium malipoense*** S. C. Chen & Z. J. Liu, *Acta Bot. Yunnan.* 26: 382. 2004.

麻栗坡杓兰 ma li po shao lan

Plants 6–9 cm tall, with a stout rhizome. Stem short, covered by 2 sheaths, apex with 2 subopposite leaves prostrate on substrate. Leaf blade yellowish, spotted with maroon, very similar in color to petals and lip, broadly ovate to suborbicular, 12–14 × 12–14 cm, apex acute. Inflorescence terminal, 1-flowered, ebracteate; pedicel 2–3 cm, glabrous; ovary 1–2 cm, glabrous. Flower 4–5 cm in diam.; dorsal sepal and synsepal liver-colored; petals and lip yellowish, spotted with maroon; staminode liver-colored, with a yellow longitudinal stripe centrally and a narrow yellow margin. Dorsal sepal broadly ovate, 3–3.5 × 2.5–2.8 cm, both surfaces glabrous, minutely ciliate, apex acute; synsepal elliptic-ovate, slightly shorter and much narrower than dorsal sepal. Petals curved forward, enfolding lip, suboblong, ca. 4 × 1.5 cm, adaxially slightly pubescent, minutely ciliate, apex acute; lip pouched, strongly dorsiventrally flattened, ca. 2.5 × 2.5 cm, ± papillose on front surface. Staminode ovate-trullate, 12–13 mm, adaxially minutely papillate. Fl. Jun.

- Grassy and humus-rich places in forests or thickets; 2200–2300 m. SE Yunnan (Malipo).

One of us (Cribb) believes that *Cypripedium malipoense* may be a chlorotic plant of *C. lentiginosum*, but further investigation is needed.

**35. *Cypripedium fargesii*** Franchet, *J. Bot. (Morot)* 8: 267. 1894.

毛瓣杓兰 mao ban shao lan

*Cypripedium ebracteatum* Rolfe; *C. margaritaceum* Franchet var. *fargesii* (Franchet) Pfitzer.

Plants 8–14 cm tall, with a stout, rather short rhizome. Stem erect, 3.5–7 cm, covered by 2 or 3 nearly tubular sheaths, apex with a subopposite leaf and bract prostrate on substrate. Leaf blade green, marked with blackish brown spots, broadly elliptic to orbicular, 10–15 × 8–14 cm, glabrous, apex obtuse. Inflorescence terminal, with 1 flower, ebracteate; pedicel 2.5–7 cm, glabrous; ovary 1.2–1.5 cm, 3-ribbed; ribs sparsely pubescent. Sepals yellowish green, with dense maroon spots toward base of dorsal sepal; petals yellowish, marked with purplish red stripes and spots; lip yellow, marked with purplish red fine spots; staminode maroon. Dorsal sepal ovate to broadly ovate, 3–4.5 × 2.5–5 cm, puberulent on abaxial veins; synsepal elliptic-ovate, 3–5 × 2.5–3 cm, apex subacute, inconspicuously bidentate. Petals incurved forward, enfolding lip, oblong, 3.5–5.5 × ca. 1.5 cm, densely white villous on upper side of abaxial surface, apex acute; lip deeply pouched, subglobose, slightly dorsiventrally flattened, ca. 2.5 cm, minutely papillose on front surface. Staminode ovate or oblong, ca. 1 cm. Fl. May–Jul.

- Humus-rich soils in thickets, sparse woods, grassy slopes; 1900–3200 m. N Chongqing, S Gansu, W Hubei, W Sichuan.

**36. *Cypripedium wumengense*** S. C. Chen, *Acta Phytotax. Sin.* 23: 372. 1985.

乌蒙杓兰 wu meng shao lan

Plants ca. 22 cm tall. Stem ca. 10 cm, covered by 3 sub-tubular sheaths, apex with an ascending subopposite leaf and bract. Leaf blade green, spotted with purple, ovate-elliptic, 11–13 × 6.5–7 cm, glabrous, apex mucronate. Inflorescence terminal, with a solitary flower, ebracteate; pedicel 10–12 cm, glabrous; ovary ca. 9 mm, glabrous. Flower with purple spots and stripes, 6–7 cm in diam. Dorsal sepal broadly ovate, ca. 3.5 × 2.8 cm, both surfaces glabrous, ciliate, apex mucronate; synse-

pal elliptic, ca. 4.1 × 2 cm, both surfaces glabrous, ciliate, apex bidentate. Petals obliquely ovate-oblong, ca. 3.8 × 1.5 cm, both surfaces glabrous, ciliate, apex slightly mucronate; lip deeply pouched, subglobose, ca. 1.6 × 1.6 cm, minutely papillate on front surface. Staminode broadly ovate, ca. 5 × 7.5 mm. Fl. May.

• Bamboo thickets on limestone cliffs; ca. 2900 m. NE Yunnan (Luquan).

#### 4. PAPHIOPEDILUM Pfitzer, Morph. Stud. Orchideenbl. 11. 1886, nom. cons.

兜兰属 dou lan shu

Liu Zhongjian (刘仲健), Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb

*Cordula* Rafinesque; *Stimegas* Rafinesque.

Plants terrestrial, lithophytic, or epiphytic. Rhizome inconspicuous or short, rarely stoloniferous, with glabrous or hairy roots. Stem short, enclosed in distichous leaf bases, rarely elongated. Leaves usually basal, 3–7, distichous, conduplicate toward base; blade abaxially pale green or sometimes spotted or flushed with purple at base or throughout, adaxially uniformly green or tessellated with dark and light green, narrowly elliptic to suboblong. Scape suberect to arching, terminating in a solitary flower or a several- to many-flowered inflorescence; peduncle usually hairy; floral bracts conduplicate; ovary 1-locular. Flowers large, showy, variable in color. Dorsal sepal often large, margin sometimes recurved; lateral sepals usually fused to form a synsepal. Petals various in shape, suborbicular to spatulate; lip deeply pouched and inflated, globose, ellipsoid, or ovoid, basal portion narrowed and with incurved lateral lobes, hairy at inner bottom. Column short, with 2 lateral fertile stamens, a terminal staminode above, and a stigma below; anthers 2-locular, with very short filament; pollen powdery or glutinous; staminode varying in shape; stigma papillate and inconspicuously 3-lobed. Fruit a capsule.

About 80–85 species: tropical Asia to the Pacific islands, with some species extending to subtropical areas; 27 species (two endemic) in China.

- 1a. Lip subglobose, ellipsoid, or ovoid, apical margin involute, usually with a rather short basal claw.
- 2a. Lip usually ellipsoid or ovoid, longer than broad; dorsal sepal broader than petals.
  - 3a. Dorsal sepal and petals with a central longitudinal stripe composed of brown-red spots; staminode with caudate apex 1.5–2 mm ..... 9. *P. wenshanense*
  - 3b. Dorsal sepal and petals without a central stripe as above; staminode lacking a caudate apex as above.
    - 4a. Flower yellowish to yellow; dorsal sepal and petals with maroon speckles 0.5–1 mm in diam. .... 7. *P. concolor*
    - 4b. Flower white or ivory, sometimes yellowish; dorsal sepal and petals with maroon spots 1.5–2 mm in diam. .... 8. *P. bellatulum*
- 2b. Lip usually subglobose, nearly as long as broad; dorsal sepal narrower than or ca. as broad as petals.
  - 5a. Leaves uniformly green, very rarely obscurely tessellated with dark and light green adaxially.
    - 6a. Flower white with a yellowish lip; staminode trullate, with a deep longitudinal groove centrally, 9–10 mm wide, yellow, strongly veined with red ..... 5. *P. emersonii*
    - 6b. Flowers dull cream-colored, sometimes flushed at base with purple; staminode broadly obovate-triangular, nearly flat, 18–22 mm wide, cream-colored, heavily veined with red, and with a yellow tip ..... 6. *P. hangianum*
  - 5b. Leaves distinctly tessellated with dark and light green adaxially.
    - 7a. Dorsal sepal apple-green or rarely yellowish green or greenish; scape usually 30–50(–65) cm ..... 1. *P. malipoense*
    - 7b. Dorsal sepal not apple-green or yellowish green; scape usually 15–25(–30) cm.
      - 8a. Plants not stoloniferous; dorsal sepal and petals white, scarcely or obscurely spotted and veined with pale pink, particularly on dorsal surface ..... 4. *P. delenatii*
      - 8b. Plants stoloniferous; dorsal sepal and petals yellow or whitish and conspicuously veined with red-purple.
        - 9a. Sepals, petals, and lip yellow, lip not much larger than synsepal ..... 2. *P. armeniacum*
        - 9b. Sepals and petals white, strongly marked with purple on veins, lip much larger than synsepal, pink or rarely white ..... 3. *P. micranthum*
  - 1b. Lip helmet-shaped or slipper-shaped, lacking an involute apical margin and with a long basal claw.
    - 10a. Leaves tessellated with dark and light green adaxially; lip tuberculate on incurved lateral lobes.
      - 11a. Petals heavily spotted with blackish maroon over whole adaxial surface ..... 26. *P. wardii*
      - 11b. Petals without or sometimes with blackish maroon speckles in basal half or a few blackish warts scattered.
        - 12a. Leaves densely spotted with purple abaxially; lip and staminode distinctly green veined ..... 27. *P. venustum*

- 12b. Leaves pale green abaxially or sometimes marked with purple at abaxial base; lip and staminode not green veined.
- 13a. Leaves usually obscurely tessellated with dark and light green adaxially, and marked with purple at abaxial base; petals spatulate, with a few warts along upper margin of basal half ..... 24. *P. appletonianum*
- 13b. Leaves usually distinctly tessellated with green and whitish green adaxially, not marked with purple abaxially; petals suboblong or oblong-elliptic, usually with blackish maroon speckles in basal half ..... 25. *P. purpuratum*
- 10b. Leaves uniformly green adaxially; lip not tuberculate on incurved lateral lobes.
- 14a. Inflorescence 2–6-flowered; petals more than 2 × as long as lip.
- 15a. Ovary glabrous; perianth persistent until fruiting ..... 10. *P. dianthum*
- 15b. Ovary densely pubescent; perianth deciduous after pollination ..... 11. *P. parishii*
- 14b. Inflorescence 1- or very rarely 2-flowered; petals less than 2 × as long as lip.
- 16a. Leaves rigid, leathery-succulent, usually 7–10(–12.5) cm; synsepal suborbicular; flowers yellow or ochre-yellow, dorsal sepal with a white margin ..... 18. *P. helenae*
- 16b. Leaves neither rigid nor leathery-succulent, usually (8–)10–40 cm; synsepal ovate to elliptic; flowers not as above.
- 17a. Flower with 3 irregular longitudinal maroon bars on dorsal sepal and 2 similar bars on petals ..... 22. *P. tigrinum*
- 17b. Flower without maroon bars as above.
- 18a. Dorsal sepal white with a maroon midvein; staminode convolute on basal margin and appearing like a pair of eyes ..... 23. *P. spicerianum*
- 18b. Dorsal sepal not colored as above; staminode without convolute basal margin as above.
- 19a. Plants with a long and stout rhizome more than 8 × 1 cm ..... 16. *P. areeanum*
- 19b. Plants lacking a long rhizome as above.
- 20a. Staminode subsquare, with a glossy convex center, lacking a distinct umbo; petals with dense blackish maroon speckles in basal half; lip ± puberulent on outer surface ..... 12. *P. hirsutissimum*
- 20b. Staminode obovate, with a distinct umbo centrally; petals without spots or with purple to dark maroon spots in basal half; lip glabrous on outer surface.
- 21a. Dorsal sepal very broad, 4.6–6.7 cm wide, pinkish to white, usually with reddish veins; staminode white ..... 13. *P. charlesworthii*
- 21b. Dorsal sepal less than 4.5 cm wide, not colored as above; staminode not white.
- 22a. Leaves 8–19 × 0.7–1.8 cm; petals 3–4 cm.
- 23a. Dorsal sepal and petals with large maroon spots; petals 14–18 mm wide ..... 19. *P. henryanum*
- 23b. Dorsal sepal and petals without large maroon spots; petals 7–10 mm wide.
- 24a. Petals undulate at margin; staminode with a yellow umbo in central or upper part ..... 15. *P. barbigerum*
- 24b. Petals strongly undulate at margin; staminode with a green umbo in lower part ..... 17. *P. tranlienianum*
- 22b. Leaves (15–)20–40 × 2–4 cm; petals 5–6 cm.
- 25a. Petals 1.5–2 cm wide, with same color on both sides of midvein, apical half slightly broader than or nearly as broad as basal half; dorsal sepal finely spotted with black ..... 14. *P. insigne*
- 25b. Petals 2–4.5 cm wide, with different color on each side of midvein, apical half more than 2 × as broad as basal half; dorsal sepal unspotted or somewhat confluent-spotted with blackish maroon.
- 26a. Peduncle shortly hairy; dorsal sepal white, often tinged with pale green or pale yellow toward its base; petals 2–2.5 cm wide ..... 20. *P. gratixianum*
- 26b. Peduncle long hairy; dorsal sepal pale green to pale yellow, central area deep maroon and deeper striped; petals 2.2–4.5 cm wide ..... 21. *P. villosum*

**1. *Paphiopedilum malipoense*** S. C. Chen & Z. H. Tsi, Acta Phytotax. Sin. 22: 119. 1984.

麻栗坡兜兰 ma li po dou lan

Plants terrestrial or lithophytic, with a short rhizome. Leaves 4–7, distichous; blade abaxially pale green, often spotted or marked in varying degrees with purple, adaxially tessellated with dark and light green, oblong or elliptic, 7–18(–23) × 2.5–6(–8) cm, leathery, ciliate near base, margin slightly denticulate, apex acute or oblique-acute. Scape initially hooked-recurved and then suberect, terminating in 1 or rarely 2 flowers; peduncle greenish, marked with purple or purple-brown, 25–40(–60) cm, white villous; floral bract greenish, marked with purple, ovate or ovate-lanceolate, conduplicate, 1.5–2.5 cm, abaxially white villous; pedicel and ovary 4–6.5 cm, white villous. Flower slightly scented, 5–10 cm in diam.; dorsal sepal, synsepal, and petals apple-green or very rarely yellowish green, veined or slightly spotted with brownish purple; lip pale yellow-green or rarely whitish green obscurely spotted with brownish purple adaxially; staminode white, apical half blackish purple or slightly veined with purplish. Dorsal sepal ovate to ovate-lanceolate, 3.3–7 × 1–4.5 cm, abaxially white villous, adaxially sparsely white puberulent, ciliate, acuminate at apex; synsepal similar to dorsal sepal, slightly shorter and broader. Petals narrowly oblong to broadly ovate, 3.5–7 × 0.6–5 cm, both surfaces sparsely puberulent, adaxially white villous toward base, ciliate, apex acute-obtuse; lip subglobose to subellipsoid, 1.5–5 × 1–5 cm, outside puberulent, apical margin involute. Staminode suboblong to broadly ovate, 8–14 × 4–15 mm, abaxially carinate, ciliate along basal margin, apex truncate. Fl. Jan–Apr.

Grassy slopes, humus-rich soil, rocky and well-drained places, forests and thickets in limestone areas; 500–2000 m. SW Guangxi, SW Guizhou, SE Yunnan [N Vietnam].

- 1a. Leaf blade heavily spotted with purple abaxially; staminode deep purple to black-purple in apical half ..... 1a. var. *malipoense*
- 1b. Leaf blade not or sparsely marked with purple abaxially; staminode green to whitish, often veined with purple-red in apical half.
- 2a. Petals 2.5–4 cm wide; lip subglobose, 3–4 cm in diam. .... 1b. var. *jackii*
- 2b. Petals 0.6–2.5 cm wide; lip not subglobose, 1–3 cm in diam.
- 3a. Roots densely pubescent; petals 1.5–2.5 cm wide; lip hooked at apex; staminode 1–1.3 cm wide ... 1c. var. *hiepii*
- 3b. Roots sparsely pubescent or glabrescent; petals 0.6–0.7 cm wide; lip subtruncate at apex; staminode 0.4–0.5 cm wide ..... 1d. var. *angustatum*

**1a. *Paphiopedilum malipoense* var. *malipoense***

麻栗坡兜兰(原变种) ma li po dou lan (yuan bian zhong)

Leaf blade heavily spotted with purple abaxially. Petals 3–

5 cm wide; lip subglobose, 3–5 cm in diam. Staminode white, deep purple to black-purple in apical half. Fl. Jan–Apr.  $2n = 26$ .

Grassy slopes or humus-rich soil in forests and thickets in limestone areas; 800–1600 m. SW Guangxi, SW Guizhou, SE Yunnan [N Vietnam].

**1b. *Paphiopedilum malipoense* var. *jackii*** (H. S. Hua) Averyanov, Orchids 66: 153. 1997.

浅斑兜兰 qian ban dou lan

*Paphiopedilum jackii* H. S. Hua, Orchidee (Hamburg) 46: 114. 1996.

Leaf blade light green, sparsely spotted with purple abaxially. Petals 2.5–4 cm wide; lip subglobose, 3–4 cm in diam. Staminode white, veined with pale purple in apical half. Fl. Feb–Mar.

Rocky and well-drained places in forests in limestone areas; 600–2000 m. SE Yunnan [N Vietnam].

**1c. *Paphiopedilum malipoense* var. *hiepii*** (Averyanov) P. J. Cribb, Gen. *Paphiopedilum*, ed. 2, 88. 1998.

钩唇兜兰 gou chun dou lan

*Paphiopedilum hiepii* Averyanov, Orchids 67: 261. 1998; *P. jackii* var. *hiepii* (Averyanov) Koopowitz.

Roots densely pubescent. Leaf blade light green, slightly marked with purple abaxially. Petals 1.5–2.5 cm wide; lip narrowly globose, 1–2.5 cm in diam., hooked at apex. Staminode white, slightly veined with pale purple, 1–1.3 cm wide. Fl. Mar–Apr.

Rocky places in forests or thickets in limestone areas; 500–1500 m. SE Yunnan [N Vietnam].

**1d. *Paphiopedilum malipoense* var. *angustatum*** (Z. J. Liu & S. C. Chen) Z. J. Liu & S. C. Chen, Acta Bot. Yunnan. 24: 196. 2002.

窄瓣兜兰 zhai ban dou lan

*Paphiopedilum angustatum* Z. J. Liu & S. C. Chen, Acta Phytotax. Sin. 38: 464. 2000.

Roots sparsely pubescent or glabrescent. Leaf blade light green, slightly marked with purple abaxially. Petals 0.6–0.7 cm wide; lip narrowly globose, ca. 1 cm in diam., subtruncate at apex. Staminode white, slightly veined with pale purple in apical half, 0.4–0.5 cm wide. Fl. Feb–Mar.

- Forests on limestone slopes. SE Yunnan.

**2. *Paphiopedilum armeniacum*** S. C. Chen & F. Y. Liu, Acta Bot. Yunnan. 4: 163. 1982.

杏黄兜兰 xing huang dou lan

*Paphiopedilum armeniacum* var. *mark-fun* Fowlie; *P. armeniacum* f. *markii* (O. Gruss) Braem; *P. armeniacum* var. *markii* O. Gruss; *P. armeniacum* var. *parviflorum* Z. J. Liu & J. Yong Zhang; *P. armeniacum* var. *undulatum* Z. J. Liu & J. Yong Zhang.

Plants terrestrial or lithophytic, with 1 to several creeping

stolons more than 10 cm × 1.5–2.5 mm. Leaves 5–7, distichous; blade abaxially densely purple spotted and carinate, adaxially tessellated with dark and light green, oblong or linear-oblong, 6–12 × 1.8–2.3 cm, thickly leathery, margin serrulate, apex acute or sometimes tridenticulate. Scape erect, terminating in 1 or rarely 2 flowers; peduncle yellowish green, densely marked with purple, 13–28 cm, with white short hairs; floral bract yellowish green, marked with purple, ovate, conduplicate, 1.4–1.8 cm, abaxially puberulent toward base; pedicel and ovary (2–)3–4.5 cm, shortly hairy. Flower (3–)7–9 cm in diam., pale yellow to golden yellow, sometimes slightly flushed with pale green, with pale maroon veins on staminode, usually with many rows of maroon speckles on inner bottom of lip. Dorsal sepal ovate, 1.8–4.8 × (0.8–)1.4–2.2 cm, adaxially pubescent toward base, minutely ciliate, acute at apex; synsepal similar to dorsal sepal, slightly smaller, obtusely bicarinate abaxially. Petals broadly ovate-elliptic to suborbicular, (1.5–)2.8–5.3 × 0.9–4.8 cm, adaxially white villous toward base, ciliate, slightly undulate at margin, rounded at apex; lip subglobose or somewhat flattened globose, (1–)4–6 × (0.5–)3.5–4 cm, apical margin involute. Staminode broadly ovate or ovate-orbicular, (5–)12–20 × (5–)12–20 mm, margin recurved, apex acute. Fl. Feb–Apr.

- Rocky and well-drained places or in crevices of rocks on woody or bushy slopes in limestone areas; 1400–2100 m. W Yunnan (along Nu Jiang).

**3. *Paphiopedilum micranthum*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 56. 1951.

硬叶兜兰 ying ye dou lan

*Paphiopedilum globulosum* Z. J. Liu & S. C. Chen; *P. micranthum* f. *alboflavum* (Braem) Braem; *P. micranthum* var. *alboflavum* Braem; *P. micranthum* f. *glanzeanum* (O. Gruss & Roeth) O. Gruss & Roeth; *P. micranthum* var. *glanzeanum* O. Gruss & Roeth; *P. micranthum* var. *oblatum* Z. J. Liu & J. Yong Zhang.

Plants terrestrial or lithophytic, with 1 to several creeping stolons more than 10 cm, 1.5–2.5 mm in diam. Leaves 3–5, distichous; blade abaxially densely purple spotted and carinate, adaxially tessellated with dark and light green, oblong to narrowly elliptic, 6–12 × 1.5–3.4 cm, thickly leathery, apex acute or slightly bilobulate. Scape erect, terminating in 1 or rarely 2 flowers; peduncle red-brown or yellowish green, heavily marked with red-brown, (5–)10–23 cm, white villous; floral bract yellowish green, marked with purple or nearly purple-brown, ovate, conduplicate, 1.1–1.4 cm, abaxially sparsely villous; pedicel and ovary 3.5–5 cm, white villous. Flower showy, 3.5–7 cm in diam.; dorsal sepal, synsepal, and petals yellowish to whitish, sometimes flushed with rose-pink, veined with red-purple; lip rose-pink, pale pink, or white, with purple spots at inner bottom; staminode white with purplish red speckles throughout and a yellow flush in apical half. Dorsal sepal ovate or broadly ovate, 1.5–2.5(–3.2) × 1.3–2.5 cm, abaxially white villous, minutely ciliate, acute at apex; synsepal similar to dorsal sepal, sometimes slightly smaller, obtusely bicarinate abaxially. Petals broadly ovate to suborbicular, (2–)2.5–3.2 × (1.5–)2.6–3.5 cm, abaxially slightly puberulent, adaxially white villous toward base, minutely ciliate, rounded at apex; lip

ovoid-globose or ellipsoid-globose, (2.2–)5–10 × (1–)4–5.5 cm, apical margin involute. Staminode elliptic, longitudinally conduplicate, 10–15 × 7–8 mm, apex acute and slightly mucronate. Fl. Mar–May.  $2n = 26$ .

Rocky and bushy places or crevices of rocks in forests in limestone areas; 1000–1700 m. SW Guangxi, S and SW Guizhou, SE Yunnan [N Vietnam].

*Paphiopedilum ×fanaticum* Koopowitz & Hasegawa, a hybrid of this species and *P. malipoense*, has been reported (Orchid Advocate 18(2): 50. 1992), and many infraspecific taxa have been proposed based on color variation. However, most were not validly published.

**4. *Paphiopedilum delenatii*** Guillaumin, Bull. Soc. Bot. France 71: 554. 1924.

德氏兜兰 de shi dou lan

*Cypripedium delenatii* (Guillaumin) C. H. Curtis; *Paphiopedilum xichouense* Z. J. Liu & S. C. Chen.

Plants terrestrial. Leaves 4–6, distichous; blade abaxially heavily purple spotted and carinate, adaxially tessellated with dark and light green and marked with golden pedate stripes toward apex, oblong, 8–12 × 3.5–4.2 cm, base ciliate, apex obtuse. Scape suberect, terminating in 1 or 2 flowers; peduncle purple-brown, 14–22 cm, densely white hirsute; floral bracts pale green spotted with purple-brown, ovate, conduplicate, ca. 1.5 cm, abaxially hairy; pedicel and ovary 4–5 cm, white hirsute. Flowers 6–8 cm wide; dorsal sepal, synsepal, and petals white, obscurely spotted and veined with pale pink particularly on abaxial surface; lip pink to pale purple-red; staminode whitish marked with purple-red in apical half and pale yellow centrally. Dorsal sepal ovate, 2.7–3.3 × 1.7–2.5 cm, pubescent on both surfaces, subacute at apex; synsepal similar to dorsal sepal, slightly shorter. Petals broadly elliptic, 3.5–4.4 × 2.7–3.7 cm, rounded at apex; lip subglobose, 3–3.8 × 2.2–2.8 cm, puberulent outside, apical margin involute. Staminode rhombic-ovate, 1.6–2 × 1.6–1.8 cm, ciliate. Fl. Mar–Apr.  $2n = 26$ .

Shrubby and grassy places in limestone areas; 1000–1300 m. N Guangxi (N of Liuzhou), SE Yunnan (Funing, Malipo, Xichou) [Vietnam].

**5. *Paphiopedilum emersonii*** Koopowitz & P. J. Cribb, Orchid Advocate 12(3): 86. 1986.

白花兜兰 bai hua dou lan

*Paphiopedilum emersonii* f. *album* O. Gruss & Petchleung.

Plants lithophytic. Leaves 5–7, distichous; blade abaxially pale green and with purple-red spots toward base, adaxially uniformly green or sometimes very obscurely tessellated with deep and light green, narrowly elliptic, 8–23 × 2.5–4(–5) cm, leathery, ciliate along basal margin. Scape erect, terminating in a solitary flower; peduncle green or yellowish green, 8–15 cm, white pubescent, usually with a greenish sheath at base; floral bract whitish, usually flushed with brown, elliptic, conduplicate, 2.8–3.8 cm, pubescent, ciliate; pedicel and ovary 2.5–3.5 cm, greenish white, white pubescent. Flower slightly fragrant, 8–9(–10) cm in diam.; dorsal sepal, synsepal, and petals white, sometimes flushed with pale purple-red toward adaxial base of

petals; lip yellowish to whitish, with deep purple spots inside; staminode yellow or whitish yellow, with pale red-brown markings. Dorsal sepal elliptic-ovate,  $3-5 \times 2-3.5$  cm, both surfaces puberulent, margin recurved, apex obtuse; synsepal broadly elliptic or suborbicular,  $3-4.8 \times 3-4.8$  cm, both surfaces puberulent, apex obtuse. Petals obovate-elliptic to suborbicular,  $3.5-6 \times 2.5-5$  cm, both surfaces sparsely puberulent, adaxially villous toward base, apex obtuse or rounded; lip subglobose or obovoid-globose,  $3.5-4.5 \times 2-3$  cm, apical margin involute and slightly grooved along veins. Staminode trullate, appearing like a crocodile head,  $15-20 \times 9-10$  mm, with a deep longitudinal groove centrally, obtuse at apex. Fl. Apr–Jun.  $2n = 26$ .

Shaded cliffs or crevices of steep rocks in evergreen broad-leaved forests or thickets in limestone areas; 300–800 m. Guangxi, S Guizhou [N Vietnam].

*Paphiopedilum ×glanzii* O. Gruss & Perner (Orchidee (Hamburg) 57(3): 315. 2006), a natural hybrid between this species and *P. micranthum*, was described recently from China (without precise locality).

**6. *Paphiopedilum hangianum*** Perner & O. Gruss, Orchidee (Hamburg) Suppl. 6: 3. 1999.

绿叶兜兰 lü ye dou lan

*Paphiopedilum hangianum* f. *album* O. Gruss & Petchleung; *P. singchii* Z. J. Liu & J. Yong Zhang.

Plants lithophytic. Leaves 4–6, distichous, spreading horizontally; blade abaxially pale green and carinate, adaxially uniformly deep green and glossy, narrowly oblong,  $12-28 \times 3.5-5.9$  cm, leathery, basal margin purple ciliate, apex obtuse. Scape suberect or slightly arching, terminating in a solitary flower; peduncle yellowish green with purple speckles, 8–20 cm, densely white pubescent; floral bract yellowish green with purplish speckles, ovate-elliptic, conduplicate, 4.5–6 cm, abaxially puberulent, ciliate; pedicel and ovary green with purplish speckles, 3–4.5 cm, densely puberulent. Flower scented, 11–14 cm in diam., yellowish, obscurely with greenish reticulate veins, flushed with purple toward base of petals, with dense purple spots at inner bottom of lip and many purple irregular transverse stripes or net on adaxial surface of staminode. Dorsal sepal suberect to curving forward over lip, broadly ovate-elliptic or elliptic,  $4.8-6.2 \times 3-4.6$  cm, both surfaces puberulent, abaxially carinate, minutely ciliate, acute at apex; synsepal broadly elliptic,  $4.8-6.4 \times 3.6-5.7$  cm, both surfaces puberulent, minutely ciliate, obtuse and slightly bilobulate at apex. Petals broadly obovate-elliptic, slightly oblique,  $5.5-7.3 \times 3.5-6.4$  cm, both surfaces puberulent, adaxially densely white villous toward base, minutely ciliate; lip subglobose,  $4-5 \times ca. 3.4$  cm, outside glabrous, apical margin involute. Staminode broadly obovate-triangular,  $1.6-2.1 \times 1.8-2.2$  cm, abruptly narrowed at base into a claw, obtuse-rounded at apex. Fl. Apr–May.

Very wet but well-drained rocky places or crevices of rocks, usually behind waterfalls; 600–800 m. S Yunnan (Jinping) [N Vietnam].

*Paphiopedilum hangianum* f. *album* was described based on a cultivated plant with a pure yellowish flower (Orchidee (Hamburg) 53: 384. 2002). Its origin is unknown.

**7. *Paphiopedilum concolor*** (Lindley ex Bateman) Pfitzer in Engler & Prantl, Nat. Pflanzenfam. 2(6): 84. 1888.

同色兜兰 tong se dou lan

*Cypripedium concolor* Bateman, Bot. Mag. 91: ad t. 5513. 1865; *Cordula concolor* (Lindley ex Bateman) Rolfe; *Paphiopedilum concolor* var. *dahuaense* Z. J. Liu & J. Yong Zhang; *P. concolor* var. *immaculatum* Z. J. Liu & J. Yong Zhang; *P. wenshanense* Z. J. Liu & J. Yong Zhang f. *album* O. Gruss & Petchleung.

Plants lithophytic or terrestrial. Leaves 4–6, distichous; blade abaxially purple or densely marked with purple speckles, adaxially tessellated with dark and whitish or light green, oblong or oblong-elliptic,  $7-21 \times 3.5-5.5(-7.5)$  cm, leathery, rounded and minutely bilobulate at apex. Scape suberect or arching, terminating in 1 or 2(or 3) flowers; peduncle green, heavily spotted purple, 5–7(–8) cm, densely white pubescent; floral bract green, ovate, conduplicate,  $1-3(-4) \times 1-2$  cm, abaxially with purple speckles and along midvein hairy, ciliate; pedicel and ovary 3–4.5 cm, densely white pubescent. Flowers slightly scented, 5–7 cm in diam., usually yellowish to ivory-white  $\pm$  finely spotted with purple or brown-purple throughout. Dorsal sepal broadly ovate,  $2.5-4.2 \times 2.4-4.4$  cm, abaxially slightly puberulent on midvein, ciliate, apex obtuse to retuse; synsepal similar to dorsal sepal, slightly smaller. Petals obliquely elliptic to rhombic-elliptic,  $3-5 \times 1.8-3.1$  cm, both surfaces very minutely puberulent, ciliate, rounded at apex; lip ellipsoid to ovoid, 3.5–4.5 cm; pouch  $2.2-3 \times 1.4-1.7$  cm, outside very minutely puberulent, apical margin incurved. Staminode ovate to ovate-triangular,  $10-12 \times 8-11$  mm, basal margin sometimes minutely ciliate. Fl. May–Aug.  $2n = 26$ .

Crevices of shaded cliffs or rocky and well-drained places in limestone areas; 300–1400 m. W Guangxi, S Guizhou, S Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

*Paphiopedilum concolor* is a widespread species very variable in leaf markings and floral morphology and coloring. Based on these variations, many varieties were described recently, including *P. concolor* var. *dahuaense* and *P. concolor* var. *immaculatum* from Guangxi (Acta Bot. Yunnan. 22: 393. 2000). *Paphiopedilum wenshanense* f. *album* (Orchidee (Hamburg) 53: 383. 2002) seems to be the same taxon as *P. concolor* var. *dahuaense*.

**8. *Paphiopedilum bellatulum*** (H. G. Reichenbach) Stein, Orchideenbuch, 456. 1892.

巨瓣兜兰 ju ban dou lan

*Cypripedium bellatulum* H. G. Reichenbach, Gard. Chron., ser. 3, 3: 648. 1888; *Cordula bellatula* (H. G. Reichenbach) Rolfe.

Plants lithophytic or terrestrial. Leaves 4 or 5, distichous; blade abaxially heavily purple spotted and carinate, adaxially tessellated with dark and pale green or green and whitish green, sometimes dark green and slightly mottled with whitish green, oblong-elliptic or narrowly elliptic,  $11-18 \times 2.9-4.2(-6)$  cm, apex acute or obtuse and unequally bilobulate. Scape arching, terminating in 1 or rarely 2 flowers; peduncle deep purple or green spotted with purple, 2.5–5 cm, white pubescent; floral bract green, spotted with purple, ovate or elliptic, conduplicate,  $2-2.6 \times 1.5-2$  cm, abaxially  $\pm$  hairy on midvein, minutely ciliate; pedicel and ovary 3–3.5 cm, white pubescent. Flower white

or rarely yellowish white, 6–8 cm in diam.; dorsal sepal and petals usually with large maroon spots 1.5–2 mm in diam.; synsepal, lip, and staminode with smaller spots. Dorsal sepal broadly ovate, 2.6–3.5 × 3.5–5 cm, slightly concave, minutely ciliate, rounded, slightly mucronate or retuse at apex; synsepal ovate-orbicular, 2–3 × 2–3 cm, concave, minutely ciliate. Petals broadly elliptic or broadly ovate-elliptic, 4.5–6 × 3–5 cm, adaxially hairy toward base, minutely ciliate, rounded at apex; lip ellipsoid-ovoid, usually 3–3.5 × 1.5–2 cm, apical margin incurved. Staminode suborbicular or subsquare, 8–10 × 8–10 mm, usually slightly tridenticulate at apex. Fl. Apr–Aug.  $2n = 26$ .

Shaded cliffs or rocky and well-drained places in forests in limestone areas; 1000–1800 m. W Guangxi, SW Guizhou, S Yunnan [Myanmar, Thailand].

**9. *Paphiopedilum wenshanense*** Z. J. Liu & J. Yong Zhang, *Acta Bot. Yunnan.* 22: 391. 2000.

文山兜兰 wen shan dou lan

*Paphiopedilum concobellatum* Hort.

Plants terrestrial. Leaves 4 or 5, distichous; blade abaxially purple except for green and purple-spotted base, adaxially tessellated with dark and pale green and somewhat mottled with dull whitish, subelliptic, 5–10 × 3.5–4.5 cm, obtuse-rounded and unequally bilobed at apex. Scape suberect, terminating in 1–3 flowers; peduncle green spotted with purple-brown, 2.5–3.5 cm, pubescent; floral bracts ovate-elliptic, duplicate, 1.6–2 × 1.5–2 cm, abaxially hairy on midvein, minutely ciliate; pedicel and ovary 4–4.5 cm, hairy. Flowers whitish or yellow-white, 5–7 cm in diam.; dorsal sepal and petals with brown-red spots 2–2.5 mm in diam., and each with a central longitudinal stripe composed of brown-red spots; synsepal, lip, and staminode with smaller brown-red spots. Dorsal sepal broadly ovate to suborbicular, 2.5–3.5 × 2.5–3.5 cm, obtuse-rounded at apex; synsepal ovate, 2–2.5 × ca. 2 cm. Petals broadly elliptic or oblong-elliptic, 3.5–4 × 2.5–3 cm, adaxially hairy toward base; lip ellipsoid, 3.5–4 × 2–2.5 cm, white puberulent outside, apical margin narrowly incurved. Staminode broadly elliptic, 8–9 × 8–9 mm, with a caudate apex 1.5–2 mm. Fl. May.

• Densely shrubby and grassy slopes in limestone areas. SE Yunnan.

**10. *Paphiopedilum dianthum*** Tang & F. T. Wang, *Bull. Fan Mem. Inst. Biol. Bot.* 10: 24. 1940.

长瓣兜兰 chang ban dou lan

*Paphiopedilum parishii* (H. G. Reichenbach) Stein var. *dianthum* (Tang & F. T. Wang) Karasawa & Saito.

Plants lithophytic. Leaves 4–6, distichous; blade abaxially pale green and carinate, adaxially uniformly dark green, usually 15–30 × 2.7–5 cm, thickly leathery, obtuse-rounded and slightly unequally bilobulate at apex. Scape arching to suberect, 30–80 cm; peduncle green, glabrous or very sparsely pubescent; raceme (1 or) 2–5-flowered; floral bracts greenish or yellowish green, broadly ovate, conduplicate, 1.3–2.9 cm, glabrous; pedicel and ovary green, 4–5 cm, glabrous. Flowers 8–10 cm in diam., persistent until fruiting; dorsal sepal white tinged and

veined with green toward base; synsepal pale green-yellow or greenish white with darker green veins; petals whitish green or brownish green, with darker stripes; lip yellowish brownish with darker veins; staminode white with a dark green center. Dorsal sepal subelliptic or obovate-elliptic, 3–5.5 × 1.8–2.5 cm, adaxially shortly hirsute toward base, sometimes very slightly puberulent on both surfaces, basal margin recurved, apex shortly acuminate; synsepal similar to dorsal sepal, slightly shorter and broader. Petals pendulous, strongly twisted, linear-lanceolate or linear-tapering, 7–10(–12) × 0.7–1 cm, often with a few blackish warts along lower margin or toward adaxial base, minutely papillose-puberulent toward adaxial base and apex; warts often with a cluster of long hairs, sometimes becoming very small or disappearing, replaced by a few clusters of long hairs; lip helmet-shaped, 4–5 cm; pouch 2–3 × 2–2.5 cm, pointed at apex. Staminode obcordate or obovate, 10–12 × 7–9 mm, carinate abaxially, slightly puberulent toward adaxial base, with a small umbo near base, minutely ciliate, with a deep sinus or 3-lobed at apex. Fl. Jul–Oct.  $2n = 26$ .

Steep rocks in evergreen broad-leaved forests or shaded limestone cliffs; 1000–2300 m. SW Guangxi, SW Guizhou, SE Yunnan [N Vietnam].

**11. *Paphiopedilum parishii*** (H. G. Reichenbach) Stein, *Orchideenbuch*, 479. 1892.

飘带兜兰 piao dai dou lan

*Cypripedium parishii* H. G. Reichenbach, *Flora* 52: 322. 1869; *Cordula parishii* (H. G. Reichenbach) Rolfe; *Selenipedium parishii* (H. G. Reichenbach) André.

Plants epiphytic. Leaves 5–7, distichous; blade pale green or yellowish green abaxially, uniformly dark green adaxially, narrowly elliptic, (8–)20–40 × 2.7–3.5 cm, thickly leathery, rounded and slightly unequally bilobulate at apex. Scape arching or suberect, 28–35 cm; peduncle green, densely white pubescent; raceme 3–5-flowered; floral bracts green, broadly ovate-elliptic, conduplicate, 2.5–3 cm, glabrous; pedicel and ovary 3–4 cm, densely white pubescent. Flowers 8–10 cm in diam., deciduous after pollination; dorsal sepal and synsepal yellowish green to greenish with darker veins; petals pale yellow-green and spotted with blackish maroon in basal half, dark maroon along margin and in apical half; lip yellowish green or green, sometimes flushed purplish, with darker veins; staminode whitish with a dark green center. Dorsal sepal elliptic, 3–5 × 2–3 cm, adaxially puberulent toward base and apex, basal margin recurved, acute at apex; synsepal similar to dorsal sepal, slightly smaller, obtuse at apex. Petals decurved-pendulous, twisted particularly in apical half, linear-lanceolate or linear-tapering, 7–9.5 × 0.6–0.8(–1) cm, margin undulate in basal half, apex rounded, both surfaces ± puberulent, abaxially with several maroon spots or warts near or along lower or rarely also upper margin in basal half; warts usually with a cluster of hairs; lip helmet-shaped, 3–4 cm; pouch 1.5–2.5 × 1.5–2 cm. Staminode obcordate or obovate, 10–13 × 7–8 mm, with a deep sinus at apex and a small umbo near base, slightly puberulent at adaxial base. Fl. Jun–Jul.  $2n = 26$ .

Tree trunks or forks in broad-leaved forests; 1000–1100 m. S and SW Yunnan (Mengla, Gengma) [Laos, Myanmar, Thailand].

**12. Paphiopedilum hirsutissimum** (Lindley ex Hooker) Stein, Orchideenbuch, 470. 1892.

带叶兜兰 dai ye dou lan

*Cypripedium hirsutissimum* Lindley ex Hooker, Bot. Mag. 83: ad t. 4990. 1857; *Cordula esquirolei* (Schlechter) Hu; *C. hirsutissima* (Lindley ex Hooker) Rolfe; *Paphiopedilum chiwuanum* Tang & F. T. Wang; *P. esquirolei* Schlechter; *P. esquirolei* var. *chiwuanum* (Tang & F. T. Wang) Braem & Chiron; *P. hirsutissimum* var. *chiwuanum* (Tang & F. T. Wang) Cribb; *P. hirsutissimum* var. *esquirolei* (Schlechter) Karasawa & Saito; *P. saccopetalum* S. H. Hu.

Plants lithophytic or terrestrial. Leaves 5 or 6, distichous; blade abaxially usually without purple marks at base, adaxially uniformly dark green, lorate or linear, 23–44 × 1.4–2.2 cm, leathery, usually acuminate and tridenticulate at apex. Scape suberect or arching, usually terminating in a solitary flower; peduncle brown-purple, 13–24(–30) cm, densely long hairy; floral bract ovate, 8–15 mm, abaxially densely hairy, ciliate; pedicel and ovary 6–8.5 cm, pubescent. Flower 8–16 cm in diam., initially dorsal sepal curving forward and petals not undulate at margins and then dorsal sepal erect and petals elongating and undulate along basal margin; dorsal sepal and synsepal dark brown, with yellowish or greenish margin; petals yellowish, with dense purple-brown speckles in basal half and purplish rose in apical half; lip yellowish to greenish, with dense brownish or purplish rose speckles; staminode dark brown with narrow yellowish margin and 2 large whitish spots and a yellowish blotch centrally. Dorsal sepal broadly ovate or ovate-elliptic, 3.7–4.4 × 2.6–3.5 cm, abaxially sparsely pubescent mainly on veins, ciliate, undulate at margin, obtuse or emarginate at apex; synsepal similar to dorsal sepal, slightly narrower. Petals often slightly twisted toward apex, spatulate, (4–)6–8 × 1.5–2.5 cm, both surfaces slightly or scarcely puberulent, basal half undulate at margin, ciliate, rounded or subtruncate at apex; lip helmet-shaped, 3–5 cm; pouch 2.5–3(–3.5) × 1.5–2.5 cm, slightly puberulent outside particularly along margin and veins. Staminode subsquare, 8–10 × 8–10 mm, adaxially convex, apex obtuse. Fl. Apr–May.  $2n = 26$ .

Crevice on shaded cliffs or rocky and well-drained places in forests or thickets in limestone areas; 700–1500 m. N and W Guangxi, SW Guizhou, SE Yunnan [NE India, Laos, Thailand, N Vietnam].

*Paphiopedilum ×grussianum* H. S. Hua (Orchidee (Hamburg) 49: 180. 1998), described from Guangxi, may be a hybrid of this species and *P. villosum* rather than of *P. dianthum* and *P. villosum*.

**13. Paphiopedilum charlesworthii** (Rolfe) Pfitzer, Bot. Jahrb. Syst. 19: 40. 1894.

红旗兜兰 hong qi dou lan

*Cypripedium charlesworthii* Rolfe, Orchid Rev. 1: 303. 1893; *Cordula charlesworthii* (Rolfe) Rolfe.

Plants terrestrial. Leaves 4 or 5, distichous; blade abaxially pale green and with blackish purple spots near base, adaxially uniformly green or sometimes very obscurely tessellated with dark and light green, linear-oblong, 14–16 × 1.5–2 cm, apex acute and unequally bilobulate. Scape erect, terminating in a solitary flower; peduncle 8–12 cm, green, mottled with purple-

brown, shortly pubescent; floral bract green spotted or mottled with deep purple, subelliptic-obovate, conduplicate, 2.1–2.8 × 1.4–1.8 cm, minutely ciliate; pedicel and ovary 2.9–3.4 cm, densely pubescent, 3-ribbed. Flower 6–8 cm in diam.; dorsal sepal pink or pinkish white, with darker veins; synsepal greenish, veined with brownish; petals pale green-yellow, with dense brown reticulate venation; lip pale yellow-brown, with darker veins; staminode white. Dorsal sepal erect, suborbicular to transversely elliptic, 3.9–4.6 × 4.5–6.7 cm, abaxially minutely puberulent particularly on midvein, adaxially purple hairy toward base, minutely ciliate, subtruncate or slightly mucronate at apex; synsepal elliptic-ovate, 3–3.5 × 1.6–2.3 cm, abaxially puberulent, minutely ciliate. Petals oblong-spatulate, 3.8–4.4 × 0.9–1.4 cm, adaxially purple villous toward base, ciliate, slightly undulate at margin; lip helmet-shaped, 3.4–4 cm; pouch 2.2–2.5 × 2–2.4 cm, with a very wide mouth. Staminode obovate, 9–10 × 8–9 mm, with a central umbo. Fl. Sep–Oct.

Rocky and humus-rich places in evergreen broad-leaved forests; 1300–1600 m. W Yunnan (W-facing slope of Gaoligong Shan) [Myanmar, Thailand].

**14. Paphiopedilum insigne** (Wallich ex Lindley) Pfitzer, Morph. Stud. Orchideenbl. 11. 1886.

波瓣兜兰 bo ban dou lan

*Cypripedium insigne* Wallich ex Lindley, Coll. Bot. ad t. 32. 1821; *Cordula insignis* (Wallich ex Lindley) Rafinesque.

Plants terrestrial. Leaves 5 or 6, distichous; blade abaxially pale green and with purple speckles toward base, adaxially uniformly deep green, narrowly elliptic or linear-oblong, 18–30 × 2.5–3.5 cm, leathery, obtuse and minutely tridenticulate at apex. Scape erect, terminating in a solitary flower; peduncle green-purple, 19–25 cm, densely purple pubescent; floral bract purple spotted, ovate-elliptic, conduplicate, 4–5.5 × 2–3 cm, glabrous; pedicel and ovary 5–6 cm, densely purple pubescent. Flower 7–10 cm in diam.; dorsal sepal greenish yellow in center, broadly white margined, with purple-brown spots; synsepal pale green-yellow, with purple-red or purple-brown spots and white margin; petals yellowish brown, with darker veins; lip yellow-brown or yellowish green, flushed and veined with brown, with a narrow greenish margin; staminode yellowish. Dorsal sepal broadly ovate or ovate-orbicular, 5–6 × 4–4.5 cm, abaxially pubescent, apical margin incurved, ciliate, obtuse at apex; synsepal ovate-elliptic, 3.8–5.5 × 1.8–3.5 cm, pubescent abaxially. Petals spatulate or oblong-spatulate, 4.9–5.5 × 1.2–2.2 cm, adaxially purple villous toward base, margin undulate, apex obtuse or slightly tridenticulate; lip helmet-shaped, 3.5–5 cm; pouch 2.5–3 × 1.5–2 cm. Staminode obovate, 9–10 × 8–9 mm, purple puberulent on both surfaces, with a central umbo. Fl. Oct–Dec.  $2n = 10, 21, 24, 26, 27, 28, 36, 39, 40$ .

Rocky and litter-rich places on grassy and bushy slopes; 1200–1600 m. NW Yunnan [NE India].

**15. Paphiopedilum barbigerum** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 23. 1940.

小叶兜兰 xiao ye dou lan

*Paphiopedilum barbigerum* var. *lockianum* Averyanov; *P.*

*insigne* (Wallich ex Lindley) Pfitzer var. *barbigerum* (Tang & F. T. Wang) Braem.

Plants lithophytic or terrestrial. Leaves 4–6, distichous; blade slightly paler and carinate abaxially, uniformly green or sometimes very obscurely tessellated dark and light green adaxially, linear, 12–19 × 0.7–1.3 cm, acute and usually minutely tridenticulate at apex. Scape suberect or arching, terminating in a solitary flower; peduncle brownish green, 10–14 cm, with dense purple-brown hairs; floral bract suboblong, 1.4–3.2(–3.6) cm, pubescent toward abaxial base; pedicel and ovary 3–4.2 cm, densely pubescent. Flower 6–7(–8) cm in diam.; dorsal sepal white, with a green, red-brown, or blackish brown central area in basal half; synsepal usually whitish green; petals brownish with paler margin; lip brownish with yellowish margin; staminode yellowish with orange umbo. Dorsal sepal suborbicular, 2.8–3.4(–4.5) × 2.6–3(–4) cm, puberulent abaxially, basal margin usually recurved, apical margin incurved or strongly undulate, obtuse or retuse at apex; synsepal elliptic, 2.5–3.3(–4) × 1.4–1.8 cm, puberulent abaxially. Petals spatulate or narrowly oblong, 3–4(–5) × 1–1.3 cm, adaxially pilose toward base, sparsely ciliate, undulate at margin, obtuse at apex; lip helmet-shaped, 3.5–4 cm; pouch 2–2.5 × 1.5–2 cm, outside glabrous. Staminode obovate-obcordate, 6–10 × 7–10 mm, umbonate centrally. Fl. Sep–Oct.

Crevices of limestone cliffs, rocks or tree trunks in open forests; 800–1500 m. N and W Guangxi, S Guizhou, SE Yunnan [N Vietnam].

**16. *Paphiopedilum arecanum*** O. Gruss, *Orchidee* (Hamburg) 52: 645. 2001, pro hybr.

根茎兜兰 gen jing dou lan

*Paphiopedilum rhizomatosum* S. C. Chen & Z. J. Liu.

Plants terrestrial, with a straight rhizome 8–10 cm × 8–12 mm. Rhizomes stemlike, linking up with each other, with nodes 5–20 mm apart, usually with several tufts of leaves at summit. Leaf blade abaxially pale green and marked with purple toward base, adaxially uniformly dark green, narrowly oblong, 15–35 × 2.5–3.5 cm, usually slightly bilobulate at apex. Scape suberect, terminating in a solitary flower; peduncle greenish brown, 15–25 cm, pubescent; floral bract greenish, ovate, conduplicate, 3.7–4.2 × 2–2.2 cm, subglabrous; pedicel and ovary 5.5–6 cm, with dense purple-brown hairs. Flower 8–9 cm in diam.; dorsal sepal brownish green with broad white margin and brown stripes in basal half; synsepal pale yellow-green, obscurely with deeper veins; petals yellowish green with purple-brown veins; lip pale green-brown with darker veins; staminode yellowish. Dorsal sepal broadly elliptic, 4.9–5.5 × 3.5–3.7 cm, densely puberulent abaxially, purplish villous toward adaxial base, basal margin recurved, apex emarginate; synsepal ovate-oblong, 4.5–4.8 × 2.2–2.4 cm, purplish puberulent abaxially. Petals narrowly oblong-spatulate, 4.5–5.5 × 1.4–1.6 cm, ciliate, slightly undulate at margin, obtuse-acute at apex; lip helmet-shaped, 4–4.5 cm; pouch 2.4–2.8 × 1.8–2.1 cm. Staminode subovate, 13–14 × 11–12 mm, with a raised umbo centrally. Fl. Oct–Nov.

Forests. W Yunnan (Gaoligong Shan) [Myanmar].

This species was described as a hybrid between *Paphiopedilum villosum* and *P. barbigerum*.

**17. *Paphiopedilum tranlienianum*** O. Gruss & Perner, *Caesiana* 11: 66. 1998.

天伦兜兰 tian lun dou lan

*Paphiopedilum tranlienianum* var. *alboviride* O. Gruss; *P. tranlienianum* var. *saxosum* X. M. Xu.

Plants terrestrial or lithophytic. Leaves 4–6, distichous; blade abaxially light green, adaxially deep green with paler margin, narrowly oblong, 10–24 × 1.6–2.7 cm, unequally bilobulate or tridenticulate at apex. Scape suberect or arching, terminating in a flower; peduncle green, 6–15 cm, with purple-red hairs; floral bract green spotted with purple-red, ovate, 1.8–3 × 1.2–1.4 cm; pedicel and ovary 3–4 mm, densely purple pubescent. Flower 6–6.5 cm in diam.; dorsal sepal white longitudinally striped with purple-brown in basal 2/3; synsepal pale green, ± veined with purple-brown; petals and lip pale green clearly flushed and veined with purple-brown; staminode pale yellow-green, with a green umbo. Dorsal sepal suborbicular, 2.5–3.5 × 2.5–3.5 cm, minutely ciliate, basal margin recurved, apex acute; synsepal subovate, 2.2–3 × 1.7–2 cm. Petals narrowly oblong, 2.7–3.9 × 0.8–1 cm, margin strongly undulate, white ciliate, apex obtuse; lip helmet-shaped; pouch ellipsoid, 2.2–2.4 × 1.5–1.8 cm. Staminode broadly obovate, ca. 1 × 1 cm, with an umbo in lower part. Fl. Sep.

Rocky and well-drained places in thickets; ca. 1000 m. SE Yunnan (Malipo) [N Vietnam].

**18. *Paphiopedilum helenae*** Averyanov, *Bot. Zhurn.* (Moscow & Leningrad) 81(9): 109. 1996.

巧花兜兰 qiao hua dou lan

*Paphiopedilum delicatum* Z. J. Liu & J. Yong Zhang.

Plants lithophytic. Leaves 2–4, distichous; blade abaxially light green and with purple speckles toward base, adaxially uniformly dark green, linear-oblong to linear-oblongate, 8–12.5 cm × 8–16 mm, leathery or leathery-fleshy, acute or unequally bilobate at apex. Scape arching or spreading horizontally, terminating in a solitary flower; peduncle green, purple spotted, 5–7 cm, with black-purple or white hairs; floral bract green, purple spotted, broadly ovate, conduplicate, 10–13 × 7–10 mm, purple hairy toward adaxial base; pedicel and ovary 2.9–3.1 cm, with black-purple or white hairs. Flower 4.5–5 cm in diam.; dorsal sepal yellowish or somewhat golden yellow, whitish margined; synsepal yellowish white; petals pale yellow-green or pale brown-yellow, upper side of midvein usually flushed with pale purple-red; lip pale yellow-green, tinged with purple-red; staminode pale yellow-green with a central green umbo. Dorsal sepal broadly elliptic, 4.2–5 × 2–2.8 cm, abaxially with black-purple hairs toward base, minutely ciliate, slightly undulate at margin, obtuse-rounded at apex; synsepal suborbicular or broadly elliptic, 2.2–2.4 × 2–2.2 cm, abaxially with black-purple hairs toward base, obtuse at apex. Petals linear-spatulate or linear-oblong, 2.5–3.2 × 0.4–0.8 cm, adaxially with black-purple hairs toward base, minutely ciliate along apical margin, obtuse or subtruncate at apex; lip helmet-shaped, 2.5–2.8 cm; pouch 1.5–1.8 cm in diam., usually convex-inflated on front surface. Staminode broadly obovate to obovate-orbic-

ular, 6–7 × 6–7 mm, adaxially with small bubble-shaped papillae and a central umbo. Fl. Sep–Nov.

Crevices of bushy cliffs; 700–1100 m. SW Guangxi (Napo) [N Vietnam].

**19. *Paphiopedilum henryanum*** Braem, *Schlechteriana* 1: [4]. 1987.

亨利兜兰 heng li dou lan

*Paphiopedilum chaoi* S. H. Hu; *P. dollii* Lückel.

Plants lithophytic or terrestrial. Leaves 3–6, distichous; blade abaxially carinate and pale green with purple-brown speckles at very base, adaxially uniformly deep green or rarely obscurely tessellated with deep and pale green, narrowly oblong, 12–23 × 1.1–1.8(–2.4) cm, leathery, unequally bilobulate or minutely tridenticulate at apex. Scape arching, terminating in a solitary flower; peduncle green to brownish green, 12–17 cm, brown-purple pubescent; floral bract brownish or brownish green, narrowly ovate, conduplicate, 2–2.6 × 0.6–1.8 cm, ciliate; pedicel and ovary 3.5–5 cm, purple-brown pubescent. Flower 6–8 cm in diam.; dorsal sepal yellowish green to dull yellow with large purple-brown spots; synsepal similar in color to dorsal sepal with much fewer spots; petals pink-violet to light purple-red, with dark purple or blackish purple large spots in basal half or throughout; lip pink-violet or light purple-red, with a yellowish rim; staminode yellowish, slightly flushed with purple or brownish, with a green or brown-yellow umbo. Dorsal sepal usually erect, broadly ovate to suborbicular-ovate, 3–3.5 × 3.2–3.8 cm, abaxially puberulent, minutely ciliate, recurved at basal margin, margin undulate, apex obtuse; synsepal elliptic-ovate, 2.7–3.2 × 1.4–1.8 cm, slightly concave, abaxially puberulent, minutely ciliate. Petals spreading horizontally, spatulate, 3.2–3.9 × 1.4–1.8 cm, purple hirsute at adaxial base, minutely ciliate, obtuse or obscurely tridenticulate at apex; lip helmet-shaped, 3.7–4.3 cm; pouch ellipsoid, 2.3–2.8 × 2.2–2.5 cm. Staminode obcordate or broadly obovate, 6–8 × 7–8 mm, with bubblelike papillae and a small umbo adaxially, apex emarginate. Fl. Sep–Nov.

Crevices of shaded cliffs or rocky and well-drained places in evergreen broad-leaved forests or in thickets in limestone areas; 900–1300 m. SW Guangxi, SE Yunnan [N Vietnam].

This species is variable in floral coloring and petal shape. *Paphiopedilum henryanum* var. *christae* Braem (*Schlechteriana* 2: 157. 1991) was described as lacking the heavy spotting on the dorsal sepal and petals. In 1999, the variety was reduced to a form (f. *christae*) by the same author (in G. J. Braem, C. O. Baker & M. L. Baker, *Gen. Paphiopedilum* Nat. Hist. & Cult. 2: 206. 1999).

*Paphiopedilum tigrinum* f. *huberae* Koopowitz (*Orchidee* (Hamburg) 53: 518. 2001) may be of Chinese origin. It seems to be a variant of this species rather than of *P. tigrinum*.

**20. *Paphiopedilum gratrixianum*** Rolfe, *Orchid Rev.* 13: 63. 1905.

格力兜兰 ge li dou lan

*Cypripedium gratrixianum* Masters, *Gard. Chron.*, ser. 3, 37: 76. 1905, not B. S. Williams (1897); *Cordula gratrixiana* (Rolfe) Rolfe; *Paphiopedilum affine* De Wildeman; *P. villosum*

(Lindley) Stein f. *affine* (De Wildeman) O. Gruss & Roellke; *P. villosum* var. *affine* (De Wildeman) Braem; *P. villosum* var. *gratrixianum* (Rolfe) Braem.

Plants terrestrial or lithophytic. Leaves 4–8, distichous; blade abaxially green and toward base spotted with purple, adaxially deep green, oblanceolate-oblong to narrowly oblong, 28–40 × 2.6–3.4 cm, unequally bilobulate or tridenticulate at apex. Scape suberect, terminating in a solitary flower; peduncle green, 13–28 cm, purple pubescent; floral bract green, sub-elliptic-ovate, 3.5–4.7 × 2–2.5 cm; pedicel and ovary 5–6.5 cm, purple pubescent. Flower 7–8 cm in diam.; dorsal sepal white, often pale green or brown-green toward its base, spotted with deep purple in basal 2/3; synsepal white, often with 2 rows of purple spots centrally; petals yellow-brown, with deeper color on upper side of midvein than on lower side; lip pale yellow-brown; staminode pale yellow, slightly flushed with brown. Dorsal sepal broadly elliptic or suborbicular, 5–5.5 × 3.8–4.6 cm, ± puberulent abaxially, ciliate, basal margin recurved, apex acute; synsepal elliptic or ovate-elliptic, 4.2–5 × 2.2–2.7 cm. Petals spatulate, 5.2–5.5 × 2–2.5 cm, margin often undulate and recurved, apex retuse to 3-dentate; lip helmet-shaped; pouch ovoid, 2.8–3.1 × 2.4–2.7 cm. Staminode obcordate, 10–11 × 10–11 mm, adaxially with bubblelike papillae and a central umbo, purple hairy toward its base. Fl. Sep–Dec. 2n = 26.

Rocky places in forests; 1800–1900 m. SE Yunnan (Malipo) [Laos, N Vietnam].

*Paphiopedilum ×vietenryanum* O. Gruss & Petchleung (*Orchidee* (Hamburg) 53: 221. 2002), a natural hybrid between this species and *P. henryanum*, was described recently from SE Yunnan.

**21. *Paphiopedilum villosum*** (Lindley) Stein, *Orchideenbuch*, 490. 1892.

紫毛兜兰 zi mao dou lan

Plants epiphytic or sometimes lithophytic. Leaves 4–7, distichous; blade abaxially green and with purple speckles toward base, adaxially uniformly dark green, linear-oblong or loriate, 20–32(–40) × 2.2–3.5(–4) cm, leathery, acute to obtuse and bilobulate at apex. Scape suberect to arching, terminating in a solitary flower; peduncle green, 10–18(–24) cm, with purple or rarely whitish hairs; floral bract green, elliptic, conduplicate, 4–5 × 2–3 cm, abaxially purple spotted and hairy toward base; pedicel and ovary 4–5 cm, with purple or rarely whitish hairs. Flower 8–13 cm in diam.; dorsal sepal greenish or yellowish to whitish, centrally blackish maroon spotted or with a deep maroon or blackish maroon area; synsepal greenish to yellowish white; petals with a deep maroon central stripe, on upper side of central stripe pale maroon with deep maroon veins, on lower side paler in color; lip pale maroon obscurely with darker veins; staminode yellowish, flushed with pale maroon, centrally with a yellow or green umbo. Dorsal sepal broadly elliptic to obovate, 4–6.5 × 2.2–4.5 cm, abaxially ± minutely hairy throughout and with rather long hairs on midvein and toward base and apex, ciliate, recurved on basal margin, apex obtuse; synsepal elliptic-ovate to narrowly ovate, usually 4–5 × 1.7–2.8 cm. Petals spatulate-obovate, 5–6.5 × 2.2–4.5 cm, adaxially purple villous at base, ciliate, obtuse to retuse at apex; lip helmet-shaped, 5–6.5 cm; pouch 2.5–4 × 2.5–3.5 cm. Staminode obcor-

date-obovate, 10–15 × 8–11 mm, adaxially with bubblelike papillae and a central umbo, subtruncate at apex.

Tree trunks or branches in open forests, sunny cliffs, crevices of rocks, rocky places; 1100–1800(–2000) m. Yunnan [NE India, Laos, Myanmar, Thailand, Vietnam].

*Paphiopedilum* × *sinovillosum* Z. J. Liu & S. C. Chen (J. S. China Agric. Univ. 25: 123. 2004), a natural hybrid between *P. villosum* and *P. henryanum*, was described recently from Malipo of SE Yunnan.

- 1a. Dorsal sepal heavily spotted with large blackish maroon marks ..... 21d. var. *boxallii*  
 1b. Dorsal sepal not spotted with large blackish maroon marks.  
 2a. Dorsal sepal with a broad white margin particularly in apical half ..... 21b. var. *annamense*  
 2b. Dorsal sepal with a yellowish to greenish margin.  
 3a. Pedicel and ovary with purple or sometimes whitish hairs; dorsal sepal 3.5–4.5 cm wide; floral bract slightly longer than pedicel and ovary ..... 21a. var. *villosum*  
 3b. Pedicel and ovary with very dense long white hairs; dorsal sepal 2.2–2.9 cm wide; floral bract much longer than pedicel and ovary ..... 21c. var. *densissimum*

### 21a. *Paphiopedilum villosum* var. *villosum*

紫毛兜兰(原变种) *zi mao dou lan* (yuan bian zhong)

*Cypripedium villosum* Lindley, Gard. Chron. 1854: 135. 1854; *Cordula villosa* (Lindley) Rolfe.

Peduncle, pedicel, and ovary with purple or sometimes whitish hairs. Dorsal sepal 3.5–4.5 cm wide, greenish to yellowish, centrally with a deep maroon or blackish maroon and darker-veined area. Floral bract slightly longer than pedicel and ovary. Fl. Nov–Mar.  $2n = 26$ .

Tree trunks or branches in open forests, sunny cliffs; 1200–1800 m. SE Yunnan (Malipo) [NE India, Myanmar, Thailand, Vietnam].

*Paphiopedilum* × *petchleungianum* O. Gruss (Orchidee (Hamburg) 52: 611. 2001), a natural hybrid between this taxon and *P. dianthum*, was described from Wenshan of SE Yunnan. Its flower is similar to that of this taxon, but its petals are narrower and longer and its staminode very similar to that of *P. dianthum*.

### 21b. *Paphiopedilum villosum* var. *annamense* Rolfe, Bot. Mag. 133: ad t. 8216. 1907.

白边兜兰 *bai bian dou lan*

*Paphiopedilum villosum* f. *annamense* (Rolfe) Braem.

Peduncle, pedicel, and ovary with purple or sometimes whitish hairs. Dorsal sepal 3.5–4 cm wide, white, centrally with a maroon or blackish maroon and darker-veined and yellow flushed area. Floral bract ca. as long as or slightly longer than pedicel and ovary. Fl. Apr–May.

Crevices of rocks, rocky places; 1200–1500 m. SE Yunnan (Malipo) [N Vietnam].

### 21c. *Paphiopedilum villosum* var. *densissimum* (Z. J. Liu & S. C. Chen) Z. J. Liu & S. C. Chen in Z. J. Liu et al., Gen. Paphiopedilum China, 148. 2009.

密毛兜兰 *mi mao dou lan*

*Paphiopedilum densissimum* Z. J. Liu & S. C. Chen, Acta Phytotax. Sin. 40: 283. 2002.

Peduncle, pedicel, and ovary with very dense long white hairs. Dorsal sepal 2.2–2.9 cm wide, pale green-yellow, centrally with a deep maroon and darker-veined area. Floral bract much longer than pedicel and ovary. Fl. Sep–Nov.

• Crevices of rocks in forests or shaded cliffs; 1200–1500 m. C and W Yunnan (Fugong, Mojiang).

### 21d. *Paphiopedilum villosum* var. *boxallii* (H. G. Reichenbach) Pfitzer in Engler, Pflanzenr. 12(IV. 50): 73. 1903.

包氏兜兰 *bao shi dou lan*

*Cypripedium boxallii* H. G. Reichenbach, Gard. Chron., n.s., 7: 367. 1877; *Cordula boxallii* (H. G. Reichenbach) Rolfe; *Cypripedium villosum* var. *boxallii* (H. G. Reichenbach) Veitch; *Paphiopedilum boxallii* (H. G. Reichenbach) Pfitzer.

Peduncle, pedicel, and ovary with dense purple hairs. Dorsal sepal 2.3–2.6 cm wide, heavily spotted with large blackish maroon marks centrally and with narrow white margin particularly in apical part. Fl. Nov.

Rocks or rocky places in forests; 1200–1300(–2000) m. SW Yunnan (Yingjiang) [Myanmar, N Vietnam].

### 22. *Paphiopedilum tigrinum* Koopowitz & N. Hasegawa, Orchid Advocate 16(3): 78. 1990.

虎斑兜兰 *hu ban dou lan*

*Paphiopedilum markianum* Fowlie.

Plants terrestrial, epiphytic, or lithophytic. Leaves 2–5, distichous; blade abaxially pale green and carinate, adaxially green or sometimes very obscurely tessellated with deep and light green, linear-ligulate, 13–27 × 2.1–2.7(–3.5) cm, leathery, rounded and tridentate at apex. Scape erect or suberect, terminating in a solitary flower; peduncle green, 20–25 cm, densely purple pubescent; floral bract green spotted or flushed with purple toward base and apex, elliptic-oblong, 3.5–6 cm, purple pubescent toward abaxial base; pedicel and ovary green, 3.5–5.5 cm, densely purple pubescent. Flower 9–12 cm in diam.; dorsal sepal yellowish green, marked with 3 longitudinal maroon bars; synsepal yellowish green with maroon stripes or spots toward base; petals yellowish green in basal half and purplish in apical half, with 2 longitudinal maroon bars in basal 2/5; lip pale yellow-green flushed with brownish or pale purple-brown; staminode whitish yellow, with a purple-brown center. Dorsal sepal broadly obovate or broadly ovate, 4–4.5 × 2.8–4 cm, puberulent abaxially and toward adaxial apex, basal margin recurved, minutely ciliate, acute-obtuse at apex; synsepal elliptic, 3–4.5 × 1.9–2.5 cm, puberulent abaxially and toward adaxial apex, obtuse to bilobulate at apex. Petals half-twisted, spatulate, 5.5–7 × 2.3–4 cm, adaxially purple pubescent at base, minutely ciliate, undulate at margin, rounded and obtusely tri-

denticulate at apex; lip helmet-shaped, 3.5–4.5 cm; pouch 2.5–3 × 2–2.5 cm, tapering toward apex. Staminode obovate-elliptic, 12–14 × 8–9 mm, obscurely tridenticulate or slightly mucronate at apex, with a central umbo. Fl. Jun–Aug.  $2n = 26$ .

Shaded and rocky places in forests or thicket margins along valleys; 1400–2200 m. SE and W Yunnan (Lushui, Malipo) [NE Myanmar].

A closely related species, *Paphiopedilum smaragdinum* Z. J. Liu & S. C. Chen (J. Wuhan Bot. Res. 21: 489. 2003; *P. tigrinum* f. *smaragdinum* (Z. J. Liu & S. C. Chen) O. Gruss), was described recently from Lushui of W Yunnan. It is similar in floral appearance to, but different in color from, *P. tigrinum*. Its flower is pale yellow-green, lacking any deep-colored striping or spotting on the sepals and petals. It is probably best regarded as a variety of *P. tigrinum*.

**23. *Paphiopedilum spicerianum*** (H. G. Reichenbach) Pfitzer, Jahrb. Wiss. Bot. 19: 164. 1888.

白旗兜兰 bai qi dou lan

*Cypripedium spicerianum* H. G. Reichenbach, Gard. Chron., n.s., 13: 41, 363. 1880; *Cordula spiceriana* (H. G. Reichenbach) Rolfe.

Plants terrestrial or lithophytic. Leaves 4–6, distichous; blade abaxially pale green and spotted with purple toward base, adaxially uniformly dark green, narrowly oblong-elliptic, usually 14–27 × 1.8–2.5(–6) cm, leathery, slightly undulate along basal margin, acute and slightly bilobulate at apex. Scape suberect, terminating in 1 or rarely 2 flowers; peduncle purple, 9–22 cm, sparsely pubescent above; floral bract greenish yellow, with a maroon midvein abaxially, elliptic, 1.7–2.9 cm; pedicel and ovary purplish to brownish, 2.5–4.3 cm, glabrous. Flower 5–7.5 cm in diam.; dorsal sepal white with a maroon midvein and greenish base; synsepal yellowish green or whitish green; petals yellowish green with a brown-purple midvein and many paler speckles along lateral veins; lip pale green-brown or pale yellow-brown with dark brown veins; staminode white with a large purple circle centrally. Dorsal sepal curving forward, broadly ovate-orbicular or suborbicular, 2.8–4.9 × 3.2–4.1 cm, both surfaces puberulent, basal margin recurved, minutely ciliate, obtuse to rounded at apex; synsepal ovate, 2.5–4 × 1.4–3 cm, puberulent on both surfaces or glabrescent adaxially, obtuse at apex. Petals linear-spatulate or narrowly oblong, 2.6–5.2 × 0.6–1.8 cm, adaxially white villous at base, margin undulate, apex rounded or obtuse; lip helmet-shaped, 3.2–3.9 cm; pouch 3–3.8 × 1.8–2.8 cm. Staminode obovate or obovate-suborbicular, 9–10 × 6–7 mm, convolute on basal margin and appearing like a pair of eyes, obtuse-acute at apex. Fl. Sep–Nov.

Rocky places, cliffs or crevices of limestone rocks in forests or on bushy slopes; 900–1400 m. Yunnan (Gaoligong Shan, Simao) [N Myanmar].

**24. *Paphiopedilum appletonianum*** (Gower) Rolfe, Orchid Rev. 4: 364. 1896.

卷萼兜兰 juan e dou lan

*Cypripedium appletonianum* Gower, Garden (London, 1871–1927) 43: 95. 1893; *Cordula appletoniana* (Gower) Rolfe; *Cypripedium bullenianum* H. G. Reichenbach var. *appletonianum* (Gower) Rolfe; *Paphiopedilum appletonianum* var. *hainanense* (Fowlie) Braem; *P. hainanense* Fowlie; *P. hookerae*

(H. G. Reichenbach ex J. D. Hooker) Stein subsp. *appletonianum* (Gower) M. W. Wood.

Plants terrestrial or lithophytic. Leaves 7 or 8, distichous; blade pale green and often marked with purple toward base abaxially, distinctly or sometimes obscurely tessellated with dark and light green adaxially, narrowly elliptic or suboblong, 9–20(–25) × 1.5–3.5(–4) cm, bilobulate or tridenticulate at acute apex. Scape erect, terminating in 1 or very rarely 2 flowers; peduncle purple, 20–60 cm, white pubescent; floral bract green, ovate-lanceolate, 1.5–2.6 cm, abaxially puberulent especially in basal half, ciliate, acuminate at apex; pedicel and ovary 4–7 cm, pubescent. Flower 6–8(–10) cm in diam.; dorsal sepal and synsepal greenish or whitish green, with green veins; dorsal sepal with brown-purple stripes at base; petals greenish at base, turning to a rose-red or dull pink toward apex, with scattered dark brown spots or sometimes green-brown stripes in basal half; lip olive-green, rose-red, or purplish, with a green or pale green-yellow margin; staminode dull yellowish with a green center. Dorsal sepal ovate or broadly ovate, 3.5–4 × 2–3 cm, abaxially puberulent on veins and margin, minutely ciliate, acute at apex; synsepal elliptic-lanceolate, 2–3 × 1–1.5 cm, abaxially puberulent on veins, minutely ciliate, acuminate at apex. Petals spatulate, 4–6 × 1.3–2 cm, with blackish brown warts along upper margin and sometimes fewer along lower margin in basal half, often half-twisted in apical half; lip helmet-shaped, 3.5–4.5 cm; pouch 2–3 × 1.5–2.5 cm, apical margin with a deep incisure centrally with usually 1–3 teeth on either side. Staminode broadly obcordate, lunate, or transversely elliptic-oblong, mucronate or with 2–5 teeth at apex. Fl. Jan–May.  $2n = 26, 28, 38$ .

Rocky and humus-rich places or crevices of rocks in forests; 300–1200 m. SW Guangxi, Hainan [Cambodia, Laos, Thailand, Vietnam].

**25. *Paphiopedilum purpuratum*** (Lindley) Stein, Orchideenbuch, 481. 1892.

紫纹兜兰 zi wen dou lan

*Cypripedium purpuratum* Lindley, Edwards's Bot. Reg. 23: ad t. 1991. 1837; *Cordula purpurata* (Lindley) Rolfe; *Cypripedium sinicum* Hance ex H. G. Reichenbach; *Paphiopedilum aestivum* Z. J. Liu & J. Yong Zhang; *P. purpuratum* var. *hainanense* F. Y. Liu & Perner; *P. sinicum* (Hance ex H. G. Reichenbach) Stein.

Plants terrestrial. Leaves 4–6, distichous; blade pale green and carinate abaxially, distinctly or obscurely tessellated with dark and light green adaxially, narrowly elliptic or suboblong, 9–15(–17) × 2.3–4.2 cm, acute and slightly tridenticulate at apex. Scape erect or suberect, terminating in a solitary flower; peduncle purple-violet, 9–19 cm, white pubescent; floral bract narrowly ovate-elliptic, 1.7–2.5 × 0.7–0.9 cm, ciliate, abaxially white pubescent particularly on midvein; pedicel and ovary 4–6 cm, pubescent. Flower 8–10 cm in diam.; dorsal sepal white, with broad maroon veins, greenish toward base; synsepal white with green veins; petals glossy purple-maroon, veined with dark purple, tinged with greenish or yellowish toward base and apex, and spotted with blackish maroon in basal half; lip purple-maroon, greenish on back of pouch; staminode pale yellow-purple, with 2 green-veined blotches on both sides of whitish

center. Dorsal sepal broadly ovate, 3–4 × 3–4.2 cm, abaxially puberulent, minutely ciliate, acuminate at apex; synsepal ovate to ovate-lanceolate, 2–3.5 × 0.9–1.6 cm, abaxially puberulent, minutely ciliate, acuminate at apex. Petals suboblong, 3.5–5 × 1–1.4 cm, blackish ciliate, with blackish maroon spots somewhat wartlike, acute or unequally bilobulate at apex; lip helmet-shaped, 3.5–4.5 cm, verrucose on incurved lateral lobes; pouch 2–3 × 2.2–2.8 cm, outside minutely warty. Staminode lunate, 7–8 × 10–11 mm, puberulent adaxially, with inwardly pointed lateral lobes and an acute tooth at apex. Fl. Jun–Dec.  $2n = 40$ .

Rocky places in forests or thickets along valleys; 100–1200 m. S Guangdong, S Guangxi, Hainan, SE Yunnan [N Vietnam].

**26. *Paphiopedilum wardii*** Summerhayes, Gard. Chron., ser. 3, 92: 446. 1932.

彩云兜兰 cai yun dou lan

*Cypripedium wardii* (Summerhayes) C. Curtis (1933), not Rolfe (1913); *Paphiopedilum brevilabium* Z. J. Liu & J. Yong Zhang; *P. microchilum* Z. J. Liu & S. C. Chen; *P. multifolium* Z. J. Liu & J. Yong Zhang.

Plants terrestrial. Leaves 2–5, distichous; blade abaxially rather densely mottled with purple, adaxially tessellated with light or bluish and dark green, oblong or elliptic, 8–23 × 2.5–4.1 cm, sparsely ciliate toward basal margin, slightly bilobulate or tridenticulate at acute apex. Scape erect, terminating in a solitary flower; peduncle purple-red, 15–40 cm, pubescent; floral bract ovate-lanceolate, conduplicate, 1.8–2.3 cm, abaxially pubescent, ciliate; pedicel and ovary 4–5.5 cm, pubescent. Flower 7–10 cm in diam.; dorsal sepal and synsepal white or whitish green, veined with deep green; petals greenish white, flushed with purplish brown and spotted throughout with blackish brown; lip greenish to pale yellow-brown, veined and finely spotted with brown; staminode greenish marbled, deep green centrally. Dorsal sepal ovate, 3–4.5 × 2–3.5 cm, both surfaces puberulent particularly on veins, ciliate, acuminate at apex; synsepal ovate-lanceolate or lanceolate, 3.5–4.5 × 1.4–2.5 cm, both surfaces puberulent, ciliate, acute or acuminate at apex. Petals usually spreading horizontally, suboblong or oblong-lanceolate, 4.5–6 × 1.5–2 cm, adaxially minutely puberulent particularly in basal half, long ciliate, shortly acuminate at apex; lip helmet-shaped, 3.4–4.6 cm, warty on incurved lateral lobes; pouch 2.2–2.5 × 2–2.4 cm, outside slightly puberulent. Staminode obcordate-lunate, 9–10 × 13–15 mm, puberulent

adaxially, apical sinus with a small central tooth and 2 incurved lateral teeth. Fl. Dec–Mar.  $2n = 41, 44$ .

Shaded and steep rocks or near roots of large trees at forest margins or in forests along streams (1–3 m from water); ca. 2000 m. SW Yunnan (Lushui) [Myanmar].

*Paphiopedilum ×yingjiangense* Z. J. Liu & S. C. Chen (Acta Bot. Yunnan. 29: 289. 2007) was recently described as a natural hybrid from W Yunnan (Yingjiang). In the protologue, *P. villosum* and *P. wardii* were suggested as the putative parents. However, a more likely parentage is *P. spicerianum* and *P. wardii*.

**27. *Paphiopedilum venustum*** (Wallich ex Sims) Pfitzer, Jahrb. Wiss. Bot. 19: 163. 1888.

秀丽兜兰 xiu li dou lan

*Cypripedium venustum* Wallich ex Sims, Bot. Mag. 47: ad t. 2129. 1820; *Cordula venusta* (Wallich ex Sims) Rolfe; *Stimegas venustum* (Wallich ex Sims) Rafinesque.

Plants terrestrial. Leaves 4 or 5, distichous; blade abaxially densely purple spotted, adaxially tessellated with dark green and gray- or yellow-brownish green, oblong-elliptic or narrowly oblong, 10–21.5 × 2.5–5.7 cm, acute and bilobulate or tricuspidate at apex. Scape erect, terminating in 1 or rarely 2 flowers; peduncle purple-brown, 12–19 cm, densely hirsute; floral bract ovate, 1.7–2.5 cm, conduplicate, abaxially sparsely pubescent, ciliate; pedicel and ovary 4.2–5.3 cm, pubescent. Flower 7–8 cm in diam.; dorsal sepal and synsepal white with green veins; petals yellow-whitish with green veins, flushed with purple in apical half, with a few large maroon warts mainly in basal half; lip and staminode yellowish, slightly tinged with purple-red and distinctly veined with green. Dorsal sepal broadly ovate or ovate-cordate, 2.7–3 × 2.1–2.3 cm, abaxially pubescent particularly on midvein, ciliate, acuminate at apex; synsepal ovate, 2.3–3.6 × 1.4–1.6 cm, abaxially pubescent, ciliate, acute at apex. Petals suboblong-oblongate, 3.5–4 × 1.2–1.4 cm, margin undulate in apical half, long ciliate, acute or obtuse at apex; lip helmet-shaped, 3.3–4.2 cm, verrucose on lateral lobes; pouch 2.2–2.4 × 2–2.8 cm, outside usually minutely papillate-puberulent. Staminode reniform-obcordate, 6–7 × 9–13 mm, puberulent, with a broad sinus and a broad mucro at apex. Fl. Jan–Mar.  $2n = 38, 40, 40 + 2B, 41, 42$ .

Humus-rich and rocky places in thickets or at forest margins; 1100–1600 m. S and SE Xizang (Dinggyê, Mêdog) [Bhutan, NE India, Nepal].

### 3. Subfam. ORCHIDOIDEAE

兰亚科 lan ya ke

Chen Xinqi (陈心启 Chen Sing-chi), Lang Kaiyong (郎楷永 Lang Kai-yung); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

Terrestrial or very rarely epiphytic plants with root-stem tubers or fleshy, short to long rhizomes, rarely mycotrophic with leaves reduced to colorless sheaths. Tubers, if present, ovoid, spherical, ellipsoidal, digitate, or cylindrical-fusiform, solitary or in clusters, hairy or glabrous; rhizome, if present, fleshy, elongate. Leaves spirally arranged, 1 to many, basal or arranged along stem, deciduous or rarely persistent for more than a year, often sheathing at base, usually green, rarely spotted or veined with silver, red, or gold, rarely purple spotted or shaded beneath. Inflorescence terminal, erect or arching, 1- to many flowered; peduncle usually terete, glabrous, hairy, or glandular; bracts linear, lanceolate, ovate, or elliptic, usually glabrous and green. Flowers small to large, usually resupinate, flat to tubular, often showy; pedicel often obscure; ovary distinct, glabrous or less frequently hairy or glandular, lacking an abscission layer. Dorsal sepal free or often adnate to petals to form a hood over column; lateral sepals usually free, sometimes connate and oblique at base to form a spurlike mentum. Petals entire or 2-lobed, often adnate to dorsal sepal; lip usually lowermost in flower, usually deflexed, entire, 3- or 5-lobed, or 2-partite, occasionally callose or with 2 basal glands, often saccate at base or with spurlike nectary; nectary fusiform, clavate, or cylindrical, rarely fused to ovary, often lacking nectar. Column basifixed or not; anther 2-locular, longer than or as long as rostellum, locules adnate, divergent, or separated on a  $\pm$  broad connective; pollinia 2 or 4, sectile, attached by short to elongate caudicles to 1 or 2 viscidia; staminodes 2, lateral, usually present, sessile or stalked; stigma entire or 2-lobed, sessile or stalked, concave to convex; rostellum usually 2- or 3-lobed, shorter than or as long as anther, sometimes obscure, when 3-lobed mid-lobe erect or porrect, lying between or in front of anther locules, side lobes short to long, porrect, rarely incurved or upcurved. Capsule 3-ribbed, longitudinally dehiscent. Seeds fusiform to almost cylindrical, with a thin testa.

About 192 genera and ca. 3,630 species in eight tribes and 20 subtribes: well represented in N temperate and tropical areas of both the Old and New Worlds; 46 genera (four endemic, one introduced) and 344 species (153 endemic, one introduced) in China.

This subfamily is particularly well represented in temperate parts of China.

### 5. GOODYERA R. Brown in W. T. Aiton, Hortus Kew., ed. 2, 5: 197. 1813.

斑叶兰属 ban ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Lang Kaiyong (郎楷永 Lang Kai-yung); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Epipactis* Séguier (1754), not Zinn (1757, nom. cons.); *Haemaria* Lindley.

Herbs, terrestrial, or rarely epiphytic or lithophytic. Rhizome elongate, creeping, few to many noded, with fibrous roots at nodes. Stem erect or ascending, short or elongate, few to many leaved. Leaves widely spaced along stem, clustered, or rosulate, pale to dark green or blackish, adaxially sometimes with a white or pink midvein or white or pink reticulate venation, lanceolate to ovate-elliptic, usually oblique, slightly fleshy, base contracted into a sheathing petiole-like stalk. Inflorescence terminal, racemose, glabrous or pubescent; peduncle with a few sheathing bracts; rachis laxly or densely 1- to many flowered, secund or cylindrical; floral bracts glabrous or pubescent. Flowers resupinate. Sepals free, subsimilar, outer surface glabrous or pubescent; dorsal sepal concave, connivent with petals and forming a hood over column; lateral sepals connivent with lip, widely spreading or reflexed. Petals membranous, glabrous; lip connate with column at base, cymbiform, composed of a concave-saccate hypochile and a sessile or rarely shortly clawed epichile; hypochile usually papillose inside or rarely glabrous, sometimes with a pair of low keels; epichile transversely elliptic to lanceolate. Column short, dilated toward apex, without appendages; anther erect; pollinia 2, each longitudinally 2-parted, granular-farinaceous, sectile, attached directly to a small, ovate viscidium or attenuate into stalks that attach to an oblong viscidium; rostellum erect, deltoid, remnant shallowly or deeply bifid; stigma lobes connate, positioned below rostellum. Capsule erect, ovoid to ellipsoid.

About 100 species: S Africa, Asia, NE Australia, Europe, Madagascar, North America including Mexico, SW Pacific islands; 29 species (12 endemic) in China.

1a. Leaves rosulate or subrosulate at base of stem.

2a. Leaves uniformly green, without white or pale green venation or markings.

3a. Lip epichile minutely papillose ..... 1. *G. yunnanensis*

3b. Lip epichile glabrous.

4a. Dorsal sepal ca. 2.5 mm ..... 2. *G. brachystegia*

4b. Dorsal sepal 4–7 mm ..... 3. *G. fusca*

2b. Leaves green with white or pale green venation and/or irregular markings on adaxial surface.

5a. Dorsal sepal 7–10 mm ..... 4. *G. schlechtendaliana*

5b. Dorsal sepal 3–4 mm.

6a. Stem less than ca. 1 cm; leaves ovate or ovate-orbicular, 1.3–2.5 cm wide; petiole-like leaf base and tubular sheath very short, ca. 0.5 cm ..... 5. *G. bomiensis*

- 6b. Stem 1–4 cm; leaves ovate to ovate-elliptic or oblong, 0.5–1.5 cm wide; petiole-like leaf base and tubular sheath 1–2 cm.  
 7a. Sepals sparsely pubescent on outer surface; lip hypochile papillose inside ..... 6. *G. repens*  
 7b. Sepals glabrous; lip hypochile glabrous, containing 2 parallel lamellae toward base ..... 7. *G. arisanensis*
- 1b. Leaves spaced along stem or clustered toward apex of stem.  
 8a. Leaves with white or pale green venation and/or irregular markings on adaxial surface.  
 9a. Floral rachis ca. 0.5 cm, 2- or rarely 3-flowered; dorsal sepal 20–25 mm ..... 20. *G. biflora*  
 9b. Floral rachis 3–11 cm, 6- or more flowered; dorsal sepal 3–14 mm.  
 10a. Dorsal sepal 3–6 mm.  
 11a. Apical margin of lip epichile and petals irregularly denticulate ..... 29. *G. yangmeishanensis*  
 11b. Margins of lip and petals entire.  
 12a. Leaves less than 1 cm wide; lip hypochile with 2 lamellae inside ..... 28. *G. wuana*  
 12b. Leaves 1.3–4 cm wide; lip hypochile lacking lamellae.  
 13a. Leaves with a white band along midvein adaxially; lip hypochile glabrous ..... 26. *G. nankoensis*  
 13b. Leaves with fine white reticulate venation adaxially; lip hypochile papillose inside ..... 27. *G. hachijoensis*
- 10b. Dorsal sepal 7–14 mm.  
 14a. Lip epichile with 2 longitudinal lamellae.  
 15a. Peduncle glabrous ..... 23. *G. vittata*  
 15b. Peduncle pubescent.  
 16a. Leaves clustered toward apex of stem; apices of sepals and petals acute .... 24. *G. kwangtungensis*  
 16b. Leaves spaced along stem; apices of sepals and petals acuminate ..... 25. *G. dongchenii*
- 14b. Lip epichile not ornamented.  
 17a. Leaves deep green or occasionally dark purplish green, with a white band along midvein, lacking white reticulate venation or irregular markings; peduncle deep reddish brown ..... 22. *G. velutina*  
 17b. Leaves green with a white or pale green midvein and/or irregular white markings; peduncle pale grayish green.  
 18a. Leaves 4.5–9 × 2–4 cm; dorsal sepal ca. 14 mm ..... 21. *G. daibuzanensis*  
 18b. Leaves 2.5–5 × 0.8–2.2 cm; dorsal sepal 7–10 mm ..... 4. *G. schlechtendaliana*
- 8b. Leaves without white or pale green venation or markings.  
 19a. Plants 25–90 cm tall.  
 20a. Peduncle green; flowers small, opening weakly, white tinged pale green; dorsal sepal 3–3.5 mm ..... 16. *G. procera*  
 20b. Peduncle reddish brown or dark greenish brown; flowers medium-sized, opening widely, yellowish brown; dorsal sepal 6–8.5 mm.  
 21a. Leaves 15–20 cm; petiole-like leaf base and tubular sheath 5–10 cm; floral rachis 10–30 cm, laxly to subdensely flowered ..... 14. *G. fumata*  
 21b. Leaves 9–15 cm; petiole-like leaf base and tubular sheath 2–5.5 cm; floral rachis 4–15 cm, densely flowered ..... 15. *G. rubicunda*
- 19b. Plants 8–28 cm tall.  
 22a. Flowers large, opening widely; lip 12–14 mm.  
 23a. Leaves slightly fleshy; peduncle pale green, 8–13 cm; rachis 1–3-flowered; lip white to pale green, epichile strongly recurved ..... 12. *G. seikoomontana*  
 23b. Leaves thinly textured; peduncle pale red-brown, 5–9 cm; rachis (2 or)3–5-flowered; lip greenish brown tinged white at apex, epichile recurved or spreading forward ..... 13. *G. viridiflora*
- 22b. Flowers small or medium-sized, opening weakly; lip 2.8–10 mm.  
 24a. Plants always epiphytic; peduncle strongly recurved.  
 25a. Stem erect; lip 5–6 mm ..... 8. *G. recurva*  
 25b. Stem pendulous; lip 2.8–3.5 mm ..... 9. *G. pendula*
- 24b. Plants terrestrial (*G. robusta* rarely epiphytic); peduncle not recurved.  
 26a. Lip epichile with 2 longitudinal lamellae or a narrow band of papillae.  
 27a. Dorsal sepal ca. 3.5 mm; lip epichile with a narrow band of papillae from base to midway along its length ..... 17. *G. yamiana*  
 27b. Dorsal sepal 7–11 mm; lip epichile with 2 longitudinal lamellae ..... 10. *G. robusta*
- 26b. Lip epichile not ornamented.  
 28a. Petiole-like leaf base and tubular sheath less than 1 cm; dorsal sepal ca. 3 mm ..... 11. *G. wolongensis*  
 28b. Petiole-like leaf base and tubular sheath more than 1 cm; dorsal sepal 5–13 mm.

- 29a. Stem 9–17 cm; peduncle pubescent, 2.5–5 cm ..... 18. *G. foliosa*  
 29b. Stem 6–10 cm; peduncle glabrous, ca. 1 cm ..... 19. *G. henryi*

**1. *Goodyera yunnanensis*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 60. 1919.

川滇斑叶兰 chuan dian ban ye lan

*Epipactis yunnanensis* (Schlechter) Hu; *Goodyera serpens* Schlechter.

Plants terrestrial, 10–23 cm tall. Rhizome slender. Stem erect, 4–7-leaved. Leaves rosulate at base of stem, green, without white markings, elliptic to lanceolate-elliptic, 1.5–3.5 × 0.7–1.5 cm, base cuneate, apex acute; petiole-like base and tubular sheath 0.8–1.8 cm. Peduncle 4.5–9 cm, pubescent, with 2–9 sterile bracts; rachis 3.5–10 cm, densely many flowered, secund; floral bracts linear-lanceolate or linear, to 12 mm, basal ones slightly exceeding flowers, pubescent, apex acuminate. Flowers opening weakly, white or pale green, small; pedicel and ovary cylindrical-fusiform, 4–6 mm, pubescent. Sepals white or pale green, outer surface pubescent, 1-veined; dorsal sepal narrowly ovate, 3–5 × ca. 2 mm, apex subacute; lateral sepals weakly spreading, narrowly ovate, oblique, 3–5 × ca. 2.2 mm, apex subacute. Petals oblong-ligulate, oblique, 3–5 × ca. 1.5 mm, 1-veined, apex slightly obtuse; lip cymbiform, 3–4 mm; hypochile concave-saccate, glabrous, inside with 4 obscure veins; epichile oblong, minutely papillose, apex obtuse. Column ca. 1.5 mm; anther transversely elliptic, ca. 0.8 mm; rostellum remnant shallowly bifid. Fl. Aug–Oct.

- Forests, scrub; 2600–3900 m. NW Sichuan, N and W Yunnan.

**2. *Goodyera brachystegia*** Handel-Mazzetti, Symb. Sin. 7: 1345. 1936.

莲座叶斑叶兰 lian zuo ye ban ye lan

Plants terrestrial, 18–20 cm tall. Rhizome short. Stem erect or ascending, 5- or 6-leaved. Leaves rosulate at base of stem, green, without white markings, broadly elliptic or ovate, 2.4–3.3 × 1.5–2 cm, base rounded, apex acute; petiole-like base and tubular sheath 1–1.5 cm. Peduncle densely pubescent, with 5–7 sterile bracts; rachis 6.5–8 cm, densely many flowered, subsecund; floral bracts lanceolate, ca. as long as ovary, sparsely pubescent, apex acuminate. Flowers opening weakly, white, small; pedicel and ovary cylindrical-fusiform, ca. 5 mm, pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal narrowly ovate-oblong, ca. 2.5 × 1.5 mm, concave, apex obtuse; lateral sepals oblong, slightly oblique, ca. 3 × 1.6 mm, apex obtuse. Petals rhombic-oblancheolate, oblique, ca. 2.5 × 1.2 mm, 1-veined, apex obtuse or subacute; lip broadly ovate, ca. 2.5 mm; hypochile concave-saccate, ca. 1.2 × 2.5 mm, glabrous, inside with thickened veins; epichile oblong, ca. 1.3 mm, apex obtuse, slightly reflexed. Column extremely short; anther ovoid-cordate, ca. 1 mm; rostellum ca. 1 mm, remnant deeply bifid. Fl. Jun, fr. Aug.

- Forests; 1300–2000 m. SW Guizhou, C and NE Yunnan.

**3. *Goodyera fusca*** (Lindley) J. D. Hooker, Fl. Brit. India 6: 112. 1890.

脊唇斑叶兰 ji chun ban ye lan

*Hetaeria fusca* Lindley, Gen. Sp. Orchid. Pl. 491. 1840 [“*Aetheria*”]; *Cystorchis fusca* (Lindley) Benth & J. D. Hooker; *Epipactis fusca* (Lindley) A. A. Eaton; *Orchiodes fusca* (Lindley) Kuntze.

Plants terrestrial, 10–22 cm tall. Rhizome short, few noded. Stem erect, 1–3 cm, 5–8-leaved. Leaves rosulate at base of stem, green, without white markings, ovate or ovate-elliptic, 1.5–3.5 × 0.8–2 cm, apex obtuse or acute; petiole-like base and tubular sheath 0.8–1.8 cm. Peduncle pale green, 4.5–9 cm, sparsely pubescent, with 1–3 sterile bracts; rachis 3–9 cm, densely many flowered, secund or not; floral bracts ovate-lanceolate or lanceolate, 6–10 mm, basal ones exceeding flowers, pubescent, apex acuminate. Flowers opening weakly, white flushed with pale green, small; pedicel and ovary cylindrical-fusiform, 6–7 mm, densely pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal oblong, 4–7 × 1.5–2 mm, concave, apex obtuse; lateral sepals oblong, oblique, 4–7 × 1.8–2.2 mm, apex subacute. Petals linear-oblong, falcate, 4–7 × 1.5–2 mm, 1-veined, apex obtuse; lip broadly ovate, 3–5 × 2–2.5 mm; hypochile conspicuous and projecting beyond base of lateral sepals, concave-saccate, glabrous, with 2 ridges running parallel to midvein inside; epichile abruptly narrowed, narrowly oblong, apex obtuse, recurved. Column ca. 1.5 mm. Fl. Aug–Sep.  $2n = 32, 32 + 2B$ .

Forests, thickets, alpine meadows; 2600–4500 m. S and SE Xizang, NW Yunnan [Bhutan, NE India, N Myanmar, Nepal].

**4. *Goodyera schlechtendaliana*** H. G. Reichenbach, Linnaea 22: 861. 1849.

斑叶兰 ban ye lan

*Epipactis labiata* (Pampanini) Hu; *E. melinoste* (Schlechter) Hu; *E. schlechtendaliana* (H. G. Reichenbach) A. A. Eaton; *E. secundiflora* (Griffith) Hu; *Georchis schlechtendaliana* (H. G. Reichenbach) H. G. Reichenbach; *Goodyera japonica* Blume; *G. labiata* Pampanini; *G. melinoste* Schlechter; *G. schlechtendaliana* f. *similis* (Blume) Makino; *G. secundiflora* Griffith; *G. similis* Blume; *Orchiodes schlechtendaliana* (H. G. Reichenbach) Kuntze; *Peramium schlechtendalianum* (H. G. Reichenbach) Makino.

Plants terrestrial, 6–25 cm tall. Rhizome slender to stout, many noded. Stem erect, 1–6 cm, 4–6-leaved. Leaves subrosulate or spaced along stem, abaxially pale green, adaxially green with irregular white markings, ovate to ovate-lanceolate, 2.5–5 × 0.8–2.2 cm, base subrounded or broadly cuneate, apex acute; petiole-like base and tubular sheath 0.4–1.8 cm. Peduncle pale green, 5–12 cm, pubescent, with 2–4 sterile bracts; rachis 3–10 cm, subdensely 5- to more than 20-flowered, secund; floral bracts lanceolate, 7–12 mm, pubescent, apex acuminate. Flowers opening weakly, white, tinged with pink, medium-sized; pedicel and ovary cylindrical-fusiform, 8–10 mm, pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal narrowly elliptic-lanceolate, cymbiform, 7–10 × 3–3.5 mm, apex acute; lateral sepals ovate-lanceolate, 7–9 × 3.5–4 mm, apex acute. Petals rhombic-oblancheolate, 7–10 × 2.5–3 mm, 1-veined, apex

obtuse or subacute; lip ovate, 6–8.5 × 3–4 mm; hypochile concave-saccate, inside papillose; epichile ligulate, 3–3.5 mm, slightly recurved. Column ca. 3 mm; anther ovoid, acuminate; pollinia ca. 3 mm; rostellum 2–3 mm, remnant deeply bifid. Fl. Aug–Oct.  $2n = 30 + 0-2B, 60$ .

Broad-leaved forests along valleys; 500–2800 m. Anhui, N Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia (Sumatra), Japan, Korea, Nepal, Thailand, Vietnam].

**5. *Goodyera bomiensis*** K. Y. Lang, Acta Phytotax. Sin. 16(4): 128. 1978.

波密斑叶兰 bo mi ban ye lan

Plants terrestrial, 19–30 cm tall. Rhizome short. Stem erect, less than ca. 1 cm, 3–6-leaved. Leaves rosulate at base of stem, abaxially pale green, adaxially green with white venation and irregular markings, ovate to ovate-orbicular, 1.8–3.2 × 1.3–2.5 cm, base cordate, rounded, or broadly cuneate, apex obtuse or acute; petiole-like base and tubular sheath extremely short, ca. 0.5 cm. Peduncle green, 14–18 cm, pubescent, with 3–5 sterile bracts; rachis 3–10 cm, laxly 8–20-flowered, secund; floral bracts ovate-lanceolate, 5–6 mm, apex acuminate. Flowers opening weakly, white or pale yellowish white, small; pedicel and ovary fusiform, 4–7 mm, pubescent. Sepals white and sometimes tinged pale brown at base, 1-veined; dorsal sepal narrowly ovate, 3–3.5 × 1.5–2 mm, outer surface sparsely pubescent at base, apex obtuse; lateral sepals narrowly elliptic, 3.5–4 × 1.5–2 mm, glabrous, apex obtuse. Petals white, rhombic-oblong, oblique, 3–3.8 × 1–1.2 mm, 1-veined, apex obtuse; lip ovate-elliptic, 3.5–4 × 2–2.5 mm; hypochile concave-saccate, with a solitary longitudinal ridge toward base and sparsely papillose on midvein inside; epichile ligulate, cymbiform, ca. 1.5 mm, apex obtuse, recurved. Column 1.8–2 mm; rostellum ca. 1.3 mm, remnant deeply bifid. Fl. May–Sep, fr. Jul–Aug.  $2n = 30^*$ .

• Mixed evergreen and broad-leaved forests, damp places in *Abies* forests; 900–3700 m. W Hubei, N Taiwan, E Xizang, Yunnan.

**6. *Goodyera repens*** (Linnaeus) R. Brown in W. T. Aiton, Hortus Kew., ed. 2, 5: 198. 1813.

小斑叶兰 xiao ban ye lan

*Satyrium repens* Linnaeus, Sp. Pl. 2: 945. 1753; *Elastium repens* (Linnaeus) Dulac; *Epipactis chinensis* (Schlechter) Hu; *E. mairei* (Schlechter) Hu (1925), not Schlechter (1919); *E. repens* (Linnaeus) Crantz; *Gonogona repens* (Linnaeus) Link; *Goodyera brevis* Schlechter; *G. chinensis* Schlechter; *G. mairei* Schlechter; *G. marginata* Lindley; *G. nantoensis* Hayata; *G. pubescens* R. Brown var. *repens* (Linnaeus) Alph. Wood; *G. repens* var. *marginata* (Lindley) Tang & F. T. Wang; *Neottia repens* (Linnaeus) Swartz; *Orchiodes marginata* (Lindley) Kuntze; *O. repens* (Linnaeus) Kuntze; *Orchis repens* (Linnaeus) Eyster ex Poiré; *Peramium nantoense* (Hayata) Makino; *P. repens* (Linnaeus) Salisbury; *Serapias repens* (Linnaeus) Villars.

Plants terrestrial, 8–20 cm tall. Rhizome slender, many

noded. Stem ascending, 1–4 cm, 4–6-leaved. Leaves subrosulate at base of stem, abaxially pale green, adaxially deep green with white venation, ovate to ovate-elliptic, 1–3 × 0.5–1.5 cm, base obtuse or broadly cuneate, apex acute; petiole-like base and tubular sheath 1–1.5 cm. Peduncle pale grayish green, 5–12 cm, pubescent, with 2–5 sterile bracts; rachis 1–5.5 cm, subdensely 5–20-flowered, secund; floral bracts lanceolate, 3–5 mm, pubescent, apex acuminate. Flowers opening weakly, white, tinged with green, small; pedicel and ovary cylindrical-fusiform, 3–5 mm, sparsely pubescent. Sepals sparsely pubescent on outer surface, 1-veined; dorsal sepal ovate to ovate-oblong, 3–4 × 1.2–1.5 mm, apex obtuse; lateral sepals ovate to ovate-elliptic, oblique, 3–4 × 1.5–2.5 mm, apex obtuse. Petals spatulate, oblique, 3–4 × 1–1.5 mm, 1-veined, apex obtuse; lip ovate, 3–3.5 × 2–2.5 mm; hypochile concave-saccate, inside papillose; epichile ligulate, ca. 1.5 mm, slightly recurved. Column 1–1.5 mm. Fl. Jul–Aug.  $2n = 30, 32, 40$ .

Forests along valleys; 700–3800 m. Anhui, N Fujian, Gansu, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Kashmir, Korea, Myanmar, Nepal, Russia; Europe, North America].

**7. *Goodyera arisanensis*** Hayata, Icon. Pl. Formosan. 6: 91. 1916.

阿里山斑叶兰 a li shan ban ye lan

*Peramium arisanense* (Hayata) Makino.

Plants possibly epiphytic, ca. 25 cm tall. Rhizome stout, densely noded. Stem ascending, ca. 4 cm, 5–7-leaved. Leaves subrosulate at base of stem, ovate or oblong, 1–4 × 0.6–1.5 cm, possibly with white reticulate venation, base cuneate, apex acute; petiole-like base and tubular sheath 1–2 cm. Peduncle ca. 11 cm, sparsely pubescent, with 8 or 9 sterile bracts; rachis ca. 10 cm, densely 12–25-flowered, secund; floral bracts ovate-lanceolate, 3.5–4 mm, glabrous. Flowers small; pedicel and ovary ovoid-fusiform, ca. 3 mm, glabrous or sparsely pubescent. Sepals glabrous, 1-veined; dorsal sepal ovate-lanceolate, 3–3.8 × 1–1.2 mm, apex obtuse; lateral sepals oblong-lanceolate, oblique, 3.5–4 × ca. 1.2 mm, apex obtuse. Petals linear-lanceolate, falcate, ca. 3.5 × 0.7 mm, apex obtuse; lip ovate-lanceolate, 3.5–4 × ca. 1.5 mm, 3-veined; hypochile saccate, projecting beyond base of lateral sepals, glabrous, containing 2 parallel lamellae toward base; epichile linear-ligulate, apex obtuse, slightly recurved. Column ca. 1.5 mm; anther ovoid, ca. 0.8 mm; rostellum remnant deeply bifid. Fl. Aug.

• Forests; ca. 2500 m. N Taiwan.

This species remains poorly circumscribed, and its placement is accordingly problematic. It has been considered synonymous with *Goodyera schlechtendaliana* (see FRPS 17: 133. 1999), though its habit and small flowers indicate that it is more closely affiliated with *G. repens*. Critical re-examination of floral characters, in particular the degree of pubescence on the sepals and the presence of papillae in the lip hypochile, is required to refine its delimitation.

**8. *Goodyera recurva*** Lindley, J. Proc. Linn. Soc., Bot. 1: 183. 1857.

长苞斑叶兰 chang bao ban ye lan

*Epipactis prainii* (J. D. Hooker) A. A. Eaton; *E. recurva* (Lindley) A. A. Eaton; *Goodyera prainii* J. D. Hooker; *G. recurva* var. *prainii* (J. D. Hooker) Pradhan; *Orchiodes recurva* (Lindley) Kuntze.

Plants epiphytic, 12–18 cm tall. Rhizome slender, few noded. Stem erect, 3–4 cm, 6- or 7-leaved. Leaves spaced along stem or clustered, abaxially pale green, adaxially green, without white markings, narrowly ovate-oblong, narrowly ovate, or ovate-elliptic, 3–5.5 × 0.5–1.5 cm, base cuneate or broadly cuneate, apex acute; petiole-like base and tubular sheath 1–2 cm. Peduncle strongly recurved toward apex, 5–9 cm, pubescent, with 3–5 sterile bracts; rachis 5–7 cm, densely many flowered; floral bracts narrowly lanceolate, 7–14 mm, basal ones exceeding flowers, pubescent, apex acuminate. Flowers barely opening, white, small; pedicel and ovary oblong-fusiform, 7–8 mm, sparsely pubescent. Sepals sparsely pubescent on outer surface, 1-veined; dorsal sepal ovate, 5–6 × 3–3.5 mm, apex acute; lateral sepals oblong, oblique, 5–6 × 2.1–2.3 mm, apex acute. Petals linear-oblong, oblique, 5–6 × 1.3–1.5 mm, 1-veined, apex acute; lip broadly ovate, cymbiform, 5–6 × 3–3.2 mm; hypochile concave-saccate, inside glabrous, slightly thickened along 5 veins; epichile linear-ligulate, ca. 3.5 mm, apex recurved. Column ca. 2 mm; anther subovoid, apex acuminate; rostellum remnant deeply bifid. Fl. Sep.

Tree trunks in evergreen broad-leaved forests; 1400–2800 m. N Fujian, Hunan, W Yunnan [Bhutan, N India].

**9. *Goodyera pendula*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 623. 1888.

垂叶斑叶兰 chui ye ban ye lan

*Epipactis pendula* (Maximowicz) A. A. Eaton; *Peramium pendulum* (Maximowicz) Makino.

Plants epiphytic or lithophytic, 13–15 cm tall. Rhizome slender, many noded. Stem pendulous, 5–6 cm, many leaved. Leaves spaced along stem, both surfaces green, without white markings, lanceolate to narrowly ovate, 2–3.5 × 0.5–0.7 cm, 3–5-veined, base cuneate, apex acuminate; petiole-like base and tubular sheath to ca. 1 cm. Peduncle strongly recurved midway along length, green, 3–5 cm, sparsely pubescent, with several foliaceous sterile bracts; rachis 4–6 cm, densely many flowered, secund; floral bracts lanceolate, 4–10 mm, membranous, pubescent, apex acuminate. Flowers opening weakly, white tinged red-orange at center of lip, small; pedicel and ovary fusiform, 3–5 mm, pubescent. Sepals similar, narrowly ovate, 3–4 × 1–1.2 mm, pubescent on outer surface, 1-veined, apex subobtuse. Petals narrowly oblanceolate, 3–4 × 0.2–0.4 mm, apex obtuse; lip ovate, cymbiform, 2.8–3.5 mm, shorter than sepals; hypochile saccate, inside glabrous and without ornamentation; epichile ligulate, incurved at apex. Column 1.5–2 mm. Fl. Jun–Jul. 2n = 28, 30.

Forest margins; 1800–1900 m. C Taiwan [Japan].

**10. *Goodyera robusta*** J. D. Hooker, Fl. Brit. India 6: 113. 1890.

滇藏斑叶兰 dian zang ban ye lan

*Epipactis robusta* (J. D. Hooker) A. A. Eaton; *Goodyera*

*bilamellata* Hayata; *Peramium bilamellatum* (Hayata) Makino.

Plants terrestrial or rarely epiphytic, 11–22 cm tall. Rhizome stout, few noded. Stem erect, 3–8 cm, 4–7-leaved. Leaves widely spaced or somewhat clustered toward apex along stem, green, without white markings, ovate to narrowly ovate-elliptic, 3.5–8 × 1.5–3 cm, base obtuse-rounded or broadly cuneate, margin undulate, apex acute; petiole-like base and tubular sheath 1.5–4 cm. Peduncle grayish green, 3–6.5 cm, pubescent, with 3 or 4 sterile bracts; rachis 5–10 cm, subdensely to densely many flowered, secund; floral bracts lanceolate, 8–12 mm, pubescent, apex acuminate. Flowers opening weakly, white or greenish white, sometimes tinged pink, medium-sized; pedicel and ovary cylindrical-fusiform, 6–9 mm, pubescent. Sepals white or pink, midvein green, pubescent on outer surface, 1-veined; dorsal sepal oblong, 7–11 × 2.8–4.5 mm, concave, apex acute; lateral sepals spreading, ovate, oblique, 7–11 × 3–4.5 mm, slightly thickened at base, apex acute. Petals white, rhombic, oblique, 7–10 × 3–4 mm, 1-veined, base attenuate, apex acute; lip white, broadly oblong-ovate, 6–9 × ca. 4 mm; hypochile concave-saccate, ca. 3 mm, inside papillose; epichile ovate-lanceolate, 3–4 mm, with 2 longitudinal lamellae, apex acute, slightly to strongly recurved. Column 2–3 mm; anther narrowly ovoid, ca. 2.5 mm; rostellum ca. 2.5 mm, remnant deeply bifid. Fl. Aug–Dec.

Damp places in forests; 1000–2500 m. SW Guizhou, Taiwan, SE Xizang, S and W Yunnan [NE India].

**11. *Goodyera wolongensis*** K. Y. Lang, Acta Phytotax. Sin. 22: 314. 1984.

卧龙斑叶兰 wo long ban ye lan

Plants terrestrial, 15–18 cm tall. Rhizome slender, few noded. Stem ascending, ca. 3 cm, 3- or 4-leaved. Leaves spaced along stem, green, without white markings, ovate, 1.5–2 × 1–1.5 cm, base rounded, apex acute; petiole-like base and tubular sheath 0.4–0.8 cm. Peduncle green, 7–10 cm, pubescent, with 3 or 4 sterile bracts; rachis 3.5–6 cm, subdensely 12–18-flowered; floral bracts lanceolate, exceeding ovary, pubescent. Flowers opening weakly, white, small; pedicel and ovary green, fusiform, 3–4 mm, pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal ovate, ca. 3 × 2 mm, apex obtuse; lateral sepals elliptic, oblique, ca. 3.5 × 1.5 mm, apex acute. Petals ovate-elliptic, ca. 3 × 3 mm, 1-veined; lip subglobose, ca. 3 mm; hypochile concave-saccate, glabrous, with 3 ridges inside; epichile very short, apex obtuse, not recurved. Column 2–2.5 mm; anther ovoid; rostellum remnant shallowly bifid. Fl. Aug.

• Damp places in *Abies* forests; ca. 2700 m. W Sichuan.

**12. *Goodyera seikoomontana*** Yamamoto, J. Soc. Trop. Agric. 4: 187. 1932.

歌绿斑叶兰 ge lu ban ye lan

*Goodyera viridiflora* (Blume) Blume var. *seikoomontana* (Yamamoto) S. S. Ying; *G. youngsayei* S. Y. Hu & Barretto.

Plants terrestrial, 14–25 cm tall. Rhizome stout, several noded. Stem ascending, 3–10 cm, 3–5-leaved. Leaves spaced along stem, slightly fleshy, both surfaces green, without white markings, elliptic or oblong-ovate, 3–7.5 × 1.5–3.5 cm, with 3

distinct veins, base subrounded, apex acute or acuminate; petiole-like base and tubular sheath 1–3.5 cm. Peduncle pale green, 8–13 cm, pubescent, with 2 or 3 sterile bracts; rachis 2–5 cm, laxly 1–3-flowered; floral bracts pale green, lanceolate, 18–25 × 3–5 mm, glabrous, apex acuminate. Flowers opening widely, pale green to green, large; pedicel and ovary pale green, cylindrical-fusiform, 10–15 mm, sparsely pubescent. Sepals whitish to pale green, streaked darker green on veins, sometimes tinged pink at apex, glabrous, 3-veined; dorsal sepal ovate, 15–16 × 5–7 mm, concave, apex acute; lateral sepals widely spreading or reflexed, ovate-elliptic, 14–16 × 5–6.5 mm, apex acute. Petals white to pale green, rhombic, oblique, 15–16 × 5–5.5 mm, 1-veined, base attenuate, apex obtuse; lip white to pale green, streaked darker green on veins, ovate, cymbiform, 12–13 × ca. 7 mm; hypochile concave-saccate, inside densely papillose, with 7 or 9 parallel veins; epichile strongly recurved, triangular-ovate, ca. 4.5 mm, apex acute. Column 3–4 mm; anther lanceolate, ca. 7 mm; pollinia 6–9 mm; viscidium linear, 3–4 mm; rostellum 5–7 mm, remnant deeply bifid. Fl. Feb–Mar.  $2n = 22^*$ .

• Forests, damp places along streams; 700–1300 m. Hong Kong, S Taiwan.

**13. *Goodyera viridiflora*** (Blume) Lindley ex D. Dietrich, Syn. Pl. 5: 165. 1852.

绿花斑叶兰 lǜ huā bān yè lán

*Neottia viridiflora* Blume, Bijdr. 408. 1825; *Epipactis cordata* (Lindley) A. A. Eaton; *E. viridiflora* (Blume) Ames; *Erythrodes viridiflora* (Blume) Schlechter; *Georchis cordata* Lindley; *G. viridiflora* (Blume) F. Mueller; *Goodyera cordata* (Lindley) Benth. ex J. D. Hooker; *G. longirostrata* Hayata; *G. ogatae* Yamamoto; *G. schlechtendaliana* H. G. Reichenbach var. *ogatae* (Yamamoto) M. Hiroe; *G. viridiflora* var. *ogatae* (Yamamoto) T. S. Liu & H. J. Su; *Orchiodes cordata* (Lindley) Kuntze; *O. viridiflora* (Blume) Kuntze; *Peramium longirostratum* (Hayata) Makino; *P. ogatae* (Yamamoto) Makino; *Phyrsurus viridiflorus* (Blume) Lindley.

Plants terrestrial, 13–20 cm tall. Rhizome slender, many noded. Stem ascending, to 6 cm, 2- or 3(-5)-leaved. Leaves widely spaced or clustered toward apex of stem, thinly textured, both surfaces green, without white markings, ovate or ovate-lanceolate, 1.5–6 × 1–3 cm, rounded at base, apex acute; petiole-like base and tubular sheath 1–3 cm. Peduncle pale red-brown, 5–9 cm, pubescent, with 2 sterile bracts; rachis 2–5 cm, laxly (2 or) 3–5-flowered, secund; floral bracts pale reddish brown, ovate-lanceolate, ca. 20 × 6–7 mm, margin ciliate, apex acute. Flowers opening widely, pale green tinged pale reddish brown, large; pedicel and ovary pale reddish brown, cylindrical-fusiform, 14–15 mm, pubescent toward apex. Sepals green tinged reddish brown at apex, glabrous, 1-veined; dorsal sepal elliptic, 12–15 × 5–6 mm, concave, apex acute; lateral sepals widely spreading or reflexed, elliptic, 12–15 × 5–6 mm, apex acute. Petals greenish white tinged brown at apex, rhombic, oblique, 12–15 × 4.5–6.5 mm, 1-veined, base attenuate, apex acute; lip greenish brown tinged white at apex, sometimes streaked darker green on veins, ovate, cymbiform, 12–14 × 8–11 mm, membranous; hypochile concave-saccate, inside densely

papillose; epichile recurved or spreading forward, ligulate, 3–4 mm, apex acute. Column ca. 4 mm; anther lanceolate; pollinia 10–12 mm; viscidium linear; rostellum 7–8 mm, remnant deeply bifid. Fl. Aug–Sep.  $2n = 22$ .

Forests, damp places along streams, in thin leaf litter on rocks; 300–2600 m. Fujian, Guangdong, Hainan, Jiangxi, Taiwan, Yunnan [Bhutan, India, Indonesia, S Japan, Malaysia, Nepal, New Guinea, Philippines, Thailand, Vietnam; Australia].

**14. *Goodyera fumata*** Thwaites, Enum. Pl. Zeyl. 314. 1861.

烟色斑叶兰 yān sè bān yè lán

*Epipactis formosana* (Rolfe) A. A. Eaton; *E. fumata* (Thwaites) A. A. Eaton; *Goodyera caudatilabella* Hayata; *G. cyrtoglossa* Hayata; *G. formosana* Rolfe; *Orchiodes fumata* (Thwaites) Kuntze; *Peramium cyrtoglossum* (Hayata) Makino; *P. formosanum* (Rolfe) Makino.

Plants terrestrial, 40–90 cm tall. Rhizome very long, stout, many noded. Stem erect, 20–50 cm, 5–7-leaved. Leaves widely spaced along stem, abaxially pale green, adaxially green, without white markings, elliptic, strongly oblique, 15–20 × 5–8 cm, base gradually contracted, apex acute; petiole-like base and tubular sheath 5–10 cm. Peduncle dark greenish brown, ca. 30 cm, pubescent, with several sterile bracts; rachis 10–30 cm, laxly to subdensely 25–50-flowered, not secund; floral bracts narrowly lanceolate, 9–12 mm, pubescent, apex acuminate. Flowers fragrant, opening widely, yellowish brown, medium-sized; pedicel and ovary cylindrical-fusiform, 8–12 mm, pubescent. Sepals pubescent on outer surface, 1- or 3-veined; dorsal sepal narrowly ovate-oblong, 6–8 × ca. 2 mm, apex obtuse; lateral sepals spreading, ovate-lanceolate, oblique, 6–8 × ca. 3 mm, apex obtuse. Petals linear-oblong, oblique, 7–9 × 1–1.5 mm, 1-veined, apex obtuse; lip pale brown, tinged white at apex, rhombic-orbicular, 6–7 × 3–4 mm; hypochile embracing column, concave, inside densely papillose; epichile linear-ligulate, ca. 3 mm, apex acute, recurved. Column pale brown, 5–6 mm; anther ovoid, ca. 2 mm, apex subacute; rostellum elongate, remnant shallowly bifid. Fl. Mar.

Forests; 1100–1300 m. Hainan, S Taiwan, SE Xizang, S Yunnan (Jinghong, Lancang, Mengla, Simao) [India (Deccan Plateau, Sikkim), Indonesia (Java), Japan (Ryukyu Islands), Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

**15. *Goodyera rubicunda*** (Blume) Lindley, Edwards's Bot. Reg. 25(Misc.): 61. 1839.

红花斑叶兰 hóng huā bān yè lán

*Neottia rubicunda* Blume, Bijdr. 408. 1825; *Epipactis grandis* (Blume) A. A. Eaton; *E. papuana* (Ridley) A. A. Eaton; *E. rubicunda* (Blume) A. A. Eaton; *Georchis rubicunda* (Blume) H. G. Reichenbach; *Goodyera clavata* N. Pearce & P. J. Cribb; *G. confundens* J. J. Smith; *G. grandis* (Blume) Blume; *G. longibracteata* Hayata; *G. longicolumna* Hayata; *G. papuana* Ridley; *G. rubens* Blume; *G. yaeyamae* Ohwi; *N. grandis* (Blume) Kuntze; *Orchiodes grandis* (Blume) Kuntze; *O. rubicunda* (Blume) Kuntze; *Peramium longibracteatum* (Hayata) Makino; *P. longicolumna* (Hayata) Makino; *Rhamphidia rubicunda* (Blume) F. Mueller (1869), not (H. G. Reichenbach) H. G. Reichenbach (1868); *Spiranthes grandis* (Blume) Hasskarl.

Plants terrestrial, 30–60 cm tall. Rhizome stout, several noded. Stem ascending or erect, 10–24 cm, 6–10-leaved. Leaves widely spaced along stem, green, without white markings, oblong, elliptic, or ovate-oblong, 9–15 × 4–6 cm, papery, with 3 distinct veins, base cuneate, apex acuminate; petiole-like base and tubular sheath 2–5.5 cm. Peduncle reddish brown, 10–18 cm, sparsely pubescent, with 3 or 4 sterile bracts; rachis 4–15 cm, densely many flowered; floral bracts reddish brown, lanceolate, 7–15 × 3.5–4.5 mm, pubescent, apex acuminate. Flowers opening widely, pale yellowish brown, medium-sized; pedicel and ovary reddish brown, cylindrical-fusiform, 6–8 mm, pubescent. Sepals reddish brown, pubescent on outer surface, 1-veined; dorsal sepal linear-oblong, 7–8.5 × 2.3–2.5 mm, apex obtuse; lateral sepals spreading, oblong, oblique, 7–8.5 × 2.5–3 mm, apex obtuse. Petals yellowish white, spatulate, 7–8 × 1.8–2 mm, base attenuate, apex obtuse; lip yellowish white, cymbiform, 6–6.5 mm; hypochile saccate, inside papillose; epichile ligulate, ca. 1.5 mm, apex obtuse, strongly recurved. Column 4–4.5 mm, with a clavate callus below stigma; anther lanceolate, ca. 3 mm; rostellum ca. 1.5 mm, remnant deeply bifid. Fl. Jul–Aug.  $2n = 22, 44$ .

Damp places in forests; 300–1500 m. Taiwan, Yunnan [NE India, Indonesia, Japan (Ryukyu Islands), Malaysia, Papua New Guinea, Philippines, Vietnam; NE Australia, Pacific islands].

**16. *Goodyera procera*** (Ker Gawler) Hooker, Exot. Fl. 1: ad t. 39. 1823.

高斑叶兰 gao ban ye lan

*Neottia procera* Ker Gawler, Bot. Reg. 8: ad t. 639. 1822; *Epipactis procera* (Ker Gawler) A. A. Eaton; *Goodyera carnea* A. Richard; *Leucostachys procera* (Ker Gawler) Hoffmann-segg; *Orchiodes procera* (Ker Gawler) Kuntze; *Peramium procerum* (Ker Gawler) Makino.

Plants terrestrial, 25–80 cm tall. Rhizome stout, few noded. Stem erect, 8–35 cm, 5–11-leaved. Leaves spaced along stem or occasionally clustered toward apex, abaxially pale green, adaxially green, without white markings, oblong-elliptic to narrowly ovate-elliptic, 5.5–15 × 1.8–5.5 cm, base attenuate, apex acute or acuminate; petiole-like base and tubular sheath 3–7 cm. Peduncle green, 8–38 cm, glabrous to sparsely pubescent, with 4–10 sterile bracts; rachis 4–18 cm, densely many flowered, usually not secund; floral bracts ovate-lanceolate, 5–7 mm, glabrous, apex acuminate. Flowers fragrant, opening weakly, white tinged pale green, small; pedicel and ovary cylindrical-fusiform, 3–5 mm, glabrous. Sepals glabrous, 1-veined; dorsal sepal ovate or elliptic, 3–3.5 × 1.7–2.5 mm, concave, apex acute; lateral sepals ovate, oblique, 2.5–3.2 × 1.5–2.2 mm, apex acute. Petals white, spatulate, 3–3.5 × 1–1.2 mm, 1-veined, apex obtuse; lip broadly ovate, 2.2–2.5 × 1.5–1.7 mm; hypochile concave-saccate, inside papillose; epichile deltoid, very small, apex obtuse or acute, recurved, with 2 small calli. Column ca. 2 mm; anther ovoid; pollinia ca. 1.3 mm; rostellum remnant shallowly bifid. Fl. Apr–May.  $2n = 38, 42$ .

Forests; 200–1600 m. Anhui, N Fujian, Guangdong, Guangxi, Guizhou, Hainan, S and W Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Laos, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

**17. *Goodyera yamiana*** Fukuyama, Bot. Mag. (Tokyo) 50: 18. 1936.

兰屿斑叶兰 lan yu ban ye lan

Plants terrestrial, 25–28 cm tall. Rhizome slender, several noded. Stem ascending, 6–8 cm, 4- or 5-leaved. Leaves widely spaced along stem, abaxially grayish white, adaxially green, rarely with irregular grayish markings, elliptic to oblong, strongly oblique, 5–8 × 1.5–2.5 cm, base subrounded, apex acuminate; petiole-like base and tubular sheath 1–1.5 cm. Peduncle green, to ca. 12 cm, glabrous to sparsely pubescent, with 3 sterile bracts; rachis 6–8 cm, densely many flowered, not secund; floral bracts ovate-lanceolate, ca. 11 × 4 mm, glabrous, apex acuminate. Flowers opening weakly, whitish green, small; pedicel and ovary green, cylindrical-fusiform, 7–8 mm, glabrous. Sepals whitish green, glabrous, 1-veined; dorsal sepal ovate, ca. 3.5 × 2.5 mm, concave, apex obtuse; lateral sepals ovate, oblique, ca. 4.5 × 2.8 mm, apex obtuse. Petals white, linear-lanceolate, strongly falcate, ca. 3.8 × 1 mm, 1-veined, apex acute; lip ovate, ca. 4.2 mm; hypochile concave-saccate, ca. 0.8 mm, inside densely papillose; epichile white, ovate, ca. 3.3 × 2.7 mm, with a band of papillae from base to midway along its length, apex subacute, not recurved. Column ca. 1.8 mm; anther broadly ovoid; rostellum short, remnant shallowly bifid. Fl. Oct–Nov.

• Forests; 200–400 m. S Taiwan (Lu Dao).

**18. *Goodyera foliosa*** (Lindley) Bentham ex C. B. Clarke, J. Linn. Soc., Bot. 25: 73. 1889.

多叶斑叶兰 duo ye ban ye lan

*Georchis foliosa* Lindley, Gen. Sp. Orchid. Pl. 496. 1840; *Cystorchis nebulorum* Hance; *Epipactis foliosa* (Lindley) A. A. Eaton; *E. nebulorum* (Hance) A. A. Eaton; *Goodyera chilensis* S. S. Ying; *G. commelinoides* Fukuyama; *G. foliosa* var. *alba* S. Y. Hu & Barretto; *G. maximowicziana* Makino f. *commelinoides* (Fukuyama) Hiroe; *G. maximowicziana* var. *commelinoides* (Fukuyama) Masamune; *G. nebulorum* (Hance) Rolfe; *G. pachyglossa* Hayata; *G. sonoharae* Fukuyama; *Orchiodes foliosa* (Lindley) Kuntze; *Peramium pachyglossum* (Hayata) Makino.

Plants terrestrial, 15–25 cm tall. Rhizome slender, few noded. Stem erect or ascending, 9–17 cm, 4–6-leaved. Leaves widely spaced along stem, green, without white markings, ovate to oblong, oblique, 2.5–7.5 × 1.6–3 cm, base truncate or rounded, apex acute; petiole-like base and tubular sheath 1–2 cm. Peduncle green, 2.5–5 cm, pubescent, with 1 or 2 sterile bracts; rachis 3–6 cm, subdensely to densely 3–15-flowered, secund; floral bracts lanceolate, 10–15 × 2–2.5 mm, exceeding flowers, pubescent. Flowers opening weakly, white tinged pink, greenish white, or white, medium-sized; pedicel and ovary cylindrical-fusiform, 8–10 mm, pubescent. Sepals similar, outer surface pubescent, 1-veined; dorsal sepal narrowly ovate, 5–8 × 3.5–4 mm, concave, apex obtuse; lateral sepals ovate, 5–8 × 3.5–4 mm, apex obtuse. Petals rhombic, oblique, 5–8 × 3.5–4 mm, 1-veined, narrowly contracted at base, apex obtuse; lip ovate, 6–8 × 3.5–4.5 mm; hypochile concave-saccate, inside papillose; epichile ligulate, 2–3 mm, apex slightly recurved.

Column ca. 3 mm; anther ovoid, ca. 4 mm; pollinia ca. 3 mm; rostellum ca. 2.5 mm, remnant deeply bifid. Fl. Jul–Sep.  $2n = 28, 56$ .

Forests, damp places along valleys; 300–1500 m. Fujian, Guangdong, Guangxi, Sichuan, Taiwan, SE Xizang, SE and W Yunnan [Bhutan, NE India, Japan, Korea, Myanmar, Nepal, Vietnam].

**19. *Goodyera henryi*** Rolfe, Bull. Misc. Inform. Kew 1896: 201. 1896.

光萼斑叶兰 guang e ban ye lan

*Epipactis henryi* (Rolfe) A. A. Eaton; *Goodyera foliosa* (Lindley) Benth. ex J. D. Hooker var. *maximowicziana* (Makino) S. S. Ying; *G. maximowicziana* Makino; *Peramium maximowiczianum* (Makino) Makino.

Plants terrestrial, 8–15 cm tall. Rhizome slender, few noded. Stem ascending, 6–10 cm, 4–6-leaved. Leaves widely spaced or occasionally somewhat clustered toward apex of stem, green, without white markings, ovate to oblong, oblique, 1.5–3 × 0.8–2 cm, base rounded or cuneate, apex acute; petiole-like base and tubular sheath 1–1.5 cm. Peduncle green, ca. 1 cm, glabrous; rachis 1–3.5 cm, densely 3–9-flowered, subsecund; floral bracts lanceolate, 11–18 × 3–4.5 mm, glabrous, apex acuminate. Flowers opening weakly, white, sometimes tinged pale pink, medium-sized; pedicel and ovary green, cylindric-fusiform, 7–12 mm, glabrous. Sepals glabrous, 1-veined; dorsal sepal oblong, 9–13 × 3.5–4.5 mm, concave, apex slightly obtuse or acute; lateral sepals ovate-oblong, oblique, 9–13 × 3.5–5 mm, concave, apex acute. Petals rhombic, 9–12 × 3.5–4 mm, 1-veined, base cuneate, apex acute; lip white, ovate, cymbiform, 8–10 × 4–5 mm; hypochile concave-saccate, inside papillose; epichile ligulate, apex acute, not decurved. Column ca. 3 mm; anther lanceolate, ca. 5 mm; rostellum ca. 4 mm, remnant deeply bifid. Fl. Aug–Oct.  $2n = 28, 56$ .

Damp places in forests; 400–2400 m. S Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**20. *Goodyera biflora*** (Lindley) J. D. Hooker, Fl. Brit. India 6: 114. 1890.

大花斑叶兰 da hua ban ye lan

*Georchis biflora* Lindley, Gen. Sp. Orchid. Pl. 496. 1840; *Epipactis biflora* (Lindley) A. A. Eaton; *E. macrantha* (Maximowicz ex Regel) A. A. Eaton; *E. pauciflora* (Schlechter) Hu; *Goodyera biflora* var. *macrantha* (Maximowicz ex Regel) T. Hashimoto; *G. macrantha* Maximowicz ex Regel; *G. pauciflora* Schlechter; *Peramium macranthum* (Maximowicz ex Regel) Makino.

Plants terrestrial, 5–15 cm tall. Rhizome slender, few noded. Stem ascending, 3–12 cm, 4- or 5-leaved. Leaves widely spaced or clustered at apex of stem, abaxially pale green to pale purplish red, adaxially green with white reticulate venation, ovate to elliptic, 2–4 × 1–2.5 cm, base rounded, apex acute; petiole-like base and tubular sheath 1–2.5 cm. Peduncle reddish brown, ca. 1 cm, pubescent, usually enclosed within leaf bases, with 1 or 2 sterile bracts; rachis ca. 0.5 cm, usually 2-flowered, rarely 3-flowered, secund; floral bracts lanceolate, 15–25 × 6–7 mm, pubescent, apex acuminate. Flowers opening weakly, tu-

bular, large; pedicel and ovary cylindric-fusiform, 5–8 mm, pubescent. Sepals reddish pink, similar, pubescent on outer surface, 1-veined; dorsal sepal linear-lanceolate, 20–25 × 3–4 mm, apex acute; lateral sepals linear-lanceolate, 20–25 × 3–4 mm, apex obtuse. Petals creamy white, linear-oblong, slightly oblique, 20–25 × ca. 3 mm, apex acute; lip creamy white, linear-lanceolate, 18–22 × 3–4 mm; hypochile concave-saccate, inside papillose; epichile ligulate, 10–15 mm, apex acute to acuminate, recurved. Column ca. 3 mm; anther narrowly triangular-lanceolate, 10–12 mm; pollinia oblong, 12–16 mm; rostellum 10–12 mm, slender, remnant deeply bifid. Fl. Feb–Jul.  $2n = 28, 29, 30, 31, 32 + 0-4B, 33$ .

Damp places in forests; 500–2200 m. Anhui, N Fujian, S Gansu, Guangdong, Guizhou, S Henan, Hubei, Hunan, Jiangsu, S Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India, Japan, Korea, Nepal, N Vietnam].

**21. *Goodyera daibuzanensis*** Yamamoto, J. Soc. Trop. Agric. 4: 305. 1932.

大武斑叶兰 da wu ban ye lan

Plants terrestrial, 25–45 cm tall. Rhizome slender, many noded. Stem ascending, 8–15 cm, stout, 5–7-leaved. Leaves widely spaced or clustered toward apex of stem, abaxially grayish white, adaxially green with white or pale green midvein and irregular white markings, elliptic to oblong, 4.5–9 × 2–4 cm, base rounded to broadly cuneate, apex acute; petiole-like base and tubular sheath 2–3 cm. Peduncle pale grayish green, 12–20 cm, pubescent, with 2 or 3 sterile bracts; rachis 6–11 cm, subdensely many flowered, secund to cylindric; floral bracts lanceolate, ca. 17 × 5 mm, pubescent, apex acuminate. Flowers barely opening, pale greenish white or white, medium-sized; pedicel and ovary cylindric-fusiform, ca. 10 mm, pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal elliptic, ca. 14 × 4.5 mm, concave, apex acute; lateral sepals ovate, oblique, 11–13 × ca. 5 mm, apex acute. Petals rhombic, oblique, ca. 13 × 4.5 mm, 1-veined, apex obtuse; lip ovate, ca. 9 × 4 mm; hypochile concave-saccate, inside papillose; epichile ligulate, cymbiform, 3–4.5 mm, apex acute, not recurved. Column ca. 3 mm; anther narrowly ovoid, ca. 4 mm, apex acuminate; pollinia ca. 1.5 mm; rostellum erect, ca. 5 mm, remnant deeply bifid. Fl. Sep–Oct.

• Shaded places in forests; 700–1600 m. Taiwan.

**22. *Goodyera velutina*** Maximowicz ex Regel, Gartenflora 16: 38. 1867.

绒叶斑叶兰 rong ye ban ye lan

*Epipactis velutina* (Maximowicz ex Regel) A. A. Eaton; *Goodyera morrisonicola* Hayata; *G. schlechtendaliana* H. G. Reichenbach var. *velutina* (Maximowicz ex Regel) M. Hiroe; *Orchiodes velutina* (Maximowicz ex Regel) Kuntze; *Peramium morrisonicola* (Hayata) Makino; *P. velutinum* (Maximowicz ex Regel) Makino.

Plants terrestrial, 8–17 cm tall. Rhizome slender, few noded. Stem ascending, 2.5–6 cm, 3–5-leaved. Leaves spaced along stem, abaxially purplish red, adaxially deep green or occasionally dark purplish green, velvetylike, with a white band along midvein, ovate to elliptic, 2–5 × 0.8–2.5 cm, base

rounded, apex acute; petiole-like base and tubular sheath reddish brown at base, 0.8–1.5 cm. Peduncle deep reddish brown, 3–6 cm, pubescent, with 2 or 3 sterile bracts; rachis 2.5–5 cm, laxly 6–15-flowered, secund; floral bracts reddish brown, lanceolate, 10–12 × 3–3.5 mm, apex acuminate. Flowers opening weakly, white tinged pink, medium-sized; pedicel and ovary greenish brown, cylindrical-fusiform, 8–11 mm, pubescent. Sepals pubescent on outer surface; dorsal sepal oblong, 7–12 × 2.2–4 mm, 1-veined, apex obtuse; lateral sepals ovate-elliptic to narrowly elliptic, oblique, 8–12 × 3.5–5 mm, 1–3-veined, apex obtuse. Petals oblong-rhombic, oblique, 7–12 × 3.5–4.5 mm, 1-veined, base attenuate, apex obtuse; lip ovate, 6.5–9 mm; hypochile concave-saccate, inside papillose; epichile ligulate, cymbiform, 2–3.5 mm, apex recurved. Column 2–3 mm; anther ovoid, apex acuminate; pollinia 2.2–3 mm; rostellum ca. 2.5 mm, remnant deeply bifid. Fl. Sep–Oct.  $2n = 28, 30, 56$ .

Damp places in forests; 700–3000 m. N Fujian, Guangdong, Guangxi, Hainan, Hubei, Hunan, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**23. *Goodyera vittata*** (Lindley) Benth. ex J. D. Hooker, Fl. Brit. India 6: 113. 1890.

秀丽斑叶兰 xiu li ban ye lan

*Georchis vittata* Lindley, J. Proc. Linn. Soc., Bot. 1: 184. 1857; *Orchiodes vittata* (Lindley) Kuntze.

Plants terrestrial, 10–16 cm tall. Rhizome slender, few noded. Stem erect, 4–6 cm, 5- or 6-leaved. Leaves widely spaced along stem, abaxially reddish purple, adaxially deep green with a white band along midvein, ovate, 1.5–2.5 × 1.2–2 cm, base rounded, apex acute; petiole-like base and tubular sheath 0.8–1 cm. Peduncle purple, 3–5 cm, glabrous, with 1 or 2 sterile bracts; rachis 3–5.5 cm, subdensely 10- or more flowered, secund; floral bracts pink, lanceolate, 9–12 mm, apex acuminate. Flowers opening weakly, pinkish white, medium-sized; pedicel and ovary cylindrical-fusiform, 8–9 mm, glabrous. Sepals white at base, tinged pink toward apex, glabrous, 3-veined; dorsal sepal oblong-lanceolate, ca. 8 × 3 mm, concave, apex obtuse; lateral sepals ovate, oblique, ca. 8 × 4 mm, apex acuminate. Petals white, oblanceolate, slightly falcate, oblique, ca. 8 × 2.5 mm, 3-veined, apex obtuse; lip white, broadly ovate-lanceolate, ca. 8.5 × 5 mm, 7-veined; hypochile concave-saccate, inside papillose; epichile oblong-lanceolate, ca. 4.5 mm, with 2 longitudinal lamellae, apex subacute, slightly recurved. Column ca. 1 mm; anther ovoid-lanceolate, apex acuminate; rostellum ca. 4 mm, remnant deeply bifid. Fl. Jul–Sep.

Shaded and humid places in mixed coniferous and broad-leaved forests; ca. 2100 m. SE Xizang [Bhutan, India (Sikkim), Nepal].

**24. *Goodyera kwangtungensis*** C. L. Tso, Sunyatsenia 1: 134. 1933.

花格斑叶兰 hua ge ban ye lan

*Goodyera rontabunensis* T. Chow.

Plants terrestrial, 18–30 cm tall. Rhizome slender. Stem ascending, 4–8 cm, 3–5-leaved. Leaves clustered toward apex of stem, abaxially pale green, adaxially deep green with white or pale green venation and markings, ovate-elliptic, 4.5–6 × 1.5–3 cm, base cuneate, apex acute; petiole-like base and tubu-

lar sheath 1–2 cm. Peduncle pale grayish green, 7–10 cm, pubescent, with 2 or 3 sterile bracts; rachis 8–10 cm, laxly to subdensely 7–12-flowered, subsecund; floral bracts ovate-lanceolate, ca. 13 × 4 mm, apex acuminate. Flowers barely opening, white, sometimes tinged green, medium-sized; pedicel and ovary cylindrical-fusiform, 12–14 mm, pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal oblong-lanceolate, 11–14 × 3–4.3 mm, concave, apex acute; lateral sepals oblong-lanceolate, oblique, 11–14 × 3–4.3 mm, apex acute. Petals white with a green blotch at apex, narrowly rhombic-spatulate, oblique, ca. 11 × 3.5 mm, 1-veined, apex subacute; lip ovate-lanceolate, ca. 10 × 3.8 mm; hypochile concave-saccate, inside papillose; epichile lanceolate, ca. 6 mm, with 2 erose lamellae, carinate abaxially, apex subacute, slightly recurved. Column ca. 4 mm; anther narrowly ovoid, ca. 4 mm; rostellum ca. 3 mm, remnant deeply bifid. Fl. May–Jun.

● Shaded places in forests; 1500–2200 m. Guangdong, Taiwan.

**25. *Goodyera dongchenii*** Lucksom var. ***gongligongensis*** X. H. Jin & S. C. Chen, Novon 18: 72. 2008.

高黎贡斑叶兰 gao li gong ban ye lan

Plants terrestrial, ca. 20 cm tall. Stem ca. 10 cm, 2- or 3-leaved. Leaves spaced along stem, adaxially green with white reticulate venation, ovate, 2.5–3.5 × 1.5–2.3 cm, apex acute; petiole-like base and tubular sheath ca. 0.3 cm. Inflorescence pubescent, ca. 8 cm, 8–10-flowered, secund; peduncle with 3 sterile bracts; floral bracts lanceolate, ca. 15 × 3 mm, pubescent. Flowers not opening widely, white; pedicel and ovary ca. 10 mm, puberulent. Sepals pubescent on outer surface, 3-veined; dorsal sepal narrowly triangular, ca. 10 × 6 mm, apex acuminate; lateral sepals ovate, ca. 10 × 6 mm, apex acuminate. Petals rhombic, ca. 9 × 4 mm, apex acuminate; lip ca. 10 mm; hypochile saccate, inside setose; epichile lanceolate, ca. 7 mm, with 2 fleshy lamellae. Column ca. 2 mm; anther ovoid, ca. 3 mm; rostellum ca. 5 mm, remnant deeply bifid. Fl. Sep.

● Forests; ca. 2400 m. NW Yunnan.

This variety should perhaps be raised to specific rank, as it seems quite distinct from typical *Goodyera dongchenii*, which occurs in NE India (Sikkim).

**26. *Goodyera nankoensis*** Fukuyama, Bot. Mag. (Tokyo) 48: 432. 1934.

南湖斑叶兰 nan hu ban ye lan

Plants terrestrial, ca. 9 cm tall. Rhizome stout, few noded. Stem ascending, 2–3 cm, 4- or 5-leaved. Leaves spaced along stem, abaxially pale green, adaxially green with a white band along midvein, ovate, ca. 2 × 1.3 cm, base rounded, apex obtuse; petiole-like base and tubular sheath ca. 1 cm. Peduncle pale green, ca. 4 cm, sparsely pubescent, with 2 sterile bracts; rachis ca. 3 cm, densely 10–15-flowered, subsecund; floral bracts ovate-lanceolate, 7–10 mm, basal ones slightly exceeding ovary, apex acuminate. Flowers opening weakly, light slightly tinged pink, small; pedicel and ovary cylindrical-fusiform, 7–8 mm, sparsely pubescent. Sepals concave, glabrous, 1-veined; dorsal sepal oblong, ca. 6 × 2.2 mm, apex acute; lateral sepals ovate-lanceolate, oblique, ca. 7 × 3 mm, apex acute. Petals ca. 6 × 2.2 mm, 1-veined, apex obtuse; lip ovate, 5–6 × ca. 2.6 mm;

hypochile concave-saccate, 3–3.5 mm, glabrous; epichile ligulate, cymbiform, 2–2.5 mm, apex acute, slightly recurved. Column ca. 1.5 mm; anther ovoid-cordate, apex acute; pollinia ca. 1.3 mm; rostellum less than 1 mm, remnant deeply bifid. Fl. Jul–Aug.

• Mossy damp places in alpine forests; 2000–3000 m. C and N Taiwan.

**27. *Goodyera hachijoensis*** Yatabe, Bot. Mag. (Tokyo) 5: 1. 1891.

白网脉斑叶兰 bai wang mai ban ye lan

*Epipactis hachijoensis* (Yatabe) A. A. Eaton; *E. matsumurana* (Schlechter) A. A. Eaton; *Goodyera alboreticulata* Hayata; *G. hachijoensis* var. *matsumurana* (Schlechter) Ohwi ex Hatusima & Amano; *G. matsumurana* Schlechter; *Peramium alboreticulatum* (Hayata) Makino; *P. hachijoense* (Yatabe) Makino; *P. matsumuranum* (Schlechter) Makino.

Plants terrestrial, 8–30 cm tall. Rhizome slender, many noded. Stem ascending, 2–10 cm, 3–5-leaved. Leaves widely spaced along stem, abaxially grayish white, adaxially green with fine white reticulate venation, ovate to ovate-oblong, 3–8 × 2–4 cm, base rounded, apex acute; petiole-like base and tubular sheath reddish brown, 1.5–2.5 cm. Peduncle pale reddish brown, 3–10 cm, pubescent, with 4–7 sterile bracts; rachis 3–10 cm, subdensely many flowered, secund; floral bracts green, reddish brown at base, lanceolate to ovate-lanceolate, ca. 8 × 3.5 mm, margin lacerate-fimbriate at base, apex acuminate. Flowers opening weakly, pale green to white, subglobose, small; pedicel and ovary cylindrical-fusiform, 5–5.5 mm, glabrous. Sepals glabrous, 1-veined; dorsal sepal ovate to ovate-oblong, 3–4 × 1.5–3 mm, concave, apex obtuse or acute; lateral sepals ovate to broadly ovate-oblong, oblique, 3–4 × 2–3 mm, apex acute. Petals rhombic, oblique, 3.2–3.5 × 1.4–2 mm, 1-veined, apex obtuse; lip ovate, 3–3.5 × ca. 3.5 mm; hypochile concave-saccate, inside papillose; epichile ligulate, cymbiform, ca. 1 mm, apex obtuse, not recurved. Column yellowish white, ca. 1.5 mm; anther ovoid; rostellum short, remnant shallowly bifid. Fl. May–Jun.  $2n = 28, 40$ .

Damp places in forests; 400–1500 m. C and S Taiwan [Japan].

**28. *Goodyera wuana*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 69. 1951.

天全斑叶兰 tian quan ban ye lan

Plants terrestrial, ca. 12 cm tall. Stem ascending, 7-leaved. Leaves spaced along stem, abaxially pale green, adaxially green with white venation and irregular markings, ovate, 1.3–1.5 ×

0.6–0.7 cm, base cuneate, apex acute; petiole-like base and tubular sheath to 0.8 cm. Peduncle green, pubescent, with 3 sterile bracts; rachis to 3 cm, 9-flowered, secund; floral bracts lanceolate, ca. 5.5 mm, apex acuminate. Flowers barely opening, white tinged pink, small; pedicel and ovary cylindrical-fusiform, ca. 5.5 mm, sparsely pubescent. Sepals glabrous, 1-veined; dorsal sepal elliptic-oblong, ca. 4.2 × 1.5–1.8 mm, apex obtuse; lateral sepals ovate, oblique, 4–4.5 × 2.3–2.5 mm, apex obtuse. Petals spatulate, oblique, 4–4.2 × ca. 1.2 mm, 1-veined, apex obtuse; lip ovate, 3.8–4 × ca. 4 mm; hypochile concave-saccate, glabrous, with 2 lamellae inside; epichile triangular, apex obtuse, extending forward. Column ca. 2.5 mm including anther. Fl. Aug–Sep.

• Forests. W Sichuan.

**29. *Goodyera yangmeishanensis*** T. P. Lin, Native Orchids Taiwan 2: 173. 1977.

小小斑叶兰 xiao xiao ban ye lan

*Goodyera shixingensis* K. Y. Lang.

Plants terrestrial, 8–11 cm tall. Rhizome slender, few noded. Stem ascending, 3–4 cm, 3–5-leaved. Leaves spaced along stem, abaxially green, adaxially green with white reticulate venation and occasionally with a white band along mid-vein, ovate to oblong-lanceolate, 1.5–5 × 0.9–2 cm, base rounded, apex acute; petiole-like base and tubular sheath 0.5–1 cm. Peduncle red or reddish brown, 2–4 cm, sparsely pubescent, with 2 or 3 sterile bracts; rachis 2–4 cm, subdensely many flowered, subsecund; floral bracts ovate-lanceolate, 6–7.5 × ca. 3.2 mm, basal margin denticulate, apex acuminate. Flowers barely opening, white, small; pedicel and ovary reddish brown, cylindrical-fusiform, 5.5–7 mm, glabrous. Sepals glabrous, 1-veined; dorsal sepal white, tinged reddish brown at apex, elliptic, 3–3.8 × 2.2–2.5 mm, concave, apex obtuse; lateral sepals pale reddish brown, tinged white at apex, ovate, oblique, 4–4.5 × 2–2.8 mm, apex obtuse. Petals white, rhombic-oblongate, oblique, ca. 3 × 1 mm, glabrous, 1-veined, apical margin denticulate, apex obtuse; lip ovate, 4–5 × ca. 4 mm, fleshy; hypochile deeply concave-saccate, ca. 3 × 3.5 mm, inside densely papillose; epichile subsquare, ca. 1.5 mm, margin irregularly denticulate, not recurved, apex often involute. Column ca. 1.5 mm; anther deltoid-obovoid; rostellum remnant deeply bifid. Fl. Jul–Sep.

• Damp shaded places in forests; 300–1000 m. Guangdong, N Taiwan.

This species is very similar to *Goodyera pusilla* Blume from Indonesia and Malaysia; the two need to be critically compared.

## 6. HYLOPHILA Lindley, Edwards's Bot. Reg. 19: ad t. 1618. 1833.

袋唇兰属 dai chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Dicerostylis* Blume.

Herbs, terrestrial, occasionally lithophytic or rarely epiphytic. Rhizome long, creeping, fleshy; roots borne at rhizome nodes, fibrous. Stem erect or ascending, terete, leafy, glabrous. Leaves ovate-elliptic, with a long petiole-like base dilating into a tubular, amplexicaul sheath. Inflorescence erect, terminal, densely racemose, pubescent; peduncle with a few sheathing bracts; floral bracts ca. as long as ovary, pubescent. Flowers resupinate, not opening widely; ovary twisted, cylindrical-fusiform, pubescent. Outer surfaces

of sepals pubescent; lateral sepals free, oblique, embracing base and sides of lip. Petals connivent with dorsal sepal and forming a hood, glabrous; lip 2-partite; hypochile a dilated, globose sac, sometimes containing 2 erect, digitate calli on each side; epichile narrowly linear to ovate, sulcate to canaliculate. Column stout, sometimes with a short V-shaped appendage below stigma; anther lanceolate, 2-locular; pollinia 2, granular-farinaceous, sectile, with a long caudicle attached to a solitary, elongate viscidium; rostellum erect, remnant deeply bifid; stigma lobes confluent, slightly raised.

About ten species: SE Asia to New Guinea and the Solomon Islands; one species (endemic) in China.

**1. *Hylophila nipponica*** (Fukuyama) S. S. Ying, Coloured Ill. Indig. Orchids Taiwan 1: 469. 1977.

袋唇兰 dai chun lan

*Dicerostylis nipponica* Fukuyama, Bot. Mag. (Tokyo) 50: 19. 1936.

Plants 20–60 cm tall. Stem ascending, 3–6-leaved, black to dark purplish brown. Leaves abaxially pale green, adaxially dark green and glossy, obovate to elliptic, 5–15 × 3–5 cm, base obtuse, apex acuminate or acute; petiole-like base ca. 4 cm. Inflorescence reddish brown, 5–10 cm; floral bracts reddish brown, ovate-lanceolate to lanceolate, ca. 18 × 7.5 mm, slightly longer than pedicel and ovary, abaxially pubescent, apex acuminate. Flowers green, tinged with reddish brown; ovary 10–11

mm including pedicel. Dorsal sepal green, apex tinged with reddish brown, recurved, ovate to ovate-lanceolate, concave, 7–9 × 3.5–4 mm, thickly textured, 3-veined; lateral sepals brownish green, tinged with white at apex, suborbicular-ovate, oblique, 7–9 × 6–9 mm, 4-veined, apex acuminate. Petals pink, tinged with white at apex, narrowly rhombic, oblique, 7–8 × 2.8–3 mm, 1-veined, apex acuminate; lip yellow; hypochile a ventricose-globose sac, 5–6.5 × ca. 4.5 mm, shallowly 2-lobed, with a triangular opening below column; epichile pendulous, pale reddish brown, linear. Column ca. 3 mm, ventrally with a V-shaped appendage; anther reddish yellow, oblong-lanceolate, ca. 5 mm; pollinia joined at tapering ends to a solitary viscidium. Fl. Jul.

• Damp places in rain forests; 100–400 m. S Taiwan.

## 7. **LUDISIA** A. Richard in Bory, Dict. Class. Hist. Nat. 7: 437. 1825.

血叶兰属 xue ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Dicrophyla* Rafinesque; *Myoda* Lindley.

Herbs, terrestrial or occasionally lithophytic. Rhizome elongate, creeping, several noded, fleshy; roots borne at rhizome nodes, stout. Stem erect, leafy. Leaves alternate, adaxially usually with silvery or pinkish veins and reticulation, oblong-lanceolate to elliptic; petiole-like base dilating into amplexicaul sheath. Inflorescence pubescent; peduncle with scattered sterile sheathing bracts; terminal raceme few to many flowered; floral bracts ca. as long as ovary, membranous. Flowers widely spreading, resupinate, relatively small; ovary twisted, terete, pubescent. Sepals free, ± similar; dorsal sepal concave, connivent with petals and forming a hood. Petals narrower than sepals; lip obliquely twisted, 3-partite, base connate with column margin; hypochile saccate, shallowly 2-lobed, containing 2 large fleshy calli; mesochile with erect margin, forming a subtubular passage; epichile enlarged into a transversely oblong limb. Column obliquely twisted in opposite direction to lip, apex dilated, abruptly contracted below anther; anther ovoid, large, 2-locular; pollinia 4, granular-farinaceous, sectile, narrowly obovoid, attenuating into slender caudicles that merge and terminate in a small, sticky, oblong viscidium; rostellum triangular, remnant bifid; stigma lobes confluent.

One species: Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam.

**1. *Ludisia discolor*** (Ker Gawler) Blume, Coll. Orchid. 113. 1859.

血叶兰 xue ye lan

*Goodyera discolor* Ker Gawler, Bot. Reg. 4: ad t. 271. 1818; *Anoetochilus dawsonianus* H. Low ex H. G. Reichenbach; *Gonogona discolor* (Ker Gawler) Link; *Haemaria dawsoniana* (H. Low ex H. G. Reichenbach) J. D. Hooker; *H. discolor* (Ker Gawler) Lindley; *H. discolor* var. *dawsoniana* (H. Low ex H. G. Reichenbach) B. S. Williams; *H. otletae* Rolfe; *Ludisia dawsoniana* (H. Low ex H. G. Reichenbach) Averyanov; *L. furetii* Blume; *L. odorata* Blume; *L. otletae* (Rolfe) Averyanov; *Neottia discolor* (Ker Gawler) Steudel; *Orchiodes discolor* (Ker Gawler) Kuntze.

Plants 10–25 cm tall. Stem erect, with (2 or)3–5 leaves near base. Leaves abaxially pale red, adaxially blackish green with 5 silvery-red veins, oblong-lanceolate to elliptic, 3–7 × 1.7–3 cm, fleshy, apex acute or mucronate; petiole-like base

1.5–2.2 cm. Inflorescence pubescent, with 2 or 3 sterile bracts; rachis 3–8 cm, laxly few to more than 10-flowered; floral bracts reddish, ovate to ovate-lanceolate, ca. 1.5 cm, membranous, margin minutely ciliate, apex acuminate. Flowers white tinged with red, ca. 7 mm in diam.; ovary 1.5–2 cm including pedicel, pubescent. Dorsal sepal ovate-elliptic, cymbiform, 8–9 × 4.5–5 mm; lateral sepals obliquely ovate to subelliptic, 9–10 × 4.5–5 mm, abaxially with a very short keel toward apex. Petals obliquely ovate, 8–9 × 2–2.2 mm, apex obtuse; lip 9–10 mm; hypochile containing 2 large fleshy calli; mesochile ca. 2 mm; epichile 5–6 mm wide. Column ca. 5 mm. Fl. Feb–Apr.

Damp areas along valleys in evergreen broad-leaved forests; 900–1300 m. Guangdong, Guangxi, Hainan, S and SE Yunnan [Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

Though the combination *Ludisia discolor* is frequently attributed to Richard (Dict. Class. Hist. Nat. 7: 437. 1825) in the literature, Blume appears to be the first to have transferred the epithet validly.

## 8. *HERPYSMA* Lindley, Edwards's Bot. Reg. 19: ad t. 1618. 1833.

爬兰属 *pa lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial. Rhizome elongate, creeping, cylindrical, several noded; roots filiform, emerging singly from rhizome nodes. Stem erect or suberect, leafy. Leaves elliptic to ovate-lanceolate, papery; petiole-like leaf base dilating into a tubular, membranous sheath, often imbricate on stem. Inflorescence terminal, shortly racemose, with many small flowers, pubescent; floral bracts large, longer than ovary, pubescent. Flowers resupinate; ovary twisted, cylindrical, pubescent. Sepals similar, abaxially hairy; dorsal sepal and petals forming a hood; lateral sepals free. Petals obliquely rhombic; lip shorter than sepals, adnate to margin of column, pandurate, recurved, long spurred at base; disk with 1 central longitudinal lamella and 2 lamellate calli (1 on either side of central lamella); spur cylindrical, protruding between base of lateral sepals, nearly as long as ovary, apex slightly 2-lobed, internally with a few, irregular, small warts near apex. Column short, lacking appendages; anther 2-locular; pollinia 2, granular-farinaceous, sectile, attached to a narrow, elongate viscidium; rostellum short, erect, 2-lobed; stigma subcircular, below rostellum.

One species: China, NE India, Indonesia, Myanmar, Nepal, Thailand, Vietnam.

### 1. *Herpysma longicaulis* Lindley, Gen. Sp. Orchid. Pl. 506. 1840.

爬兰 *pa lan*

*Erythrodes bracteata* (Blume) Schlechter; *Herpysma bracteata* (Blume) J. J. Smith; *H. sumatrana* Carr; *Physurus bracteatus* Blume.

Plants 18–30 cm tall. Stem stout, 5–8 mm in diam. Leaves several to many, elliptic-oblong to ovate-lanceolate, 5–10 × 2.8–3.5 cm, apex acute or acuminate; petiole-like base attenuate, 2–3 cm. Inflorescence 3–4 cm, many flowered; floral bracts oblong-lanceolate, 1.5–2 cm, longer than ovary, abaxially pu-

bescent, apex acuminate. Flowers white; sepals and petals sometimes orange or pink above middle; ovary 1.2–1.5 cm including pedicel. Dorsal sepal ovate, cymbiform, 8–9 × 4–4.5 mm, apex acute and recurved; lateral sepals spreading, narrowly oblong, concave, 10–11 × 2–2.5 mm, apex obtuse. Petals narrowly rhombic-obovate, 9–10 × 4.5–4.7 mm, thinly textured, apex obtuse; lip reflexed above middle, slightly shorter than sepals, base with 2 crenate, erect lateral lobes, apex obtusely mucronate; spur pendulous, parallel to ovary, 7–10 mm. Fl. Aug–Sep.

Dense forests; ca. 1200 m. W Yunnan [Bhutan, NE India, Indonesia, Myanmar, Nepal, Thailand, Vietnam].

## 9. *ERYTHRODES* Blume, Bijdr. 410. 1825.

钳唇兰属 *qian chun lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Physurus* Richard ex Lindley, nom. illeg. superfl.

Herbs, terrestrial or rarely epiphytic. Rhizome creeping, cylindrical, fleshy, noded, with several roots at nodes. Stem erect or decumbent, terete, with several to many subrosulate leaves. Leaves green to reddish purple, ovate to elliptic, slightly fleshy, with amplexicaul petiole-like bases. Inflorescence erect, pubescent, terminating in a short, many-flowered raceme. Flowers resupinate, small; ovary pubescent. Sepals abaxially hairy; dorsal sepal and petals adnate and forming a hood; lateral sepals free, spreading. Lip erect, entire or 3-lobed, adnate to column at base, spurred at base; spur tubular, protruding beyond base of lateral sepals, apex obtuse, unlobed or slightly 2-lobed, containing 2 clavate appendages or empty. Column short, apically dilated; anther erect, ovoid, 2-locular; pollinia 2, each ± longitudinally 2-parted, clavate, granular-farinaceous, sectile, attached to an ovate-lanceolate viscidium; rostellum erect, bifid; stigma lobes connate, below base of rostellum. Capsule fusiform.

About 20 species: tropical Asia from India and Sri Lanka to New Guinea and the Pacific islands; two species in China.

- 1a. Mid-lobe of lip broadly ovate to triangular-ovate; spur pendulous, apex shallowly 2-lobed ..... 1. *E. blumei*  
 1b. Mid-lobe of lip suborbicular or transversely elliptic; spur spreading horizontally, apex distinctly 2-lobed and sometimes almost 4-lobed ..... 2. *E. hirsuta*

### 1. *Erythrodes blumei* (Lindley) Schlechter in Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee, 87. 1905.

钳唇兰 *qian chun lan*

*Physurus blumei* Lindley, Gen. Sp. Orchid. Pl. 504. 1840; *Erythrodes brevicealcar* J. J. Smith; *E. chinensis* (Rolfe) Schlechter; *E. formosana* Schlechter; *E. henryi* Schlechter; *E. triantherae* C. L. Yeh & C. S. Leou; *Microchilus blumei* (Lindley) D. Dietrich; *P. chinensis* Rolfe; *P. henryi* (Schlechter) K. Schumann & Lauterbach.

Plants 18–60 cm tall. Stem erect, green, 2.5–3.5 mm in diam., with 3–6 leaves. Leaves petiolate, abaxially pale green, adaxially dark green, ovate, elliptic, or ovate-lanceolate, sometimes slightly oblique, 4.5–10 × 2–6 cm, abaxially with 3 conspicuous veins, base broadly cuneate or obtuse, apex acute; petiole 2.4–4 cm, basally dilated into amplexicaul sheath. Peduncle 12–40 cm, pubescent, with 3–6 sterile bracts; rachis 5–10 cm, pubescent, subdensely many flowered; floral bracts reddish brown, lanceolate, 10–12 × ca. 4 mm, abaxially pubescent, apex acuminate. Flowers small; sepals pubescent outside, reddish brown or brownish green outside, white with pinkish

markings inside; ovary reddish brown, twisted, terete, pubescent, including pedicel 9–10 mm. Dorsal sepal erect, concave, narrowly elliptic, 4–6 × 1.5–2.5 mm, apex slightly obtuse; lateral sepals spreading, obliquely elliptic or ovate-elliptic, 5.5–6 × ca. 3 mm, apex acute or slightly obtuse. Petals similar in color to sepals, oblanceolate, 4–6 × 1.5–2 mm, midvein transparent, apex obtuse; lip reddish brown adaxially, 4–5.5 mm, 3-lobed at apex; lateral lobes erect, small; mid-lobe reflexed, white, broadly ovate to triangular-ovate, apex subacute; spur pendulous, reddish brown, tubular, 1.5–4 mm, centrally slightly dilated, glabrous, apex shallowly 2-lobed. Column erect, 1.5–4 mm, bearing up to 3 anthers in some Taiwanese populations. Fl. Apr–May.

Evergreen broad-leaved forests; 400–1500 m. Guangdong, Guangxi, Taiwan, SE Yunnan [NE India, Indonesia, Malaysia, N Myanmar, Thailand, Vietnam].

Continuity in the length of the spur and in the outline of the central lobe of the lip make it difficult to distinguish between *Erythrodes chinensis* and *E. blumei*, though Ormerod (Lindleyana 17: 194. 2002) used these characters to differentiate the two. The report of *E. latifolia* Blume from Taiwan (in T. S. Liu & H. J. Su, Fl. Taiwan 5: 990. 1978) is considered a misidentification of *E. blumei*. The recently described *E. triantherae* from Taiwan, which the authors distinguished from *E. blumei* primarily by the presence of up to three anthers on the column (see C. L. Yeh & C. S. Leou, Taiwania 51: 266. 2006), is probably a peloric mutant and is referable to *E. blumei* when the full range in dimensions of other floral parts in the latter is taken into account.

**2. *Erythrodes hirsuta*** (Griffith) Ormerod in Seidenfaden, Contr. Orchid Fl. Thailand 13: 12. 1997.

硬毛钳唇兰 ying mao qian chun lan

*Goodyera hirsuta* Griffith, Not. Pl. Asiat. 3: 393. 1851; *Erythrodes herpysmoides* (King & Pantling) Schlechter; *E. seshagiriana* A. N. Rao; *Physurus hirsutus* (Griffith) Lindley; *P. herpysmoides* King & Pantling.

Plants 15–30 cm tall. Stem erect, green, ca. 2 mm in diam., with 6 or 7 leaves. Leaves petiolate, green, ovate, oblique, 4–6 × 2–3 cm, usually with 3 conspicuous veins abaxially, base obtuse, apex acute; petiole 2–3 cm, basally dilated into amplexicaul sheath. Peduncle 11–20 cm, pubescent, with 2–5 sterile bracts; rachis 1–6 cm, pubescent, densely few to several flowered; floral bracts lanceolate, 6–10 × 1.2–2.5 mm, pubescent, apex acuminate. Flowers small; sepals pubescent and pale reddish brown outside, white tinged pinkish inside; ovary slightly twisted, terete, pubescent, including pedicel 5–10 mm. Dorsal sepal spreading forward, concave, oblong-lanceolate, 6–6.5 × ca. 2 mm, apex subacute; lateral sepals spreading, oblong-lanceolate, 6–6.5 × ca. 2.5 mm, apex acute. Petals similar in color to sepals, spatulate, ca. 6 × 1.5 mm, apex obtuse; lip white, 5.5–6 × ca. 2.4 mm, obscurely 3-lobed at apex; lateral lobes erect, small; mid-lobe reflexed, suborbicular or transversely elliptic, apex rounded and sometimes shortly apiculate; spur spreading horizontally, cylindrical, 3–4.5 mm, dilated below apex, glabrous, apex distinctly 2-lobed and sometimes almost 4-lobed. Column suberect, 3–4 mm. Fl. Jan–Mar.

Evergreen broad-leaved forests; 100–1500 m. Hainan [Bhutan, NE India, Myanmar, Thailand, Vietnam].

## 10. CHEIROSTYLIS Blume, Bijdr. 413. 1825.

叉柱兰属 cha zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Arisanorchis* Hayata; *Gymnochilus* Blume; *Mariarisqueta* Guinea.

Herbs, terrestrial or occasionally epiphytic, small. Rhizome decumbent, moniliform to terete, fleshy, with many contracted nodes; roots usually reduced to fine hairs and arranged along ridges on rhizome internodes, rarely fleshy and emerging from rhizome nodes. Stem erect, very short to elongate, glabrous, with 2 to several subrosulate or scattered cauline leaves. Leaves often withered at anthesis, ovate to cordate, with a short petiole-like base dilating into a tubular amplexicaul sheath. Inflorescence erect, terminal, racemose, very short to elongate, 1- to many flowered, glabrous to pubescent. Flowers resupinate, usually small, mostly not secund; ovary shortly pedicellate, twisted, fusiform, glabrous to pubescent. Sepals membranous, outer surface glabrous to pubescent, connate for half to almost entire length and forming a tube, or rarely free. Petals usually connivent with dorsal sepal; lip adnate to column margin at base, sometimes simple and entire though usually 3-partite; hypochile often dilated and saccate, containing fleshy, lobed or seriate (comblike) papillose calli; mesochile subtubular, short to elongate; epichile spreading, 2-lobed or rarely entire, margin lacinate, dentate, wavy, or entire. Column short, ventrally with 2 elongate armlike appendages (stelia) parallel to rostellum; anther erect, ovoid, 2-locular; pollinia 2, each longitudinally 2-partite, granular-farinaceous, clavate, attached to solitary oblong viscidium; rostellum deeply bifid, 2 elongate arms erect, parallel; stigma lobes 2, separate, convex, rather large, placed laterally near apex of column and below rostellum. Capsule ellipsoid.

About 50 species: from tropical Africa through tropical Asia to New Guinea, Australia, and the Pacific islands; 17 species (eight endemic) in China.

Hayata considered species with an entire lip to comprise a distinct genus, *Arisanorchis*, but they conform to *Cheirostylis* in other respects (sepals basally fused and forming a tube, column with two elongate stelia, rostellum deeply bifid) and are most likely peloric forms. A monographic revision of the genus is highly desirable given that overlapping species concepts remain a problem in separating taxa named from different regions. The endemic species of Taiwan and Hong Kong in particular remain poorly known and are in need of re-examination.

- 1a. Leafy stem elongate, (1.5–)3–8 cm; leaves cauline, scattered, sometimes becoming clustered toward apex of stem; inflorescence shorter than, equal to, or sometimes slightly longer than (but always less than 2 × as long as) leafy stem.

- 2a. Leaves elliptic-oblong, 5–7 cm; sepals free, not forming a tube ..... 1. *C. tabiyahanensis*
- 2b. Leaves usually ovate, 0.4–3.2 cm; sepals connate for 1/2–3/5 of length and forming a tube.
- 3a. Leaves up to 0.7 cm; sepals 2.5–3 mm ..... 2. *C. pusilla*
- 3b. Leaves 1–3.2 cm; sepals 3–11 mm.
- 4a. Inflorescence to 1 cm, peduncle often enclosed by leaf bases and not visible beyond stem apex; ovary glabrous; petals 9–10 mm; hypochile calli comblike, composed of several seriate papillose appendages.
- 5a. Apices of sepals acute; epichile without a tooth at apex between 2 lobes, lobes deeply 4- or 5-lacinate, each division 3–4 mm ..... 3. *C. octodactyla*
- 5b. Apices of sepals obtuse; epichile with an acute tooth at apex between 2 lobes, lobes 5- or 6-lacinate, each division 1–2 mm ..... 4. *C. pingbianensis*
- 4b. Inflorescence 2–7 cm, peduncle long, free of leaf bases and visible beyond stem apex; ovary pubescent or villous; petals 4–4.5 mm; hypochile calli bifid.
- 6a. Leaves ovate to lanceolate, 1.5–2.2 cm, petiole-like base and sheath 1.5–1.8 cm; epichile lobes deeply 4- or 5-lacinate ..... 5. *C. tortilacinia*
- 6b. Leaves ovate-orbicular, 2–3 cm, petiole-like base and sheath 0.7–0.9 cm; epichile lobes wavy to shallowly 2- or 3-dentate, teeth broad with acute tips ..... 6. *C. liukuensis*
- 1b. Leafy stem usually no more than 3 cm (rarely to 5 cm); leaves subrosulate or congested at base of stem; inflorescence at least 2 × as long as leafy stem.
- 7a. Lip simple, entire; hypochile lacking papillose calli.
- 8a. Ovary and outer surface of sepals glabrous; lip spatulate, 3–5 mm ..... 7. *C. clibborndyeri*
- 8b. Ovary and outer surface of sepals pubescent; lip narrowly oblong, 6–8 mm ..... 8. *C. takeoi*
- 7b. Lip 3-partite; epichile lobes dentate or lacinate at margin, hypochile containing papillose calli.
- 9a. Sepals and petals 13–15 mm; lip 15–17 mm ..... 9. *C. griffithii*
- 9b. Sepals and petals 3–6.5(–9) mm; lip 5–12 mm.
- 10a. Hypochile shortly spurred ..... 17. *C. calcarata*
- 10b. Hypochile saccate, never spurred.
- 11a. Hypochile divided by a longitudinal septum into 2 parts, each part with (1 or)2 horn-shaped calli ..... 13. *C. malipoensis*
- 11b. Hypochile lacking a longitudinal septum; calli bifid or comblike.
- 12a. Epichile lobes deeply lacinate, divisions narrowly linear; hypochile calli bifid.
- 13a. Rhizome moniliform, olive-green; leaves 0.8–1 cm wide, petiole-like base to 4 mm; lip 8–11.5 mm ..... 10. *C. monteiroi*
- 13b. Rhizome torose, reddish; leaves 1.2–1.7 cm wide, petiole-like base 4–10 mm; lip 5–6 mm ..... 11. *C. cochinchinensis*
- 12b. Epichile lobes irregularly dentate to wavy, teeth coarse, triangular with acute tips or truncate with obtuse tips; hypochile calli comblike, 3–6-toothed.
- 14a. Sepals and petals 5–6.5(–9) mm; lip 9–12 mm.
- 15a. Epichile deeply bilobed, apical margin obviously dentate ..... 12. *C. yunnanensis*
- 15b. Epichile shallowly bilobed, apical margin obscurely denticulate to wavy ..... 14. *C. thailandica*
- 14b. Sepals and petals 3–4 mm; lip 5–7 mm.
- 16a. Epichile lobes wavy to shallowly dentate, teeth truncate with obtuse tips; hypochile calli 2- or 3-lobed ..... 15. *C. jamesleungii*
- 16b. Epichile margin distinctly dentate, teeth triangular with acute tips; hypochile calli 4–6-lobed ..... 16. *C. chinensis*

**1. *Cheirostylis tabiyahanensis*** (Hayata) N. Pearce & P. J. Cribb, *Edinburgh J. Bot.* 56: 278. 1999.

东部叉柱兰 *dong bu cha zhu lan*

*Zeuxine tabiyahanensis* Hayata, *Icon. Pl. Formosan.* 6: 89. 1916; *Cheirostylis nemorosa* Fukuyama; *Macodes tabiyahanensis* (Hayata) S. S. Ying; *Z. nemorosa* (Fukuyama) T. P. Lin.

Plants 10–20 cm tall. Rhizome creeping, terete, short; roots emerging from rhizome nodes, cylindrical, slender, densely pubescent. Stem ascending, 5–8 cm, 5- or 6-leaved. Leaves cauline to clustered at stem apex, elliptic-oblong, 5–7 × ca. 2.5 cm, base cuneate, apex acute; petiole-like base and sheath 1–2 cm.

Inflorescence 6–7 cm, sparsely pubescent, with 2 or 3 sterile bracts; rachis 3–4 cm, subdensely 3–8-flowered; floral bracts lanceolate, 1.5–2 × ca. 0.4 cm, abaxially pubescent, apex acuminate. Flowers slightly nodding; ovary and pedicel 7–9 mm, sparsely pubescent. Sepals free, not spreading, green, tinged with pink, outer surface pubescent, 3-veined; dorsal sepal ovate, 8–10 × ca. 5 mm; lateral sepals oblong, 8–10 × ca. 4 mm. Petals appressed to dorsal sepal, white, obovate-oblong, falcate, 8–10 × ca. 4 mm, 2-veined; lip white, 8–10 mm, 3-partite; hypochile saccate, containing 2 several-toothed, papillose, comblike calli; mesochile thickened, ca. 2 mm, canaliculate with margin first incurved but slightly recurved distally; epichile transversely

dilated, 2-lobed; lobes upturned, subsquare, ca. 4 mm, margin irregularly dentate, teeth shallow with obtuse tips. Column 3–4 mm; stelidia elongate, parallel and subequal to rostellum arms; anther triangular-ovoid, ca. 2 mm; pollinia ca. 1.5 mm; rostellum arms 2–2.5 mm. Fl. Mar–May.

- Broad-leaved forests; ca. 1000 m. S Taiwan.

This taxon, the generic placement of which has been questioned by several authors, was transferred most recently to *Cheirostylis* (Pearce & Cribb, Edinburgh J. Bot. 56: 278. 1999) on account of the shape of the lip, despite it having cylindrical roots that emerge from the rhizome nodes and sepals that are not fused into a synsepal to form a tube.

## 2. *Cheirostylis pusilla* Lindley, Gen. Sp. Orchid. Pl. 489. 1840.

细小叉柱兰 xi xiao cha zhu lan

Plants 4–6 cm tall. Rhizome elongate, creeping, moniliform, ca. 0.2 cm in diam. Stem erect, terete, 1.5–3 cm, 3–6-leaved. Leaves scattered along stem, green, ovate, 0.4–0.7 × 0.2–0.4 cm, glabrous, base truncate-rounded, apex acute; petiole-like base and sheath 0.2–0.4 cm. Inflorescence 1–2.5 cm, glabrous to very sparsely pubescent, with 1 or 2 sterile bracts; rachis to 0.4 cm, 1- or 2-flowered; floral bracts ovate, ca. 3 mm, shorter than ovary, apex acuminate. Flowers white, small, suberect; ovary cylindrical-fusiform, 3–4.5 mm including pedicel, glabrous. Sepals 2.5–3 mm, connate for ca. 1/2 of length and forming a tube; free apical lobes ca. 1.2 mm, apex acute. Petals appressed to dorsal sepal, spatulate, slightly oblique, ca. 3 mm, 1-veined, apex obtuse; lip 4–6 mm, 3-partite; hypochile shallowly saccate, containing 2 bifid calli; mesochile ca. 1.5 mm, adaxially with glandular hairs; epichile ca. 2.5 × 3.5–4 mm, 2-lobed; lobes flabellate, ca. 2 mm, apex truncate and with irregular shallow notches. Column ca. 1.5 mm; stelidia linear; anther ovoid; rostellum arms ca. 1.5 mm. Fl. Oct.

Shaded forests; ca. 1300 m. S Yunnan (Menghai) [NE India, Malaysia, Thailand].

## 3. *Cheirostylis octodactyla* Ames, Philipp. J. Sci., C, 2: 314. 1907.

羽唇叉柱兰 yu chun cha zhu lan

*Cheirostylis inabae* Hayata; *C. oligantha* Masamune & Fukuyama.

Plants 5–15 cm tall. Rhizome creeping, torose to moniliform, 0.2–0.5 cm in diam., sometimes branching; roots hairlike, in raised bands along rhizome internodes. Stem ascending, pale reddish brown, 4–5 cm, fleshy, 3–6-leaved. Leaves scattered along stem, abaxially pale green, adaxially green, ovate to elliptic, sometimes orbicular-cordate, 1–3.2 × 0.5–1.5 cm, glabrous, base obtuse-rounded or cordate, apex acute; petiole-like base and sheath 0.3–0.8 cm. Inflorescence less than 1 cm, (1 or) 2- or 3-flowered; peduncle often enclosed by leaf bases and not visible beyond stem apex; floral bracts pale green, ovate, 3–4 mm, shorter than ovary, apex acuminate. Flowers white, tubular; ovary green, cylindrical-fusiform, 8–10 mm including pedicel, glabrous. Sepals 8–10 mm, 1-veined, connate for ca. 2/3 of length and forming a tube ca. 4 mm in diam.; free apical lobes triangular, 2–3.5 mm, apex acute. Petals appressed to dorsal sepal, white, narrowly spatulate, oblique, 9–10 × 2.5–3 mm, 1-

veined, apex obtuse; lip 10–11 mm, 3-partite; hypochile shallowly saccate, containing 2 comblike calli, each 7- or 8-toothed; mesochile ca. 7 × 2 mm; epichile with 2 green spots at base, ca. 3 × 8 mm, 2-lobed; lobes 3–5.3 mm, 4- or 5-laciniate, each division 3–4 mm. Column ca. 3 mm; stelidia straight, linear, nearly as long as rostellum arms; anther ovoid; rostellum arms ca. 2 mm. Capsule ellipsoid, 1–1.4 cm, borne on elongated peduncle. Fl. Sep.

Damp places in forests, mountain ridges; 1000–2400 m. Taiwan [Philippines, S Vietnam].

## 4. *Cheirostylis pingbianensis* K. Y. Lang, Acta Phytotax. Sin. 34: 635. 1996.

屏边叉柱兰 ping bian cha zhu lan

Plants 5–10 cm tall. Rhizome elongate, creeping, torose. Stem erect, terete, ca. 5 cm, fleshy, 4–8-leaved. Leaves green, cauline, ovate, 1–2.5 × 0.8–1.7 cm, base rounded, apex acute; petiole-like base and sheath 1–1.5 cm. Inflorescence extremely short, to 1 cm, 2- or 3-flowered; peduncle often enclosed by leaf bases and not visible beyond stem apex; floral bracts green, ovate, shorter than ovary, apex acuminate. Flowers glabrous; ovary cylindrical-fusiform, 10–12 mm including pedicel, glabrous. Sepals 10–11 mm, connate for ca. 3/5 of length and forming a tube; free dorsal lobe ca. 3.5 mm and lateral lobes ca. 1.8 mm, apex slightly obtuse. Petals appressed to dorsal sepal, narrowly spatulate, slightly oblique, ca. 9 × 2 mm, base attenuate, apex obtuse; lip 8–13 mm, 3-partite; hypochile slightly saccate, ca. 1.5 mm, containing 2 comblike calli; mesochile ca. 4.5 × 2 mm; epichile ca. 2 × 4 mm, 2-lobed and with an acute tooth between 2 lobes; margin of lobes 5- or 6-laciniate, each linear division 1–2 mm. Column ca. 2.5 mm; stelidia linear, ca. 3 mm; anther broadly ovoid, ca. 1.5 mm; rostellum arms to 3.5 mm. Fl. Sep–Oct.

- Shaded humid areas in dense forests; ca. 2100 m. SE Yunnan.

This species is clearly closely related to *Cheirostylis octodactyla*. More material is required on which to base a critical comparison.

## 5. *Cheirostylis tortilacinia* C. S. Leou, Quart. J. Exp. Forest. Natl. Taiwan Univ. 4(4): 72. 1990.

和社叉柱兰 he she cha zhu lan

*Cheirostylis chinensis* Rolfe var. *tortilacinia* (C. S. Leou) S. S. Ying.

Plants 6–7 cm tall. Rhizome ascending, green, tinged with brown, moniliform, 3–10 cm, 10–15-noded. Stem erect, more than 4 cm, fleshy, 2–6-leaved. Leaves cauline, ovate to lanceolate, 1.5–2.2 × 1–2 cm, membranous, glabrous, base rounded to truncate, apex acute; petiole-like base and sheath brownish, 1.5–1.8 cm, glabrous. Inflorescence 2–5 cm, pubescent, with 1–3 sterile bracts; rachis less than 1 cm, 1–6-flowered; floral bracts ovate-lanceolate, shorter than ovary, abaxially hairy, apex acuminate. Flowers small; ovary brownish green, villous. Sepals brownish green, 3–5 mm, basal 1/2 connate and forming a tube, outer surface villous; free lateral lobes longer than dorsal lobe. Petals appressed to dorsal sepal, white, spatulate, oblique, ca. 4.5 mm; lip white, 3-partite; hypochile saccate, containing 2 bifid glands; mesochile short, adaxially with glandular hairs;

epichile often curved or twisted, with 2 green spots at base, deeply 2-lobed; lobes somewhat square in outline, 2–2.5 mm, deeply 4- or 5-laciniate. Column erect, ca. 3 mm; stelia elongate, triangular at apex, ca. 1.5 mm; anther adaxially pink, ca. 2 mm; pollinia ca. 1.5 mm, attached to slender, attenuate viscidium; rostellum arms ca. 1.5 mm. Fl. Jan.

- Bamboo forests; ca. 1000 m. C Taiwan.

**6. *Cheirostylis liukuensis*** Masamune, J. Soc. Trop. Agric. 2: 36. 1930.

琉球叉柱兰 liu qiu cha zhu lan

*Cheirostylis kanashiroi* Ohwi.

Plants 5–9 cm tall. Rhizome creeping, purplish brown, torose to moniliform, sometimes branching; roots hairlike, in tufts on rhizome internodes. Stem erect, brownish, elongate, 4–5 cm, fleshy, 3- or 4-leaved. Leaves scattered along stem, abaxially reddish purple, adaxially dark grayish green, ovate to ovate-orbicular, 2–3 × 1–2 cm, glabrous, base rounded or slightly cordate, apex acute; petiole-like base and sheath 0.7–1 cm. Inflorescence 4–7 cm, pubescent, with 2–4 sterile bracts; rachis 1–1.5 cm, 5–9-flowered; floral bracts ovate, concave, 7–9 mm, often slightly longer than ovary, apex acuminate. Flowers often secund; ovary cylindrical-fusiform, 5–8 mm including pedicel, pubescent. Sepals white, tinged with reddish brown, 4.5–5 mm, connate for ca. 2/3 of length and forming a tube, sparsely pubescent on outer surface; tube 2.1–2.7 mm in diam.; free apical lobes triangular. Petals appressed to dorsal sepal, white, obliquely oblong or oblanceolate, 4–4.5 × 0.7–2 mm, 1-veined, apex obtuse; lip white, 6–7 mm, 3-partite; hypochile shallowly saccate, containing 2 bifid calli; mesochile 2–3 mm, narrow; epichile dilated, with a pair of diffuse green spots at base, 2-lobed; lobes widely diverging, subsquare, 2–2.5 mm, margin wavy to shallowly 2- or 3-dentate, teeth broad with acute tips. Column 2–2.4 mm; stelia elongate, slightly incurved and embracing rostellum arms; anther broadly ovoid, ca. 1.5 mm; pollinia ca. 1.2 mm; rostellum arms ca. 1.2 mm. Fl. Jan–Feb.

Forests, bamboo forests; 200–800 m. Hong Kong, Taiwan [Japan (Ryukyu Islands)].

**7. *Cheirostylis clibborndyeri*** S. Y. Hu & Barretto, Chung Chi J. 13(2): 15. 1976.

叉柱兰 cha zhu lan

*Cheirostylis derchiensis* S. S. Ying; *C. hungyehensis* T. P. Lin.

Plants 13–17 cm tall. Rhizome olive-green to pale yellow, moniliform, 7–12 cm; roots hairlike, in narrow lines along rhizome internodes. Stem ascending, 1–2 cm, 2–5-leaved. Leaves subrosulate, abaxially slightly paler green and tinged with purple, adaxially dark green, ovate, 1–3.5 × 1.5–2.5 cm, abaxially sometimes with variegated venation and minutely hairy, base cordate, apex acute; petiole-like base and sheath pink to red, 1–1.5 cm, glabrous. Inflorescence pink, 10–15 cm, pubescent, with 1–4 sterile bracts; rachis 1.5–2 cm, 5–7-flowered; floral bracts sheathing, ovate-lanceolate, 5–6 × 1–2 mm, apex acute. Flowers not widely spreading; ovary and pedicel 5–10 mm,

glabrous. Sepals greenish brown, 4–4.5 mm, connate for ca. 3/5 of length and forming a tube, glabrous on outer surface; free apical lobes pink, triangular, 1.8–2 mm, apex obtuse. Petals appressed to dorsal sepal, white with single green vein, ovate to ovate-lanceolate, 2–5 × 1–1.5 mm, apex obtuse; lip simple, white, tinged with green, spatulate, 3–5 × 1–2.3 mm, glabrous, base attenuate, margin entire, apex obtuse. Column 2–3 mm; stelia variable, parallel to rostellum or reflexed, usually much shorter than rostellum arms; anther broadly ovoid, ca. 1.5 mm; viscidium 1–1.5 mm; rostellum arms elongate, 1–1.5 mm. Fl. Mar–Apr.

- Damp rocks in forests and along valleys; 300–1500 m. Hong Kong, C and S Taiwan.

**8. *Cheirostylis takeoi*** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 171. 1919.

全唇叉柱兰 quan chun cha zhu lan

*Arisanorchis takeoi* Hayata, Icon. Pl. Formosan. 4: 110. 1914; *A. tairae* Fukuyama; *Cheirostylis anomala* Ohwi; *C. eglanulosa* Averyanov; *C. tairae* (Fukuyama) Masamune; *C. tatewakii* Masamune; *Goodyera tatewakii* (Masamune) S. S. Ying.

Plants 12–22 cm tall. Rhizome creeping, moniliform, to 1.5 cm in diam.; roots hairlike, in 2–4 rows along rhizome internodes. Stem ascending, 1–2 cm, 2–6-leaved. Leaves often absent or withered at anthesis, subrosulate, pale green, ovate or broadly ovate, 2.5–4 × 2.5–3.5 cm, base rounded or subcordate, apex acute; petiole-like base and sheath 1–1.2 cm. Inflorescence 10–18 cm, sparsely pubescent, with 2 or 3 sheathing sterile bracts; rachis ca. 1 cm, 2–5-flowered; floral bracts ovate to ovate-lanceolate, 4–6 mm, equal in length to ovary, apex acuminate. Flowers barely opening, small; ovary and pedicel green, cylindrical-fusiform, 5–6 mm, sparsely pubescent. Sepals greenish, 5–6 mm, connate for ca. 3/5 of length and forming a tube, sparsely pubescent on outer surface; tube slightly contracted at middle, 3–4 mm in diam.; apical lobes triangular. Petals appressed to dorsal sepal, whitish, oblong, oblique, falcate, 5–6 × ca. 1.5 mm, 1-veined, apex obtuse; lip simple, white, narrowly oblong, 6–8 × 2–2.5 mm, entire, lateral margins incurved, apex obtuse to subacute, recurved. Column 2–3.7 mm; stelia variable, parallel to rostellum or malformed, green, usually much shorter than rostellum arms; anther ovoid, ca. 1.5 mm; pollinia ca. 1.5 mm; viscidium ca. 2 mm; rostellum arms elongate, 1.5–2 mm. Fl. Mar.

Broad-leaved forests; 100–1400 m. Taiwan [Japan (Ryukyu Islands), N Vietnam].

**9. *Cheirostylis griffithii*** Lindley, J. Proc. Linn. Soc., Bot. 1: 188. 1857.

大花叉柱兰 da hua cha zhu lan

*Cheirostylis macrantha* Schlechter.

Plants 15–20 cm tall. Rhizome creeping, terete to torose; roots hairlike, in raised bands along rhizome internodes. Stem erect, short to occasionally elongate, 2–5 cm, fleshy, 3- or 4-leaved. Leaves often withered at anthesis, congested to rarely well spaced, ovate, 1.8–2.5 × 1.2–2 cm, base subrounded, apex

acuminate; petiole-like base and sheath 0.8–1.4 cm. Inflorescence 8–15 cm, sparsely villous, with 2 or 3 sterile bracts; rachis 1–2.5 cm, 1–3-flowered; floral bracts lanceolate, 7–9 mm, shorter than or ca. as long as ovary, apex acuminate. Flowers whitish, rather large; ovary 11–13 mm including pedicel, pubescent. Sepals 13–15 mm, basal 1/2 connate and forming a tube, outer surface sparsely pubescent; free apical lobes acute, spreading. Petals narrowly oblong, oblique, falcate, 13–15 × 2–2.5 mm, apex obtuse; lip 15–17 mm, 3-partite; hypochile slightly saccate, ca. 2 mm, containing 2 comblike calli, each callus 8- or 9-toothed; mesochile 5–7 mm; epichile orbicular, 5–6 × 6–7 mm, base with 2 green spots, 2-lobed; lobes deeply lacinate with 8–10 divisions, each division 1–3.5 mm. Column 2.5–3 mm; stelidia straight, linear, ca. 3 mm, ca. as long as rostellum arms; anther ovoid, ca. 2 mm; rostellum arms spatulate, ca. 3 mm. Fl. Sep.  $2n = 26$ .

Damp places in forests; 2200–2300 m. C Yunnan [India, Myanmar, Nepal, Thailand].

**10. *Cheirostylis monteiroi*** S. Y. Hu & Barretto, *Chung Chi J.* 13(2): 15. 1976.

箭药叉柱兰 jian yao cha zhu lan

Plants 9–13 cm tall. Rhizome olive-green, moniliform, with 4–6 nodes, internodes 5–15 mm, nodes 6–10 mm in diam.; roots hairlike, in narrow rows along rhizome internodes. Stem erect, short, ca. 2.5 cm, 2- or 3-leaved. Leaves congested, green with dark green venation, ovate, 1.2–1.6 × 0.8–1 cm, midvein conspicuous on both surfaces, base subcordate, apex acute or acuminate; petiole-like base and sheath purplish green, 0.3–0.4 cm. Inflorescence 7–9 cm, slender, pubescent, with 3–7 sterile bracts; rachis ca. 1 cm, 2–8-flowered; floral bracts purplish red, cymbiform, ca. 7 mm. Flowers small, glabrous; ovary and pedicel cylindric, 5–6 × 1.5–2 mm, glabrous. Sepals olive-green, tinged with pinkish red, ca. 5 mm, connate for ca. 3/5 of length and forming a tube; tube ca. 3 mm, base slightly swollen; free apical lobes ca. 2 mm. Petals appressed to dorsal sepal, white, oblanceolate, oblique, ca. 5 × 1.5 mm; lip 8–11.5 mm, 3-partite; hypochile saccate, fleshy, margin incurved, containing 2 bifid calli; mesochile short; epichile nearly orbicular in outline, ca. 7 mm, 2-lobed; lobes white, tinged with green at middle, margin deeply 5–8-lacinate, each division ca. 2 mm. Column cylindric, ca. 3 mm; stelidia ca. 1.5 mm, acuminate; anther yellow, broadly ovoid, ca. 1 mm; viscidium linear-lanceolate, ca. 1 mm; rostellum arms ca. 1.5 mm. Fl. Mar–May.

• In shade on damp rocks, along streams in forests; ca. 300 m. Hong Kong.

**11. *Cheirostylis cochinchinensis*** Blume, *Coll. Orchid.* 55. 1858–1859.

雌尾叉柱兰 zhi wei cha zhu lan

*Cheirostylis taichungensis* S. S. Ying.

Plants 7–14 cm tall. Rhizome reddish, torose, 4–10 × 0.2–0.5 cm, internodes 1–1.4 cm; roots hairlike, in rows along rhizome internodes. Stem erect, 1.5–3 cm, 2–4-leaved. Leaves subrosulate, ovate to ovate-oblong, 1.5–3 × 1.2–1.7 cm, papery, glabrous, adaxially with dark green reticulate venation, abaxially paler, base obtuse, apex obtuse or subacute; petiole-like

base and sheath reddish at base, 0.4–1 cm. Inflorescence 5–12 cm, slender, pubescent at base, becoming ± glabrous above, with 2 or 3 sterile bracts; rachis 1–3 cm, 3–10-flowered; floral bracts lanceolate to linear-lanceolate, 2–3 × ca. 1 mm, glabrous, apex acuminate. Flowers small; ovary and pedicel greenish brown, 5–8 mm, glabrous. Sepals pale greenish brown or white, 4–4.5 mm, basal 1/2 connate and forming a tube, slightly pubescent or glabrous; free apical lobes triangular, 2–2.7 mm, apex obtuse. Petals white, obliquely falcate, 4–5 × 1–1.5 mm, 1-veined, apex obtuse; lip white, 5–6 mm, longer than sepals, 3-partite; hypochile saccate, containing 2 bifid calli and often with keel at center; mesochile short; epichile white, with green patch near base, orbicular in outline, 7–9 mm, 2-lobed; lobes suborbicular or flabellate, margin lacinate with 7–9 deep linear divisions, each division 1–1.5 mm. Column erect, 2.4–3 mm; stelidia straight, parallel to rostellum arms and equal in length; anther ovoid, 1.5–2 mm, apex with 1 triangular reddish brown spot; pollinia ca. 1.2 mm; rostellum arms ca. 2 mm. Fl. Feb–May.

Forests; 700–2500 m. S Taiwan [Vietnam].

**12. *Cheirostylis yunnanensis*** Rolfe, *Bull. Misc. Inform. Kew* 1896: 201. 1896.

云南叉柱兰 yun nan cha zhu lan

*Cheirostylis josephii* Schlechter; *C. munnacampensis* A. N. Rao; *C. pabongensis* Lucksom.

Plants 10–18 cm tall. Rhizome moniliform, 1–3.5 × 0.6–1.5 cm; roots in broad, raised bands along rhizome internodes. Stem pale green, usually less than 1 cm, 2- or 3-leaved. Leaves congested, often withered or absent at anthesis, green, ovate, 1.5–3.5 × 0.8–2 cm, membranous, base subrounded, apex acute; petiole-like base and sheath 0.6–1.5 cm. Inflorescence 8–16 cm, sparsely villous, with 3 or 4 sterile bracts; rachis 0.4–2 cm, 2–5(–10)-flowered; floral bracts ovate, concave, 5–6.5 mm, shorter than ovary, abaxially villous, apex acuminate. Flowers often erect; ovary cylindric-fusiform, 7–9 mm including pedicel, sparsely villous. Sepals 5–6.5 mm, basal 1/2 connate and forming a tube, membranous, outer surface sparsely villous, 1-veined; free apical lobes triangular-ovate, 2.5–3 mm, apex subobtuse. Petals appressed to dorsal sepal, white, narrowly oblanceolate-oblong, oblique, 5–6.5 × 1.5–1.8 mm, membranous, 1-veined, entire or sometimes with 2 or 3 obtuse teeth, apex obtuse; lip erect, white, 9–12 mm, 3-partite; hypochile saccate, containing 2 comblike calli, each callus 3- or 4-toothed; mesochile ca. 2 mm, narrow, with 2 lamellae; epichile with green spots at base, flabellate, 5–6 mm, deeply 2-lobed; lobes 4–6 mm wide, margin irregularly 5–7-dentate, teeth triangular with acute tips. Column ca. 2.5 mm; stelidia erect, nearly as long as rostellum arms; anther ovoid, ca. 1 mm; rostellum arms ca. 1.5 mm. Fl. Mar–Apr.

In shade on rocky soils in forests, along streams; 200–1800 m. Guangdong, Guangxi, S Guizhou, Hainan, S Hunan, W Sichuan, S Yunnan [India (Sikkim), Myanmar, Thailand, Vietnam].

**13. *Cheirostylis malipoensis*** X. H. Jin & S. C. Chen, *Acta Phytotax. Sin.* 45: 797. 2007.

麻栗坡叉柱兰 ma li po cha zhu lan

Plants 10–12 cm tall. Rhizome creeping, 8–20 × 2–2.5 mm, fleshy, nodes slightly contracted. Stem erect, 5–30 mm, 1–4-leaved. Leaves green, often reticulated with dark green, ovate-cordate, 1.2–2 × 0.9–1.2 cm, apex acute to subacuminate; petiole-like base and sheath 0.6–0.8 cm. Inflorescence 6–9 cm, pubescent, with 2 or 3 sterile bracts; rachis short, usually less than 1 cm, 2–4-flowered; floral bracts ovate-lanceolate, 7–9 mm, apex acuminate. Flowers white; pedicel and ovary 4–6 mm, sparsely villous. Sepals 4–5 mm, basal 1/2 connate and forming a tube, sparsely villous on outer surface toward base; free apical lobes triangular-ovate, 2–2.5 mm, subobtusate. Petals appressed to dorsal sepal, narrowly lanceolate-oblong, 3.5–4 × ca. 1.5 mm; lip 6–9 mm, 3-partite; hypochile saccate, ca. 2 × 1.5 mm, divided by a longitudinal septum into 2 parts, each part with 2 horn-shaped calli (rarely with just 1 callus on each side); mesochile ca. 1 mm; epichile with 2 green or beige spots at base, deeply bilobed; lobes flabellate, ca. 4 × 4 mm, apical margin 3–5-toothed. Column 1–2 mm; stelidia ca. 1 mm, slightly longer than rostellum arms. Fl. Dec–Feb.

• Forests on limestone mountains, thickets; ca. 1100 m. SE Yunnan.

**14. *Cheirostylis thailandica*** Seidenfaden, Dansk Bot. Ark. 32(2): 74. 1978.

反瓣叉柱兰 fan ban cha zhu lan

Plants 12–25 cm tall. Rhizome creeping, swollen, ca. 1 cm in diam. Stem erect, 1–3 cm, often 3- or 4-leaved. Leaves ± withered at anthesis, broadly lanceolate, 2–6 × 1.5–2 cm, thinly textured; petiole-like base and sheath ca. 1 cm. Inflorescence 11–22 cm, pubescent, with several sterile bracts; rachis short, 3- or 4-flowered; floral bracts lanceolate, small, pubescent; pedicel and ovary ca. 5 mm, pubescent. Sepals green-brown, ca. 8 mm, basal 2/3 connate and forming a tube; free apical lobes triangular. Petals not appressed to dorsal sepal, whitish, suboblong, ca. 9 × 2.5 mm, 1-veined, apex recurved; lip whitish, ca. 12 mm, slightly 3-partite; hypochile saccate, inside containing 2 comb-like calli; mesochile ca. 4 mm, margin involute; epichile with 2 green spots at base, shallowly bilobed; lobes somewhat flabellate, apical margin irregularly denticulate to wavy. Column ca. 4 mm; stelidia ca. 2 mm; rostellum arms ca. 1.5 mm. Fl. Feb.

In shade of open forests; ca. 1200 m. S Yunnan [Thailand].

**15. *Cheirostylis jamesleungii*** S. Y. Hu & Barretto, Chung Chi J. 13(2): 13. 1976.

粉红叉柱兰 fen hong cha zhu lan

Plants ca. 11 cm tall. Rhizome creeping, olive-green, moniliform, 4–5 × 0.3–0.6 cm. Roots minute, in rows along rhizome internodes. Stem erect, ca. 1 cm, with 2 or 3 small leaves. Leaves subrosulate, reddish green with dark green reticulate veins, cordate, 3–8 × 3–8 cm, base truncate, apex acute. Inflorescence ca. 10 cm, slender, with 4 sterile bracts, sparsely villous; rachis less than 1 cm, 2- or 3-flowered; floral bracts pink, cymbiform, shorter than ovary, membranous, 1-veined. Flowers small; ovary and pedicel pink, ca. 5 × 2 mm, sparsely villous. Sepals green, tinged with pink, ca. 4 mm, basal 1/2 connate and forming a tube, outer surface villous at base; free api-

cal lobes triangular, ca. 2 mm. Petals white, lanceolate, oblique, ca. 4 × 1 mm; lip white, ca. 5 mm, 3-partite; hypochile saccate, containing 2 2- or 3-lobed calli; mesochile short, margin incurved; epichile dilated, subrectangular, ca. 3 × 5 mm, 2-lobed; lobes subsquare, margin wavy to shallowly 5- or 6-dentate, teeth broad, truncate with obtuse tips. Column 1.5–2 mm; stelidia acuminate, ca. 0.8 mm; anther ovoid, ca. 1 mm, apex obtuse; viscidium ca. 1 mm; rostellum arms ca. 1 mm. Fl. Mar.

• Damp soils and mossy rocks, in shade by streams; ca. 600 m. Hong Kong.

**16. *Cheirostylis chinensis*** Rolfe, Ann. Bot. (Oxford) 9: 158. 1895.

中华叉柱兰 zhong hua cha zhu lan

*Cheirostylis philippinensis* Ames; *C. taiwanensis* Yamamoto.

Plants 6–20 cm tall. Rhizome creeping, torose to moniliform, to 10 cm; roots in rows along rhizome internodes. Stem ascending, pale green, 1–3 cm, 2–4-leaved. Leaves subrosulate, green, ovate or broadly ovate, 1–3 × 0.7–1.7 cm, membranous, base rounded, apex acute; petiole-like base and sheath 0.3–1 cm. Inflorescence 5–18 cm, pubescent, with 3 or 4 sterile bracts; rachis 1–3 cm, 2–6-flowered; floral bracts oblong-lanceolate, concave, 5–8 mm, nearly as long as ovary, abaxially hairy, apex long acuminate. Flowers small; ovary green, cylindrical-fusiform, 7–8 mm including pedicel, sparsely pubescent. Sepals 3–4 mm, basal 1/2 connate and forming a tube, membranous, outer surface sparsely pubescent, 1-veined; free apical lobes triangular-ovate, ca. 1.8 mm, apex subobtusate. Petals appressed to dorsal sepal, white, narrowly oblanceolate-oblong, oblique, falcate, 3–4 × 1.2–1.5 mm, membranous, 1-veined, apex obtuse; lip erect, white, 5–7 mm, 3-partite; hypochile saccate, containing 2 comblike calli, each callus (4 or) 5- or 6-toothed; mesochile ca. 1 mm, narrow; epichile with 2 green spots at base, flabellate, ca. 3.5 mm, 2-lobed; lobes ca. 3 mm, margin 4- or 5-dentate, teeth triangular with acute tips. Column ca. 2.5 mm; stelidia erect, nearly as long as rostellum; anther pinkish, ovoid, ca. 1.5 mm; viscidium narrowly oblong, ca. 1 mm; rostellum arms ca. 1.5 mm. Fl. Jan–Mar.

Damp rocky soils in forests, along streams; 200–800 m. Guangxi, Guizhou, Hainan, C and S Taiwan [Myanmar, Philippines, Vietnam].

**17. *Cheirostylis calcarata*** X. H. Jin & S. C. Chen, Acta Phytotax. Sin. 45: 797. 2007.

短距叉柱兰 duan ju cha zhu lan

Plants ca. 15 cm tall. Rhizome almost vertical, ca. 3.5 × 1 cm, fleshy, nodes slightly contracted. Stem short, 4- or 5-leaved. Leaves withered at anthesis, clustered, lanceolate, 1.5–4.5 × 0.7–1.2 cm; petiole-like base and sheath 1–2.5 cm. Inflorescence ca. 14 cm, pubescent, with 2 or 3 sterile bracts; rachis short, 1–5-flowered; floral bracts ovate to lanceolate, 5–10 mm, glabrous. Flowers white; pedicel and ovary ca. 8 mm, glandular hairy. Sepals 6–7 mm, connate for ca. 3/5 of length and forming a ± curved tube; free apical lobes triangular, ca. 2 mm. Petals appressed to dorsal sepal, spatulate, ca. 10 × 1 mm;

lip ca. 1.6 cm, 3-partite; hypochile saccate and shortly spurred, ca. 2 mm, inside with 2 3- or 4-lobed calli; mesochile ca. 6 mm; epichile with 2 green spots at base, deeply bilobed; lobes ca. 10 × 7 mm, 4- or 5-laciniate, each division 1.5–2.5 mm. Column

ca. 2.5 mm; stelia ca. 4 mm, slightly longer than rostellum arm. Fl. Mar.

• Forests on limestone mountains; ca. 1200 m. S Yunnan.

## 11. KUHLHASSELLIA J. J. Smith, Icon. Bogor. 4: 1, t. 301. 1910.

旗唇兰属 qi chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Vexillabium* F. Maekawa.

Herbs, terrestrial. Rhizome elongate, creeping, noded, fleshy. Stem ascending, glabrous, leafy. Leaves ovate to subcircular, with a short petiole-like base sheathing stem. Inflorescence erect, pubescent; peduncle green, sometimes tinged with purplish red, with scattered sterile bracts; rachis 1- to many flowered; floral bracts lanceolate, ca. as long as pedicel and ovary, membranous, often pubescent and with ciliate margin. Flowers resupinate, small; ovary twisted, glabrous to pubescent. Sepals adaxially glabrous to pubescent; lateral sepals connate along inner margin for up to half their length, forming a tube and enclosing hypochile. Petals membranous, upper margin adnate to dorsal sepal and forming a hood; lip longer than sepals, attached at base to column margin, 3-partite; hypochile a shallowly bilobed sac, sometimes septate, containing 2 oblong appendages; mesochile elongate, margin involute, sub-tubular, with a fleshy flange along exterior margin on each side; epichile dilated, flabellate, obcordate to transversely oblong, entire or bilobed. Column erect, stout, basally dilated; anther on ventral side of column, ovoid, 2-locular; pollinia 2, clavate, each longitudinally parted, granular-farinaceous, sectile, with short caudicle, attached to a solitary viscidium; rostellum at column apex, erect, 2-lobed; stigma lobes connate, at base of rostellum.

About ten species: Indonesia, Malaysia, New Guinea, and the Philippines, north to China, Japan, and Korea; one species in China.

Recent analyses of the Goodyerinae by Ormerod (Lindleyana 17: 189–238. 2002) and Pridgeon et al. (Gen. Orchid. 3: 63–153. 2003) have concluded that *Vexillabium* and *Kuhlhasseltia* are congeneric.

**1. *Kuhlhasseltia yakushimensis*** (Yamamoto) Ormerod, Lindleyana 17: 209. 2002.

旗唇兰 qi chun lan

*Anoectochilus yakushimensis* Yamamoto, Bot. Mag. (Tokyo) 38: 131. 1924; *Cystopus humilis* Fukuyama; *Kuhlhasseltia integra* (Fukuyama) T. C. Hsu & S. W. Chung; *Pristiglottis humilis* (Fukuyama) Fukuyama; *P. integra* Fukuyama; *P. yakushimensis* (Yamamoto) Masamune; *Vexillabium humilum* (Fukuyama) S. S. Ying; *V. integrum* (Fukuyama) S. S. Ying; *V. yakushimense* (Yamamoto) F. Maekawa.

Plants 8–15 cm tall. Rhizome branching, pubescent. Stem ascending, green. Leaves subsulate at base of stem or spaced along stem, green, tinged with reddish purple, ovate, 0.8–5 × 0.6–2.5 cm, fleshy, 3-veined, base rounded, margin sometimes minutely toothed, apex acute; petiole-like base 5–15 mm. Inflorescence often purplish red, 4–8 cm, white pubescent, with 1–3 pinkish red sterile bracts; rachis pinkish, 1.5–4.5 cm, 2–7-flowered, sparsely pubescent; floral bracts purplish red, broadly lan-

ceolate, 5–6 mm, abaxially sparsely pubescent, margin ciliate, apex acuminate. Flowers small; ovary slightly curved, cylindrical-fusiform, 7–8 mm including pedicel, glabrous to pubescent. Sepals green at base, whitish pink toward apex; dorsal sepal shortly connate to lateral sepals at base, erect, oblong-ovate, concave, 3.5–4.5 mm, 1-veined, apex obtuse; lateral sepals oblong, falcate, 5–6 × ca. 2 mm, 1-veined, apex obtuse. Petals ovate, falcate, 4–5 × 1.5–2.5 mm, apex obtuse-apiculate; lip white, ca. 8 mm; hypochile saccate, containing 2 appendages; mesochile with 2 usually dentate flanges; epichile divergently 2-lobed, 3–4 × 4.5–5 mm. Column 2–3 mm; anther cordate, ca. 1.4 mm, apex acuminate; pollinia obovoid, attached to triangular viscidium; rostellum erect, furcately 2-lobed, lobes unequal in size. Fl. Aug–Sep.  $2n = 26$ .

Forests, rocky crevices, along streams; 400–1600 m. Anhui, Hunan, Shaanxi, Sichuan, Taiwan, Zhejiang [Japan, Philippines].

The S Taiwan (Lan Yu) endemic *Pristiglottis integra* has a pubescent ovary but in other character states overlaps with *Kuhlhasseltia yakushimensis*.

## 12. MYRMECHIS (Lindley) Blume, Coll. Orchid. 76. 1859.

全唇兰属 quan chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Anoectochilus* sect. *Myrmechis* Lindley, Gen. Sp. Orchid. Pl. 500. 1840; *Tubilabium* J. J. Smith.

Herbs, terrestrial or rarely epiphytic, small. Rhizome elongate, creeping or decumbent, several noded, fleshy; roots hairlike, arranged in irregular clumps or ridges along rhizome internodes. Stem ascending, terete, glabrous, with few to many scattered leaves. Leaves green, ovate or orbicular, small, usually less than 2 cm, slightly fleshy, base shortly petiolate and dilating into tubular amplexicaul sheath. Inflorescence abbreviate or occasionally elongate, glabrous to pubescent, with a few sheathing bracts proximally and 1 to few flowers in a short terminal raceme. Flowers not opening fully, resupinate, small; ovary erect, twisted, glabrous to pubes-

cent. Sepals similar, glabrous to pubescent on outer surface, free or basally connate; dorsal sepal often concave at base; lateral sepals oblique, concave, enclosing base of lip. Petals oblong to elliptic, margin oblique to subequal, connivent with dorsal sepal and forming a hood though apex usually free; lip basally adnate to column margin, 3-partite; hypochile saccate, containing a single, fleshy, entire or divided callus on either side of midvein at base; mesochile elongate, margin involute, subtubular, glabrous or pubescent; epichile transversely dilated or distinctly 2-lobed. Column very short, ventrally with 2 ligulate to longitudinally transverse, low wings; anther ovoid, 2-locular; clinandrium shallow; pollinia 2, 2-partite, granular-farinaceous, sectile, basally attenuate and attached to a solitary, elliptic viscidium; rostellum erect, short, 2-lobed; stigma lobes partly free at apical corners of column, protruding from lateral margin of rostellum.

About 15 species: NE India and the E Himalayas to S Japan, the Philippines, SE Asia, and New Guinea; five species (three endemic) in China.

- 1a. Lip T-shaped, epichile transversely dilated but not divided; petals with equal margins and an obtuse apex (neither oblique nor apiculate at apex).  
 2a. Lip ca. 7 mm; hypochile calli oblong; epichile transversely oblong to obtriangular, 3–3.5 mm wide, entire ..... 1. *M. japonica*  
 2b. Lip ca. 5 mm; hypochile calli subquadrate; epichile transversely obcordate-obovate, 1–1.5 mm wide, occasionally slightly emarginate ..... 2. *M. chinensis*
- 1b. Lip Y-shaped, epichile divergently 2-lobed; petals distinctly oblique and obtuse at apex, or with equal margins and an apiculate apex.  
 3a. Petals broadly urceolate, with equal margins, apex abruptly narrowed into an apiculate, oblong tip ca. 1 mm, ca. 3.5 mm wide ..... 4. *M. urceolata*  
 3b. Petals narrowly ovate or oblanceolate, oblique, apex obtuse, less than 3 mm wide.  
 4a. Lip 10–12 mm; mesochile minutely papillose, margin entire ..... 3. *M. drymoglossifolia*  
 4b. Lip 7–8 mm; mesochile glabrous, margin minutely crenulate ..... 5. *M. pumila*

**1. *Myrmechis japonica*** (H. G. Reichenbach) Rolfe, J. Linn. Soc., Bot. 36: 44. 1903.

日本全唇兰 ri ben quan chun lan

*Rhamphidia japonica* H. G. Reichenbach, Bot. Zeitung (Berlin) 36: 75. 1878.

Plants 8–15 cm tall. Rhizome creeping. Stem somewhat stout, with several leaves. Leaves widely spaced along stem, orbicular to ovate, 5–8 × 5–7 mm, base obtuse-rounded, apex obtuse or acute; petiole-like base and sheath 4–5 mm. Inflorescence 1.5–3 cm, sparsely villous; rachis 1–3-flowered; floral bracts oblong to ovate-lanceolate, shorter than ovary, abaxially sparsely villous, margin ciliate, apex acute or acuminate. Flowers not opening widely, white; ovary and pedicel cylindrical, 8–9 mm, sparsely villous. Sepals white, often tinged with pink on outer surface, ovate-lanceolate, ca. 6 mm, outer surface sparsely villous, 1-veined, connate at base, apex subacute; dorsal sepal cymbiform, ca. 2.3 mm; lateral sepals slightly oblique, ca. 2.3 mm wide. Petals connivent with dorsal sepal and forming a hood though apical 1/3 free and recurved, white, ovate-oblong, not oblique (margins equal), ca. 6 × 2.3 mm, 1-veined, apex obtuse; lip T-shaped, ca. 7 mm, 3-partite; hypochile concave-saccate; calli oblong, entire, apex obtuse; mesochile oblong; epichile dilated, transversely oblong to nearly obtriangular, 3–3.5 mm wide. Fl. Jul–Aug.  $2n = 56$ .

Shaded places and mossy rocks in forests; 800–2600 m. N Fujian, W Sichuan, SE Xizang, NW Yunnan [Japan, Korea].

**2. *Myrmechis chinensis*** Rolfe, J. Linn. Soc., Bot. 36: 44. 1903.

全唇兰 quan chun lan

Plants 5–10 cm tall. Rhizome creeping. Stem slender, with several leaves. Leaves widely spaced along stem, orbicular or ovate, 4–6 × 4–5 mm, base obtuse-rounded, apex obtuse or acute; petiole-like base and sheath 3–5 mm. Inflorescence 1.5–2.5 cm, minutely villous; rachis 1–3-flowered; floral bracts ob-

long-lanceolate, shorter than ovary, abaxially sparsely villous, margin ciliate, apex acute. Flowers not opening widely, white; ovary and pedicel cylindrical, 6–7 mm, sparsely villous. Sepals ovate-lanceolate, 5–6 mm, glabrous, 1-veined, connate at base, apex subacute; dorsal sepal cymbiform, 2–2.2 mm wide; lateral sepals slightly oblique, 2.3–2.5 mm wide. Petals connivent with dorsal sepal and forming a hood though apical 1/3 free and recurved, ovate, not oblique (margins equal), 5–6 × ca. 2.5 mm, 1-veined, apex obtuse; lip white, T-shaped, ca. 5 mm, 3-partite; hypochile concave-saccate; calli subquadrate, entire, apex obtuse; mesochile oblong, minutely papillose; epichile slightly transversely dilated, obcordate-obovate, 1–1.5 mm wide, occasionally slightly emarginate. Fl. Jul.

• Damp places in forests, valleys; 2000–2200 m. N Fujian, W Hubei, NE and W Sichuan.

**3. *Myrmechis drymoglossifolia*** Hayata, Icon. Pl. Formosan. 6: 90. 1916.

阿里山全唇兰 a li shan quan chun lan

*Myrmechis gracilis* (Blume) Blume var. *sasakii* (Yamamoto) S. S. Ying; *M. japonica* (H. G. Reichenbach) Rolfe var. *sasakii* (Yamamoto) S. S. Ying; *M. sasakii* Yamamoto.

Plants 5–7 cm tall. Rhizome slender, branched. Stem white, tinged with red, 2–6 cm, with several leaves. Leaves abaxially grayish green, adaxially green, ovate or orbicular-ovate, 7–15 × 5–10 mm, with 3 main veins, base obtuse, margin slightly undulate, apex acute; petiole-like base and sheath 2–7 mm. Inflorescence to 3 cm, slender, pubescent; rachis 1–3-flowered; floral bracts lanceolate, shorter than ovary, glabrous, margin slightly ciliate. Flowers not fully opening, white; ovary and pedicel cylindrical-fusiform, ca. 10 mm, glabrous. Sepals lanceolate, cymbiform, 6–8 × 2.5–3.5 mm, glabrous, 1-veined, connate at base; dorsal sepal recurved at apex; lateral sepals dilated at base. Petals connivent with dorsal sepal for almost entire length and forming a hood, narrowly ovate, oblique, 6–8

× ca. 2.8 mm, 1-veined, apex obtuse and recurved; lip Y-shaped, 10–12 mm, 3-partite; hypochile concave-saccate; calli suboblong, bidentate; mesochile canaliculate, minutely papillose; epichile distinctly 2-lobed; lobes widely divergent, oblong, 1.5–2 × 1–1.5 mm, apex obtuse. Fl. May–Aug.

- Damp places in forests; 1000–3000 m. Taiwan.

Reports of *Myrmechis gracilis* (in S. S. Ying, Mem. Coll. Agric. Nat. Taiwan Univ. 29(1): 74. 1989) and *M. japonica* (in T. S. Liu & H. J. Su, Fl. Taiwan 5: 1064. 1978) from Taiwan are considered misidentifications of *M. drymoglossifolia*.

**4. *Myrmechis urceolata*** Tang & K. Y. Lang, Acta Phytotax. Sin. 34: 638. 1996.

宽瓣全唇兰 kuan ban quan chun lan

Plants 5–9 cm tall. Rhizome creeping. Stem stout, subfleshy, 5–7-leaved. Leaves widely spaced along stem, abaxially pale green, tinged with reddish purple, adaxially green, ovate, 7–12 × 6–8 mm, base obtuse-rounded, apex acute; petiole-like base and sheath 2–5 mm. Inflorescence ca. 1 cm, pubescent; rachis 1–3-flowered; floral bracts ovate-triangular, 4–5 × 3–4 mm, abaxially pubescent, margin ciliate, apex acute. Flowers not fully opening, white or pink; ovary and pedicel slightly arching, cylindrical-fusiform, sparsely pubescent, 6–7 mm. Sepals free, oblong-ovate, outer surface sparsely pubescent, 1-veined; dorsal sepal cymbiform, 5–6 × ca. 3 mm, apex narrowly attenuate, obtuse; lateral sepals 6–7 × 3.5–4 mm, apex narrowly attenuate, obtuse. Petals connivent with dorsal sepal and forming a hood though apiculate apex free, broadly urceolate, not oblique (margins equal), 5–6 × ca. 3.5 mm, 1-veined, apex abruptly narrowed into an apiculate, oblong tip ca. 1 mm; lip Y-shaped, cymbiform, 7–8 mm, 3-partite; hypochile slightly dilated, concave-saccate; calli transversely elliptic, entire, apex obtuse; mesochile short, conduplicate, glabrous; epichile distinctly 2-lobed; lobes divergent, oblong, ca. 2 × 1 mm. Fl. May–Jul.

- Shaded humid places in forests; 500–600 m. N and W Guangdong, C and S Hainan, SE Yunnan.

**5. *Myrmechis pumila*** (J. D. Hooker) Tang & F. T. Wang, Acta Phytotax. Sin. 1: 69. 1951.

矮全唇兰 ai quan chun lan

*Odontochilus pumilus* J. D. Hooker, Fl. Brit. India 6: 99. 1890; *Anoetochilus pumilus* (J. D. Hooker) Seidenfaden & Smitinand; *Cheirostylis franchetiana* King & Pantling; *Cystopus pumilus* (J. D. Hooker) Kuntze; *Myrmechis franchetiana* (King & Pantling) Schlechter; *Zeuxine franchetiana* (King & Pantling) King & Pantling; *Z. pumila* (J. D. Hooker) King & Pantling.

Plants 5–12 cm tall. Rhizome creeping. Stem stout, with several leaves. Leaves ovate to long ovate, 7–14 × 5–8 mm, somewhat fleshy, base obtuse, margin somewhat undulate, apex acute; petiole-like base and sheath 5–8 mm. Inflorescence 2–3 cm, pubescent, proximally with 1 lanceolate sterile bract; rachis 1–4-flowered; floral bracts ovate-lanceolate, 4–5 mm, shorter than ovary, abaxially pubescent, margin ciliate. Flowers barely opening, pale white or grayish white; ovary and pedicel cylindrical, 7–8 mm, slightly pubescent. Sepals ovate, 1-veined, connate at base; dorsal sepal cymbiform, 5–6 mm, apex obtuse and recurved; lateral sepals 6–7 mm, oblique, apex obtuse-acute. Petals connivent with dorsal sepal for almost entire length and forming a hood, oblanceolate, oblique, 5–6 × ca. 2 mm, 1-veined, base slightly contracted, apex obtuse; lip Y-shaped, 7–8 × ca. 3 mm, 3-partite; hypochile dilated, concave-saccate, ca. 3 × 3 mm; calli oblong, truncate, entire to slightly emarginate; mesochile ca. 2 × 1 mm, glabrous, margin involute, minutely crenulate; epichile distinctly 2-lobed; lobes diverging widely, oblong, 2–3 × 1–1.5 mm. Fl. Jul–Aug.

- Damp places in forests; 2800–3800 m. W Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, S Vietnam].

### 13. **HETAERIA** Blume, Bijdr. 409. 1825 [*“Etaeria”*], nom. cons.

翻唇兰属 fan chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Cerochilus* Lindley; *Goodyera* sect. *Rhamphidia* Lindley; *Rhamphidia* (Lindley) Lindley.

Herbs, terrestrial. Rhizome ascending, elongate, several noded, fleshy; roots arising from rhizome nodes, elongate, fleshy, pubescent. Stem glabrous, leafy. Leaves subrosulate or scattered along stem, narrowly ovate to elliptic, usually asymmetric, membranous to slightly fleshy, with a petiole-like base dilating into tubular amplexicaul sheath. Inflorescence pubescent, with a few scattered sheathing sterile bracts and several to many flowers in a terminal raceme. Flowers not resupinate; ovary not (or rarely slightly) twisted, glabrous or pubescent. Sepals free, similar, outer surface glabrous or pubescent; lateral sepals embracing base of lip. Petals connivent with dorsal sepal and forming inverted hood, usually narrower than sepals, membranous; lip adnate to margin of column, 2-partite or with a short mesochile and 3-partite; hypochile concave, saccate or cupular, containing 1 to several papillose, warty or lamellate calli on either side of midvein; mesochile (when present) with involute margin; epichile entire and tapering or 2-lobed. Column short, with thin to fleshy winglike appendages at apical margin; anther ovoid, 2-locular; pollinia 4, in 2 pairs, clavate, granular-farinaceous, basally attenuate into short caudicles, attached to solitary ovate viscidium; rostellum erect, relatively long, bifid; stigma lobes separate and placed at apical corners of column. Capsule erect, fusiform.

- About 30 species: tropical Africa and Asia, extending to New Guinea, NE Australia, and the Pacific islands; six species in China.

Records of *Hetaeria cristata* Blume from Taiwan and Hong Kong are based on misidentifications of *Rhomboda tokioi* and *R. abbreviata*, respectively (see p. 68).

- 1a. Lip 3-partite; mesochile short, slender, with involute margin; epichile enlarged, with 2 suborbicular lobes  
ca.  $2.5 \times 2.5$  mm ..... 1. *H. anomala*
- 1b. Lip 2-partite, lacking a mesochile; epichile very small, entire.
- 2a. Epichile narrowly linear or slightly dilated and broadly ovate; petals obliquely (sub)spatulate.
- 3a. Leaves 7.5–13 cm; epichile broadly ovate, ca. 0.5 mm; hypochile calli fleshy, oblong, 2–4-lobed ..... 5. *H. affinis*
- 3b. Leaves 6–7 cm; epichile narrowly linear, ca. 1.8 mm; hypochile calli lamellate, suboblong, toothed ..... 6. *H. obliqua*
- 2b. Epichile abruptly attenuate; petals obliquely obovate or rhombic-obovate.
- 4a. Leaves 8–11 cm; dorsal sepal ca. 3.5 mm; epichile ca. 0.5 mm, lateral margin not involute, apex  
subacute ..... 4. *H. oblongifolia*
- 4b. Leaves 3–9 cm; dorsal sepal 5–7 mm; epichile 1–1.8 mm, lateral margin involute, apex  
acuminate-apiculate.
- 5a. Sepals weakly pubescent on outer surface; hypochile calli papillose, hooked, not divided ..... 2. *H. finlaysoniana*
- 5b. Sepals densely pubescent on outer surface; hypochile calli warty, 2- or 3-lobed ..... 3. *H. youngsayei*

**1. *Hetaeria anomala*** Lindley, J. Proc. Linn. Soc., Bot. 1: 185. 1857 [“*Aetheria*”].

四腺翻唇兰 si xian fan chun lan

*Hetaeria biloba* (Ridley) Seidenfaden & J. J. Wood; *H. grandiflora* Ridley; *H. hainanensis* Tang & F. T. Wang; *H. rotundiloba* J. J. Smith; *Heterozeuxine rotundiloba* (J. J. Smith) C. S. Leou; *Zeuxine biloba* Ridley.

Plants 28–34 cm tall. Stem 3–7-leaved. Leaves scattered along stem, ovate-lanceolate,  $3.5\text{--}7 \times 1.1\text{--}2$  cm, 3-veined, base obtuse, apex acute or acuminate; petiole-like base and sheath 1.5–2 cm. Inflorescence erect, villous, with 1–3 sterile bracts; rachis laxly to subdensely 4–20-flowered, 2–10 cm; floral bracts lanceolate, ca. 7 mm, abaxially villous, margin ciliate. Flowers white; ovary not twisted, often arcuate, subcylindric or ellipsoid, 7–8 mm including pedicel, hispid. Sepals ca. 5 mm, abaxially sparsely hispid, 3-veined; dorsal sepal elliptic, concave, ca. 2 mm wide, apex acute; lateral sepals ovate, somewhat oblique, ca. 2.4 mm wide, apex acute. Petals linear, ca.  $5 \times 0.6$  mm, glabrous, 1-veined, apex obtuse; lip ca. 5 mm, 3-partite; hypochile concave to shallowly saccate, 5-veined, lateral veins each with 1 lamellate, transversely oblong, hooked callus; mesochile short, ca. 1 mm, margin involute; epichile dilated, ca. 6 mm wide, 2-lobed; lobes strongly revolute but divaricate in unfolded state, suborbicular, ca.  $2.5 \times 2.5$  mm, apex slightly emarginate. Column ca. 3 mm; wings reduced; rostellum arms ca. 1.5 mm. Fl. Feb–Mar.

Dense or sparse forests; 800–1000 m. Hainan, C and S Taiwan [NE India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**2. *Hetaeria finlaysoniana*** Seidenfaden, Contr. Orchid Fl. Thailand 13: 10. 1997.

长序翻唇兰 chang xu fan chun lan

*Goodyera elongata* Lindley, Gen. Sp. Orchid. Pl. 494. 1840; *Hetaeria elongata* (Lindley) J. D. Hooker (1890), not (Blume) Miquel (1859); *Rhamphidia elongata* (Lindley) Lindley.

Plants 30–35 cm tall. Stem 4- or 5-leaved. Leaves scattered along stem, oblong to narrowly elliptic, slightly to strongly unequal,  $6\text{--}9 \times 2.5\text{--}4$  cm, base obtuse-rounded, apex acute; petiole-like base and sheath 1.5–3 cm. Inflorescence elongate,

15–22 cm, slender, pubescent; sterile bracts 2 or 3, pink, lanceolate, abaxially weakly pubescent; rachis 8–12 cm, subdensely many flowered; floral bracts pink, lanceolate, 8–9 mm, slightly shorter than ovary, abaxially weakly pubescent, apex acuminate. Flowers half opening, small; ovary subcylindric, not twisted, 10–11 mm including pedicel, densely pubescent. Sepals pink to whitish, outer surface weakly pubescent, 3-veined; dorsal sepal oblong to ovate-oblong, concave,  $5\text{--}6 \times 2.8\text{--}3$  mm, apex obtuse; lateral sepals obliquely oblong to ovate-oblong,  $5\text{--}6 \times 2.8\text{--}3$  mm, apex obtuse. Petals white, obliquely rhombic-obovate,  $5\text{--}6 \times$  ca. 2.5 mm, 2-veined, apex narrowed and apiculate; lip cymbiform, suboblong to oblong-lanceolate,  $4\text{--}4.5 \times 2\text{--}2.3$  mm; hypochile saccate, 5-veined, lateral veins each with 1–3 papillose, hooked calli near base; epichile attenuate, ca. 1.8 mm, lateral margin involute, apex acuminate-apiculate. Column ca. 2 mm; wings subsquare to oblong flaps; rostellum arms ca. 1 mm. Fl. Sep–Oct.

Dense forests. SW Guangxi, Hainan [Sri Lanka, Thailand].

**3. *Hetaeria youngsayei*** Ormerod, Oasis Suppl. 3: 7. 2004.

香港翻唇兰 xiang gang fan chun lan

*Hetaeria shiuyingiana* L. Li & F. W. Xing.

Plants 20–40 cm tall. Stem slender, 2–5-leaved. Leaves cauline or crowded at stem apex, broadly ovate, oblique,  $3\text{--}8 \times 2\text{--}4$  cm, 3-veined, base obliquely obtuse, apex shortly acuminate; petiole-like base and sheath 2–3 cm. Inflorescence 20–22 cm, slender, villous; sterile bracts 3 or 4, pinkish brown, lanceolate, glabrous; rachis subdensely 14–20-flowered, 7–9 cm, glandular pubescent; floral bracts lanceolate, 7–9 mm, shorter than ovary, puberulent, apex acuminate. Flowers half opening; ovary and pedicel held close to rachis, olive-green, subcylindric, not twisted, 8–10 mm, densely glandular pubescent. Sepals pink, tinged olive-green at base, ovate, outer surface densely glandular pubescent, 3-veined, apex acute; dorsal sepal  $5\text{--}7 \times 2\text{--}4$  mm, apex recurved; lateral sepals oblique,  $5\text{--}6 \times$  ca. 2 mm. Petals spreading, white, obliquely obovate,  $4\text{--}6 \times 2.2\text{--}3$  mm, 1-veined, apex obtuse; lip broadly ovate-cymbiform,  $4.5\text{--}5$  mm, fleshy, 2-partite; hypochile yellowish, concave, ca.  $3 \times 2.5$  mm, containing several warty, 2- or 3-lobed calli, 5-veined, distal margin slightly involute; epichile white, 1–1.5 mm, attenuate, margin involute, apex acuminate-apiculate. Column ca. 2 mm, stout; wings broad, oblong flaps; rostellum arms ca. 1 mm. Fl. Mar–Apr.

Forests, ravines; 600–900 m. Hainan, Hong Kong [Thailand].

This taxon has been confused with *Hetaeria nitida* Ridley (J. Linn. Soc., Bot. 32: 404. 1896). See Ormerod (Oasis Suppl. 3: 7. 2004) and Li and Xing (Novon 19: 187–190. 2009) for further discussion.

#### 4. *Hetaeria oblongifolia* Blume, Bijdr. 410. 1825.

矩叶翻唇兰 ju ye fan chun lan

*Epipactis discoidea* (H. G. Reichenbach) A. A. Eaton; *E. erimae* (Schlechter) A. A. Eaton; *Goodyera discoidea* (H. G. Reichenbach) Schlechter; *G. erimae* Schlechter; *Hetaeria discoidea* (H. G. Reichenbach) Schlechter; *H. erimae* (Schlechter) Schlechter; *H. forcipata* H. G. Reichenbach; *H. helferi* J. D. Hooker; *H. micrantha* Blume; *H. pauciseta* J. J. Smith; *H. raymundii* Schlechter; *H. rubicunda* H. G. Reichenbach; *H. samoensis* Rolfe; *H. similis* Schlechter; *H. tenuis* (Lindley) Benthams; *Rhamphidia discoidea* H. G. Reichenbach; *R. rubicunda* (H. G. Reichenbach) H. G. Reichenbach (1868), not (Blume) F. Mueller (1869); *R. tenuis* Lindley.

Plants 30–50 cm tall. Stem fleshy, 4–6-leaved. Leaves cauline, oblong, oblique, 8–11 × 2.5–4.1 cm, 3-veined, base obliquely obtuse or rounded, apex acute; petiole-like base and sheath 2.8–3.3 cm. Inflorescence 24–26 cm, slender, pubescent; sterile bracts 4, pinkish brown, lanceolate, glabrous to sparsely pubescent; rachis subdensely 30–40-flowered, 8–10 cm, pubescent; floral bracts lanceolate, 7–9 mm, subequal in length to ovary, puberulent, margins ciliate below middle, apex acuminate. Flowers half opening; ovary and pedicel held close to rachis, olive-green, subcylindric, not twisted, 4.5–5.5 mm, densely pubescent. Sepals white, tinged light yellowish green at base, broadly ovate, outer surface densely pubescent, apex obtuse; dorsal sepal ca. 3.5 × 2.5 mm; lateral sepals oblique, ca. 4 × 2.2 mm. Petals incurved at apex, white, narrowly rhombic-ovate, falcate, ca. 4 × 1.3 mm, apex subacute; lip cream-colored, broadly ovate-cymbiform, ca. 4 mm, 2-partite, fleshy toward apex; hypochile saccate, ca. 3.5 mm, containing 8–10 papillous calli, distal margin involute; epichile ligulate, attenuate, ca. 0.5 mm, apex subacute. Column ca. 2.2 mm, stout; wings small, ovate; rostellum arms small, linear, ca. 0.5 mm. Fl. Mar–Apr.

Montane forests; ca. 200 m. S Taiwan (Lan Yu) [Indonesia, S Japan, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; Australia, SW Pacific islands].

#### 5. *Hetaeria affinis* (Griffith) Seidenfaden & Ormerod, Oasis Suppl. 2: 9. 2001.

滇南翻唇兰 dian nan fan chun lan

*Goodyera affinis* Griffith, Not. Pl. Asiat. 3: 391. 1851; *Cerochilus rubens* Lindley; *Hetaeria rubens* (Lindley) Benthams

ex J. D. Hooker; *Rhamphidia rubens* (Lindley) Lindley.

Plants 25–45 cm tall. Stem somewhat robust, with 6–8 well-spaced leaves. Leaves ovate or elliptic, slightly oblique, 7.5–13 × 3.5–5.5 cm, 5-veined, base obtuse, apex acute; petiole-like base and sheath 2.5–5 cm. Inflorescence 16–28 cm, slender, pubescent; sterile bracts 3–5, lanceolate, abaxially weakly pubescent; rachis densely many flowered, 7–14 cm, densely glandular pubescent; floral bracts lanceolate, 7–8 × ca. 3 mm, nearly as long as ovary, puberulent, apex acuminate. Flowers opening slightly, small; ovary and pedicel subcylindric, not twisted, 8–9 mm, densely glandular pubescent. Sepals green, adaxial apex tinged with pink, outer surface densely glandular pubescent; dorsal sepal broadly ovate, cymbiform, ca. 5 × 3.5 mm, 3-veined, apex obtuse to acute; lateral sepals broadly ovate, concave, slightly oblique, ca. 4.2 × 3.2 mm, 1-veined, apex obtuse. Petals white, obliquely spatulate, ca. 4.5 × 1.6 mm, 1-veined, apex slightly mucronate; lip lageniform-ovate, ca. 3.5 mm, 2-partite; hypochile dilated, concave, ca. 3 × 3.8 mm, 1-veined, containing a solitary, warty, 2–4-lobed callus on either side of midvein, distal margin slightly involute; epichile dilated, broadly ovate, ca. 0.5 × 0.8 mm, apex obtuse. Column ca. 2 mm; wings small, narrow; rostellum arms to 0.8 mm. Fl. Mar–Apr.  $2n = 22, 24, 42$ .

Dense forests; 800–1000 m. S and SE Yunnan [Bhutan, NE India, N Myanmar, Thailand, Vietnam].

#### 6. *Hetaeria obliqua* Blume, Coll. Orchid. 104. 1859.

斜瓣翻唇兰 xie ban fan chun lan

*Dossinia obliqua* (Blume) Miquel.

Plants 30–37 cm tall. Stem 4- or 5-leaved. Leaves scattered along stem, elliptic to oblong-ovate, oblique, 6–7 × 2.5–3.5 cm, base obtuse-rounded, apex acute; petiole-like base and sheath 2–2.5 cm. Inflorescence 18–23 cm, pubescent, with 4 or 5 sterile bracts; rachis 8–11 cm, with many densely arranged flowers; floral bracts lanceolate, 6–7 mm, shorter than ovary, abaxially puberulent, apex acuminate. Flowers small; ovary subcylindric, not twisted, 8–9 mm including pedicel, pubescent. Sepals 3-veined, outer surface pubescent; dorsal sepal ovate, concave, ca. 5.8 × 3 mm, apex obtuse; lateral sepals ovate-oblong, ca. 5.5 × 2.1 mm, apex obtuse. Petals white, obliquely subspatulate, ca. 5 × 1.6 mm, glabrous, 1-veined, apex obtuse; lip white, suboblong, cymbiform, ca. 4.5 × 2 mm; hypochile concave, 3-veined, lateral veins each with 1 or 2 suboblong, lamellate, toothed calli toward base; epichile a narrow, sublinear blade, ca. 1.8 mm, lateral margin involute. Column 2.5–3 mm; wings shallow, broad; rostellum arms linear, ca. 1.2 mm. Fl. Mar.

Dense forests. Hainan [Indonesia, Malaysia, Thailand].

## 14. RHOMBODA Lindley, J. Proc. Linn. Soc., Bot. 1: 181. 1857.

菱兰属 ling lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

Herbs, terrestrial or rarely epiphytic. Rhizome creeping, several noded, fleshy; roots fibrous, villous, arising from rhizome nodes. Stem erect, glabrous, with a few tubular sheaths at base, leafy. Leaves usually crowded at stem apex, green-red, midvein often

white, lanceolate, ovate, or elliptic, oblique, apex acute, with a petiole-like base dilating into tubular amplexicaul sheath. Inflorescence erect, terminal, racemose, pubescent; peduncle with a few scattered sheathing bracts; rachis laxly to subdensely few to many flowered; floral bracts sparsely pubescent. Flowers not opening widely, obliquely resupinate or not resupinate; ovary and pedicel not twisted, glabrous to sparsely pubescent. Sepals free, similar, ovate-elliptic, outer surface glabrous to sparsely pubescent. Petals connivent with dorsal sepal and forming a hood, often broadly dilated, membranous; lip adnate to ventral margin of column, 2-partite or with a short mesochile and 3-partite; hypochile saccate, with a low, longitudinal carina along midvein forming a large, raised bicarinate callus toward apex of hypochile, and with 1 fleshy, undivided callus on either side near base; exterior of hypochile with fleshy flanges; mesochile (when present) short, margin involute; epichile linear, quadrate or transversely dilated, simple or 2-lobed. Column short, abruptly dilated apically, with 2 large, parallel wings; anther ovoid, 2-locular; pollinia 2, clavate, attached to a solitary, small, ovate viscidium; rostellum deltoid, short, broad, remnant shortly bifid; stigma lobes 2, separate, placed laterally at column apex, convex. Capsule erect.

About 25 species: from the Himalayas and NE India, across S and SE China to S Japan, and throughout SE Asia to New Guinea and the SW Pacific islands; four species (one endemic) in China.

The genus *Rhomboda* was recently reinstated by Ormerod (Orchadian 11: 323–339. 1995), having been neglected (with its constituent taxa being variously referred to *Hetaeria*, *Zeuxine*, or *Odontochilus*) for over a century. Species belonging to *Rhomboda* can be distinguished by the medial bicarinate callus within the hypochile of the lip (in addition to the two large, often stalked, basal calli) in combination with the flanges on the exterior surfaces of the hypochile and the presence of two large wings on the column. Most of the Chinese species remain poorly known.

- 1a. Lip oblong-ovate or broadly ovate, 3–3.5 mm; mesochile lacking or to 0.5 mm and often indistinct; epichile small, broadly elliptic, subquadrate, or obtriangular, 0.4–0.8 mm wide, narrower than hypochile.  
 2a. Epichile broadly elliptic to subquadrate, tapering, apex obtuse ..... 1. *R. tokioi*  
 2b. Epichile obtriangular, apex truncate with acute corners and sometimes a small apiculate extension at center ..... 2. *R. abbreviata*  
 1b. Lip T-shaped, 6–7 mm, distinctly 3-partite; mesochile 1–1.8 mm; epichile transversely dilated, ca. 6 mm wide, wider than hypochile.  
 3a. Hypochile 3–3.5 × 3.2–4 mm; epichile lobes obovate, apex irregularly denticulate ..... 3. *R. moulmeinensis*  
 3b. Hypochile ca. 5 × 4.6 mm; epichile lobes subquadrate, apex rounded ..... 4. *R. fanjingensis*

**1. *Rhomboda tokioi*** (Fukuyama) Ormerod, Austral. Orchid. Rev. 63(4): 11. 1998.

白肋菱兰 bai lei ling lan

*Hetaeria tokioi* Fukuyama, Bot. Mag. (Tokyo) 48: 434. 1934; *Goodyera pogonorrhyncha* Handel-Mazzetti; *H. cristata* Blume var. *minor* Rendle; *H. cristata* var. *tokioi* (Fukuyama) S. S. Ying; *Rhomboda pogonorrhyncha* (Handel-Mazzetti) Ormerod.

Plants 15–28 cm tall. Stem dark reddish brown, 5–9 cm, 4–6-leaved. Leaves abaxially pale green, adaxially sometimes with a white stripe along midvein, ovate to ovate-lanceolate, 3–9 × 1.5–4 cm; petiole-like base and tubular sheath 1–3 cm. Peduncle 5–15 cm, with 1–4 sterile bracts; rachis 3–6 cm, laxly 3–15-flowered; floral bracts brownish red, ovate-lanceolate, 5–8 × 2.5–3 mm, lower ones exceeding ovary, margin ciliate, apex acuminate. Flowers half opening, not resupinate, small; ovary and pedicel 7–10 mm, glabrous to sparsely pubescent. Sepals reddish brown, glabrous to sparsely pubescent, 1-veined; dorsal sepal broadly ovate, 2.8–3 × 1.5–2 mm, apex acute; lateral sepals ovate, oblique, 3.2–4 × 2–2.3 mm, apex acute. Petals white, ovate, oblique, sides extremely unequal, 2.8–3 × ca. 2 mm, glabrous, 1-veined, apex acute; lip white, oblong-ovate, cymbiform, 3–3.5 mm, 2-partite; hypochile concave-saccate, 2–2.5 × 1.8–2 mm, containing 2 large hornlike calli near base; carina low, forming a fleshy bicarinate callus toward apex of hypochile; epichile broadly elliptic to subquadrate, tapering, ca. 1 × 0.4–0.8 mm, margin involute, apex obtuse; disk irregularly papillose. Column ca. 1.5 mm. Fl. Sep–Oct.  $2n = 42$ .

Forests; below 1500 m. Guangdong, C and N Taiwan [Japan, Vietnam].

Plants of this species from Taiwan were misidentified in Fl. Taiwan (5: 1033. 1978; ed. 2, 5: 926. 2000) and FRPS (17: 183–185. 1999) as *Hetaeria cristata* Blume (*Rhomboda cristata* (Blume) Ormerod). True *Rhomboda cristata* is known only from Indonesia (Java).

**2. *Rhomboda abbreviata*** (Lindley) Ormerod, Orchadian 11: 329. 1995.

小片菱兰 xiao pian ling lan

*Hetaeria abbreviata* Lindley, Gen. Sp. Orchid. Pl. 481. 1840; *Anoetochilus abbreviatus* (Lindley) Seidenfaden; *Hetaeria abbreviata* (Lindley) J. J. Smith; *Odontochilus abbreviatus* (Lindley) Tang & F. T. Wang; *Zeuxine abbreviata* (Lindley) J. D. Hooker.

Plants 15–30 cm tall. Stem dark green, 4–5 cm, 3–5-leaved. Leaves abaxially pale green, sometimes tinged with red, adaxially dark green, ovate-lanceolate, 4–8 × 2–3 cm, apex acute to acuminate; petiole-like base and tubular sheath 1–2 cm. Peduncle 8–10 cm, with 2 or 3 sterile bracts; rachis 3–7 cm, laxly 8–12-flowered; floral bracts pinkish red, ovate, 7–10 × ca. 2.5 mm, shorter than to equal to ovary, margin ciliate, apex acuminate. Flowers half opening, obliquely resupinate, small; ovary and pedicel 9–11 mm, glabrous. Sepals greenish white, glabrous to sparsely pubescent, 1-veined; dorsal sepal broadly ovate, 2.5–3.5 × 1.5–2 mm, apex acute; lateral sepals spreading, ovate, slightly oblique, ca. 4 × 2.2 mm, apex acute. Petals white, ovate-lanceolate, oblique, sides unequal, 2.5–3.5 × 1.2–1.4 mm, glabrous, 1-veined, apex abruptly narrowed into a

short apiculus; lip white, broadly ovate, cymbiform, 3–3.5 mm, obscurely 3-partite; hypochile concave-saccate, ca. 2.5 × 2–2.2 mm, containing 2 oblong-ellipsoid calli near base; carina low, forming a 2-laminate callus toward apex of hypochile; mesochile short and often indistinct, ca. 0.5 mm, margin involute; epichile obtriangular, ca. 1.2 × 0.8 mm, margin involute, apex truncate with acute corners and sometimes a small apiculate extension at center. Column ca. 2 mm. Fl. Aug–Sep.

Forests, valleys; 600–1200 m. Guangdong, Guangxi, Guizhou, Hainan [NE India, Myanmar, Nepal, Thailand].

Plants of this species from Hong Kong were misidentified in Gen. Orchidaceae Hong Kong (49. 1977) and FRPS (17: 183–185. 1999) as *Hetaeria cristata* Blume (*Rhomboda cristata* (Blume) Ormerod). See also the comment under *R. tokioi* above.

**3. *Rhomboda moulemeinensis*** (E. C. Parish & H. G. Reichenbach) Ormerod, *Orchadian* 11: 325. 1995.

艳丽菱兰 yan li ling lan

*Hetaeria moulemeinensis* E. C. Parish & H. G. Reichenbach, *Trans. Linn. Soc. London* 30: 142. 1874; *Anoectochilus moulemeinensis* (E. C. Parish & H. G. Reichenbach) Seidenfaden; *A. multiflorus* Rolfe ex Downie; *Odontochilus moulemeinensis* (E. C. Parish & H. G. Reichenbach) Tang & F. T. Wang; *O. multiflorus* (Rolfe ex Downie) Tang & F. T. Wang; *Zeuxine moulemeinensis* (E. C. Parish & H. G. Reichenbach) J. D. Hooker.

Plants 16–35 cm tall. Stem dark reddish brown, 4–11 cm, 5–7-leaved. Leaves abaxially grayish green, adaxially green with a broad white stripe along midvein, ovate-elliptic to ovate-lanceolate, 3–11 × 1.5–3.5 cm, apex acute or acuminate; petiole-like base and tubular sheath 1.5–4 cm. Peduncle 10–22 cm, with 1–3 pale red sterile bracts, sometimes densely villous; rachis 2–6 cm, laxly 5–16-flowered; floral bracts pale red, ovate to ovate-lanceolate, 5–10 × ca. 2.5 mm, shorter than to equal to ovary, margin ciliate, apex acuminate. Flowers spreading, obliquely resupinate, medium-sized; ovary and pedicel 8–11 mm, purplish green, glabrous to sparsely pubescent. Sepals pale red, glabrous, 1-veined; dorsal sepal erect, broadly ovate, cymbiform, 5.5–7 × 2.5–3.2 mm, apex acute to acuminate; lateral sepals spreading, broadly ovate, slightly oblique, 5.8–7.5 × 3–4

mm, apex acuminate. Petals white suffused with pink, broadly subovate, sides extremely unequal, 5.5–7 × 3.5–4 mm, apex apiculate; lip white, T-shaped, 6–7 mm, 3-partite; hypochile saccate, 3–3.5 × 3.2–4 mm, apex truncate or emarginate, containing 2 subglobose calli near base; basal calli shortly stalked, crenulate at apex; carina undulate, forming a fleshy bicarinate callus midway along hypochile; mesochile linear, 1–1.8 mm, slender; epichile transversely dilated, ca. 6 mm wide, 2-lobed; lobes diverging ± at right angles to lip axis, obovate, 2–3 × 1.2–1.8 mm, apex irregularly denticulate; disk irregularly papillose. Column 2.5–3.5 mm. Fl. Aug–Oct.

Damp forests, valleys; 400–2200 m. Guangxi, Guizhou, Sichuan, SE Xizang, Yunnan [Myanmar, Thailand].

**4. *Rhomboda fanjingensis*** Ormerod, *Orchadian* 11: 327. 1995.

贵州菱兰 gui zhou ling lan

Plants ca. 28 cm tall. Stem dark reddish brown, ca. 6.5 cm, 5-leaved. Leaves adaxially green with a narrow white stripe along midvein, ovate-elliptic, 6–8 × 3–4 cm, apex acute; petiole-like base and tubular sheath 2–3 cm. Peduncle ca. 10 cm, with 3 or 4 sterile bracts; rachis ca. 10 cm, laxly 17-flowered; floral bracts pale red, ovate-lanceolate, ca. 9 × 4 mm, shorter than to equal to ovary, margin ciliate, apex acuminate. Flowers half opening, obliquely resupinate, medium-sized; ovary and pedicel ca. 9 mm, glabrous. Sepals pink-red, glabrous, 1-veined; dorsal sepal narrowly ovate-elliptic, ca. 7 × 3.3 mm, apex acuminate; lateral sepals reflexed, ovate-elliptic, oblique, ca. 7 × 2.5–3 mm, apex acute. Petals white suffused with pink, narrowly ovate-oblong, sides extremely unequal, ca. 7 × 2–3 mm, shortly clawed at base, apex acuminate; lip white, irregularly T-shaped, ca. 7 mm, 3-partite; hypochile saccate, ca. 5 × 4.6 mm, apex truncate or emarginate, containing 2 transversely elliptic calli near base; apical lobes rounded, projecting forward beyond base of mesochile; basal calli minutely denticulate; carina low, abruptly arising toward apex of hypochile and forming a laminate, bicarinate callus; mesochile linear, ca. 1 mm, slender; epichile transversely dilated, ca. 6 mm wide, 2-lobed, apiculate; lobes diverging ± at right angles to lip axis, subquadrate, ca. 2.3 × 1.8–2 mm, apex rounded. Column 4–5.5 mm. Fl. Oct–Nov.

• Forests; ca. 500 m. NE Guizhou.

## 15. CHAMAEGASTRODIA Makino & F. Maekawa, *Bot. Mag. (Tokyo)* 49: 596. 1935.

叠鞘兰属 die qiao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, small, holomycotrophic. Rhizome coralloid, fleshy, sometimes branching. Stem ascending or erect, yellow to pale brownish red, tinged purplish red, glabrous, leafless, with overlapping sheathing scales. Inflorescence erect, terminal, racemose, glabrous, several to many flowered; floral bracts membranous, glabrous. Flowers erect, not resupinate, small; ovary fusiform, not twisted, glabrous. Sepals free, ± similar, glabrous; dorsal sepal ovate, usually connivent with petals; lateral sepals enclosing base of lip. Petals oblong to ligulate-lanceolate, nearly as long as dorsal sepal, much narrower than sepals, membranous; lip usually 3-partite and T-shaped, or rarely entire, ovate with unlobed apex; hypochile concave-saccate, containing 2 fleshy calli toward base (1 on either side of midvein); mesochile subtubular, sometimes with narrow lamellate flanges along external lateral margins; epichile bilobed. Column stout, ventrally with 2 triangular-falcate appendages (wings) toward apex; anther ovoid, 2-locular, sessile or rarely attached to column via a slender filament; pollinia 2, each longitudinally parted, granular-farinaceous, sectile, attenuate into slender stalk and attached to a solitary viscidium; rostellum long or short, remnant entire to shortly bifid; stigma lobes confluent to narrowly separated, small to relatively large, raised, placed toward apex of column beneath lower margin of rostellum.

About three species: China, India, Japan, Myanmar, Thailand, Vietnam; three species (one endemic) in China.

Despite the leafless, mycotrophic habit, the shape of the lip and the structure of the column indicate that *Chamaegastrodia* is closely related to *Odontochilus*. Indeed, taxa previously included here (see Seidenfaden, Nordic J. Bot. 14: 293–301. 1994) that were first described in the now defunct genus *Evrardia* have been transferred recently to *Odontochilus* (see Pridgeon et al., Gen. Orchid. 3: 74. 2003). The shape and placement of the column wings in the remaining three species of *Chamaegastrodia* are thought to distinguish them from the rest of *Odontochilus*, though more detailed study, including molecular data, may reveal this distinction to be artificial.

- 1a. Lip narrowly ovate to ovate-oblong, 3–3.5 mm, apex acute to acuminate ..... 1. *C. vaginata*  
 1b. Lip T-shaped, 5–7 mm, with a dilated, 2-lobed epichile.  
 2a. Lip mesochile with external flanges; anther lacking basal lobes, attached to column via a short filament ..... 2. *C. shikokiana*  
 2b. Lip mesochile lacking external flanges; anther with 2 narrowly triangular-lanceolate lobes at base, sessile ..... 3. *C. inverta*

**1. *Chamaegastrodia vaginata*** (J. D. Hooker) Seidenfaden, Nordic J. Bot. 14: 294. 1994.

戟唇叠鞘兰 ji chun die qiao lan

*Aphyllorchis vaginata* J. D. Hooker, Fl. Brit. India 6: 117. 1890; *Chamaegastrodia exigua* (Rolfe) F. Maekawa ex Ormerod; *Evrardianthe exigua* (Rolfe) Rauschert; *Hetaeria exigua* (Rolfe) Schlechter; *Spiranthes exigua* Rolfe.

Plants 4–6 cm tall. Rhizome stout, fleshy. Stem erect, deep red, somewhat slender, with several dark red sheathing scales. Inflorescence 4-flowered; rachis 2–3 cm; floral bracts dark red, oblong-lanceolate, ca. 8 mm, slightly exceeding to subequal in length to ovary, apex subacute. Flowers deep red; ovary and pedicel brownish red, cylindrical-fusiform, 6–8 mm. Dorsal sepal connivent with petals, ovate, concave, ca. 3 × 1.6 mm, 1-veined, apex subobtusate; lateral sepals ovate, oblique, ca. 3.2 × 1.6 mm, 1-veined, apex subobtusate. Petals narrowly oblong to oblong-lanceolate, ca. 3 × 0.8–1 mm, 1-veined, apex obtuse-acute; lip narrowly ovate to ovate-oblong, 3–3.5 × ca. 1.2 mm, base concave and with 2 sessile, elliptic calli, apex unlobed, acute to acuminate. Column stout, with 2 narrowly lanceolate wings toward apex; anther broadly ovoid, sessile; pollinia 2, attached to a narrowly oblong viscidium; rostellum subulate, curved slightly backward, remnant shortly bifid. Fl. Aug.

Along valleys and in damp places in evergreen broad-leaved forests; 1000–1600 m. Hubei, Sichuan [NE India].

The shape of the lip suggests that this entity is probably a semi-peloric form. Seidenfaden (Nordic J. Bot. 14: 293–301. 1994) provides commentary that suggests that its closest relative is *Chamaegastrodia asraoa* (J. Joseph & Abbareddy) Seidenfaden & A. N. Rao, an Indian species now regarded as a member of *Odontochilus*; if so, the validity of *Chamaegastrodia* as an independent genus is questionable.

**2. *Chamaegastrodia shikokiana*** Makino & F. Maekawa, Bot. Mag. (Tokyo) 49: 596. 1935.

叠鞘兰 die qiao lan

*Hetaeria shikokiana* (Makino & F. Maekawa) Tuyama.

Plants 5–18 cm tall. Rhizome 1.2–1.4 cm, stout, 2.5–3.5 mm in diam. Stem erect, yellow to pale brownish red, with a few membranous sheathing scales. Inflorescence few to more than 10-flowered; rachis 3–5 cm; floral bracts yellow to pale brownish red, narrowly ovate-elliptic, 5–8 mm, shorter than ovary, membranous, apex acute. Flowers yellowish brown; ovary and pedicel yellow to pale brownish red, cylindrical-fusiform, 8–10 mm. Sepals 1-veined; dorsal sepal connivent with

petals, ovate, concave, ca. 3 × 1.6 mm, apex obtuse; lateral sepals ovate, oblique, 3–3.5 × 1.8–2 mm, apex obtuse. Petals linear, ca. 3 × 0.6 mm, 1-veined, apex obtuse; lip T-shaped, ca. 4.5 mm, 3-partite; hypochile slightly dilated, concave-saccate, ca. 0.8 mm, containing 2 sessile, subglobose calli at base; mesochile ca. 2 mm, with external flanges; flanges narrow, margin irregularly incised-crenulate; epichile transversely dilated, sub-oblong, ca. 2 × 5 mm, 2-lobed; lobes suboblong, diverging at right angles to axis of lip, ca. 1.5 × 2 mm, margin entire or slightly crenulate, apex truncate or occasionally slightly apiculate. Column short, with 2 triangular, falcate wings toward apex; anther ovoid, attached to column via a short linear filament; rostellum very small. Fl. Jul–Aug.

Damp places in evergreen broad-leaved forests; 2500–2800 m. SW Sichuan, E Xizang [NE India, Japan].

“*Gastrodia shikokiana*” (Makino, Bot. Mag. (Tokyo) 6: 48. 1892) is a nomen nudum and was therefore not validly published.

**3. *Chamaegastrodia inverta*** (W. W. Smith) Seidenfaden, Nordic J. Bot. 14: 297. 1994.

川滇叠鞘兰 chuan dian die qiao lan

*Zeuxine inverta* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 222. 1921; *Evrardianthe inverta* (W. W. Smith) Rauschert; *Hetaeria inverta* (W. W. Smith) Schlechter.

Plants 5–15 cm tall. Rhizome stout, fleshy. Stem erect, pale brownish yellow, with a few brownish yellow sheathing scales. Inflorescence few to more than 10-flowered; rachis 2.5–5.5 cm; floral bracts ovate-lanceolate, 7–9 mm, slightly shorter than ovary, glabrous, apex acute. Flowers orange-yellow; ovary and pedicel brownish yellow, fusiform, 8–10 mm. Dorsal sepal connivent with petals, narrowly oblong, concave, ca. 4 × 1.2 mm, 1-veined, apex obtuse; lateral sepals ovate, oblique, falcate, ca. 4.5 × 1.8 mm, 1-veined, apex subacute. Petals linear to linear-lanceolate, falcate, ca. 4 × 0.5 mm, 1-veined, apex acute; lip T-shaped, 5–6 mm, 3-partite; hypochile slightly dilated, concave-saccate, ca. 1.5 mm, containing 2 domed calli near base; mesochile 2.5–3 mm, lacking external flanges; epichile transversely dilated, suboblong, 1.2–1.6 × ca. 4 mm, 2-lobed; lobes subquadrate, diverging at right angles to axis of lip, ca. 1.5 × 1.5 mm, margin minutely erose, apex truncate. Column short, with 2 triangular-falcate wings; anther ovoid, with 2 narrowly triangular-lanceolate lamellate lobes at base; rostellum erect, remnant bifid. Fl. Jul–Aug.

• Damp places in forests, along valleys; 1200–2600 m. SW Sichuan, C and W Yunnan.

## 16. ZEUXINE Lindley, Orchid. Scelet. 9. 1826 [“*Zeuxina*”], nom. cons.

线柱兰属 xian zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Haplochilus* Endlicher; *Heterozeuxine* T. Hashimoto; *Monochilus* Wallich ex Lindley; *Psychechilos* Breda; *Strateuma* Rafinesque; *Tripleura* Lindley.

Herbs, terrestrial or rarely lithophytic. Rhizome usually elongate, creeping, fleshy, several noded; roots emerging from rhizome nodes, cylindric, stout. Stem erect or ascending, terete, leafy, glabrous. Leaves cauline or subrosulate, withered or pendulous at anthesis in some species, adaxially green to blackish, sometimes with a white stripe along midvein, linear-lanceolate, obliquely ovate-lanceolate, or elliptic, with or without a petiole-like base sheathing stem, sometimes slightly fleshy. Inflorescence glabrous or pubescent, with a few crowded to scattered sheathing bracts and a few to many flowers in a short to elongate terminal raceme; floral bracts usually equal in length to pedicel and ovary. Flowers resupinate or occasionally erect, small, not opening widely; ovary twisted, glabrous or pubescent. Sepals free, similar, outer surface glabrous to pubescent; dorsal sepal concave, forming a hood with petals; lateral sepals enclosing base of lip. Petals connivent with dorsal sepal, nearly as long as dorsal sepal though usually narrower; lip usually adnate to column margin at base, 2- or 3-partite or rarely entire; hypochile concave-saccate to cymbiform, containing 1 to a few scalelike, subulate or lamellate calli on each side at base; mesochile (when present) short, margin often involute and forming a tube, externally glabrous or pubescent and sometimes with a lamellate flange on each side; epichile dilated, entire to 2-lobed. Column short, dilated, with or without a pair of lateral wings; anther ovoid, 2-locular; pollinia 2, each longitudinally parted, granular-farinaceous, sectile, attached either directly to viscidium or via a short tegula; viscidium ligulate-lanceolate to ovate; rostellum conspicuous, erect, bifid; stigma lobes separate, convex, lateral or at apical corners of column. Capsule erect.

About 80 species: tropical and S Africa, through tropical and subtropical Asia, to New Guinea, NE Australia, and the SW Pacific islands; 14 species (two endemic) in China; two additional species (both endemic) are incompletely known.

This is a taxonomically complex group and further analysis of collections from throughout Asia is necessary before nomenclatural stability can be achieved.

- 1a. Leaves linear to linear-lanceolate, not stalked, base directly sheathing stem.
  - 2a. Plants 4–24 cm tall; ovary and sepals glabrous ..... 1. *Z. strateumatika*
  - 2b. Plants 20–35 cm tall; ovary and sepals pubescent ..... 2. *Z. membranacea*
- 1b. Leaves ovate-lanceolate to elliptic, base contracted into a petiole-like stalk sheathing stem.
  - 3a. Lip entire, rhombic, not adnate to column, base contracted and lacking calli ..... 3. *Z. integrilabella*
  - 3b. Lip 2- or 3-partite, base adnate to column, hypochile concave and containing 2 or more subulate, lamellate, or 2- or 3-digitate calli near base.
    - 4a. Epichile of lip transversely dilated but as broad as or narrower than hypochile, entire to shallowly 2-lobed.
      - 5a. Ovary sparsely hairy; sepals hairy abaxially ..... 5. *Z. philippinensis*
      - 5b. Ovary glabrous; sepals glabrous.
        - 6a. Leaves with a white line along midvein; inflorescence subdensely flowered; lip with a much-reduced mesochile; mesochile margin membranous, glabrous ..... 4. *Z. goodyeroides*
        - 6b. Leaves lacking a white line along midvein; inflorescence laxly flowered; lip lacking a mesochile, apical margin of hypochile fleshy, papillose ..... 6. *Z. agyokuana*
    - 4b. Epichile of lip dilated, broader than hypochile, distinctly 2-lobed.
      - 7a. Plants robust, 30–50 cm tall; leaves 5–12 × 3–7 cm; lateral sepals 8–9 mm ..... 7. *Z. odorata*
      - 7b. Plants slender to somewhat stout, to 35 cm tall; leaves 2–6 × 1–3 cm; lateral sepals 3–7.5 mm.
        - 8a. Midvein of leaves marked with silvery blotches or a white line (also on lateral veins in *Z. gengmanensis*); leaves not usually withering at anthesis.
          - 9a. Stem stout, ca. 5 mm in diam.; lateral veins of leaves marked with white lines; flowers pink; hypochile containing 2 short, rounded calli ..... 8. *Z. gengmanensis*
          - 9b. Stem slender, 1–2 mm in diam.; lateral veins of leaves without white lines; flowers white or pale yellow; hypochile containing 2 2- or 3-digitate to narrowly lamellate calli ..... 9. *Z. nervosa*
      - 8b. Leaves uniformly green or occasionally tinged with red, withering and pendulous at anthesis.
        - 10a. Lip T-shaped; epichile lobes diverging at right angles to axis of lip.
          - 11a. Lip white ..... 10. *Z. parvifolia*
          - 11b. Lip saffron ..... 11. *Z. flava*
        - 10b. Lip Y-shaped; epichile lobes diverging at acute angles to axis of lip; epichile not mucronate at apex.
          - 12a. Lip 7–9 mm; hypochile containing 2 lamellate calli, each often with a linear extension; epichile lobes 3–5.5 mm; column wings lacking ..... 12. *Z. grandis*
          - 12b. Lip to 6 mm; hypochile containing 2 subulate, hooked calli; epichile lobes 2–3 mm; column with triangular or transversely oblong wings.

- 13a. Lip straight, or epichile rotated gently downward; epichile lobes obovate-flabellate, 2–2.5 × 2–2.2 mm ..... 13. *Z. affinis*  
 13b. Epichile reflexed sharply downward from apex of mesochile; epichile lobes oblong to irregularly rhombic, 2.5–3 × 1.2–1.8 mm ..... 14. *Z. reflexa*

**1. *Zeuxine strateumatica*** (Linnaeus) Schlechter, Bot. Jahrb. Syst. 45: 394. 1911.

线柱兰 xian zhu lan

*Orchis strateumatica* Linnaeus, Sp. Pl. 2: 943. 1753; *Adenostylis emarginata* Blume; *A. integerrima* Blume; *A. strateumatica* (Linnaeus) Ames; *A. sulcata* (Roxburgh) Hayata; *Neottia strateumatica* (Linnaeus) R. Brown; *Pterygodium sulcatum* Roxburgh; *Spiranthes strateumatica* (Linnaeus) Lindley; *Tripleura pallida* Lindley; *Zeuxine bonii* Gagnepain; *Z. bracteata* Wight; *Z. brevifolia* Wight; *Z. emarginata* (Blume) Lindley; *Z. integerrima* (Blume) Lindley; *Z. procumbens* Blume; *Z. robusta* Wight; *Z. rupicola* Fukuyama; *Z. stenochila* Schlechter; *Z. strateumatica* f. *rupicola* (Fukuyama) T. Hashimoto; *Z. strateumatica* var. *rupicola* (Fukuyama) S. S. Ying; *Z. sulcata* (Roxburgh) Lindley; *Z. tripleura* Lindley; *Z. wariana* Schlechter.

Plants 4–24 cm tall, slender. Rhizome short. Stem erect or ascending, pale brown, with several to many leaves. Leaves cauline, usually clustered and overlapping, pale brown, linear to linear-lanceolate, sometimes bractlike, 2–8 × 0.2–0.6 cm, base directly sheathing stem, not stalked, apex acuminate. Inflorescence 2–7 cm, glabrous, with a few to more than 20 densely arranged flowers; floral bracts reddish brown, ovate-lanceolate, 8–12 mm, longer than flower, glabrous, apex long acuminate. Flowers resupinate, white or yellowish white, small; ovary and pedicel elliptic-cylindric, 5–6 mm, glabrous. Sepals glabrous; dorsal sepal narrowly ovate-oblong, concave, 4–6 × 2–3 mm, 1-veined, apex obtuse; lateral sepals obliquely oblong, 4–5.5 × 1.5–2.5 mm, 1-veined, apex acute or obtuse. Petals subovate to obovate, oblique, 4–5.5 × 1.5–1.8 mm, glabrous, 1-veined, apex obtuse; lip pale yellow to yellow, cymbiform, 4–5 mm, 3-partite; hypochile concave-saccate, containing 2 subtriangular, lamellate calli; mesochile ca. 1 mm, exterior surfaces minutely papillate toward apex, margin denticulate, involute; epichile transversely elliptic-oblong, 1.4–1.8 × 2–2.5 mm, minutely papillate, apex with a small mucro to slightly emarginate. Column ca. 1.5 mm; wings longitudinally oblong; rostellum arms ca. 0.6 mm. Capsule pale brown, elliptic, ca. 6 mm. Fl. Mar–Jul.  $2n = 20, 22, 40, 42, 50, 100$ .

Damp grasslands, meadows, valleys, along streams; below 1000 m. Fujian, Guangdong, Guangxi, Hainan, Hubei, Sichuan, Taiwan, Yunnan [Afghanistan, Bhutan, Cambodia, India, Japan, Kashmir, Laos, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; SW Asia, Pacific islands].

This is a weed in Saudi Arabia and the United States (Florida, Hawaii).

**2. *Zeuxine membranacea*** Lindley, Gen. Sp. Orchid. Pl. 486. 1840.

膜质线柱兰 mo zhi xian zhu lan

*Zeuxine debrajiana* Sud. Chowdhury; *Z. evrardii* Gagnepain; *Z. godefroyi* H. G. Reichenbach.

Plants 20–35 cm tall, slender. Rhizome short. Stem erect or ascending, pale brown, with several to many leaves. Leaves cauline, usually spaced along stem, pale brown, linear, 4–6 × 0.2–0.6 cm, base directly sheathing stem, not stalked, apex acuminate. Inflorescence 4–11 cm, often puberulent above, with many densely arranged flowers; floral bracts lanceolate, 5–10 mm, lower ones exceeding flower, abaxially pubescent, apex acuminate. Flowers resupinate, white, small; ovary and pedicel elliptic-fusiform, 5–7 mm, pubescent. Sepals puberulent on outer surface; dorsal sepal oblong-lanceolate, concave, ca. 6 × 3 mm, 1-veined, apex acute; lateral sepals oblong, ca. 5.5 × 2.5 mm, apex acute. Petals oblong-ovate, 4–5 × ca. 2.2 mm, glabrous, 1-veined, apex acute; lip white, cymbiform, 4–5 mm, 3-partite; hypochile concave-saccate, containing 2 calli; mesochile short; epichile transversely oblong, ca. 1.2 × 2.5 mm, apex with a small mucro. Column ca. 2 mm. Capsule pale brown, elliptic, ca. 7 mm. Fl. Nov–Jan.

Damp grasslands, meadows, valleys, along streams. Hong Kong [Bhutan, Cambodia, NE India, Myanmar, Thailand, Vietnam].

**3. *Zeuxine integrilabella*** C. S. Leou, Quart. J. Exp. Forest. Natl. Taiwan Univ. 8(4): 2. 1994.

全唇线柱兰 quan chun xian zhu lan

*Hetaeria integrilabella* (C. S. Leou) S. S. Ying.

Plants ca. 27 cm tall, slender. Rhizome usually short. Stem erect or ascending, pale reddish brown, 8–18 × 0.3–0.5 cm, 4- or 5-leaved. Leaves subrosulate, abaxially pale red, adaxially green with a silver-white stripe along midvein, oblong to ovate-elliptic, 2–7 × 1.5–3.5 cm, base obtuse or rounded, apex acute; petiole-like base pale purple, 0.5–1.7 cm including tubular sheath. Inflorescence to 15 cm, with 2 or 3 sterile bracts, tomentose, pale purple; rachis 8–14-flowered; floral bracts ovate, shorter than ovary, margin usually ciliate toward apex. Flowers resupinate; ovary and pedicel subcylindric, 7–8 mm, glabrous. Sepals pale brown, unequal in size, concave, glabrous; dorsal sepal elliptic, ca. 5.5 mm; lateral sepals oblong, ca. 5 mm. Petals white, falcate, 1-veined; lip rhombic, ca. 6 × 4 mm, entire, base contracted, not connate with column, lacking calli. Column 2.5–2.8 mm; wings low, triangular; anther ca. 2.2 mm; pollinia ca. 1.3 mm; rostellum arms ca. 1.2 mm. Fl. Apr.

- Broad-leaved forests; 1000–1800 m. C Taiwan.

The shape of the lip indicates that this taxon is a peloric mutant, with the presence of a silver-white stripe on the leaves and the low column wings suggesting an alliance to *Zeuxine goodyeroides*. More material is required on which to base a critical comparison.

**4. *Zeuxine goodyeroides*** Lindley, Gen. Sp. Orchid. Pl. 486. 1840.

白肋线柱兰 bai lei xian zhu lan

*Monochilus galeatus* Lindley; *M. goodyeroides* (Lindley) Lindley.

Plants 17–30 cm tall, slender to somewhat stout. Rhizome elongate. Stem erect, 4–6-leaved. Leaves cauline, adaxially green, with a white line along midvein, ovate to oblong-ovate, 3–5.5 × 1.8–2.5 cm, base obtuse, apex acute; petiole-like base 1–2 cm including tubular sheath. Inflorescence 9–18 cm, with 1 or 2 widely spaced sterile bracts, puberulent; rachis 2.5–5 cm, with several to more than 10 subdensely arranged flowers; floral bracts pink, ovate, nearly as long as ovary, abaxially glabrous, apex acuminate. Flowers resupinate, white or pink, small; ovary and pedicel fusiform, 9–10 mm, glabrous. Sepals glabrous, 1-veined; dorsal sepal ovate, concave, ca. 5 × 2.5 mm, apex acute; lateral sepals spreading, narrowly oblong-lanceolate, ca. 4.5 × 1–1.4 mm. Petals white, falcate, ca. 4.5 × 1.5 mm, 1-veined, apex subacute; lip white, cymbiform, ca. 4.5 mm, obscurely 3-partite; hypochile dilated, saccate, ca. 2.5 × 2 mm, containing 2 subulate, hooked calli; mesochile short, ca. 0.5 mm, glabrous, margin involute; epichile transversely dilated but narrower than hypochile, suborbicular or subreniform, ca. 1 × 1.8 mm, membranous, entire to shallowly 2-lobed at apex. Column 2–2.4 mm; wings low, transversely oblong; rostellum arms ca. 0.8 mm. Fl. Sep–Oct.

Forests, valleys, crevices on limestone; 1200–2500 m. W Guangxi, SE Yunnan [Bhutan, NE India, Myanmar, Nepal, Vietnam].

**5. *Zeuxine philippinensis*** (Ames) Ames, *Schedul. Orchid. Corrig.* xxxvii. 1938.

菲律宾线柱兰 *fei lü bin xian zhu lan*

*Adenostylis philippinensis* Ames, *Schedul. Orchid.* 6: 9. 1923.

Plants slender, ca. 10 cm tall. Rhizome elongate. Stem ascending, pale red-brown, 2–4-leaved. Leaves adaxially green, midrib white with dark green reticulation, triangular-lanceolate, 3.2–6 × 1.4–2.3 cm, 5-veined, apex acuminate; petiole ca. 1.5 cm. Inflorescence ca. 17 cm, hairy, with 5 sterile bracts; rachis ca. 8 cm, 13-flowered; floral bracts hairy. Flowers half opening, resupinate; ovary sparsely hairy. Sepals hairy abaxially; dorsal sepal concave, light brown, ovate, ca. 5 mm; lateral sepals dark green, ovate-lanceolate, ca. 4 mm. Petals white, falcate, ca. 4.5 mm; lip white, ca. 4 mm, obscurely 3-partite; hypochile ventricose-saccate, ca. 1.7 mm wide, inside containing 2 digitate calli; mesochile short; epichile dilated, reflexed, transverse-oblong or subreniform, ca. 1.7 mm wide, nearly entire at apex. Column ca. 2.2 mm. Fl. Feb–Mar.

Forests; ca. 200 m. S Taiwan [Philippines].

**6. *Zeuxine agyokuana*** Fukuyama, *Bot. Mag. (Tokyo)* 48: 433. 1934.

绿叶线柱兰 *lü ye xian zhu lan*

*Hetaeria agyokuana* (Fukuyama) Nackejima; *H. cristata* Blume var. *agyokuana* (Fukuyama) S. S. Ying.

Plants 10–25 cm tall, slender. Rhizome short. Stem ascending, purplish green, 4- or 5-leaved. Leaves usually clustered at stem apex, abaxially pale green, adaxially deep green, ovate-elliptic, 3–4.5 × 1.5–2 cm, margin undulate, apex acute; petiole-like base 0.8–1.2 cm including tubular sheath. Inflorescence 5–15 cm, with 2 or 3 sterile bracts, reddish brown,

puberulent; rachis 2–6 cm, laxly 3–10-flowered; floral bracts ovate-lanceolate, 6–8 mm, apex acuminate. Flowers resupinate, small; ovary and pedicel reddish, fusiform, 8–10 mm, glabrous. Sepals reddish brown, glabrous; dorsal sepal ovate, concave, 4–5 × 2.8–3 mm, apex acute to obtuse; lateral sepals widely spreading, lanceolate to narrowly ovate, 4–5 × 1.5–1.6 mm, apex acute. Petals white, narrowly obovate, 4–5 × ca. 2.5 mm, apex acute; lip ovate-cymbiform, shorter than sepals, 3–4 × 1.7–2 mm, 2-partite; hypochile concave-saccate, containing 2 subulate, occasionally divided, hooked calli, apical margin of hypochile slightly involute, thickened and distinctly fleshy, outer surface papillose; epichile much reduced, narrower than hypochile, reniform to ovate, 1–1.5 × ca. 1 mm, apex obtuse. Column ca. 3 mm; wings much reduced and indistinct; anther ca. 1.7 mm; rostellum arms narrowly linear, 1.5–2 mm. Fl. Sep.  $2n = 20$ .

Shaded humid places in broad-leaved forests; ca. 900 m. N Taiwan [Japan].

**7. *Zeuxine odorata*** Fukuyama, *Bot. Mag. (Tokyo)* 50: 20. 1936.

香线柱兰 *xiang xian zhu lan*

*Heterozeuxine odorata* (Fukuyama) T. Hashimoto.

Plants robust, 30–50 cm tall. Rhizome elongate, ca. 5 mm in diam. Stem ascending, stout, 4–6-leaved. Leaves cauline, widely spaced or sometimes clustered, not withering at anthesis, obliquely elliptic to ovate-elliptic, 5–12 × 3–7 cm, base rounded, apex acute; petiole-like base 1.5–3.5 cm including tubular sheath. Inflorescence 20–35 cm, with 3 or 4 sterile bracts, puberulent; rachis 5–8 cm, subdensely 10–15-flowered; floral bracts ovate-lanceolate, ca. 15 × 8 mm, pubescent on abaxial surface and margin, apex acuminate. Flowers fragrant, resupinate, half opening, relatively large; ovary and pedicel subcylindric, 8–10 mm, sparsely pubescent. Sepals whitish green, glabrous to puberulent; dorsal sepal ovate, concave, 6–8 × 4–5.5 mm, apex obtuse; lateral sepals obliquely ovate, 8–9 × 4–4.5 mm, apex obtuse to acute. Petals white, obliquely ovate, 7–8 × 3–4.5 mm, apex mucronate; lip white, Y-shaped, 9–9.5 mm, 3-partite; hypochile slightly dilated, saccate, ca. 4 × 3 mm, containing 2 to several lamellate calli; mesochile flat, ca. 1.5 × 1.5 mm, with 2 longitudinal keels; epichile dilated, ca. 3 × 7 mm, 2-lobed; lobes diverging at an acute angle, subsquare to suborbicular, ca. 2.8 × 2.8 mm, margin undulate, yellowish at base. Column 4–4.5 mm; wings quadrate; anther cordate, ca. 2.5 mm; rostellum arms ca. 2 mm. Fl. Apr.  $2n = 20$ .

Shaded humid places in forests; ca. 300 m. S Taiwan [Japan (Ryukyu Islands)].

**8. *Zeuxine gengmanensis*** (K. Y. Lang) Ormerod, *Lindleyana* 17: 238. 2002.

耿马齿唇兰 *geng ma chi chun lan*

*Anoectochilus gengmanensis* K. Y. Lang, *Acta Phytotax. Sin.* 34: 554. 1996.

Plants 18–22 cm tall, somewhat stout. Rhizome elongate. Stem ascending, stout, ca. 5 mm in diam., 5- or 6-leaved. Leaves cauline, not withering at anthesis, abaxially green, adax-

ially dark green, with white line along midvein and lateral veins, ovate to elliptic, 3–5.5 × 2–3 cm, base obliquely cuneate to obtuse, apex acute; petiole-like base 1.5–3 cm including tubular sheath. Inflorescence 8–12 cm, with 2 or 3 sterile bracts, pilose; rachis 5–6 cm, subdensely several to many flowered; floral bracts lanceolate to ovate-lanceolate, slightly shorter than ovary, abaxially puberulent, apex acuminate. Flowers resupinate, pink, small; ovary and pedicel cylindrical-fusiform, 10–12 mm, pubescent. Sepals pubescent; dorsal sepal ovate, concave, ca. 4 × 3 mm, 1-veined; lateral sepals widely spreading, ovate-elliptic, ca. 5.5 × 4 mm, 1-veined. Petals obliquely obovate, ca. 4.5 × 2.2 mm, 1-veined, apex obtuse; lip Y-shaped, ca. 6 mm, 3-partite; hypochile concave-saccate, containing 2 short, rounded calli; mesochile narrow, ca. 0.8 mm; epichile dilated, 2-lobed; lobes diverging at acute angle, quadrate, 2.5–3 × ca. 2 mm. Column ca. 2.8 mm; wings transversely oblong; anther triangular-ovoid, ca. 1.8 mm; rostellum arms ca. 0.5 mm. Fl. May.

- Shaded rocky slopes in forests; ca. 2500 m. SW Yunnan.

**9. *Zeuxine nervosa*** (Wallich ex Lindley) Trimen, J. Ceylon Branch Roy. Asiat. Soc. 9: 90. 1885.

芳香线柱兰 fang xiang xian zhu lan

*Monochilus nervosus* Wallich ex Lindley, Gen. Sp. Orchid. Pl. 487. 1840; *Adenostylis formosana* (Rolfe) Hayata; *A. zamboangensis* Ames; *Haplochilus nervosus* (Wallich ex Lindley) D. Dietrich; *Heterozeuxine nervosa* (Wallich ex Lindley) T. Hashimoto; *Zeuxine cognata* Ohwi & T. Koyama; *Z. fluvida* Fukuyama; *Z. formosana* Rolfe; *Z. hengchuanense* S. S. Ying; *Z. somae* Tuyama; *Z. vittata* Rolfe ex Downie; *Z. zamboangensis* (Ames) Ames.

Plants 20–35 cm tall, slender. Rhizome elongate. Stem erect, 1–2 mm in diam., 3–6-leaved. Leaves clustered at stem apex, not usually withering at anthesis, adaxially green, usually with silvery blotches or a white line along midvein, ovate to ovate-elliptic, 4–6 × 1.5–2.5 cm, apex acute; petiole-like base 1–1.5 cm including tubular sheath. Inflorescence 18–28 cm, with 2 or 3 widely spaced sterile bracts, sparsely villous; rachis 3–10 cm, with a few to more than 10 subdensely arranged flowers; floral bracts reddish brown, ovate-lanceolate, cymbiform, 6–10 × 3–4.5 mm, abaxially puberulent to glabrous, margin ciliate, apex acuminate. Flowers fragrant, resupinate, weakly spreading, small; ovary and pedicel fusiform, 8–9 mm, glabrous to puberulent. Sepals reddish brown to yellowish green, glabrous; dorsal sepal ovate, concave, 5–5.5 × 4.5–5 mm, apex acute or subacuminate; lateral sepals oblong-ovate, 6–6.5 × ca. 3.5 mm, apex acute to obtuse. Petals white, ovate, oblique, ca. 5.5 × 3.2 mm, glabrous, apex obtuse; lip white or pale yellow, Y-shaped, to 7 mm, 3-partite; hypochile concave-saccate, ca. 2.5 × 2.5 mm, containing 2 2- or 3-digitate to narrowly lamellate calli; mesochile relatively long and narrow, ca. 1.5 mm, margin incurved; epichile dilated, ca. 4 mm wide, 2-lobed; lobes diverging at an acute angle, suborbicular, ca. 2 × 2 mm. Column ca. 2.2 mm; wings prominent, broadly triangular; rostellum arms ca. 1.2 mm. Fl. Feb–Mar.  $2n = 20$ .

Damp places in forests; 200–1200 m. S Taiwan, S and SW Yunnan [Bangladesh, Bhutan, Cambodia, NE India, Japan (Ryukyu Islands), Laos, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

**10. *Zeuxine parvifolia*** (Ridley) Seidenfaden, Dansk Bot. Ark. 32(2): 82. 1978.

白花线柱兰 bai hua xian zhu lan

*Hetaeria parvifolia* Ridley, J. Straits Branch Roy. Asiat. Soc. 39: 87. 1903; *Adenostylis benguetensis* Ames; *Zeuxine benguetensis* (Ames) Ames; *Z. boninensis* Tuyama; *Z. gracilis* (Breda) Blume var. *sakagutii* (Tuyama) Hashimoto; *Z. gracilis* var. *tenuifolia* (Tuyama) T. Hashimoto; *Z. leucochila* Schlechter; *Z. sakagutii* Tuyama; *Z. shuishiehensis* S. S. Ying; *Z. tenuifolia* Tuyama; *Z. tonkinensis* Gagnepain.

Plants 15–22 cm tall, slender. Rhizome elongate. Stem erect, pale purplish brown, 3–6-leaved. Leaves cauline, widely spaced, withered or pendulous at anthesis, pale green, ovate to elliptic, 2–4(–6) × 1.2–2 cm, apex obtuse to acute; petiole-like base 1–1.5 cm including tubular sheath, margin sometimes ciliate. Inflorescence 10–20 cm, with 2 or 3 sterile bracts, pubescent; rachis 2–7.5 cm, with 3 to more than 10 laxly to subdensely arranged flowers; floral bracts pale red, ovate-lanceolate, 4–7 mm, shorter than ovary, pubescent abaxially and on margin, apex long acuminate. Flowers resupinate, small; ovary and pedicel fusiform, 6–9 mm, puberulent. Sepals dark green to purple-brown, sparsely puberulent; dorsal sepal ovate-lanceolate to ovate, 3.8–4.5 × 2–2.8 mm, 1-veined, apex acute; lateral sepals weakly to widely spreading, oblong-ovate, slightly oblique, 3.8–4.5 × 1.5–2 mm, 1-veined, apex acute to obtuse. Petals white, suboblanceolate-oblong, oblique, 4–4.5 × 1.2–1.3 mm, 1-veined, base attenuate, apex subobtuse; lip white or pale yellow, T-shaped, 3.5–5 mm, 3-partite; hypochile saccate, containing 2 subulate, hooked calli; mesochile ca. 1 mm, margin involute toward apex; epichile transversely oblong, ca. 1 × 3–4 mm, composed of 2 lobes diverging at right angles to axis of lip, often with a small mucro at apex between lobes; lobes suboblong, 1.5–2 × 0.8–1.2 mm, apical margin entire or sometimes irregularly denticulate. Column ca. 2 mm; wings much reduced and indistinct; anther ovoid-lanceolate, ca. 1.5 mm; rostellum arms linear, ca. 0.8 mm. Fl. Feb–Aug.  $2n = 20$ .

Damp places, rocky soils in forests, mountain slopes; 200–1700 m. Hainan, Hong Kong, Taiwan, S and SW Yunnan [Cambodia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

This is a widespread and variable species in need of critical review. Reassessment of type material for certain synonyms placed here may reveal that they represent distinct species. The Japanese names are tentatively considered conspecific, following Garay and Sweet (Orchids S. Ryukyu Islands, 83–85. 1974).

**11. *Zeuxine flava*** (Wallich ex Lindley) Trimen, J. Ceylon Branch Roy. Asiat. Soc. 9: 90. 1885.

黄花线柱兰 huang hua xian zhu lan

*Monochilus flavus* Wallich ex Lindley, Gen. Sp. Orchid. Pl. 487. 1840; *Haplochilus flavus* (Wallich ex Lindley) D. Dietrich; *Zeuxine aurantiaca* Schlechter.

Plants 20–30 cm tall, slender. Stem erect, 3- or 4-leaved. Leaves spaced, often withered and pendulous at anthesis, broadly lanceolate to narrowly ovate, 5–6 × 1.5–2 cm, apex

acuminate; petiole-like base including tubular sheath 1–1.2 cm. Inflorescence to 13 cm, with several sterile bracts, pubescent; rachis 4–5 cm, 8–15-flowered; floral bracts lanceolate, ca. 5 mm, hairy abaxially, apex caudate. Flowers resupinate, not fully opening, saffron, small; pedicel and ovary glabrescent, ca. 1.2 cm. Dorsal sepal subovate, concave, ca.  $3.5 \times 2$  mm; lateral sepals oblique, ca.  $3 \times 1.2$  mm. Petals oblong, ca.  $2.5 \times 1$  mm; lip T-shaped, ca. 3 mm, 3-partite; hypochile saccate, inside with 2 hooked calli; mesochile ca. 1 mm, with involute margin; epichile transversely oblong, ca.  $1 \times 4.5$  mm, with 2 lobes diverging at nearly right angles to axis of lip. Column ca. 2 mm. Fl. May.

Open forests in limestone areas; ca. 1400 m. SE Yunnan [Bhutan, N India, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**12. *Zeuxine grandis*** Seidenfaden, Dansk Bot. Ark. 32(2): 90. 1978.

大花线柱兰 da hua xian zhu lan

Plants 12–25 cm tall, slender. Rhizome elongate. Stem erect, 3–6-leaved. Leaves cauline, withered and pendulous at anthesis, green, often tinged with red, lanceolate, narrowly elliptic, or ovate,  $2-5 \times 1-2$  cm, apex acute; petiole-like base 1.5–2.5 cm including tubular sheath. Inflorescence 6–20 cm, with 2 or 3 sterile bracts, pubescent; sterile bracts small, abaxially pubescent; rachis 2–10 cm, laxly to subdensely 4–23-flowered; floral bracts lanceolate, ca. 10 mm, slightly shorter than ovary, abaxially pubescent, apex long acuminate. Flowers resupinate, relatively large; ovary and pedicel narrowly elliptic, 7–10 mm, pubescent. Sepals greenish, ovate,  $5-7.5 \times$  ca. 3 mm, pubescent; dorsal sepal tinged white toward apex, 1-veined, apex obtuse; lateral sepals slightly longer than dorsal sepal, 1-veined, margin white, apex obtuse to acute. Petals white, oblong, slightly oblique,  $5-7.5 \times 2-3$  mm, glabrous, 2-veined, apex obtuse-subtruncate; lip white, sometimes with a yellow patch on disk, Y-shaped, 7–9 mm, 3-partite; hypochile concave-saccate, ca.  $2 \times 1.5$  mm, containing 2 lamellate calli, each often with a linear extension; mesochile ca. 2 mm, narrow, margin erect; epichile dilated, distinctly 2-lobed; lobes not diverging widely, orbicular to obovate,  $3-5.5 \times 3-4$  mm, apical margin undulate. Column ca. 3 mm; wings lacking; rostellum arms ca. 1 mm. Fl. Feb–Apr.

Forests; ca. 600 m. Hainan, Hunan [Thailand, Vietnam].

**13. *Zeuxine affinis*** (Lindley) Bentham ex J. D. Hooker, Fl. Brit. India 6: 108. 1890.

宽叶线柱兰 kuan ye xian zhu lan

*Monochilus affinis* Lindley, Gen. Sp. Orchid. Pl. 487. 1840; *Adenostylis arisanensis* (Hayata) Hayata; *Zeuxine arisanensis* Hayata; *Z. sutepensis* Rolfe ex Downie; *Z. taiwaniana* S. S. Ying; *Z. uraiensis* S. S. Ying.

Plants 11–30 cm tall, slender. Rhizome elongate. Stem erect, deep reddish brown to greenish brown, 4–6-leaved. Leaves subrosulate, withered and pendulous at anthesis, often reddish, ovate, ovate-lanceolate, or elliptic,  $2.5-4 \times 1.2-2.5$  cm, apex acute or obtuse; petiole-like base ca. 1 cm including

tubular sheath. Inflorescence 5–20 cm, with 1 or 2 puberulent sterile bracts, pubescent, pale brown; rachis 3–9 cm, subdensely several to many flowered; floral bracts ovate-lanceolate, 7–8 mm, pubescent on margin and lower half of abaxial surface, apex long acuminate. Flowers resupinate or occasionally erect, small; ovary and pedicel fusiform, 5–6 mm, glabrous to puberulent. Sepals not spreading, dark brownish green at base, white toward apex, pubescent; dorsal sepal broadly ovate,  $4-5 \times$  ca. 2.5 mm, concave, 1-veined, apex obtuse or acute; lateral sepals ovate-oblong, slightly oblique,  $3.5-4.5 \times$  ca. 2.5 mm, 1-veined, apex obtuse. Petals white, elliptic to obovate, oblique, ca. as long as dorsal sepal, 1.5–2 mm wide, 1-veined, apex obtuse; lip white or pale yellow, Y-shaped, 4.5–6 mm, 3-partite; hypochile concave-saccate, containing 2 subulate, hooked calli; mesochile short, to 1 mm, tapering toward apex, margin involute; epichile dilated, 2-lobed; lobes not diverging widely, obovate-flabellate, widening toward apex,  $2-2.5 \times 2-2.2$  mm. Column 1.5–2 mm; wings triangular; anther ovoid-lanceolate, to 2 mm; rostellum arms oblong, ca. 0.6 mm. Fl. Feb–Apr.  $2n = 20$ .

Shaded places in forests, forest margins, valleys; 800–1700 m. Guangdong, Hainan, Hunan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Laos, Malaysia, Myanmar, Thailand, Vietnam].

Hong Kong plants previously treated as *Zeuxine gracilis* (Breda) Blume (e.g., by S. Y. Hu, Gen. Orchidaceae Hong Kong, 50. 1977) are probably referable here.

**14. *Zeuxine reflexa*** King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 291. 1898.

折唇线柱兰 zhe chun xian zhu lan

Plants 15–30 cm tall, slender. Rhizome elongate. Stem erect, greenish brown, 4–6-leaved. Leaves cauline, widely spaced, withered at anthesis, bright green, ovate-lanceolate,  $3-4 \times 1.5-2$  cm, base obtuse, apex acute; petiole-like base 1–2.5 cm including tubular sheath. Inflorescence 10–20 cm, with 1 or 2 pubescent sterile bracts, villous; rachis 5–8 cm, subdensely several to densely many flowered; floral bracts reddish brown, ovate-lanceolate, 6–8 mm, pubescent, margin ciliate, apex acuminate. Flowers resupinate, small; ovary and pedicel subcylindric-elliptic, 8–10 mm, pubescent. Sepals not widely spreading, dark greenish brown, puberulent; dorsal sepal ovate,  $3-4.5 \times$  ca. 2 mm; lateral sepals ovate, slightly oblique,  $3-4.3 \times$  ca. 1.8 mm. Petals white, suboblong to subovate, ca. as long as to slightly longer than dorsal sepal, apex acute to obtuse; lip Y-shaped, 3.8–5.2 mm, 3-partite, white at base, mesochile and epichile sometimes yellow; hypochile saccate, containing 2 subulate, hooked calli; mesochile flat, variable in length, to 1.5 mm; epichile dilated, reflexed downward, 2-lobed; lobes diverging at an acute angle, oblong to irregularly rhombic,  $2.5-3 \times 1.2-1.8$  mm. Column 2–2.5 mm; wings low, transversely oblong; anther triangular-lanceolate, ca. 1.5 mm; rostellum arms oblong, ca. 0.8 mm. Fl. Apr.

Open places in forests; ca. 700 m. Hong Kong, Taiwan [Bhutan, NE India, Thailand].

A collection from Hong Kong at Kew (*Barretto s.n.*) is tentatively referred here.

## Incompletely known species

**Zeuxine nijimae** Tatewaki & Masamune, Bot. Mag. (Tokyo) 46: 772. 1932 [“*nijimai*”].

眉原线柱兰 *mei yuan xian zhu lan*

Plants ca. 20 cm tall, slender. Rhizome ascending. Stem 2-leaved. Leaves ovate-lanceolate, slightly oblique, ca.  $2.5 \times 1.5$  cm, membranous, base rounded, apex acute; petiole-like base ca. 0.7 cm including tubular sheath. Rachis ca. 2 cm, 2- or 3-flowered; floral bracts ovate-lanceolate, ca. as long as ovary, apex acuminate. Flowers small. Dorsal sepal ovate, concave, ca. 6 mm, apex acuminate; lateral sepals obliquely ovate, ca.  $5 \times 2$  mm, 1- or 3-veined, apex obtuse. Petals ovate-deltoid, ca.  $5 \times 2.5$  mm, apex acute; lip Y-shaped, ca. 4 mm; epichile 2-lobed; lobes obliquely orbicular, ca.  $2 \times 1.5$  mm. Column ca. 2 mm. Fl. Apr.

• C Taiwan.

The type material has not been seen by us. This taxon is possibly conspecific with *Zeuxine affinis*.

**Zeuxine kantokeiensis** Tatewaki & Masamune, Bot. Mag. (Tokyo) 46: 772. 1932.

关刀溪线柱兰 *guan dao xi xian zhu lan*

Plants ca. 30 cm tall, slender. Leaves withered at anthesis. Inflorescence 9–21 cm, pubescent, with a few sterile bracts; sterile bracts ovate-deltoid, ca.  $10 \times 3$  mm, apex acuminate; rachis 3–9 cm; floral bracts ovate, ca.  $4 \times 2$  mm, apex acute-acuminate. Flowers subaxially arranged, small; ovary ovoid, ca. 3 mm including pedicel. Dorsal sepal ovate, concave, ca. 3 mm, outer surface pubescent, 1-veined, apex acute to obtuse; lateral sepals obliquely ovate, ca.  $2 \times 1$  mm, 3-veined, apex acute to obtuse. Petals oblong, ca.  $2 \times 1$  mm, glabrous, apex obtuse; lip T-shaped; epichile 2-lobed; lobes ca.  $1.3 \times 1$  mm, apex obtuse. Column ca. 1 mm; rostellum arms linear, ca. 1 mm. Fl. Apr.

• C Taiwan.

The type material has not been seen by us. This taxon is possibly conspecific with *Zeuxine parvifolia*.

## 17. VRYDAGZYNEA Blume, Coll. Orchid. 71; Fl. Javae Nov. Ser. 1: 59. 1858–1859.

二尾兰属 *er wei lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial or rarely epiphytic. Rhizome elongate or short, ascending, cylindrical, fleshy, with nodes bearing several slender roots. Stem erect or ascending, leafy. Leaves ovate, slightly fleshy, with a short petiole-like base sheathing stem. Inflorescence erect, terminal, racemose, densely several to many flowered. Flowers resupinate, not fully opening, medium-sized or small; ovary twisted, cylindrical-fusiform, pubescent. Sepals subequal; dorsal sepal and petals forming a hood; lateral sepals free, spreading. Lip short, triangular-ovate, obscurely 3-lobed, spurred at base; spur conic to fusiform, large, projecting between base of lateral sepals, containing 2 stalked glands near base. Column very short, stout; anther erect, on dorsal side of column, 2-locular; pollinia 2, granular-farinaceous, narrowly obovoid, attenuate at base, attached to a large ovate-oblong viscidium; rostellum short, erect, remnant shortly bifid; stigma 2-lobed; lobes separate, raised, protruding beyond sides of rostellum.

About 35 species: India to the Pacific islands; one species in China.

### 1. *Vrydagzynea nuda* Blume, Coll. Orchid. 71. 1858–1859.

二尾兰 *er wei lan*

*Vrydagzynea albida* Blume var. *formosana* (Hayata) T. Hashimoto; *V. formosana* Hayata.

Plants terrestrial, 5–18 cm tall. Leaves 5–7, deep green, ovate to ovate-elliptic,  $2-3.5 \times 0.7-2.5$  cm, base broadly truncate or subrounded, apex acute; petiole-like base 1–1.5 cm. Rachis 2–5 cm, 3–10-flowered, pubescent; floral bracts triangular to ovate-lanceolate,  $8-9 \times 3.5-4$  mm, abaxially pubescent, apex acuminate. Flowers white or greenish white; ovary and pedicel 6–8 mm. Sepals white or pale green, abaxially pubes-

cent at base, fleshy at apex; dorsal sepal narrowly ovate-oblong, cymbiform,  $5-6 \times 1.5-2.5$  mm, apex obtuse; lateral sepals ovate-lanceolate, oblique,  $5-6 \times 2-3$  mm, apex obtuse. Petals white, linear to narrowly ovate,  $4.5-5 \times 0.8-2.3$  mm, apex obtuse; lip white, erect, oblong-elliptic or obovate, concave,  $3-4 \times 2.5-3.5$  mm, apex rounded-bifid; spur pendulous, parallel to ovary, conic-cylindrical,  $4-5 \times 1.5-2.5$  mm, apex obtuse and shallowly 2-lobed. Column erect, 3-lobed, ca. 2 mm; rostellum flat, apex forming a viscidium. Fl. Mar–May.

Damp forests and humid places along valleys; 300–700 m. Hainan, Hong Kong, C and N Taiwan [Indonesia (Java), Malay Archipelago (Borneo)].

## 18. ANOECTOCHILUS Blume, Bijdr. 411. 1825 [“*Anecochilus*”], nom. cons.

金线兰属 *jin xian lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Chrysobaphus* Wallich.

Herbs, terrestrial. Rhizome creeping, terete, several noded, fleshy; roots narrowly filiform to fibrous, villous, arising singly from rhizome nodes. Stem erect or ascending, with 1 to a few loose tubular sheaths at base, and a few clustered subrosulate leaves, glabrous. Leaves green to purplish black with white, pinkish, or golden reticulate venation on adaxial surface, ovate or elliptic, velvety and often slightly fleshy, with a long petiole-like base dilating into tubular amplexicaul sheath. Inflorescence erect, terminal, race-

mose, pubescent; peduncle with a few scattered sheathing bracts; rachis laxly 2–10-flowered. Flowers resupinate or not; ovary slender, twisted or not. Sepals free, similar, often widely spreading, outer surface usually pubescent; dorsal sepal forming a hood with petals. Petals obliquely ligulate-oblong, membranous; lip basally adnate to base of column, distinctly 3-partite, with an exerted conic to cylindrical spur at base; hypochile subtubular, lateral margin erect; mesochile short to elongate, canaliculate, both external lateral margins with an entire, pectinate or filamentous flange; epichile entire to deeply 2-lobed, lobes divergent, rarely divided; spur containing a pair of irregular calli or septa. Column short, dorsally dilated, ventrally with 2 intramarginal, lamellate or fleshy appendages (wings); anther erect, ovoid, 2-locular; pollinia 2, clavate, sectile, granular-farinaceous, each attenuate into a narrow stalk attached to a solitary ovate viscidium; rostellum usually erect, remnant shortly bifid; stigma lobes 2, separate, convex, placed laterally toward apex of column. Capsule narrowly ellipsoid.

About 30 species: India and the E Himalayas, through S and SE Asia to Australia and the SW Pacific islands; 11 species (seven endemic) in China.

The taxonomic distinction between *Anoectochilus* and its close ally *Odontochilus* has been problematic, and members of the latter (and other closely related genera) have frequently been lumped with those of the former. *Anoectochilus* is circumscribed here in line with Pridgeon et al. (Gen. Orchid. 3: 69–72. 2003), which regards the ornate venation of the leaves, the conic spur that is exerted beyond the bases of the lateral sepals, and the widely separated stigma lobes that are placed laterally toward the apex of the column as definitive generic characters. Members of *Odontochilus*, in contrast, lack colored reticulate venation on their leaves, possess only a short saccate hypochile that is enclosed within the bases of the lateral sepals, and have confluent or narrowly separated stigma lobes that are positioned directly beneath the rostellum. Further work is clearly required to better resolve generic and specific affinities; the endemic species of China, in particular, remain poorly known.

A photograph labeled “*Anoectochilus roxburghii*” by X. H. Jin, X. D. Zhao, and X. C. Shi (Native Orchids Gaoligongshan Mts. China, 79. 2009) appears to represent *A. calcareus* Averyanov (Bot. Zhurn. (Moscow & Leningrad) 81(10): 75. 1996). This would be a new record for China, but it was discovered too late to be given a full entry in the present treatment.

- 1a. Lip T-shaped, epichile lobes diverging at right angles to axis of lip ..... 1. *A. pingbianensis*
- 1b. Lip Y-shaped, epichile lobes diverging at an acute angle to one another.
  - 2a. Mesochile of lip with entire or occasionally shallowly notched flanges.
    - 3a. Lip 13–22 mm, yellow; spur 2–3.2 mm, apex obtuse ..... 2. *A. burmannicus*
    - 3b. Lip ca. 10 mm, white; spur 4–6 mm, apex deeply bilobed ..... 3. *A. koshunensis*
  - 2b. Mesochile of lip with pectinate or filamentous flanges.
    - 4a. Flowers resupinate; ovary twisted.
      - 5a. Mesochile flange composed of 4–8 teeth, each tooth ca. 1 mm ..... 4. *A. xingrenensis*
      - 5b. Mesochile flange 3–9-laciniate, each filament 2–8 mm.
        - 6a. Ovary and pedicel ca. 8 mm; flange filaments of lip mesochile 2–3.5 mm ..... 5. *A. baotingensis*
        - 6b. Ovary and pedicel 10–14 mm; flange filaments of lip mesochile 4–8 mm.
          - 7a. Lip pale yellowish white; mesochile flanges 4- or 5-laciniate; spur 2–4 mm ..... 6. *A. formosanus*
          - 7b. Lip white; mesochile flanges 7–9-laciniate; spur ca. 8 mm ..... 7. *A. hainanensis*
      - 4b. Flowers usually erect, not resupinate; ovary not twisted.
        - 8a. Lip pinkish white, mesochile flanges 6–8-laciniate, each filament 2.5–6 mm ..... 8. *A. roxburghii*
        - 8b. Lip white, mesochile flanges fimbriate, composed of 2–5 teeth, each tooth 1.5–3 mm.
          - 9a. Epichile lobes 8–9 × 6–7 mm ..... 9. *A. chapaensis*
          - 9b. Epichile lobes 5–6 × 2–5 mm.
            - 10a. Leaves 0.7–2.6 × 0.6–2.1 cm; epichile lobes flabellate, ca. 5 mm wide ..... 10. *A. zhejiangensis*
            - 10b. Leaves 3.5–4 × 3–3.2 cm; epichile lobes oblong to oblanceolate, ca. 2 mm wide ..... 11. *A. emeiensis*

**1. *Anoectochilus pingbianensis*** K. Y. Lang, Acta Phytotax. Sin. 34: 556. 1996.

屏边金线兰 ping bian jin xian lan

Plants 15–18 cm tall. Stem erect or ascending, 3–4 mm in diam., 4- or 5-leaved. Leaves abaxially pale green or pale red, adaxially dark green with gold venation, ovate, slightly oblique, 3–4.5 × 2–3 cm, apex acute; petiole-like base and tubular sheath 1.5–2 cm. Peduncle ca. 9 cm, with 2 or 3 pale red sheathing sterile bracts; rachis ca. 4 cm, few to 8-flowered; floral bracts ovate-lanceolate, 10–13 mm, ca. as long as ovary, outer surface pubescent, apex acuminate. Flowers resupinate; ovary and pedicel twisted, cylindrical-fusiform, 10–12 mm, densely pubescent. Sepals pink, outer surface pubescent, 1-veined; dorsal sepal ovate, cymbiform, ca. 6 × 4 mm, apex acute; lateral sepals spreading, oblong, slightly oblique, ca. 8 × 3.5 mm, apex acute. Petals white, ovate, slightly oblique, ca. 6

× 2 mm, 1-veined, apex acute; lip white, T-shaped, ca. 9 mm; hypochile ca. 2 mm; mesochile ca. 2.8 mm; flanges lacinate, composed of 5 or 6 narrow filaments; epichile transversely dilated, broader than long, 2-lobed; lobes diverging at right angles to axis of lip, narrowly oblong, entire, ca. 5.5 × 1.2 mm, apex obtuse; spur conic, ca. 3 mm, mouth ca. 2 mm in diam., apex obtuse, containing 2 narrowly elliptic, fleshy, stalked calli near entrance. Column ovoid, ca. 2.8 mm, with 2 lamellate wings; stigma lobes suborbicular. Fl. Oct.

• Shaded humid places in forests; ca. 1500 m. SE Yunnan.

**2. *Anoectochilus burmannicus*** Rolfe, Bull. Misc. Inform. Kew 1922: 24. 1922.

滇南金线兰 dian nan jin xian lan

Plants 16–30 cm tall. Roots fibrous, to 9 cm. Stem erect, 3–6-leaved. Leaves abaxially pinkish red, adaxially blackish

green with limited bronze venation, broadly ovate to ovate-elliptic, slightly oblique, 3–8 × 1.8–5 cm, apex acute; petiole-like base and tubular sheath 1.5–2.8 cm. Peduncle 9–14 cm, with 2 or 3 pale red sterile sheathing bracts; rachis 3.5–6 cm, 3–12-flowered; floral bracts ovate-lanceolate, often sheathing ovary at base, 9–14 mm, shorter than ovary, outer surface sparsely pubescent, apex acuminate. Flowers erect, not resupinate; ovary and pedicel narrowly fusiform, not twisted, 11–15 mm, pubescent. Sepals pink, outer surface pubescent, 1-veined; dorsal sepal broadly ovate, cymbiform, 4.5–6 × 4–5 mm, apex subobtusate; lateral sepals spreading, oblong-elliptic, oblique, 6–7.5 × 3–5 mm, apex subacute. Petals yellowish white, broadly ovate-elliptic, strongly oblique, falcate, 5–6 × 3–4 mm, 1-veined, apex obtuse; lip yellow, Y-shaped, 13–22 mm; hypochile 2–3 mm; mesochile reflexed at right angle from apex of hypochile, 5–9 mm; flanges narrow, margin entire, terminating in small, slightly revolute auricles at apex of mesochile; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, oblong, oblanceolate, or spatulate, 6–9 × 2–3 mm, entire, apex obtuse; spur conic, 2–3.2 mm, mouth 1.5–2.2 mm in diam., apex obtuse, containing 2 subelliptic, sessile calli near entrance. Column broadly ovoid, ca. 3 mm, with 2 lamellate wings; stigma lobes elliptic. Fl. Sep–Dec.

Damp places in evergreen broad-leaved forests, valleys; 1000–2200 m. S Yunnan [Laos, Malaysia (Peninsular), Myanmar, Thailand].

**3. *Anoectochilus koshunensis*** Hayata, Icon. Pl. Formosan. 4: 104. 1914.

恒春银线兰 heng chun yin xian lan

*Odontochilus koshunensis* (Hayata) S. S. Ying.

Plants ca. 20 cm tall. Stem ascending, 2–4-leaved. Leaves abaxially reddish purple, adaxially blackish green with white venation, ovate to orbicular-ovate, 3–4 × 2–3 cm, apex acute; petiole-like base and tubular sheath ca. 1 cm. Peduncle 7–10 cm, with 2 or 3 sheathing sterile bracts, reddish brown; rachis ca. 4.5 cm, 5- or 6-flowered; floral bracts pinkish, ovate to ovate-lanceolate, ca. 7 mm, shorter than ovary, outer surface pubescent. Flowers suberect, not resupinate, white; ovary and pedicel cylindrical-fusiform, not twisted, ca. 12 mm, pubescent. Sepals reddish brown, pubescent on outer surface, 1-veined; dorsal sepal orbicular-ovate, cymbiform, 5–5.5 × 3–4 mm, apex acute to cuspidate; lateral sepals spreading, narrowly elliptic, oblique, 7–8 × 3.5–4 mm, apex acute. Petals white, ovate-elliptic, strongly oblique, falcate, 5.5–6 × 1.5–2 mm, 1-veined, apex cuspidate and incurved; lip white, Y-shaped, ca. 10 mm; hypochile 1–2 mm; mesochile reflexed at right angle from apex of hypochile, 3–4 mm; flanges oblong to linear-lanceolate, 4–5 × ca. 2 mm, entire or sometimes shallowly notched at apex; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, oblong, 7–9 × 3.5–3.7 mm, apex obtuse to slightly mucronate; spur tubular-conic, 4–6 mm, mouth ca. 2 mm in diam., apex deeply bilobed, containing 2 irregular, stalked calli. Column ovoid, 3–3.5 mm, with 2 lamellate wings; stigma lobes orbicular. Fl. Jul–Oct.

• Broad-leaved evergreen forests; 700–2000 m. Taiwan.

**4. *Anoectochilus xingrenensis*** Z. H. Tsi & X. H. Jin, Acta Phytotax. Sin. 40: 84. 2002.

兴仁金线兰 xing ren jin xian lan

Plants 15–20 cm tall. Stem ascending, 2–3 mm in diam., 2–5-leaved. Leaves adaxially dark green with golden venation, ovate to orbicular-ovate, 2–5 × 2–3 cm, apex apiculate; petiole-like base and tubular sheath 1.5–2 cm. Peduncle ca. 12 cm, with 2 or 3 sterile sheathing bracts; rachis 3–5 cm, 3–5-flowered; floral bracts pink, ovate-lanceolate, 10–12 mm, subequal in length to ovary. Flowers resupinate; ovary and pedicel twisted, 10–13 mm, pubescent. Sepals pinkish red, outer surface pubescent; dorsal sepal ovate, concave, 5–7 × 3–5 mm, apex acute; lateral sepals suboblong, slightly oblique, 7–9 × 3.5–5 mm, apex acute. Petals white, ovate, oblique, 6–8 × 2–3 mm, 1-veined, apex cuspidate; lip white, Y-shaped, 13–18 mm; hypochile ca. 3 mm; mesochile ca. 3 mm; flanges pectinate, composed of 4–8 short teeth, each tooth ca. 1 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, flabellate, 6–7 × 2.5–3.5 mm, apical margin slightly incised; spur narrowly conic, 3–4 mm, mouth ca. 2 mm in diam., containing 2 irregular calli. Column ca. 1 mm. Fl. Aug.

• Forests; ca. 1200 m. SW Guizhou (Xingren).

**5. *Anoectochilus baotingensis*** (K. Y. Lang) Ormerod, Taiwaniana 48: 87. 2003.

保亭金线兰 bao ting jin xian lan

*Anoectochilus roxburghii* (Wallich) Lindley var. *baotingensis* K. Y. Lang, Acta Phytotax. Sin. 34: 557. 1996.

Plants 15–17 cm tall. Stem erect, 2- or 3-leaved. Leaves purplish red, suborbicular, ca. 3 × 2.5 mm, apex acute; petiole-like base and tubular sheath ca. 0.6 cm. Peduncle ca. 8 cm, with 3 sheathing sterile bracts; rachis ca. 1 cm, 3-flowered; floral bracts ovate-lanceolate, 9–12 mm, ca. as long as to exceeding ovary, apex acute. Flowers resupinate, white; ovary and pedicel twisted, cylindrical-fusiform, ca. 8 mm, pubescent. Sepals 1-veined, outer surface pubescent; dorsal sepal ovate, cymbiform, ca. 6.5 × 2.5 mm, apex acuminate; lateral sepals spreading, oblong-elliptic, ca. 7.5 × 3 mm, apex acute. Petals oblong-cuneate, strongly oblique, ca. 6.5 × 2.5 mm, 1-veined, apex ligulate-acute; lip white, Y-shaped, ca. 17.5 mm; hypochile rectangular, ca. 5 mm, with lateral lobes ca. 1.5 mm wide; mesochile ca. 3 mm; flanges 3-laciniate, each filament 2–3.5 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, ligulate, ca. 8 × 2.5 mm, entire, apex obtuse; spur conic, 3–3.5 mm, apex obtuse, containing 2 large, circular, carunculate calli. Column ovoid, 5–6 mm, with 2 oblong-elliptic wings; stigma lobes deltoid. Fl. Apr.

• Soil-covered rocks in forests; 300–400 m. Hainan.

**6. *Anoectochilus formosanus*** Hayata, Icon. Pl. Formosan. 4: 101. 1914.

台湾银线兰 tai wan yin xian lan

Plants 11–20 cm tall. Stem ascending, 2–4-leaved. Leaves abaxially reddish purple, adaxially dark green with white venation, ovate to orbicular, 2–5 × 1–3.5 cm, apex acute; petiole-like base and tubular sheath 0.8–1.6 cm. Peduncle 10–15 cm, with 2 or 3 sheathing sterile bracts, reddish brown; rachis 1.5–5 cm, 3–5-flowered; floral bracts ovate-lanceolate, 8–10

mm, shorter than ovary, outer surface hairy, apex acuminate. Flowers resupinate, pale yellowish white; ovary and pedicel twisted, fusiform, 10–14 mm, pubescent. Sepals reddish brown, pubescent on outer surface; dorsal sepal suborbicular, cymbiform, 6–7 × 5–6 mm, apex acute; lateral sepals narrowly elliptic, oblique, 8–10 × 5–6 mm, apex acute. Petals white, ovate, strongly oblique, falcate, ca. 8 × 2.6 mm, apex cuspidate; lip pale yellowish white, Y-shaped, 12–16 mm; hypochile ca. 2 mm; mesochile 5–6 mm; flanges 4- or 5-laciniate, each filament 4–6 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, linear-oblong to rhombic-oblong, 6–7.5 × 1.5–3 mm, apex obtuse; spur conic, 2–4 mm, mouth ca. 3 mm in diam., apex shallowly bilobed, containing 2 carunculate calli. Column ovoid, ca. 2 mm. Fl. Oct–Nov.  $2n = 24, 40$ .

Broad-leaved evergreen forests, bamboo forests; 500–1500 m. Taiwan [Japan (Ryukyu Islands)].

**7. *Anoectochilus hainanensis*** H. Z. Tian, F. W. Xing & L. Li, *Ann. Bot. Fenn.* 45: 220. 2008.

海南开唇兰 *hai nan kai chun lan*

Plants ca. 12 cm tall. Stem ascending, 3- or 4-leaved. Leaves abaxially lilac, adaxially velvety blackish green with dense golden reticulate venation, ovate, oblique, 3–3.5 × 1.8–2.2 cm, apex acute; petiole-like base and tubular sheath 1.2–1.5 cm. Peduncle 3–3.5 cm, with 2 or 3 sterile bracts, pubescent; rachis 3–4 cm, 4–6-flowered; floral bracts ovate-lanceolate, 6–9 mm, shorter than ovary, outer surface hairy, apex acuminate. Flowers resupinate, slightly fragrant, white; ovary and pedicel twisted, fusiform, ca. 14 mm, pubescent. Sepals green tinged reddish brown at apex and pubescent on outer surface; dorsal sepal ovate-elliptic, 9–10 × ca. 6 mm, apex acuminate; lateral sepals elliptic, oblique, 11–12 × 4.5–5 mm, apex subacute. Petals olive-green with white margins, elliptic-falcate, oblique, 8–8.5 × ca. 3.6 mm, apex acuminate; lip white, Y-shaped, ca. 16 mm; hypochile ca. 2.5 mm; mesochile ca. 4.5 mm; flanges 7–9-laciniate, each filament 4–8 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, ligulate-elliptic, ca. 9 × 3.5 mm, apex truncate; spur cylindrical-conic, ca. 8 mm, mouth ca. 3.5 mm in diam., apex distinctly bilobed, containing 2 trapeziform calli. Column stout, ca. 4 mm, with 2 semicircular wings. Fl. Jan (in cultivation).

• Damp shady places in montane forests. Hainan.

**8. *Anoectochilus roxburghii*** (Wallich) Lindley, *Ill. Bot. Himal. Mts.* 368. 1839.

金线兰 *jin xian lan*

*Chrysobaphus roxburghii* Wallich, *Tent. Fl. Nepal.* 37. 1826; *Anoectochilus yungianus* S. Y. Hu; *Zeuxine roxburghii* (Wallich) M. Hiroe.

Plants 8–20 cm tall. Stem erect, 2–5-leaved. Leaves abaxially pale purplish red, adaxially dark green to blackish purple with pinkish golden reticulate venation, ovate to ovate-orbicular, 1.3–4.5 × 0.8–3.6 cm, apex acute; petiole-like base and tubular sheath 0.6–1.8 cm. Peduncle 7–15 cm, with 2 or 3 pinkish sterile bracts; rachis 1–5 cm, 2–10-flowered; floral bracts

pinkish, ovate-lanceolate to lanceolate, 6–9 mm, shorter than ovary, apex acuminate. Flowers usually erect, not resupinate; ovary and pedicel narrowly cylindrical, not twisted, 10–15 mm, pubescent. Sepals pinkish, outer surface pubescent, 1-veined; dorsal sepal ovate, cymbiform, ca. 6 × 2.5–3 mm, apex acuminate; lateral sepals spreading, oblong to oblong-elliptic, 7–8 × 2.5–3 mm, apex subacute. Petals pinkish white, ovate-elliptic, strongly oblique, 7–8 × 2–2.5 mm, 1-veined, apex acuminate; lip pinkish white, Y-shaped, 10–16 mm; hypochile 2–4 mm; mesochile reflexed at right angle from apex of hypochile, 4–5 mm; flanges 6–8-laciniate, each filament 2.5–6 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, obovate-oblong to spatulate, entire, 5.5–8 × 1.5–2.2 mm, apex obtuse; spur conic, 3–4.5 mm, apex shallowly bilobed, mouth ca. 1.5 mm in diam., containing 2 irregular, fleshy calli near entrance. Column ovoid, ca. 2.5 mm, with 2 broad, lamellate wings; stigma lobes elliptic. Fl. Aug–Dec.  $2n = 15 + 2-3B, 30$ .

Evergreen broad-leaved forests, damp valleys; 100–1600 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan, SE Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Japan, Laos, Nepal, Thailand, Vietnam].

**9. *Anoectochilus chapaensis*** Gagnepain, *Bull. Mus. Natl. Hist. Nat.*, sér. 2, 3: 679. 1931.

滇越金线兰 *dian yue jin xian lan*

Plants 12–18 cm tall. Stem ascending or erect, 2.5–3 mm in diam., 4- or 5-leaved. Leaves abaxially pale green, adaxially blackish green with golden-red venation, ovate, oblique, 2–5 × 1.5–3.5 cm, apex acute; petiole-like base and tubular sheath 0.8–1.6 cm. Peduncle 8–11 cm, with 2 or 3 pale red sheathing sterile bracts; rachis 2–5 cm, 2–7-flowered; floral bracts pale red, ovate-lanceolate, 6–10 mm, shorter than ovary, outer surface pubescent, apex acuminate. Flowers erect, not resupinate, white; ovary and pedicel narrowly cylindrical, not twisted, 10–13 mm, pubescent. Sepals pubescent on outer surface, 1-veined; dorsal sepal ovate, cymbiform, ca. 6 × 3.5 mm, apex acuminate; lateral sepals ovate-oblong, ca. 6 × 3 mm, apex obtuse. Petals ovate, strongly oblique, falcate, ca. 6 × 3 mm, 1-veined, apex caudate and incurved; lip white, Y-shaped, 10–12 mm; hypochile short; mesochile 5–6 × ca. 3 mm; flanges oblong, pectinate, divided into 3 or 4 narrow teeth; epichile longitudinally dilated, 2-lobed; lobes diverging widely, obovate, 8–9 × 6–7 mm, margin crenulate, apex truncate; spur conic, 4–5 mm, apex obtuse, containing 2 calli. Column short, with 2 broad lamellate wings. Fl. Jul–Aug.

Shaded humid places in dense forests; 1300–1400 m. SE Yunnan [N Vietnam].

**10. *Anoectochilus zhejiangensis*** Z. Wei & Y. B. Chang, *Bull. Bot. Res.*, Harbin 9(2): 39. 1989.

浙江金线兰 *zhe jiang jin xian lan*

Plants 8–16 cm tall. Stem ascending, pale reddish brown, 2–6-leaved. Leaves abaxially pale purplish red, adaxially dark greenish purple with golden-red venation, broadly ovate to ovate-orbicular, 0.7–2.6 × 0.6–2.1 cm, margin slightly undulate, apex acute; petiole-like base and tubular sheath ca. 0.8 cm.

Peduncle 5–10 cm, with 2 sterile bracts; rachis 1–4 cm, 1–4-flowered; floral bracts ovate-lanceolate, ca. 6.5 mm, subequal in length to ovary, outer surface pubescent, apex acuminate. Flowers erect, not resupinate; ovary and pedicel pale reddish brown, narrowly fusiform, not twisted, ca. 7 mm, white pubescent. Sepals pinkish red, outer surface pubescent; dorsal sepal ovate, cymbiform, ca. 5 × 3.5 mm, apex acute; lateral sepals spreading, oblong-obovate, slightly oblique, ca. 7 × 3 mm, apex obtuse. Petals white, oblanceolate, strongly oblique, ca. 6 × 2 mm, apex acute; lip white, Y-shaped, ca. 10 mm; hypochile ca. 2.5 mm; mesochile ca. 3 mm; flanges pectinate, composed of 2–5 narrow teeth, each tooth ca. 2 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, flabellate, slightly oblique, ca. 6 × 5 mm, entire, apex truncate; spur conic, slightly curved, ca. 5 mm, apex shallowly bilobed, containing 2 irregular, stalked calli near entrance. Column short. Fl. Jul–Sep.

• Damp places in dense forests, valleys; 700–1200 m. C and N Fujian, N Guangxi, SW Zhejiang.

**11. *Anoectochilus emeiensis*** K. Y. Lang, Acta Phytotax. Sin. 20: 183. 1982.

峨眉金线兰 e mei jin xian lan

Plants 19–21 cm tall. Stem ascending, ca. 2 mm in diam.,

3-leaved. Leaves abaxially purplish red, adaxially blackish green with golden-red venation, ovate, 3.5–4 × 3–3.2 cm, apex acute; petiole-like base and tubular sheath 1–2 cm. Peduncle pale purplish red, ca. 12 cm, with 2–4 pale purplish red sterile bracts; rachis 2–2.5 cm, 3- or 4-flowered; floral bracts pale purplish red, lanceolate, ca. 6 mm, shorter than ovary, outer surface pubescent, apex acuminate. Flowers erect, not resupinate, white, foetid; ovary and pedicel cylindrical-fusiform, not twisted, ca. 13 mm, pubescent. Sepals purplish red, outer surface sparsely pubescent, 1-veined; dorsal sepal ovate-elliptic, cymbiform, ca. 7 × 2 mm, apex acute; lateral sepals spreading, narrowly oblong-obovate, oblique, 7–8 × ca. 3.2 mm, apex acute to shortly mucronate. Petals pinkish white, ovate, strongly oblique, falcate, ca. 7 × 3 mm, 1-veined, apex acute; lip white, Y-shaped, ca. 13 mm; hypochile ca. 3 mm; mesochile reflexed sharply downward from apex of hypochile, ca. 4 mm; flanges subsquare, 3–3.5 × 3–3.5 mm, margin fimbriate, divided into 5 teeth, each tooth ca. 1.5 mm; epichile longitudinally dilated, 2-lobed; lobes diverging at an acute angle to one another, oblong to oblanceolate, ca. 5 × 2 mm, entire, apex obtuse; spur conic, ca. 6 mm, apex shallowly bilobed, containing 2 subcuneate calli. Column ca. 5.5 mm, stout, with 2 broad, oblong wings; stigma lobes elliptic. Fl. Aug–Sep.

• Forests along streams; ca. 900 m. SC Sichuan.

## 19. ODONTOCHILUS Blume, Fl. Javae Nov. Ser. 1: 66. 1858–1859.

齿唇兰属 chi chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb, Paul Ormerod

*Cystopus* Blume (1858), not Lévillé (1847); *Evardia* Gagnepain (1932), not Adanson (1763); *Evardiana* Averyanov, nom. illeg. superfl.; *Evardianthe* Rauschert; *Pristiglottis* Cretzoiu & J. J. Smith.

Herbs, terrestrial, autotrophic or rarely holomycotrophic. Rhizome creeping, cylindrical, several noded, fleshy; roots narrowly filiform to fibrous, arising singly from rhizome nodes or rarely absent. Stem erect or ascending, with 1 to a few loose tubular sheaths at base, and a few scattered or subrosulate leaves, or leafless (when holomycotrophic), glabrous. Leaves green or purple, occasionally with 1–3 white stripes, suborbicular, ovate-lanceolate, or elliptic, oblique, with a short to long petiole-like base dilating into tubular amplexicaul sheath. Inflorescence erect, terminal, racemose, glabrous or pubescent; peduncle with a few scattered sheathing bracts; rachis laxly to subdensely few to many flowered; floral bracts membranous, glabrous or pubescent. Flowers resupinate or erect and not resupinate; ovary twisted or not, slender, glabrous or pubescent. Sepals glabrous or pubescent; dorsal sepal free or connate for half its length with lateral sepals; lateral sepals similar to dorsal sepal, completely enclosing base of lip. Petals usually appressed to dorsal sepal, linear-ligulate to ovate, membranous; lip 3-partite, spurless; hypochile subglobose, aseptate and saccate or with a central septum and bisaccate, containing a pair of fleshy calli; mesochile usually elongate, tubular, external margin with an entire or fimbriate-pectinate flange, rarely with 2 flanges on either side, or rarely not flanged at all. Column dilated, twisted or not, ventrally with 2 intramarginal, lamellate appendages (wings); anther erect, ovoid, 2-locular; pollinia 2, obovoid-obpyriform or clavate, usually attenuate into slender stalks that attach to a solitary small viscidium; rostellum deltoid, remnant shortly to deeply bifid; stigma lobes separate to confluent, placed directly beneath rostellum. Capsule ellipsoid.

About 40 species: N India and the Himalayas, through SE Asia, as far north as Japan, east to the SW Pacific islands; 11 species (two endemic) in China.

The circumscription of *Odontochilus* has been contentious, with the structural similarity of its flowers to those of *Anoectochilus* often resulting in its inclusion in the latter. It is defined here (following Pridgeon et al., Gen. Orchid. 3: 126–129. 2003) by the combination of a saccate but spurless lip that is enclosed at its base by the lateral sepals and the placement of the confluent or occasionally separate stigma lobes directly beneath the rostellum.

1a. Plants holomycotrophic, achlorophyllous and lacking leaves, purplish red or brown.

2a. Flowers resupinate; petals and lip white ..... 3. *O. saprophyticus*

2b. Flowers not resupinate; petals and lip purplish red, yellow, or fawn-colored.

3a. Dorsal sepal ca. 7 × 4 mm; lip T-shaped, ca. 16 mm, with 2 hornlike, divergent, V-shaped lacunae

at apex; lobes of epichile oblong, ca. 5 × 2.5 mm ..... 1. *O. poilanei*

- 3b. Dorsal sepal 3.8–4.1 × 1.8–2 mm; lip Y-shaped, 11.2–12.2 mm, without lacunae at apex; lobes of epichile subquadrate, 3.2–4 × 2.8–3.2 mm ..... 2. *O. guangdongensis*
- 1b. Plants autotrophic, leafy, green, dark green, greenish brown, or dark greenish purple.
- 4a. Sepals uniformly green or yellowish green, sometimes tinged red toward apex; hypochile of lip bisaccate, divided by a central longitudinal septum.
- 5a. Lip mesochile lacking flanges ..... 4. *O. crispus*
- 5b. Lip mesochile with a fimbriate-pectinate flange along each external margin.
- 6a. Floral bracts ca. 5 mm, much shorter than ovary; ovary and pedicel pubescent ..... 5. *O. elwesii*
- 6b. Floral bracts 8–15 mm, subequal in length to or exceeding ovary; ovary and pedicel glabrous.
- 7a. Adaxial surface of leaves uniformly dark green; flowers white or yellowish white; lateral sepals 9–10 mm ..... 6. *O. brevistylis*
- 7b. Adaxial surface of leaves dark green with whitish stripes along midvein and 2 lateral veins; flowers yellow; lateral sepals 6–7.5 mm ..... 7. *O. lanceolatus*
- 4b. Sepals white, pale green, or purplish with either dark brownish green patches or purplish red longitudinal stripes; hypochile of lip globose-saccate (though hypochile of *O. clarkei* occasionally shallowly 2-lobed), aseptate.
- 8a. Plants 7.5–8.5 cm tall; leaf petiole-like base and tubular sheath 0.3–0.5 cm; lip 12–13 mm ..... 8. *O. nanlingensis*
- 8b. Plants 10–30 cm tall; leaf petiole-like base and tubular sheath 1.5–3.5 cm; lip 17–26 mm.
- 9a. Lip epichile lobes ca. 5.5 mm ..... 9. *O. tortus*
- 9b. Lip epichile lobes ca. 10 mm.
- 10a. Flowers erect, not resupinate; ovary and pedicel not twisted; lip uniformly white; mesochile 9.5–16 mm, not dilated at base ..... 10. *O. inabae*
- 10b. Flowers resupinate; ovary and pedicel twisted; mesochile ca. 5 mm, dilated at base, reddish; epichile lobes yellow ..... 11. *O. clarkei*

**1. *Odontochilus poilanei*** (Gagnepain) Ormerod, Lindleyana 17: 225. 2002.

齿爪齿唇兰 *chi zhao chi chun lan*

*Evrardia poilanei* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 596. 1932; *Chamaegastrodia poilanei* (Gagnepain) Seidenfaden & A. N. Rao; *Evrardiana poilanei* (Gagnepain) Averyanov; *Evrardianthe poilanei* (Gagnepain) Rauschert; *Hetaeria poilanei* (Gagnepain) Tang & F. T. Wang.

Plants holomycotrophic, 12–18 cm tall. Rhizome yellowish white, short, stout. Stem erect, purplish red, stout, leafless, with many sheathing scales; scales overlapping, purplish red, membranous, pubescent on outer surface and margin. Rachis 3–7 cm, subdensely several to more than 10-flowered, pubescent; floral bracts purplish red, ovate, ca. 10 mm, ca. as long as ovary, outer surface pubescent, apex acuminate. Flowers fragrant, erect, not resupinate; ovary and pedicel purplish red, cylindrical-fusiform, not twisted, 10–12 mm, pubescent. Sepals purplish red, pubescent on outer surface; dorsal sepal connivent with petals, ovate, cymbiform, ca. 7 × 4 mm, 1-veined, apex subacute; lateral sepals slightly spreading, ovate, oblique, ca. 7 × 3.3 mm, apex acute. Petals purplish red, linear-lanceolate, oblique, falcate, ca. 7 × 1.5 mm, 1-veined, apex acute; lip deep yellow, T-shaped, ca. 16 mm; hypochile slightly dilated, concave-saccate, ca. 2 mm, aseptate, containing 2 sessile, domed calli at base; mesochile 6–8 mm; flanges narrow, irregularly erose-crenulate; epichile transversely dilated, ca. 3 × 12 mm wide, 2-lobed, with 2 hornlike, divergent, V-shaped lacunae at apex; lobes diverging at right angles to axis of lip, oblong, ca. 5 × 2.5 mm, minutely papillate on both surfaces, margin incised-erose, apex truncate. Column short, with 2 subsquare, lamellate wings; anther ovoid, ca. 2.5 mm, apex acuminate; rostellum erect, furcately 2-lobed. Fl. Aug.

Damp places in broad-leaved evergreen forests, valleys; 1000–1800 m. SE Xizang, SE Yunnan [Japan, Myanmar, Thailand, S Vietnam].

**2. *Odontochilus guangdongensis*** S. C. Chen, S. W. Gale & P. J. Cribb, *nom. nov.*

广东齿唇兰 *guang dong chi chun lan*

Replaced synonym: *Chamaegastrodia nanlingensis* H. Z. Tian & F. W. Xing, Novon 18: 261. 2008, not *Odontochilus nanlingensis* (L. P. Siu & K. Y. Lang) Ormerod, Taiwania 48: 91. 2003 [see p. 83].

Plants holomycotrophic, 20–26 cm tall. Rhizome hazel in color, translucent, fleshy, slender, up to 25 cm; roots coralloid. Stem erect, light brown, slender to stout, leafless, with many sheathing scales; scales overlapping, brick-red, membranous, puberulent along margin. Rachis up to 6 cm, subdensely 4–9-flowered, puberulent; floral bracts maroon, ovate-lanceolate, ca. 8 × 3.2 mm, ca. as long as ovary, outer surface puberulent, apex acuminate. Flowers not resupinate; ovary and pedicel fusiform, not twisted, ca. 8 mm, finely puberulent. Sepals fawn-colored, puberulent on outer surface and densely so at apex; dorsal sepal connivent with petals, ovate, cymbiform, 3.8–4.1 × 1.8–2 mm, 1-veined, apex acute; lateral sepals slightly spreading, narrowly ovate-falcate, oblique, 7–7.2 × 3.2–3.5 mm, 2-veined, apex acute. Petals fawn-colored, linear-lanceolate, oblique, falcate, 4.5–4.8 × 1–1.3 mm, 1-veined, apex acute; lip yellow, Y-shaped, 11.2–12.2 mm; hypochile slightly dilated, concave-saccate, 2–2.2 mm, containing 2 sessile, subglobose calli at base; mesochile ca. 5.5 mm; flanges narrow, irregularly erose-crenulate; epichile transversely dilated, 3.2–4 × ca. 7 mm, 2-lobed; lobes diverging at acute angle to one another, subquadrate, 3.2–4 × 2.8–3.2 mm, margin slightly erose, apex truncate. Column short, with 2 oblong, lamellate wings; anther lanceolate, ca. 2 mm, apex acuminate; rostellum erect, furcately 2-lobed. Capsule brick-red, ellipsoid, ca. 11 × 5 mm. Fl. Aug.

• Humus-rich soils in evergreen broad-leaved forests; 1300–1600 m. Guangdong, Hunan.

**3. *Odontochilus saprophyticus*** (Averyanov) Ormerod, *Taiwania* 48: 141. 2003.

腐生齿唇兰 fu sheng chi chun lan

*Pristiglottis saprophytica* Averyanov, Updated Checkl. Orchids Vietnam, 90. 2003.

Plants holomycotrophic, achlorophyllous, 15–18 cm tall. Rhizome 2–4.5 cm, 0.5–2 cm in diam. Stem erect, pinkish brown, leafless, with 6 or 7 sheathing scales; scales overlapping, membranous, pubescent on outer surface. Rachis ca. 7.5 cm, subdensely 12- or 13-flowered, pubescent; floral bracts elliptic-ovate, concave, 8–10 × 4–5 mm, outer surface pubescent, apex acuminate. Flowers resupinate; ovary and pedicel 10–11 mm, pubescent. Sepals olive pinkish brown, pubescent on outer surface; dorsal sepal connivent with petals and forming a hood, ovate, cymbiform, 4–5 × ca. 3 mm, 1-veined, apex obtuse; lateral sepals reflexed, oblong, oblique, 8–9 × 2–3 mm, 1-veined, apex subacute. Petals white, narrowly oblong, 4–5 × 1.5–2 mm, 1-veined, apex acute; lip white, T-shaped, 11–12 × 4–5 mm; hypochile concave-saccate, ca. 2 mm, aseptate, containing 2 sessile, ligulate calli at base; mesochile 4–5 mm; flanges irregularly erose-papillate; epichile 2-lobed; lobes diverging at right angles to axis of lip, subquadrate-obovate, 4–5 × 3–4 mm. Column ca. 1.5 mm, with 2 semicircular to cordate wings; anther narrowly ovoid, ca. 2 mm; rostellum erect, furcately 2-lobed. Fl. May–Jun.

Leaf litter in tropical montane forests; 900–1100 m. Hainan [Vietnam].

**4. *Odontochilus crispus*** (Lindley) J. D. Hooker, *Fl. Brit. India* 6: 99. 1890.

小齿唇兰 xiao chi chun lan

*Anoetochilus crispus* Lindley, *J. Proc. Linn. Soc., Bot.* 1: 180. 1857; *Cystopus crispus* (Lindley) Kuntze.

Plants autotrophic, 6–20 cm tall. Stem ascending, 3–5-leaved. Leaves abaxially pale green, adaxially dark green, ovate, 1.2–1.5 × 0.9–1.2 cm, apex acute; petiole-like base and tubular sheath 0.5–1 cm. Peduncle 1.5–7 cm, with 1 or 2 sterile bracts, pubescent, purplish red; rachis 1–5 cm, subdensely (1–)3–8-flowered, pubescent; floral bracts purplish, lanceolate, 7–9 mm, nearly as long as ovary, outer surface pubescent, apex acuminate. Flowers resupinate, greenish white; ovary and pedicel twisted, cylindrical, 8–10 mm, glabrous. Sepals green, pubescent on outer surface, 1-veined; dorsal sepal forming a hood with petals, narrowly ovate, cymbiform, ca. 6 × 2.3 mm, apex acuminate; lateral sepals narrowly elliptic, oblique, ca. 6.5 × 2.7 mm, apex subacute. Petals green, triangular, falcate, ca. 6 × 2 mm, glabrous, 1-veined, apex acuminate; lip white, Y-shaped, ca. 13 mm; hypochile slightly dilated, shallowly bisaccate, ca. 2 mm, containing a central longitudinal septum and 1 stalked, fleshy callus on either side; mesochile ca. 4 mm, margin incurved and entire to shallowly crenulate, lacking flanges; epichile longitudinally dilated, long, 2-lobed; lobes diverging at an acute angle to one another, oblong to obovate, ca. 7 × 3 mm,

margin crenulate or serrulate, apex truncate-obtuse. Column stout, not twisted, with 2 lamellate wings; rostellum short, erect, bifid; stigma lobes separate. Fl. Sep–Oct.

Damp places in forests, valleys; 1600–1800 m. SE Xizang, NW Yunnan [Bhutan, NE India, Nepal].

**5. *Odontochilus elwesii*** C. B. Clarke ex J. D. Hooker, *Fl. Brit. India* 6: 100. 1890.

西南齿唇兰 xi nan chi chun lan

*Anoetochilus elwesii* (C. B. Clarke ex J. D. Hooker) King & Pantling; *A. purpureus* (C. S. Leou) S. S. Ying; *Cystopus elwesii* (C. B. Clarke ex J. D. Hooker) Kuntze; *Odontochilus purpureus* C. S. Leou.

Plants autotrophic, 15–25 cm tall. Stem ascending or erect, somewhat robust, ca. 3 mm in diam., 6- or 7-leaved. Leaves abaxially pale red or pale green, adaxially deep green to dark greenish purple and sometimes with 3 reddish veins, ovate to ovate-lanceolate, 1.5–5 × 1–3 cm, apex acute; petiole-like base and tubular sheath 0.5–2 cm. Peduncle 8–11 cm, with 1–3 sheathing sterile bracts, pubescent; rachis 1–6 cm, laxly 2–4-flowered, pubescent; floral bracts ovate, ca. 5 mm, much shorter than ovary, outer surface pubescent, apex mucronate. Flowers resupinate; ovary and pedicel twisted, cylindrical-fusiform, ca. 13 mm, pubescent. Sepals green or white, tinged purplish red toward apex, outer surface pubescent, 1-veined; dorsal sepal forming a hood with petals, with 2 broad purplish red stripes, ovate, cymbiform, ca. 7 × 4 mm, apex acuminate; lateral sepals ovate, oblique, ca. 10 × 6 mm, saccate at base. Petals white, ovate, strongly oblique, falcate, ca. 7 × 4 mm, 1-veined, apex acuminate; lip white, Y-shaped, ca. 15 mm; hypochile slightly dilated, shallowly bisaccate, ca. 3.5 mm, containing a central longitudinal septum and 1 fleshy, subsquare callus on either side; mesochile dark purple, 5–7 mm, with a fimbriate flange along either margin; flanges composed of 4 or 5 filaments; epichile transversely dilated, ca. 12 × 14 mm, 2-lobed; lobes diverging widely, suboblong, ca. 10 × 5 mm, margin slightly undulate, apex truncate. Column ca. 4 mm, stout, with 2 suboblong, lamellate wings; anther narrowly ovoid, ca. 4 mm; pollinia clavate, ca. 3 mm, attached to a narrowly lanceolate viscidium ca. 1.5 mm; rostellum erect, small, remnant furcately bifid; stigma lobes separate, suborbicular, large. Fl. Jul–Aug.

Damp places in evergreen broad-leaved forests, bamboo forests, valleys; 300–1500 m. Guangxi, Guizhou, Sichuan, C Taiwan, Yunnan [Bhutan, NE India, N Myanmar, Thailand, N Vietnam].

**6. *Odontochilus brevistylis*** J. D. Hooker, *Fl. Brit. India* 6: 100. 1890.

短柱齿唇兰 duan zhu chi chun lan

*Anoetochilus brevistylis* (J. D. Hooker) Ridley; *A. candidus* (T. P. Lin & C. C. Hsu) K. Y. Lang; *A. inabae* Hayata var. *candidus* (T. P. Lin & C. C. Hsu) S. S. Ying; *A. tonkinensis* Gagnepain; *Cystopus brevistylis* (J. D. Hooker) Kuntze; *Odontochilus candidus* T. P. Lin & C. C. Hsu; *O. inabae* (Hayata) Hayata var. *candidus* (T. P. Lin & C. C. Hsu) S. S. Ying.

Plants autotrophic, 12–18 cm tall. Stem ascending, dark

purple-brown, 3–4 mm in diam., 4- or 5-leaved. Leaves abaxially pale green, adaxially dark green, ovate-lanceolate to oblong, oblique, 2.5–5 × 1–2 cm, apex acute; petiole-like base and tubular sheath 1–1.5 cm. Peduncle 6–8 cm, pubescent, with 1 or 2 sterile bracts; rachis 4–7 cm, subdensely 5–9-flowered, pubescent; floral bracts lanceolate, 10–15 mm, subequal in length to or exceeding ovary, outer surface pubescent, apex acuminate. Flowers resupinate, white or yellowish white; ovary and pedicel twisted, cylindrical-fusiform, 9–10 mm, glabrous. Sepals yellowish green, outer surface pubescent, 1-veined; dorsal sepal forming a hood with petals, ovate, cymbiform, 6–6.5 × 4–4.5 mm, apex acute; lateral sepals ovate-elliptic, oblique, 9–10 × 3.5–3.7 mm, apex subobtusely. Petals white, ovate, strongly oblique, falcate, 6–6.5 × ca. 3 mm, glabrous, 1-veined, apex long apiculate; lip white or yellowish white, Y-shaped, 16–18 mm; hypochile slightly dilated, bisaccate, ca. 2 mm, containing a central longitudinal septum and 1 fleshy, hooked callus on either side; mesochile 6–8 mm, with a pectinate flange along each margin; flanges composed of 4 or 5 filaments to ca. 3 mm and 3 or 4 shorter obtuse teeth; epichile longitudinally dilated, ca. 6 × 8 mm, 2-lobed; lobes diverging at an acute angle to one another, obovate-flabellate, ca. 5.5 × 3.5 mm, margin slightly crenulate, apex obtuse. Column twisted, ca. 3 mm, stout, with 2 lamellate wings; anther ovoid, short, apex obtuse; pollinia attached to 1 small, narrowly elliptic viscidium; rostellum broad, bifid; stigma lobes separate. Fl. Aug.  $2n = 40, 42$ .

Damp places in evergreen broad-leaved forests; 1700–1900 m. SE Xizang, Yunnan [Malaysia (Peninsular), Thailand, Vietnam].

**7. *Odontochilus lanceolatus*** (Lindley) Blume, Coll. Orchid. 80. 1859.

齿唇兰 *chi chun lan*

*Anoetochilus lanceolatus* Lindley, Gen. Sp. Orchid. Pl. 499. 1840; *A. bisaccatus* Hayata; *A. flavus* Benth & J. D. Hooker; *A. luteus* Lindley; *Cystopus flavus* (Benth & J. D. Hooker) Kuntze; *C. lanceolatus* (Lindley) Kuntze; *Odontochilus bisaccatus* (Hayata) Hayata ex T. P. Lin; *O. yunnanensis* Rolfe; *Pristiglottis bisaccata* (Hayata) K. Nakajima.

Plants 15–30 cm tall. Stem ascending, green-brown, 4- or 5-leaved. Leaves abaxially pale green, adaxially dark green with whitish stripes along midvein and 2 lateral veins, ovate, ovate-lanceolate, or elliptic, 1.5–8 × 1–5 cm, apex acute; petiole-like base and tubular sheath 0.9–2 cm. Peduncle 4–6 cm, pubescent, with 1 or 2 sheathing sterile bracts; rachis 4–6 cm, subdensely 3–10-flowered, pubescent; floral bracts lanceolate to ovate-lanceolate, 8–10 mm, subequal in length to ovary, abaxially glabrous, ciliate along basal margin, apex acuminate. Flowers resupinate, yellow; ovary and pedicel twisted, fusiform, 9–10 mm, glabrous. Sepals yellowish green, glabrous, 1-veined; dorsal sepal forming a hood with petals, ovate to ovate-oblong, cymbiform, 4–6 × 3–4 mm; lateral sepals spreading, ovate-elliptic, oblique, 6–7.5 × 4–5 mm, apex acute to slightly obtuse. Petals whitish green, ovate, strongly oblique, 4–6 × 2.5–4 mm, 1-veined; lip golden yellow, Y-shaped, 12–18 mm; hypochile slightly dilated, bisaccate, ca. 3 mm, containing a central longitudinal septum and 1 subulate, usually curved callus on either side; mesochile 4–6 mm, with a pectinate flange along

either margin; flanges composed of 4–7(–9) obtuse teeth to ca. 2.5 mm; epichile transversely dilated, 2-lobed; lobes diverging widely, cuneate-oblong to obovate, 5–6 × 4–4.5 mm, margin entire or slightly crenulate, apex truncate. Column very short, squat, with 2 deltoid wings toward apex; rostellum twisted, broad, remnant bifid; stigma lobes separate, large. Fl. Jun–Sep.  $2n = 60, 120$ .

Damp places in evergreen broad-leaved forests, valleys; 800–2200 m. Guangdong, Guangxi, C Taiwan, Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

**8. *Odontochilus nanlingensis*** (L. P. Siu & K. Y. Lang) Ormerod, Taiwania 48: 91. 2003.

南岭齿唇兰 *nan ling chi chun lan*

*Anoetochilus nanlingensis* L. P. Siu & K. Y. Lang, Acta Phytotax. Sin. 40: 164. 2002.

Plants autotrophic, 7.5–8.5 cm tall. Stem ascending, green-brown, 1–1.5 mm in diam., 3–5-leaved. Leaves abaxially purple, adaxially deep green, ovate, 0.6–0.8 × 0.4–0.6 cm, apex acute; petiole-like base and tubular sheath 0.3–0.5 cm, base sheathing. Peduncle 3–4 cm, with 2 sheathing sterile bracts, villous; rachis 1.5–3 cm, subdensely (1 or)2- or 3(or 4)-flowered; floral bracts purplish, narrowly ovate, 5–7 × 2.5–3 mm, glabrous with sparsely ciliate margin, apex long acuminate. Flowers resupinate; ovary and pedicel fusiform, 7–8 mm. Sepals white with a reddish purple longitudinal stripe on either side of midvein, 1-veined; dorsal sepal forming a hood with petals, narrowly ovate, 5–6 × 2–2.5 mm, glabrous, apex obtuse; lateral sepals oblong-lanceolate, oblique, 8–9 × 2.8–3 mm, saccate at base. Petals white with a reddish purple longitudinal band along midvein, linear-lanceolate, oblique, 5–6 × ca. 1 mm, margin ciliate, apex acute; lip white, Y-shaped, 12–13 mm, membranous; hypochile concave, globose-saccate, 2–2.5 × 1.5–2 mm, aseptate, containing 2 narrowly oblong calli; mesochile 4.5–5 mm, with a fimbriate flange along each margin, with 3 or 4 reddish purple blotches on either side of midvein; flanges composed of 5–8 narrow, well-spaced filaments, each filament 1–2 mm; epichile dilated, 2-lobed, with a solitary reddish purple blotch in sinus; lobes diverging at an acute angle to one another, obovate, 4–5 × 3.5–4 mm, margin slightly undulate, apex truncate-obtusely. Column ca. 1.5 mm, stout; anther purple-red, narrowly lanceolate, ca. 3.5 mm; rostellum pink, apex forked; stigma lobes separate, subrotund. Fl. Jun–Jul.

• Forests; 600–1600 m. Guangdong, Taiwan.

**9. *Odontochilus tortus*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 125. 1896.

一柱齿唇兰 *yi zhu chi chun lan*

*Anoetochilus densiflorus* Mansfeld; *A. repens* (Downie) Seidenfaden & Smitinand; *A. tortus* (King & Pantling) King & Pantling; *Odontochilus densiflorus* (Mansfeld) Tang & F. T. Wang ex Merrill & Metcalf; *O. repens* Downie; *Pristiglottis torta* (King & Pantling) Averyanov.

Plants autotrophic, 18–25 cm tall. Stem ascending, stout, ca. 5 mm in diam., 5- or 6-leaved. Leaves abaxially pale green, adaxially deep green, elliptic to ovate-lanceolate, slightly

oblique, 2.5–8 × 2–4.5 cm, apex acute; petiole-like base and tubular sheath 2–2.5 cm. Peduncle relatively short, stout, pubescent, with 1 or 2 sterile bracts; rachis subdensely many flowered; floral bracts ovate-lanceolate, slightly longer than ovary, outer surface pubescent, apex acuminate. Flowers resupinate; ovary and pedicel twisted, cylindric, ca. 13 mm, sparsely pubescent. Sepals purplish green with brownish purple stripes on either side of midvein, sparsely pubescent on outer surface, 1-veined; dorsal sepal forming a hood with petals, ovate, concave, ca. 8 × 4 mm, apex acute; lateral sepals spreading, oblong, oblique, ca. 9 × 3 mm, apex acute. Petals greenish white with brownish purple stripes on either side of midvein, ovate, oblique, falcate, ca. 8 × 4 mm, glabrous, 1-veined, apex apiculate; lip white, Y-shaped, ca. 17 mm; hypochile slightly dilated, globose-saccate, ca. 3 mm, aseptate, containing 2 oblong, shallowly 3-lobed calli; mesochile ca. 7 mm, with a pectinate flange along each margin; flanges composed of 4 or 5 filaments and 4 or 5 shorter obtuse teeth; epichile transversely dilated, ca. 6 × 11 mm, 2-lobed; lobes diverging widely, obovate, ca. 5.5 × 4 mm, margin crenulate, apex obtuse. Column ca. 2.5 mm, with 2 triangular-linear wings; anther narrowly ovoid, ca. 6 mm, apex acuminate; rostellum obovate, very large, ca. 3 × 2 mm, remnant deeply bifid; stigma lobes confluent, large. Fl. Jul–Sep.

Dense forests, along valleys; 400–1300 m. N and W Guangxi, Hainan, SE Xizang, S and SW Yunnan [Bhutan, Myanmar, Thailand, N Vietnam].

**10. *Odontochilus inabae*** (Hayata) T. P. Lin, *Native Orchids Taiwan* 1: 216. 1975 [*“inabai”*].

台湾齿唇兰 tai wan chi chun lan

*Anoectochilus inabae* Hayata, *Icon. Pl. Formosan.* 4: 102. 1914 [*“inabai”*].

Plants autotrophic, 10–20 cm tall. Stem ascending, 4- or 5-leaved. Leaves green, ovate-oblong to ovate, slightly oblique, 4–6 × 2.5–3.5 cm, apex acute; petiole-like base and tubular sheath 1.5–3.5 cm. Peduncle green, tinged reddish brown, 5–8 cm, pubescent; rachis 2–6 cm, laxly 3–10-flowered; floral bracts pale brown, ovate-lanceolate to lanceolate, 8–12 mm, slightly shorter than ovary, outer surface pubescent. Flowers erect, not resupinate; ovary and pedicel reddish brown or green, cylindric-fusiform, not twisted, 10–15 mm, pubescent. Sepals pale green with large dark brownish green patches, outer surface pubescent; dorsal sepal forming a hood with petals, ovate, 5–6 × 3.5–4 mm, apex acuminate or shortly cuspidate; lateral sepals oblong, slightly oblique, 11–12 × 4.5–5 mm, apex acute. Petals pale green with large dark brownish green patches, ovate-lanceolate, strongly oblique, 6.5–7 × 2.2–3 mm, apex acuminate-caudate; lip white, Y-shaped, 17–26 mm; hypochile

globose-saccate, ca. 3 mm, aseptate, containing 2 digitate calli; mesochile 9.5–16 × 2–3 mm, with a fimbriate flange along each margin; flanges composed of 5 or 6 filaments and a shallowly crenulate lamella, each filament 4–8 mm; epichile longitudinally dilated, 2-lobed; lobes diverging widely, flabellate, ca. 10 × 5.5 mm, apex obtuse to slightly crenulate. Column slightly twisted, ca. 3.5 mm, with 2 low, lamellate wings; anther ovoid; rostellum erect, furcately bifid; stigma lobes narrowly separated. Fl. May–Aug.  $2n = 28$ .

Moist forests; 500–1700 m. Taiwan [Japan (Ryukyu Islands), N Vietnam].

**11. *Odontochilus clarkei*** J. D. Hooker, *Fl. Brit. India* 6: 100. 1890.

红萼齿唇兰 hong e chi chun lan

*Anoectochilus clarkei* (J. D. Hooker) Seidenfaden & Smitinand; *Cystopus clarkei* (J. D. Hooker) Kuntze.

Plants autotrophic, to 30 cm tall. Stem ascending or erect, ca. 5 mm in diam., 5- or 6-leaved. Leaves abaxially pale green, adaxially dark green, ovate, ovate-elliptic, or elliptic, oblique, 4–6 × 2–3 cm, apex acute; petiole-like base and tubular sheath 2–2.5 cm. Peduncle 3–5 cm, with 1 or 2 sheathing sterile bracts, pubescent; rachis 4–7 cm, subdensely many flowered; floral bracts purplish red, lanceolate, to 13 mm, slightly exceeding ovary, outer surface pubescent, apex acuminate. Flowers resupinate; ovary and pedicel twisted, cylindric, 8–10 mm, pubescent. Sepals purplish red with a deep purplish red stripe on either side of midvein, outer surface glabrous to sparsely pubescent, 1-veined; dorsal sepal forming a hood with petals, ovate, ca. 5 × 3.2 mm, apex acuminate-caudate; lateral sepals broadly ovate-elliptic, oblique, ca. 9 × 5.5 mm, apex subobtuse. Petals yellow, tinged red and with a deep purplish red stripe on either side of midvein, ovate, strongly oblique, falcate, ca. 6 × 2.5 mm, 1-veined, apex long acuminate; lip Y-shaped, 18–20 mm; hypochile slightly dilated, globose-saccate, ca. 3 mm, aseptate but sometimes shallowly 2-lobed, containing 2 fleshy, somewhat acerose, hooked calli near center; mesochile ca. 5 mm, expanded at base into an orbicular to obcordate plate, reddish, with a pectinate flange along each margin; flanges composed of 2 or 3 obtuse teeth; epichile yellow, longitudinally dilated, 2-lobed, apiculate in sinus between lobes; lobes diverging widely, obovate-cuneate, ca. 10 × 5 mm, apex truncate. Column ca. 2 mm, stout, with 2 elliptic wings; anther ovoid-lanceolate; pollinia attached to a small, elliptic viscidium; rostellum erect, remnant bifid; stigma lobes separate. Fl. Sep.

Shaded places in evergreen broad-leaved forests; ca. 1100 m. SE Xizang [India (Sikkim), Myanmar].

## 20. *SPIRANTHES* Richard, *De Orchid. Eur.* 20, 28, 36. 1817, nom. cons.

绶草属 shou cao shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Aristotelea* Loureiro (1790), not *Aristotela* Adanson (1763), nor *Aristotelia* L'Héritier (1785–1786, nom. cons.); *Gyrostachys* Persoon ex Blume; *Ibidium* Salisbury ex Small; *Monustes* Rafinesque; *Orchiastrum* Séguier.

Herbs, terrestrial, acaulescent. Roots fasciculate, fusiform, fleshy, glabrous. Leaves basal, forming a rosette, linear, elliptic,

or broadly ovate, rarely subcylindric, base sheathing. Inflorescence terminal, racemose with many small flowers arranged spirally around rachis. Flowers resupinate, horizontal or nodding, not opening widely, small; ovary twisted, fusiform. Sepals free, narrowly elliptic to lanceolate, subsimilar; dorsal sepal erect, often connivent with petals and forming a hood; lateral sepals dilated or sometimes saccate at base. Petals erect, oblanceolate, recurved; lip entire or obscurely 3-lobed, shortly clawed, apex recurved, undulate, lateral margins embracing column; disk usually papillose, with 2 fleshy glands at base. Column clavate, ventrally pubescent; anther erect, 2-locular, on dorsal surface of column; pollinia 2, each 2-partite, granular-farinaceous, with or without short caudicle and attached to narrow viscidium; rostellum erect, 2-lobed at apex after removal of viscidium; stigma suborbicular to elliptic. Capsule ellipsoid.

About 50 species: mainly in North America, with a few species in Africa, Asia, Australia, Central and South America, and Europe; three species (two endemic) in China.

- 1a. Flowers purplish red or pink; floral bracts, ovary, and sepals glabrous ..... 1. *S. sinensis*
- 1b. Flowers white; floral bracts, ovary, and sepals glandular pubescent.
  - 2a. Dorsal sepal ca. 4 mm, apex obtuse ..... 2. *S. hongkongensis*
  - 2b. Dorsal sepal ca. 6 mm, apex acute ..... 3. *S. sunii*

**1. *Spiranthes sinensis*** (Persoon) Ames, *Orchidaceae* 2: 53. 1908.

绶草 shou cao

*Neottia sinensis* Persoon, *Syn. Pl.* 2: 511. 1807; *Gyrostachys australis* (R. Brown) Blume; *G. stylites* (Lindley) Kuntze; *Monustes australis* (R. Brown) Rafinesque; *N. amoena* M. Bieberstein; *N. australis* R. Brown; *N. australis* var. *chinensis* Ker Gawler; *Spiranthes amoena* (M. Bieberstein) Sprengel; *S. australis* (R. Brown) Lindley; *S. australis* var. *suishaensis* Hayata; *S. sinensis* var. *amoena* (M. Bieberstein) H. Hara; *S. sinensis* var. *australis* (R. Brown) H. Hara & S. Kitamura; *S. stylites* Lindley; *S. suishaensis* (Hayata) Schlechter.

Plants 13–30 cm tall. Roots 2–3 mm in diam. Leaves 2–5, erect and spreading, broadly linear to broadly linear-lanceolate, rarely narrowly oblong, 3–10 × 0.5–1 cm, apex acute or acuminate, with an indistinct petiole-like base. Inflorescence erect, 10–25 cm, glabrous; rachis 4–10 cm, with many spirally arranged flowers; floral bracts ovate-lanceolate, glabrous, apex long acuminate. Flowers purplish red or pink; ovary pale green, 4–5 mm including pedicel, glabrous. Dorsal sepal forming a hood with petals, narrowly oblong, cymbiform, ca. 4 × 1.5 mm, glabrous, apex subacute; lateral sepals lanceolate, slightly oblique, ca. 5 × 2 mm, glabrous, base slightly gibbous, apex subacute. Petals rhombic-oblong, oblique, ca. as long as dorsal sepal, thinly textured, apex obtuse; lip broadly oblong, 4–5.5 × ca. 2.5 mm, shortly clawed, concave base containing 2 clavate glands, lateral margins erect, apical margin with strongly wrinkled teeth, apex obtuse and recurved; disk papillate. Column erect, ca. 2 mm; anther ovoid; pollinia ca. 1 mm; rostellum narrowly triangular-lanceolate; stigma discoid, weakly 3-lobed, slightly raised. Fl. Jul–Aug.  $2n = 24, 30, 32$ .

Open and moist areas in forests, thickets, wet grasslands, meadows, marshes; 200–3400 m. Almost throughout China [Afghanistan, Bhutan, India, Japan, Kashmir, Korea, Malaysia, Mongolia, Myanmar, Nepal, Philippines, Russia (Siberia), Thailand, Vietnam; Australia].

**2. *Spiranthes hongkongensis*** S. Y. Hu & Barretto, *Chung Chi J.* 13(2): 2. 1976.

香港绶草 xiang gang shou cao

Plants 11–44 cm tall. Roots 1.5–3.5 mm in diam. Leaves 2–6, erect and spreading, linear to oblanceolate, 4–12 × 0.5–0.9

cm, apex acute. Inflorescence erect, 10–42 cm, becoming densely glandular pubescent distally; rachis 3.5–13 cm, with many spirally arranged flowers; floral bracts lanceolate, sparsely glandular pubescent, apex acuminate. Flowers creamy white; ovary green, ca. 4 mm, glandular pubescent. Dorsal sepal forming a hood with petals, oblong, cymbiform, ca. 4 × 1.5 mm, outer surface glandular pubescent, apex obtuse; lateral sepals oblong-lanceolate, slightly oblique, ca. 4 × 1.5 mm, outer surface glandular pubescent, apex obtuse. Petals sometimes tinged pale pink, oblong, slightly oblique, ca. as long as dorsal sepal, thinly textured, apex obtuse; lip broadly oblong, 4–5 × ca. 2.5 mm, basal portion thickened and with 2 transparent, spherical glands, lateral margins erect and crisped, apex truncate-obtuse and recurved; disk papillate. Column erect, ca. 1 mm; anther ovoid; pollinia ca. 1 mm; rostellum triangular-lanceolate; stigma slightly raised, shield-shaped, distinctly 3-lobed. Fl. Mar–Apr.  $2n = 60^*$ .

- Open moist to dry hillsides, grasslands, meadows; 800–900 m. Hong Kong.

Since it was first described, this species has largely been ignored by subsequent authors who have referred it to synonymy of *Spiranthes sinensis*. However, Hu and Barretto (*Chung Chi J.* 13(2): 4–6. 1976) identified the often densely glandular pubescent rachis, glandular pubescent floral bracts and sepals, and the broad, distinctly 3-lobed stigma as clear morphological characters that distinguish it from *S. sinensis*. More recently, Sun (*Amer. J. Bot.* 83: 252–260. 1996) demonstrated that *S. hongkongensis* is an allopolyploid probably derived from natural hybridization between *S. sinensis* and *S. spiralis* (Linnaeus) Chevallier. Though *S. hongkongensis* has only been confirmed from Hong Kong to date, it is likely to be more widespread, particularly where the two parental species are sympatric; re-examination of herbarium material may result in the revoking of its endemic status, and synonymy may have to be re-assigned.

**3. *Spiranthes sunii*** Boufford & Wen H. Zhang, *Harvard Pap. Bot.* 13: 261. 2008.

宋氏绶草 song shi shou cao

Plants 8–20 cm tall. Roots up to ca. 5 mm in diam. Leaves 5–7, spreading, elliptic to narrowly lanceolate, 2–6.5 × 0.5–1.2 cm, apex acute, basally contracted into a distinct petiole-like stalk. Inflorescence erect, 8.5–21 cm, basally sparsely glandular pubescent, distally densely so; rachis 2.5–6 cm, with several to many spirally arranged flowers; floral bracts obovate, elliptic, or rhombic, sparsely glandular pubescent, apex acuminate.

Flowers white; ovary green, 4–6 mm, glandular pubescent. Dorsal sepal forming a hood with petals, oblong, ca. 6 × 2 mm, outer surface glandular pubescent, apex acute; lateral sepals narrowly oblong, slightly oblique, 5–6 × ca. 0.8 mm, outer surface glandular pubescent, apex acute. Petals oblanceolate, slightly oblique, 5–6 × ca. 0.8 mm, apex obtuse; lip oblong, 5–6 × ca. 2 mm, basal portion with 2 clavate glands, lateral margins erect and shallowly erose, apex truncate and recurved; disk

glabrous. Column erect, ca. 1.5 mm; anther ovoid; pollinia ca. 1.5 mm; rostellum triangular. Fl. May.

• Open moist soil along streams, grasslands and mixed deciduous forests; 800–900 m. Gansu.

This taxon is clearly very similar to *Spiranthes hongkongensis*. Further comparative studies, including observations of chromosome numbers, are required.

## 21. PELEXIA Poiteau ex Lindley, Bot. Reg. 12: ad t. 985. 1826, nom. cons.

肥根兰属 fei gen lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Adnula* Rafinesque; *Collea* Lindley.

Herbs, terrestrial, lithophytic, or rarely epiphytic. Rhizome absent, inconspicuous, or long; roots numerous, fleshy. Leaves usually forming a basal rosette, rarely cauline, several to many, lanceolate to ovate, petiole-like at base; petiole-like base slender or stout, channeled. Inflorescence erect, terminal, racemose, proximally glabrous, pubescent above; peduncle covered by several sheathing bracts. Flowers sometimes produced before leaves, resupinate, erect or horizontal, medium-sized, tubular; ovary fusiform, pubescent. Sepals pubescent adaxially; dorsal sepal concave, connivent with petals and forming a hood; lateral sepals connate at base, adnate to column foot and forming a short spur, or rarely free and not forming a spur. Petals elliptic to oblanceolate, often oblique at base; lip entire and obovate to spatulate, or sometimes 2-partite with an expanded epichile, fleshy, margin adherent to column for most of its length. Column elongate, stout, ventrally often puberulent or pubescent, base with long column foot; anther sessile, 2-locular; pollinia 2, longitudinally cleft, oblong-ovoid to narrowly ovoid, granular-farinaceous, tapering into caudicles attached to a solitary ovate viscidium; rostellum flexible, narrowly oblong or ligulate; stigma 2-lobed; lobes confluent or separate.

About 75 species: Central and South America; one species (introduced) in China.

**1. *Pelexia obliqua*** (J. J. Smith) Garay, Bot. Mus. Leaflet. 28: 345. 1982.

肥根兰 fei gen lan

*Spiranthes obliqua* J. J. Smith, Bull. Dépt. Agric. Indes Néerl. 43: 74. 1910; *Manniella hongkongensis* S. Y. Hu & Barretto.

Plants terrestrial, 12–15 cm tall. Rhizome short; roots 1–7 × 0.5–1 cm, fleshy, pilose. Leaves forming a basal rosette, appearing after flowering, 7 or 8, oblong to elliptic, 3.5–6.5 × 1.5–3.5 cm, margin occasionally undulate, apex acute; petiole-like base short. Inflorescence glandular hairy; rachis ca. 4 cm,

5–18-flowered; floral bracts linear-lanceolate, 7–11 mm, puberulent. Flowers ca. 3 mm in diam. Sepals pale grayish green, glandular hairy; dorsal sepal suboblong, concave at base, ca. 4 × 1.5 mm, 3-veined; lateral sepals basally connate and forming a pouch, united with base of column. Petals pale grayish green, ca. as long as dorsal sepal, ca. 1 mm wide; lip subsessile, cream-yellow, 2-partite, fleshy; hypochile subquadrate, concave, papillate, base with 2 fleshy appendages near margin; epichile recurved, transversely ovate. Column short; stigma 2-lobed. Fl. Sep.

Valleys. Hong Kong [introduced in Indonesia (Java) and the SW Pacific islands; native to Central America].

## 22. CORYBAS Salisbury, Parad. Lond. ad t. 83. 1807.

铠兰属 kai lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Calcearia* Blume; *Corysanthes* R. Brown; *Nematoceras* J. D. Hooker.

Herbs, terrestrial or rarely epiphytic, small. Tuber solitary, globose to ovoid; subterranean stem and roots slender, fleshy, pubescent. Stem slender, erect, sometimes short and remaining subterranean, usually angled or winged, with a membranous tubular cataphyll at base. Leaf solitary (rarely 2), cordate or broadly ovate, entire or rarely 3- or 5-lobed, sessile or with a short petiole-like base, often appressed to ground, with 1–3 main veins, venation usually white or red. Floral bracts 1 or 2. Flower terminal, solitary, nearly sessile, resupinate, held ± erect at leaf base; ovary usually 6-ridged. Dorsal sepal hoodlike and curved over lip, basal margin incurved and forming a tube that embraces base of lip; lateral sepals and petals linear, narrow, free or connate at base; lip deeply channeled at base and forming a decurved tube with dorsal sepal, upper limb enlarged, spreading or reflexed, adaxially usually minutely papillose or hairy, with 2 spurs or auricles (rarely neither) at base. Column short; anther terminal, erect, 2-locular; pollinia 4 or 2 with cleft, granular-farinaceous, without caudicles, directly attached to sticky viscidium; rostellum dorsal; stigma entire, concave. Capsule strongly 6-ridged, borne on elongate pedicel.

About 100 species: mainly in New Guinea, Australia, and the Pacific islands, extending through SE Asia to the Himalayas; five species (four endemic) in China.

- 1a. Petals 12–30 mm.  
 2a. Dorsal sepal apex long apiculate; lateral sepals free ..... 4. *C. sinii*  
 2b. Dorsal sepal apex rounded; lateral sepals connate at base ..... 5. *C. himalaicus*  
 1b. Petals 8.5–10 mm.  
 3a. Lip without callus at base; floral bracts conspicuously longer than ovary ..... 1. *C. taiwanensis*  
 3b. Lip with a large callus at base; floral bracts slightly longer to shorter than ovary.  
 4a. Lip with a suborbicular lamella; floral bracts slightly longer than pedicel and ovary ..... 2. *C. taliensis*  
 4b. Lip without a lamella; floral bracts nearly equal to or slightly shorter than pedicel and ovary ..... 3. *C. fanjingshanensis*

**1. *Corybas taiwanensis*** T. P. Lin & S. Y. Leu, *Taiwania* 20: 162. 1975.

台湾铠兰 tai wan kai lan

*Calcearia taiwanensis* (T. P. Lin & S. Y. Leu) M. A. Clements & D. L. Jones.

Plants small, 3–5 cm tall. Tuber subglobose or ovoid, 3–4 × ca. 3 mm; subterranean stem erect, pilose. Stem erect, glabrous, with 1 short cataphyll at basal node. Leaf solitary, near apex of stem, sessile, cordate, ca. 1.5 × 1.6 cm, with reticulate venation, apex acute. Floral bract lanceolate, ca. 5 mm. Flower solitary, pale purplish red, subsessile; ovary ca. 3 mm. Dorsal sepal incurved, linear, entire, ca. 13 × 2 mm, apex obtuse; lateral sepals narrowly linear, ca. 13 mm, connate at base for up to 3 mm. Petals narrowly linear, ca. 10 mm; lip orbicular-elliptic when expanded, ca. 17 × 10 mm, base tubular, apical margin fimbriate; disk with several dark red stripes but lacking calli and lamellae; spurs 2, hornlike, ca. 3 mm. Column broadly elliptic, ca. 3.5 mm; pollinia 4, in 2 pairs, ca. 1.2 mm; viscidium elliptic, large; stigma protruding, cupular. Fl. Aug.

- Mossy cliffs, rocky outcrops in forests; ca. 1400 m. N Taiwan.

**2. *Corybas taliensis*** Tang & F. T. Wang, *Acta Phytotax. Sin.* 1: 185. 1951.

大理铠兰 da li kai lan

*Calcearia taliensis* (Tang & F. T. Wang) M. A. Clements & D. L. Jones.

Plants small, 5–6.5 cm tall. Tuber subglobose, ca. 5 mm in diam.; subterranean stem erect, pilose. Stem erect, slender, with 1 short cataphyll at basal node. Leaf solitary, near apex of stem, sessile, cordate to broadly ovate, 8.5–14 × 8–10.5 mm, adaxially with pale reticulate venation, base amplexicaul, apex shortly acuminate. Floral bract linear-lanceolate, slightly longer than ovary. Flower solitary, purplish. Dorsal sepal erect, spatulate, hoodlike, ca. 14 × 7 mm, 5–7-veined, apex rounded, apiculate; lateral sepals similar to petals, narrowly linear or subulate, ca. 8.5 × 1.5 mm, 1-veined; lip subobovoid when expanded, ca. 10 × 8 mm, base tubular and erect, apex recurved; disk with 1 suborbicular, slightly fleshy lamella and 1 large callus at base; spurs 2, hornlike, ca. 3.5 mm. Column ca. 2.5 mm. Fl. Sep.

- Forests; 2100–2500 m. W Sichuan, W Yunnan.

**3. *Corybas fanjingshanensis*** Y. X. Xiong, *Acta Phytotax. Sin.* 45: 809. 2007.

梵净山铠兰 fan jing shan kai lan

Plants small, 3.5–6 cm tall. Tuber subglobose, 4–6 mm in diam.; subterranean stem erect. Stem erect, with 1 short cata-

phyll at basal node. Leaf solitary, near apex of stem, cordate or broadly ovate, 9–14 × 7–9.5 cm, adaxially with white reticulate venation, base amplexicaul, apex shortly acuminate. Floral bract lanceolate, nearly equal to or slightly shorter than pedicel and ovary. Flower solitary, rosy or pink, longitudinally striped with purple. Dorsal sepal erect, spatulate, hoodlike, 10–12 × 5–8 mm, 7–9-veined, apex rounded; lateral sepals narrowly linear or subulate, 5–5.5 × 0.5–0.8 mm, 1-veined. Petals similar to lateral sepals, 6–7 × 0.5–1 mm; lip subobovate when expanded, 11–15 × 6–10 mm, base tubular, apical half recurved; disk with a callus at base; spurs 2, ca. 3 mm. Column ca. 2 mm. Fl. Jun–Jul.

- Mossy places; 2100–2400 m. NE Guizhou.

**4. *Corybas sinii*** Tang & F. T. Wang, *Acta Phytotax. Sin.* 1: 186. 1951.

铠兰 kai lan

*Calcearia sinii* (Tang & F. T. Wang) M. A. Clements & D. L. Jones.

Plants small, to 4 cm tall. Tuber ovoid to ellipsoid, 3.5–6 × 3.5–4 mm; subterranean stem erect, with long curved soft hairs. Stem puberulent, with 1 short cataphyll at basal node. Leaf solitary, near apex of stem, sessile, broadly ovate, 9–18 × 8–16.5 mm, with reticulate venation, base cordate, amplexicaul, margin shallowly undulate, apex long acuminate. Floral bract subulate, ca. 1.5 × as long as ovary. Flower solitary, deep purple; ovary ca. 3 mm. Dorsal sepal oblanceolate, ca. 18.5 × 5 mm, 9-veined, apex rounded and long apiculate; lateral sepals free, subulate, ca. 14 × 1 mm. Petals similar to lateral sepals, to 25–30 mm, 1-veined; lip subobovoid when expanded, ca. 13 × 11 mm, 13-veined, basally tubular and erect, apical part recurved, margin erose, apex rounded; disk lacking a lamella but with 1 large callus at base; spurs 2, hornlike, ca. 5 mm. Column ca. 3.8 mm. Fl. Jun–Nov.

- Forests; 1500–2300 m. C and N Guangxi, C Taiwan.

**5. *Corybas himalaicus*** (King & Pantling) Schlechter, *Repert. Spec. Nov. Regni Veg.* 19: 19. 1923.

杉林溪铠兰 shan lin xi kai lan

*Corysanthes himalaica* King & Pantling, *J. Asiatic Soc. Bengal, Pt. 2, Nat. Hist.* 65: 128. 1896; *Corybas purpureus* J. Joseph & Yoganarasimhan; *C. shanlinshiensis* W. M. Lin, T. C. Hsu & T. P. Lin.

Plants small, 3–6 cm tall. Tuber globose to ellipsoid, ca. 4 mm, minutely pilose; subterranean stem erect, 0.5–3 cm, pilose. Stem erect, to 5 cm, glabrous, with a tubular cataphyll at basal node. Leaf solitary, near apex of stem, cordate, 0.8–2.2 × 0.7–2.3 cm, adaxially with palmate venation, base amplexicaul,

apex cuspidate. Floral bract linear-lanceolate, 6–12 × ca. 2 mm. Flower solitary, white and purplish red; pedicel and ovary 4–5 mm. Dorsal sepal spatulate, 12–17 × 4–8 mm, apex rounded; lateral sepals filiform, 11–14 mm, connate at base for ca. 1/5 of length. Petals similar to lateral sepals, 12–20 mm; lip orbicular and 8–14 mm wide when expanded, slightly shorter than petals,

base tubular, apical part recurved; disk papillose, marked with parallel violet-red lines, with a conspicuous callus at base; spurs 2, whitish, straight or slightly arcuate, 3–7 mm. Column ca. 2.5 mm. Fl. Jul–Aug.

Mossy rocky places in forests; 1700–1900 m. C Taiwan [Bhutan, NE India].

### 23. STIGMATODACTYLUS Maximowicz ex Makino, Ill. Fl. Japan 1(7): 81, t. 43. 1891.

指柱兰属 zhi zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Pantlingia* Prain.

Herbs, terrestrial, small. Tubers solitary, globose, small; subterranean stem above tuber erect, elongate, becoming fleshy and rhizomatous apically, producing lateral droppers that form new tubers at their tips. Stem slender, glabrous, unbranched, with membranous cataphylls at each node. Leaf solitary, cauline, green. Inflorescence terminal, racemose, 1- to few flowered; floral bracts foliaceous, smaller than leaf. Flowers resupinate, suberect, shortly pedicellate. Sepals free, narrow, similar but lateral sepals slightly oblique and shorter than dorsal sepal. Petals similar to lateral sepals; lip broad, base with fleshy, deeply lobed callus. Column erect, incurved toward apex, sometimes keeled ventrally and with narrow wings at margin, lacking column foot; anther terminal, 2-locular; stigma concave, with prominent digital appendage at posterior margin; pollinia 4, in 2 pairs, granular-farinaceous, lacking caudicle and viscidium.

About ten species: Indonesia, New Guinea, and the Solomon Islands, with a few species reaching China, the Himalayas, N India, and Japan; one species in China.

1. *Stigmatodactylus sikokianus* Maximowicz ex Makino, Ill. Fl. Japan 1(7): 70, t. 43. 1891.

指柱兰 zhi zhu lan

Plants to 10 cm tall. Tuber ca. 3 mm in diam.; rhizomatous portion of subterranean stem cylindric, 6–10 × 1–2 mm, puberulent, with 1 or 2 small apical scales. Stem 4–10 cm, slender, angled, with 1 short cataphyll near base. Leaf midway along stem, triangular-ovate, 3–5 × 2–4 mm, 3-veined, apex acuminate. Inflorescence 1–3-flowered; floral bracts pale green, slightly smaller than leaf. Flowers pale green with pale reddish

purple lip; pedicel and ovary 5–9 mm. Dorsal sepal linear, ca. 4 × 0.5 mm, basal margin long ciliate; lateral sepals narrowly linear, ca. 2.5 mm. Petals ca. 3.5 mm, narrower than dorsal sepal; lip broadly ovate, ca. 3.5 mm, margin denticulate; basal callus ca. 1.5 mm, fleshy, divided at middle into apical and basal lobes, apical lobe slightly shorter than basal lobe, both shallowly 2-lobed at apex. Column ca. 3.5 mm, with a digital appendage below stigma. Fl. Aug–Sep.

In shade and along gullies in dense forests; ca. 1800 m. N Fujian, S Hunan, Taiwan [Japan].

### 24. CRYPTOSTYLIS R. Brown, Prodr. 317. 1810.

隐柱兰属 yin zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Chlorosa* Blume; *Zosterostylis* Blume.

Herbs, terrestrial. Rhizome horizontal or ascending, short, densely noded, producing aerial shoots from apical nodes; roots fasciculate, long, fleshy. Leaves basal, elliptic to ovate-lanceolate, base long attenuate into erect petiole-like stalks, with or without loosely sheathing cataphylls at base. Inflorescence erect or ascending, terminal, racemose, several flowered, with sheathing cataphylls at base and scattered sterile bracts along peduncle; floral bracts sheathing. Flowers not resupinate; pedicel and ovary erect, arcuate. Sepals and petals subsimilar, free, spreading, very narrow, margin often involute. Petals often slightly shorter and smaller than sepals; lip attached to base of column, entire, tapering toward apex, basally expanded and embracing column, spurless; disk usually with longitudinal ridges or elongate calli. Column short, with lateral wings; anther terminal, erect, 4-locular; pollinia 4, in 2 pairs, clavate, granular-farinaceous, attached to solitary viscidium; stigma entire, convex, fleshy; rostellum erect, broad and stout.

About 20 species: mainly in tropical Asia, from India and Sri Lanka to the Philippines, Australia, and the Pacific islands; two species in China.

- 1a. Leaves, petioles, inflorescence, and floral bracts uniformly green, lacking dark green or purplish brown blotches; lip ovate-lanceolate to ovate-oblong, lateral veins running closely parallel to midvein ..... 1. *C. arachnites*  
 1b. Leaves, petioles, inflorescence, and floral bracts with dark green or purplish brown blotches; lip rhombic-ovate or obovate, outermost lateral veins widely spaced and running midway between midvein and lateral margins .... 2. *C. taiwaniana*

**1. *Cryptostylis arachnites*** (Blume) Blume, Coll. Orchid. 133. 1859.

隐柱兰 *yin zhu lan*

*Zosterostylis arachnites* Blume, Bijdr. 419. 1825; *Chlorosa latifolia* Blume; *Cryptostylis alismatifolia* F. Mueller; *C. erythroglossa* Hayata; *C. fulva* Schlechter; *C. fulva* var. *subregularis* Schlechter; *C. papuana* Schlechter; *C. stenochila* Schlechter; *C. vitiensis* Schlechter; *C. walkerae* (Wight) Blume; *C. zeylanica* (Lindley) Blume; *Zosterostylis walkerae* Wight; *Z. zeylanica* Lindley.

Plants 15–50 cm tall. Rhizome creeping; roots 4–6 cm, 5–7 mm in diam. Leaves 2 or 3, abaxially pale green, adaxially green, elliptic-ovate to elliptic, 8.5–11 × 4.5–5 cm, glabrous, base broadly cuneate or obtuse, apex acuminate; petiole-like base green, 6.5–11.5 cm. Inflorescence green, 15–47 cm, slender, glabrous, with several to many sterile bracts; rachis 8–10 cm, 10–20-flowered; floral bracts green, lanceolate, 10–15 × 2–3 mm, apex acuminate; ovary cylindric, 8–14 mm including pedicel, glabrous. Sepals yellowish green, linear-lanceolate, 15–19 × 1.5–2 mm, 3-veined, margin involute, apex acuminate. Petals yellowish green, linear, 9–10 × ca. 1 mm, 1-veined, margin involute, apex acuminate; lip abaxially yellowish green, adaxially orange-red, tinged yellow near apex and with bright red spots, elliptic-lanceolate to ovate-oblong, 15–21 × 5–7 mm, 5-veined, lateral veins running closely parallel to midvein, base rounded and shallowly saccate, apex acuminate; disk with minute hairs. Column 2–2.5 mm; wings smooth; anther ellipsoid; pollinia 1.5–1.7 mm. Fl. May–Jun.  $2n = 42$ .

Broad-leaved evergreen forests, bamboo forests; 200–1500 m. S Guangdong, SW Guangxi, Taiwan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

**2. *Cryptostylis taiwaniana*** Masamune, Trans. Nat. Hist. Soc. Formosa 23: 208. 1933.

台湾隐柱兰 *tai wan yin zhu lan*

*Cryptostylis arachnites* (Blume) Blume var. *taiwaniana* (Masamune) S. S. Ying.

Plants 15–25 cm tall. Rhizome creeping or ascending. Leaves 1–3, pale green abaxially, green with dark green blotches adaxially, ovate to ovate-oblong, 5–15 × 3–6 cm, base obtuse or rounded, apex acute; petiole-like base with dark green or purplish brown spots, 7–12 cm. Inflorescence green with dark green or purplish brown spots, to 25 cm, glabrous, with 2–5 sterile bracts; rachis 5–15 cm, 5–15-flowered; floral bracts green with purplish brown spots, ovate-lanceolate, ca. 15 × 5 mm, 5-veined, apex acute or acuminate; ovary cylindric, 8–10 mm including pedicel, glabrous. Sepals green, lanceolate, 8–15 × 2–3 mm, 3-veined, margin involute, apex acute. Petals similar to sepals, green, 7–12 × ca. 2 mm, 1-veined, margin involute, apex acute; lip adaxially orange-purple, with scattered dark crimson spots, rhombic-oblong to obovate, 15–20 × 8–12 mm, 5-veined, lateral veins widely spaced, outermost pair running midway between midvein and lateral margins, base rounded and shallowly saccate, lateral margins slightly revolute, apex acute; disk with minute hairs. Column 2.3–2.5 mm; wings rugose; anther ellipsoid; pollinia 1–1.5 mm. Fl. Apr–Aug.

Broad-leaved forests; 100–500 m. S Taiwan [Philippines].

Sufficient material of *Cryptostylis taiwaniana* on which to base a critical comparison with the widespread and variable *C. arachnites* is presently unavailable. In particular, the stability of the primary character used to distinguish the two—namely, the presence/absence of purple-green blotches on the vegetative parts—remains uncertain. As well, other character states are similar or overlap.

“*Cryptostylis philippinensis*” (Schlechter, Bot. Jahrb. Syst. 58: 54. 1922) is a nomen nudum and was therefore not validly published, and neither was the intended new combination “*Cryptostylis arachnites* var. *philippinensis*” (S. S. Ying, Coloured Ill. Indig. Orchids Taiwan 1(2): 118. 1977).

## 25. MICROTIS R. Brown, Prodr. 320. 1810.

葱叶兰属 *cong ye lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small. Tubers subglobose, to 1 cm in diam., fleshy; roots wiry, filamentous. Stem erect, slender, with membranous cataphylls at nodes. Leaf basal, solitary, cylindric, slender, hollow, glabrous, basally amplexicaul, sessile. Inflorescence terminal, racemose, with several to many flowers, emerging through opening in leaf; floral bracts small, sheathing. Flowers resupinate, small; ovary ribbed, glabrous; pedicel extremely short. Dorsal sepal free, erect, similar to but larger than lateral sepals, cucullate over column; lateral sepals free, spreading. Petals free, smaller than sepals; lip adnate to base of column, usually with basal callus adaxially, entire or sometimes apically emarginate, spurless. Column very short, fleshy, with 2 wings apically or laterally; anther erect, 2-locular; stigma entire, quadrate; pollinia 4, in 2 pairs, granular-farinaceous, with short caudicle and viscidium. Capsule erect.

About 14 species: mainly in Australia and New Zealand, with one species extending to tropical and subtropical Asia; one species in China.

**1. *Microtis unifolia*** (G. Forster) H. G. Reichenbach, Beitr. Syst. Pflanzenk. 62. 1871.

葱叶兰 *cong ye lan*

*Ophrys unifolia* G. Forster, Fl. Ins. Austr. 59. 1786; *Microtis formosana* Schlechter; *M. parviflora* R. Brown.

Plants 15–30 cm tall. Tuber small, 4–7 × 3–6 mm. Leaf erect or suberect, 16–33 × 0.2–0.3 cm, adaxially channeled. Inflorescence usually more than 10-flowered, emergent through opening in lower half of leaf; rachis 2.5–5 cm; floral bracts narrowly ovate-lanceolate, 1–2 mm. Flowers green or pale green; ovary and pedicel 2–3.5 mm. Dorsal sepal concave and forming

a hood, broadly elliptic, ca.  $2 \times 1.5$  mm, apex obtuse; lateral sepals suboblong or narrowly elliptic, ca.  $1.5 \times 0.8$  mm. Petals narrowly oblong, ca.  $1.2 \times 0.5$  mm, apex obtuse; lip narrowly elliptic-ligulate,  $1.5\text{--}2 \times$  ca.  $1.2$  mm, slightly fleshy, with notched callus at base. Column extremely short. Capsule ellip-

tic, ca.  $4 \times 2\text{--}2.5$  mm. Fl. and fr. May–Sep.  $2n = 44, 88$ .

Grassy slopes, moist sunny meadows; 100–800 m (to 2000 m in Taiwan). Anhui, Fujian, Guangdong, Guangxi, Hunan, Jiangxi, SE Sichuan, Taiwan, Zhejiang [Indonesia, Japan, Philippines; Australia, Pacific islands (New Zealand)].

## 26. ORCHIS Linnaeus, Sp. Pl. 2: 939. 1753.

红门兰属 hong men lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

Herbs, terrestrial, small to medium-sized. Tubers ovoid or ellipsoid; roots filiform, emerging from subterranean stem at apex of tubers. Stem usually erect, terete, with tubular sheaths near base, glabrous. Leaves 2–5, basal or cauline, alternate, rarely subopposite, base contracted into clasping sheaths, spotted or not. Inflorescence terminal, cylindric, few to many flowered; floral bracts lanceolate to ovate, membranous. Flowers resupinate, secund or not, small to medium-sized; ovary twisted, pedicellate. Sepals free, glabrous; dorsal sepal erect, often concave; lateral sepals spreading, erect or connivent with dorsal sepal and petals to form a hood. Petals free, usually porrect; lip simple or 3- or 4-lobed, spurred at base or rarely spurless; disk with or without basal calli. Column stout; anther erect, base firmly adnate to apex of column, with 2 parallel or divergent locules; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium by a slender caudicle; each viscidium enclosed in a sticky globe, both globes enclosed in a common bursicle formed by folding of rostellar arms; stigma lobes confluent, concave, beneath rostellum; rostellum slightly protruding, with 2 arms; auricles 2, on each side of column. Capsule erect.

About 20 species: mainly in Europe, temperate C and W Asia, and N Africa; one species in China.

### 1. *Orchis militaris* Linnaeus, Sp. Pl. 2: 941. 1753.

四裂红门兰 si lie hong men lan

Plants 20–45 cm tall. Tubers ovoid, 1–1.5 cm, fleshy, entire. Stem with 2 tubular sheaths at base, 3–5-leaved. Leaves abaxially pale green, adaxially green, not spotted, oblong-elliptic to elliptic,  $8\text{--}18 \times 2.5\text{--}5$  cm, apex obtuse. Inflorescence  $4\text{--}10 \times 0.3\text{--}0.5$  cm, densely 5–15-flowered; floral bracts green sometimes tinged purplish red, ovate, 2–3 mm, much shorter than ovary, apex acuminate. Flowers scented, medium-sized; ovary green, tinged with violet, oblong, slightly arching, 1–1.5 cm including pedicel, glabrous. Sepals pinkish white, veined rose-purple on inner surfaces; dorsal sepal erect, ovate-lanceolate, concave,  $9\text{--}13 \times 3\text{--}4$  mm, 3-veined, apex acuminate; lateral sepals erect, obliquely ovate-lanceolate,  $9\text{--}13 \times 3.5\text{--}4.5$

mm, 3-veined, apex acuminate. Petals erect, connivent with dorsal sepal and forming a hood, pale purple to pink, linear, slightly shorter and narrower than dorsal sepal, 1-veined, apex acuminate; lip whitish in center with fine purplish red papillate spots, 1–1.4 cm, spurred at base, 4-lobed, lobes purplish red; basal lobes often erect, linear-falcate, ca.  $8 \times 1$  mm, apex obtuse; mid-lobe much larger than basal lobes, linear-oblong to obovate, ca. 2 mm wide, apex divergently 2-lobed, with an apiculus between 2 lobules; lobules oblong-obovate, to 4 mm; spur pendulous, curving slightly forward, white or pink, cylindrical, 5–6 mm, much shorter than ovary, apex obtuse. Column obtuse; anther purplish; rostellum 3-lobed. Fl. May–Jun, fr. Jul–Aug.  $2n = 42$ .

Limestone grasslands; ca. 600 m. N Xinjiang (Habahe) [Afghanistan, Mongolia, Russia; SW Asia, Europe].

## 27. GALEARIS Rafinesque, Herb. Raf. 71. 1833.

盔花兰属 kui hua lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

*Aceratorchis* Schlechter; *Aorchis* Vermeulen; *Galeorchis* Rydberg.

Herbs, terrestrial, small to medium-sized. Rhizome creeping, usually short; roots fibrous to fleshy. Stem erect, terete, with tubular sheaths near base. Leaves basal or cauline, 1 or 2, alternate, rarely subopposite, base contracted into clasping sheath. Inflorescence erect, terminal, racemose, laxly 1- to several flowered, glabrous; floral bracts conspicuous, lanceolate to ovate, leaflike. Flowers resupinate, secund or not, showy, small to medium-sized; ovary twisted, pedicellate, glabrous. Sepals free, glabrous; dorsal sepal erect, often concave; lateral sepals and petals usually connivent with dorsal sepal and forming a hood; lip simple or obscurely 3-lobed, spurred at base or rarely spurless. Column stout; anther erect, base firmly adnate to apex of column, with 2 parallel or divergent locules; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium by a slender caudicle; each viscidium enclosed in a sticky globe, both globes enclosed in a common bursicle formed by folding of rostellar arms; stigma lobes confluent, concave, beneath rostellum; rostellum slightly protruding, with 2 arms; auricles 2, winglike, on each side of column. Capsule erect.

About ten species: mainly in the N temperate zone, extending to alpine areas of subtropical Asia and North America; five species (two endemic) in China.

*Galearis huanglongensis* Q. W. Meng & Y. B. Luo (Bot. J. Linn. Soc. 158: 690. 2008), recently described from Sichuan (Songpan, 3000–3100 m), could not be treated here because no specimens were seen by the present authors.

- 1a. Lip similar to but shorter than petals, base not contracted or clawed, spurless ..... 1. *G. tschiliensis*
- 1b. Lip distinct from and longer than petals, base contracted or shortly clawed, spurred.
  - 2a. Spur straight, stout, ca. 2 mm, much shorter than ovary ..... 2. *G. spathulata*
  - 2b. Spur curved forward, slender, 6–10 mm, almost as long as to slightly longer than ovary.
    - 3a. Lip deeply 3-lobed near apex ..... 5. *G. roborowskyi*
    - 3b. Lip simple, undivided.
      - 4a. Plants 1-leaved; leaf broadly elliptic, broadly ovate, or suborbicular, base abruptly contracted; rachis 1- or 2-flowered; lip 4–6 mm wide ..... 3. *G. cyclochila*
      - 4b. Plants 2-leaved; leaf elliptic to oblong-lanceolate, base gradually attenuate; rachis 5- to more than 10-flowered; lip 8–9 mm wide ..... 4. *G. wardii*

**1. Galearis tschiliensis** (Schlechter) S. C. Chen, P. J. Cribb & S. W. Gale, *comb. nov.*

河北盔花兰 he bei kui hua lan

Basionym: *Aceratorchis tschiliensis* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 329. 1922; *A. albiflora* Schlechter; *Galeorchis albiflora* (Schlechter) Grubov; *Orchis aceratorchis* Soó; *O. tschiliensis* (Schlechter) Soó.

Plants 6–15 cm tall. Rhizome fleshy. Stem with 2 tubular sheaths at base, 1-leaved. Leaf basal, green, oblong-spatulate to spatulate, 3–5 × 1.2–2.6 cm, base gradually attenuate into conduplicate sheath, apex obtuse. Inflorescence 3–6 cm, slender; rachis 0.5–2.5 cm, with 1–6 secund flowers; floral bracts lanceolate, apex acuminate, basal one often longer than flower. Flowers spreading, pink, small to medium-sized; ovary cylindrical-fusiform, 1–13 mm including pedicel. Sepals rose-purple, oblong, subequal in size, 5–8 × 2.5–4 mm, 3-veined, apex obtuse; dorsal sepal erect, concave; lateral sepals spreading. Petals erect, forming a hood with dorsal sepal, purplish red, pale purple, or white, oblong-lanceolate, oblique, 4–7 × 2–3.5 mm, 1-veined, apex acute; lip similar to petals, spreading, simple, ovate-lanceolate to ovate-oblong, 4–6.8 × 3–3.8 mm, slightly shorter but broader than petals, base slightly concave, spurless, margin entire to slightly undulate, apex obtuse or subacute. Fl. Jun–Aug, fr. Jul–Sep.

• Forests, meadows; 1600–4100 m. Gansu, Hebei, S Qinghai, Shaanxi, Shanxi, NW Sichuan, Xizang, Yunnan.

**2. Galearis spathulata** (Lindley) P. F. Hunt, Kew Bull. 26: 172. 1971.

二叶盔花兰 er ye kui hua lan

*Gymnadenia spathulata* Lindley, Gen. Sp. Orchid. Pl. 280. 1835; *Aorchis spathulata* (Lindley) Vermeulen; *A. spathulata* var. *foliosa* (Finet) Soó; *A. spathulata* var. *wilsonii* (Schlechter) Soó; *Galearis diantha* (Schlechter) P. F. Hunt; *Galeorchis diantha* (Schlechter) Soó; *G. reichenbachii* Nevski; *G. spathulata* (Lindley) Soó; *G. spathulata* var. *wilsonii* (Schlechter) Soó; *Habenaria spathulata* (Lindley) Benth; *Orchis diantha* Schlechter; *O. spathulata* (Lindley) H. G. Reichenbach ex Benth (1881), not Linnaeus (1781); *O. spathulata* var. *foliosa* Finet; *O. spathulata* var. *wilsonii* Schlechter; *Ponerorchis diantha* (Schlechter) Soó.

Plants 8–15 cm tall. Rhizome slender. Stem with 1 or 2 tubular, somewhat membranous sheaths at base, (1 or)2(or)3-leaved. Leaves subopposite, narrowly spatulate-oblong-lanceolate,

narrowly spatulate, or elliptic, 2.3–9 × 0.5–3 cm, base gradually attenuate into a long conduplicate sheath, apex obtuse-rounded to acute. Inflorescence 4–10 cm, slender to slightly fleshy; rachis to 2 cm, with 1–5 often secund flowers; floral bracts spreading, suboblong to narrowly elliptic-lanceolate, apex obtuse or acute, basal one often equal to or longer than flower. Flowers spreading, purple, medium-sized to relatively large; ovary fusiform, 7–9 mm including pedicel. Sepals rose-purple, suboblong, 7–10 × 2.5–4 mm, subequal in length, apex obtuse; dorsal sepal erect, concave, 3(or)5-veined; lateral sepals spreading, slightly oblique, 3-veined. Petals erect, forming a hood with dorsal sepal, purplish pink, ovate-oblong to broadly oblong, 6.5–8 × 2.5–3.5 mm, 3-veined, apex obtuse; lip simple, oblong, elliptic, ovate, or subsquare, 8–11 × 4–6.5 mm, longer than petals, base narrowed into a short claw, spurred, margin entire to slightly undulate, apex obtuse-rounded or subtruncate; disk purplish pink, spotted with dark purple, papillose; spur straight, cylindrical, short, ca. 2 mm, much shorter than ovary, stout. Fl. Jul–Aug, fr. Jul–Sep.

Open forests, scrub, alpine meadows, roadsides; 2300–4300 m. SE Gansu, NE Qinghai, Shaanxi, W Sichuan, E and S Xizang, NW Yunnan [Bhutan, India, Nepal].

**3. Galearis cyclochila** (Franchet & Savatier) Soó, Ann. Univ. Sci. Budapest. Rolando Eötvös, Sect. Biol. 11: 72. 1969.

卵唇盔花兰 luan chun kui hua lan

*Habenaria cyclochila* Franchet & Savatier, Enum. Pl. Jap. 2: 516. 1879; *Galeorchis cyclochilus* (Franchet & Savatier) Nevski; *Orchis cyclochila* (Franchet & Savatier) Maximowicz.

Plants 9–19 cm tall. Rhizome fleshy. Stem slender, with 1 or 2 tubular, membranous sheaths at base, 1-leaved. Leaf green, broadly elliptic, broadly ovate, or suborbicular, 5–9 × 2.5–5 cm, thickly textured, base abruptly contracted into a conduplicate sheath, apex obtuse or obtuse-rounded. Inflorescence 5–12 cm, slender, ca. 1 mm in diam.; rachis branching at apex of scape, (1 or)2-flowered; floral bracts subopposite, oblong-lanceolate to narrowly ovate, 1–2.5 cm, apex obtuse to subacute. Flowers spreading, pink, relatively large; ovary cylindrical, 9–13 mm including pedicel, slender. Dorsal sepal erect, pink, broadly lanceolate to oblong-ovate, concave, 6–9 × 3–4 mm, 3-veined, apex acuminate; lateral sepals spreading, pink, ovate-lanceolate, oblique, 7–10 × 2.5–3 mm, 3-veined, apex acuminate. Petals erect, forming a hood with dorsal sepal, pale pink to white, narrowly oblong to linear-lanceolate, 6–9 × 1.2–2 mm, 1-veined, apex subobtuse; lip spreading, simple, ovate-orbicular, 7–10 × 4–6 mm, longer than petals, basally contracted into a

claw, spurred, margin irregularly wavy-dentate, apex obtuse-rounded; disk pale pink, spotted with purple, papillose; spur pendulous, slightly curved forward, linear-cylindric, slender, 6–9 mm, almost as long as ovary, attenuate toward end, apex subacute. Fl. May–Jun, fr. Jul–Aug.  $2n = 42$ .

Forests, scrub; 1000–2900 m. Heilongjiang, Jilin, NE Qinghai [Japan, Korea, Russia].

**4. *Galearis wardii*** (W. W. Smith) P. F. Hunt, Kew Bull. 26: 172. 1971.

斑唇盔花兰 ban chun kui hua lan

*Orchis wardii* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 215. 1921.

Plants 12–25 cm tall. Rhizome stout, fleshy. Stem stout, with 2 or 3 tubular sheaths at base, 2-leaved. Leaves green, elliptic to oblong-lanceolate, 7–15 × 2.5–4.5 cm, thickly textured, base gradually attenuate into a conduplicate sheath, apex obtuse-rounded or mucronate. Inflorescence 3.5–8 cm, stout, 2–3 mm in diam.; rachis to 3 cm, 5- to more than 10-flowered; floral bracts lanceolate, basal ones to 3.5 cm, much longer than flowers, apex acuminate. Flowers spreading, whitish pink to purple, spotted with dark purple, relatively large; ovary cylindrical, 10–12 mm including pedicel. Sepals pinkish purple, inner surfaces spotted with purple, subequal in length, 8–9 × 3–3.5 mm, 3-veined; dorsal sepal erect, narrowly ovate-lanceolate, apex obtuse; lateral sepals spreading horizontally or reflexed, falcate to narrowly ovate-lanceolate, apex slightly obtuse. Petals erect, forming a hood with dorsal sepal, pinkish purple spotted with deep purple, ovate-lanceolate, ca. 7 × 2.5 mm, 3-veined; lip simple, spreading, pinkish purple spotted with deep purple to purplish black, broadly ovate to suborbicular, 8–9 × 8–9 mm, longer than petals, base contracted, spurred, margin strongly erose and wrinkled, apex obtuse-rounded; spur pendulous, cylindrical, slightly curved forward, 7–10 mm, almost as long as ovary, slender, apex obtuse. Fl. Jun–Jul, fr. Jul–Aug.

• Forests, alpine meadows; 2400–4500 m. W Sichuan, E Xizang, NW Yunnan.

**5. *Galearis roborowskyi*** (Maximowicz) S. C. Chen, P. J. Cribb & S. W. Gale, **comb. nov.**

北方盔花兰 bei fang kui hua lan

Basionym: *Orchis roborowskyi* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 31: 104. 1887; *Aorchis roborowskyi* (Maximowicz) Seidenfaden; *Chusua roborowskyi* (Maximowicz) P. F. Hunt; *Galearis paxiana* (Schlechter) P. F. Hunt; *G. stracheyi* (J. D. Hooker) P. F. Hunt; *G. szechenyiana* (H. G. Reichenbach ex Kanitz) P. F. Hunt; *Galeorchis paxiana* (Schlechter) Soó; *G. roborowskyi* (Maximowicz) Nevski; *G. stracheyi* (J. D. Hooker) Soó; *G. szechenyiana* (H. G. Reichenbach ex Kanitz) Soó; *Orchis paxiana* Schlechter; *O. stracheyi* J. D. Hooker; *O. szechenyiana* H. G. Reichenbach ex Kanitz.

Plants 5–15 cm tall. Rhizome fleshy. Stem with 2 or 3 tubular sheaths at base, 1(or 2)-leaved. Leaves basal, ovate, ovate-orbicular, or narrowly oblong, 3–9 × 1–2.5 cm, base attenuate into a clasping sheath, apex obtuse to subacute. Inflorescence 5–10 cm, somewhat slender; rachis 2–3.5 cm, with 1–5 often secund flowers; floral bracts ovate-lanceolate to lanceolate, apex acuminate, basal one often longer than flower. Flowers spreading, pinkish white or purple, medium-sized; ovary fusiform, 8–10 mm including pedicel. Sepals purplish red, nearly equal in size, 6–7 × ca. 4 mm; dorsal sepal erect, ovate to ovate-oblong, concave, 3-veined, apex obtuse; lateral sepals erect to slightly spreading, ovate-oblong, oblique, 3-veined, apex obtuse. Petals erect, forming a hood with dorsal sepal, purplish red, ovate, 5–6 × ca. 2.5 mm, slightly smaller than sepals, 3-veined, apex obtuse to acute; lip spreading horizontally, purple, deeply 3-lobed near apex, broadly ovate, ca. 7 × 8–9 mm, longer than petals, base contracted, spurred; lateral lobes triangular to obtusely triangular, margin undulate, apex acuminate to obtuse; mid-lobe oblong to triangular, apex obtuse; spur pendulous, curved forward, cylindrical, 6–9 mm, almost as long as to slightly longer than ovary, slender, apex obtuse. Fl. Jun–Jul, fr. Jul–Sep.

Forests, scrub, alpine meadows; 1700–4500 m. Gansu, Hebei, Henan, Qinghai, W Sichuan, Xinjiang, S Xizang [Bhutan, India, Nepal].

## 28. PONERORCHIS H. G. Reichenbach, Linnaea 25: 227. 1852.

小红门兰属 xiao hong men lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

*Chusua* Nevski.

Herbs, terrestrial, small to medium-sized, slender. Tubers subglobose, ovoid, or ellipsoid, not divided, fleshy. Stem usually erect, terete, glabrous, with 1–3 tubular sheaths near base and 1–5 leaves above. Leaves basal or cauline, alternate or rarely subopposite, basally contracted into clasping sheath, glabrous to sparsely pubescent. Inflorescence terminal, glabrous or pubescent; rachis laxly or densely 1- to many flowered; floral bracts lanceolate to ovate. Flowers resupinate, secund or not, small to medium-sized; ovary twisted, often slightly arcuate, glabrous or pubescent. Sepals free; dorsal sepal erect, often concave; lateral sepals spreading. Petals often connivent with dorsal sepal and forming a hood; lip entire or 3- or 4-lobed, spurred at base or rarely spurless; spur usually as long as ovary. Column stout; anther erect, base firmly adnate to apex of column, with 2 parallel locules; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium by a slender caudicle; each viscidium enclosed in a sticky globe, both globes enclosed in a common bursicle formed by folding of rostellar arms; stigma concave, beneath rostellum; rostellum protruding, with 2 arms; auricles 2, usually prominent, one on each side of column. Capsule erect.

About 20 species: from the Himalayas through C and E China to Korea and Japan; 13 species (ten endemic) in China; one additional species (endemic) is incompletely known.

From observations of many fresh flowers of this genus in the field, we infer that the bursicle formed by the rostellar arms is solitary but later becomes separate.

- 1a. Plants always 1-leaved; leaf basal, cordate, ovate, or elliptic; leaf adaxially often marked with purple spots, abaxially purplish red.
  - 2a. Leaf adaxially with off-white lines along principal veins; rachis 1–3-flowered; spur short, saccate, ca. 1 mm ..... 1. *P. brevicealcarata*
  - 2b. Leaf lacking lines along veins; rachis 2- to more than 20-flowered; spur pendulous, cylindric, 4–12 mm.
    - 3a. Inflorescence and ovary pubescent; flowers often secund; lip obtriangular-flabellate, 5–6 × 5–6 mm; spur pendulous, slightly bent forward, 4–6 mm ..... 2. *P. monophylla*
    - 3b. Inflorescence and ovary glabrous; flowers not usually secund; lip broadly oblong-ovate, 10–11 × 8–9 mm; spur horizontal, straight or slightly curved upward, occasionally slightly curved downward, 8–12 mm ..... 3. *P. limprichtii*
- 1b. Plants usually 2–5-leaved; if 1-leaved (some plants of *P. tominagae*, *P. omeishanica*, and *P. chusua*) then leaf cauline, linear, lanceolate, oblong, or elliptic; leaves green, lacking purple spots.
  - 4a. Flowers whitish, creamy white, yellow, or yellowish green.
    - 5a. Leaves basal, subopposite; rachis 1-flowered; petals broadly ovate, 8.5–15 mm; spur 12–25 mm ..... 4. *P. chrysea*
    - 5b. Leaves cauline, alternate, widely spaced, or rarely clustered near base of stem; rachis (1 or)2–8-flowered; petals ovate or narrowly ovate-lanceolate, 4.5–6.5 mm; spur 4–7 mm.
      - 6a. Stem (1–)2–6 cm; rachis (1 or)2–4-flowered; floral bracts to 12 mm, shorter than to slightly exceeding ovary; lip 8–12 mm; spur 4–5.5 mm ..... 6. *P. tominagae*
      - 6b. Stem 8–12 cm; rachis 4–8-flowered; floral bracts to 20 mm, basal ones conspicuously exceeding flowers; lip 5–6 mm; spur ca. 7 mm ..... 8. *P. omeishanica*
  - 4b. Flowers pink, rose, purplish rose, purplish red, purple, or violet, rarely white.
    - 7a. Plants 3.5–6 cm tall; stem 1.5–2 cm; leaves basal, subopposite; lip not lobed ..... 5. *P. crenulata*
    - 7b. Plants (5–)8–45 cm tall; stem (2.5–)5–23 cm; leaves cauline, alternate, widely spaced; lip 3- or 4-lobed.
      - 8a. Petals glabrous.
        - 9a. Lip broadly oblong to obovate, lobed above middle; mid-lobe oblong, square, or ovate, 1.8–3.5(–5) × 2–3.5(–6) mm, usually longer than broad ..... 7. *P. chusua*
        - 9b. Lip obtriangular to suborbicular, lobed toward apex; mid-lobe transversely oblong to ovate, 4–8 × 4–8 mm, usually broader than long ..... 10. *P. kiraishiensis*
      - 8b. Petals papillose and/or with ciliate margins.
        - 10a. Floral bracts foliaceous, 20–40 mm, conspicuously exceeding flowers ..... 9. *P. pugeensis*
        - 10b. Floral bracts to 15 mm, shorter than to slightly exceeding ovary.
          - 11a. Stem and inflorescence green; rachis 2–6-flowered; ovary and pedicel 20–22 mm, densely minutely pubescent; sepals and petals densely minutely papillose on both surfaces ..... 11. *P. sichuanica*
          - 11b. Stem and inflorescence green with purple striations, purple, or purplish with dark striations; rachis 5–20-flowered; ovary and pedicel 6–15 mm, glabrous; sepals glabrous; petals glabrous apart from ciliate margins.
            - 12a. Lip oblong to obovate, 3-lobed below middle, 6–10 × 6–8 mm; lateral lobes ovate to suboblong; mid-lobe oblong to obovate-oblong, longer than broad; spur 8–12 mm ..... 12. *P. takasagomontana*
            - 12b. Lip ovate-orbicular, 3-lobed near middle, 9–15 × 8–12 mm; lateral lobes transversely oblong to subsquare; mid-lobe suborbicular, usually broader than long; spur 12–20 mm ..... 13. *P. taiwanensis*

**1. Ponerorchis brevicealcarata** (Finet) Soó, Acta Bot. Acad. Sci. Hung. 12: 353. 1966.

短距小红门兰 duan ju xiao hong men lan

*Hemipilia brevicealcarata* Finet, Bull. Soc. Bot. France 44: 420. 1898; *Chusua brevicealcarata* (Finet) P. F. Hunt; *Gymnadenia brevicealcarata* (Finet) Finet; *Orchis brevicealcarata* (Finet) Schlechter.

Plants 5–18 cm tall. Tubers elliptic or ovoid, 5–20 mm. Stem to 2.5 cm, with 1 or 2 tubular, membranous sheaths at base, 1-leaved. Leaf basal, abaxially often purplish red, adaxially deep green with off-white lines along 5–7 principal veins and dark purple spots between them, cordate to broadly ovate,

1–3 × 0.7–2 cm, adaxially sparsely minutely papillose, base subcordate, apex acute. Inflorescence erect or slightly curved, 4–14 cm, slender, glabrous; rachis 1–3.5 cm, laxly 1–3-flowered; floral bracts broadly ovate, 4–5 × 2.5–3 mm, much shorter than ovary, apex acuminate. Flowers often secund, deep purplish red, small to medium-sized; ovary cylindric, 10–12 mm including pedicel, slender, glabrous. Dorsal sepal erect, concave, oblong, 5–6 × 2–3 mm, 1-veined, apex obtuse; lateral sepals ovate-oblong, oblique, 6–8 × 3–4 mm, 1-veined, often with pinnate veinlets, apex obtuse. Petals erect, forming a hood with dorsal sepal, obliquely ovate, 5–6 × 3–4 mm, glabrous, 1-veined, apex obtuse; lip spreading, with dark purple spots at base, cuneate-obovate, 3-lobed above middle, 10–11 × 10–11 mm, spurred, margin entire to slightly crenulate; lateral lobes

elliptic to suborbicular, 1.8–4 × 3–4 mm, usually broader than mid-lobe, apex obtuse, truncate; mid-lobe subsquare, 2–3.8 × 2.2–3.8 mm, apex obtuse-rounded, occasionally emarginate; spur saccate, short, ca. 1 mm, apex obtuse. Fl. Jun–Jul.

• Open forests, grassy slopes; 1500–3400 m. SW Sichuan, NW Yunnan.

**2. *Ponerorchis monophylla*** (Collett & Hemsley) Soó, Acta Bot. Acad. Sci. Hung. 12: 353. 1966.

毛轴小红门兰 mao zhou xiao hong men lan

*Habenaria monophylla* Collett & Hemsley, J. Linn. Soc., Bot. 28: 134. 1890; *Chusua monophylla* (Collett & Hemsley) P. F. Hunt; *Orchis geniculata* Finet; *O. monophylla* (Collett & Hemsley) Rolfe; *Peristylus monophyllus* (Collett & Hemsley) Kraenzlin; *Sirindhornia monophylla* (Collett & Hemsley) H. A. Pedersen & Suksathan.

Plants 12–25 cm tall. Tubers oblong, 10–35 mm. Stem 1–3 cm, slender, with 2 tubular, membranous sheaths at base, 1-leaved. Leaf basal, abaxially purplish red, adaxially deep green with dark purple spots, cordate, ovate, or elliptic, 3–6 × 2.5–3.5 cm, sparsely pubescent on principal veins on both surfaces, apex acute. Inflorescence erect or slightly curved, 9–19 cm, with 2 or 3 lanceolate sterile bracts, pubescent; rachis 4–10 cm, laxly several to subdensely more than 20-flowered; floral bracts ovate-lanceolate or ovate, 5–9 mm, usually shorter than ovary, margin ciliate, apex acuminate. Flowers often secund, pinkish white or purplish rose, small to medium-sized; ovary cylindrical, 6–10 mm including pedicel, slender, pubescent. Dorsal sepal erect, oblong, concave, 3.5–5 × 2–2.5 mm, 3-veined, apex subobtuse; lateral sepals obliquely ovate-elliptic, 4–5 × 2–3 mm, 3-veined, apex obtuse. Petals erect, forming a hood with dorsal sepal, marked with chestnut-colored spots, suboblong, 3.5–5 × 1.5–2.5 mm, glabrous, 2-veined, apex obtuse; lip spreading, obtriangular-flabellate, 5–6 × 5–6 mm, 3-lobed above middle, spurred, disk papillose, base narrowed and cuneate; lateral lobes obliquely subsquare, 1.2–2 × 1–2 mm, apical margin minutely crenulate, apex truncate; mid-lobe subsquare, 1–1.5 × 1–1.8 mm, apex obtuse-rounded, sometimes emarginate; spur pendulous, slightly bent forward, cylindrical, 4–6 mm, much shorter than to almost as long as ovary, apex obtuse. Fl. Jun–Aug.

Forests; ca. 1200 m. C and SE Yunnan [Myanmar].

**3. *Ponerorchis limprichtii*** (Schlechter) Soó, Acta Bot. Acad. Sci. Hung. 12: 353. 1966.

华西小红门兰 hua xi xiao hong men lan

*Orchis limprichtii* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 330. 1922; *Chusua hui* (Tang & F. T. Wang) P. F. Hunt; *C. limprichtii* (Schlechter) P. F. Hunt; *O. hui* Tang & F. T. Wang; *Ponerorchis hui* (Tang & F. T. Wang) Soó.

Plants 4.5–23 cm tall. Tubers oblong or ovoid, 12–30 mm. Stem 1–3 cm, with 1 or 2 (or 3) tubular, membranous sheaths at base, 1-leaved. Leaf basal, abaxially purplish green, adaxially deep green and often marked with purple spots, cordate, ovate, or elliptic, 2.8–6.5 × 1.2–4.5 cm, glabrous, apex acuminate or acute. Inflorescence erect or slightly curved, 2–17 cm, glabrous; rachis to 7 cm, laxly 2–14-flowered; floral bracts lanceolate or ovate-lanceolate, 5–15 mm, shorter than ovary, apex acuminate.

Flowers not usually secund, lilac to rose-purple, medium-sized; ovary cylindrical, 10–12 mm including pedicel, slender, glabrous. Dorsal sepal erect, suboblong, concave, 6–8 × 3–3.5 mm, 1-veined, apex subacute; lateral sepals spreading, obliquely ovate, 7–9 × 3.5–4 mm, 1-veined, apex acute. Petals erect, forming a hood with dorsal sepal, ovate-cymbiform, oblique, 5–7 × ca. 3 mm, glabrous, 1-veined, apex slightly obtuse; lip spreading, broadly oblong-ovate, slightly concave, 10–11 × 8–9 mm, disk papillose, spurred, 3-lobed at middle, margin slightly undulate, tinged white at base, dotted with deep lilac; lateral lobes transversely suboblong, 2–3 × 3–5.5 mm, apex obtuse-rounded; mid-lobe subsquare, 4–5 × 3–4 mm, longer than lateral lobes, apex obtuse-rounded, sometimes slightly emarginate or shortly apiculate; spur horizontal, straight or slightly curved upward, occasionally slightly curved downward, cylindrical, 8–12 mm, slightly swollen toward apex, apex obtuse. Fl. May–Jun.

• Forests, alpine grasslands; 1400–4000 m. SE Gansu, Henan, Shaanxi, NW Sichuan, Yunnan.

**4. *Ponerorchis chrysea*** (W. W. Smith) Soó, Acta Bot. Acad. Sci. Hung. 12: 353. 1966.

黄花小红门兰 huang hua xiao hong men lan

*Habenaria chrysea* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 204. 1921; *Chusua chrysea* (W. W. Smith) P. F. Hunt; *Orchis chrysea* (W. W. Smith) Schlechter.

Plants 4–10 cm tall. Tubers subglobose, 5–10 mm in diam. Stem 1–3 cm, with 1 or 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, green, lacking purple spots, oblong to narrowly elliptic, 2–6.5 × 0.6–1.5 cm, glabrous, apex acuminate or subobtuse. Inflorescence erect, 1–3 cm, 1-flowered, glabrous; floral bract foliaceous, sheathing, oblanceolate, 18–45 mm, base contracted, apex acute to acuminate. Flower fragrant, creamy white or yellow, medium-sized; pedicel 10–15 mm; ovary fusiform, ca. 10 mm, glabrous. Dorsal sepal erect, oblong-lanceolate, concave, 9–15 × 3.5–4.5 mm, 1-veined, apex acuminate; lateral sepals falcate-lanceolate, oblique, 9–16 × ca. 3 mm, 1-veined, apex acuminate. Petals erect, forming a loose hood with dorsal sepal, broadly ovate, oblique, 8.5–15 × 4.5–7 mm, glabrous, 3-veined, apex obtuse; lip spreading, broadly ovate-triangular, slightly concave, simple to obscurely 3-lobed, ca. 12 × 8–12 mm, slightly fleshy, thickened along midvein, spurred, margin slightly crenulate; spur pendulous, cylindrical, 12–25 mm, slightly narrowed toward acuminate apex. Fl. Aug–Sep.

Mossy rocks in forests, grassy slopes; 3400–4200 m. S and SW Xizang, NW Yunnan [Bhutan].

**5. *Ponerorchis crenulata*** Soó, Acta Bot. Acad. Sci. Hung. 12: 353. 1966.

齿缘小红门兰 chi yuan xiao hong men lan

*Orchis crenulata* Schlechter, Repert. Spec. Nov. Regni Veg. 19: 373. 1924, not Gilibert (1792); *Chusua crenulata* (Soó) P. F. Hunt; *Ponerorchis schlechteri* Perner & Y. B. Luo, nom. illeg. superfl.

Plants 3.5–6 cm tall. Tubers ellipsoid, 5–10 mm. Stem 1.5–2 cm, with 1 or 2 membranous, tubular sheaths at base, 2-leaved. Leaves basal, subopposite, green, lacking purple spots, linear-oblong, 1.3–3 × 0.2–0.6 cm, glabrous, apex acute. Inflo-

rescence erect, 1–2 cm, 1-flowered, glabrous; floral bract linear-lanceolate to linear, 7–12 mm, exceeding ovary, apex acute. Flower purplish rose, medium-sized; pedicel 8–10 mm; ovary fusiform, 6–8 mm, slender, glabrous. Dorsal sepal erect, concave, lanceolate-oblong, 6–8 × 3–3.5 mm, 3- or 5-veined, apex obtuse; lateral sepals spreading or reflexed, ovate-lanceolate, oblique, 8–9 × 4–5 mm, 3- or 5-veined, base attenuate, apex obtuse. Petals erect, obliquely ovate, 6–7 × 3–3.5 mm, glabrous, 3-veined, apex subobtusate; lip spreading, broadly ovate to suborbicular, 6–7 × 7–8 mm, base contracted and subcordate, spurred, not lobed, margin irregularly erose-crenulate, apex rounded to slightly emarginate and apiculate at center; spur pendulous, parallel to ovary, cylindrical-conic, slightly curved, 8–9 mm, ca. as long as to slightly exceeding ovary, slightly dilated at mouth, apex obtuse. Fl. Jun.

• Forests on slopes, moist limestone rubble; 3400–3700 m. NW Yunnan.

**6. *Ponerorchis tominagae*** (Hayata) H. J. Su & J. J. Chen, Fl. Taiwan, ed. 2, 5: 1029. 2000 [“*tominagai*”].

白花小红门兰 bai hua xiao hong men lan

*Gymnadenia tominagae* Hayata, Icon. Pl. Formosan. 6: 93. 1916; *Amitostigma tominagae* (Hayata) Schlechter; *Chusua kunihikoana* (Masamune & Fukuyama) P. F. Hunt; *Orchis kiraishiensis* Hayata f. *leucantha* Masamune; *O. kiraishiensis* var. *leucantha* (Masamune) Masamune; *O. kuanshanensis* S. S. Ying; *O. kunihikoana* Masamune & Fukuyama; *O. taolii* S. S. Ying; *O. tominagae* (Hayata) Soó; *Ponerorchis kiraishiensis* (Hayata) Ohwi var. *leucantha* (Masamune) A. T. Hsieh; *P. kuanshanensis* (S. S. Ying) S. S. Ying; *P. kunihikoana* (Masamune & Fukuyama) Soó; *P. taolii* (S. S. Ying) T. P. Lin.

Plants 3.5–18 cm tall. Tubers ovoid to subglobose, 5–10 × 4–9 mm. Stem green, (1–)2–6 cm, with 1 or 2 tubular sheaths at base, 1–3-leaved. Leaves cauline, alternate and widely spaced, or rarely clustered near base of stem, green, lacking purple spots, lanceolate to linear-oblong, 2–7 × 0.5–0.8 cm, glabrous, apex acute. Inflorescence erect, green, 2–10 cm, glabrous; rachis 1–2 cm, (1 or)2–4-flowered; floral bracts lanceolate to ovate-lanceolate, 5–12 × 2–3 mm, shorter than to slightly exceeding ovary, apex acuminate. Flowers secund, whitish or with purple or red dots on lip, medium-sized; ovary cylindrical-fusiform, 8–10 mm including pedicel, glabrous. Dorsal sepal erect, oblong to elliptic, 5.5–7 × 2–3 mm, 3-veined, apex obtuse or subacute; lateral sepals ovate-oblong, oblique, 7–9 × 3–4 mm, 3-veined, apex obtuse or acute. Petals erect, forming a hood with dorsal sepal, ovate, oblique, 5–6.5 × ca. 3 mm, glabrous, 3-veined, apex obtuse; lip obtriangular to obovate, 8–12 × 7–11 mm, 3- or 4-lobed above middle, margin subentire to irregularly serrate, spurred, disk pubescent on midvein, tinged greenish at base, sometimes spotted with rose; lateral lobes subtriangular to ovate, ca. 3 × 3 mm, apex obtuse or subacute; mid-lobe ovate-quadrangular, 3–5 × 4–5 mm, margin slightly undulate, apex truncate, shallowly to deeply emarginate and forming 2 lobules, often apiculate between lobules; spur pendulous, straight, cylindrical to conic-cylindrical, 4–5.5 mm, much shorter than ovary, apex obtuse. Fl. Jul–Aug.

• Mossy rocks in alpine forests, alpine grasslands, scree slopes; 2700–3800 m. Taiwan.

**7. *Ponerorchis chusua*** (D. Don) Soó, Acta Bot. Acad. Sci. Hung. 12: 352. 1966.

广布小红门兰 guang bu xiao hong men lan

*Orchis chusua* D. Don, Prodr. Fl. Nepal. 23. 1825; *Amitostigma beesianum* (W. W. Smith) Tang & F. T. Wang; *Chusua donii* Nevski; *C. nana* (King & Pantling) Pradhan; *C. pauciflora* (Lindley) P. F. Hunt; *C. pulchella* (Handel-Mazzetti) P. F. Hunt; *C. roborowskyi* (Maximowicz) P. F. Hunt var. *delavayi* (Schlechter) P. F. Hunt; *C. roborowskyi* var. *giraldiana* (Kraenzlin) P. F. Hunt; *C. roborowskyi* var. *nana* (King & Pantling) P. F. Hunt; *C. roborowskyi* var. *tenii* (Schlechter) P. F. Hunt; *C. roborowskyi* var. *unifoliata* (Schlechter) P. F. Hunt; *C. secunda* Nevski; *Gymnadenia chusua* (D. Don) Lindley; *G. chusua* var. *nana* (King & Pantling) Finet; *G. pauciflora* Lindley; *Habenaria chusua* (D. Don) Benthams; *Orchis beesiana* W. W. Smith; *O. chusua* var. *delavayi* (Schlechter) Soó; *O. chusua* var. *nana* King & Pantling; *O. chusua* var. *pulchella* (Handel-Mazzetti) Tang & F. T. Wang; *O. chusua* var. *tenii* (Schlechter) Soó; *O. delavayi* Schlechter; *O. giraldiana* Kraenzlin; *O. mairei* H. Léveillé; *O. nana* (King & Pantling) Schlechter; *O. parcifloroides* Handel-Mazzetti; *O. pulchella* Handel-Mazzetti; *O. secunda* (Nevski) Voroschilov; *O. tenii* Schlechter; *O. unifoliata* Schlechter; *Ponerorchis beesiana* (W. W. Smith) Soó; *P. chusua* var. *delavayi* (Schlechter) Soó; *P. chusua* var. *giraldiana* (Kraenzlin) Soó; *P. chusua* subsp. *nana* (King & Pantling) Soó; *P. chusua* var. *tenii* (Schlechter) Soó; *P. chusua* var. *unifoliata* (Schlechter) Soó; *P. nana* (King & Pantling) Soó; *P. pauciflora* (Lindley) Ohwi; *P. pulchella* (Handel-Mazzetti) Soó.

Plants (5–)8–45 cm tall. Tubers oblong or globose, 10–20 × ca. 10 mm. Stem (2.5–)5–23 cm, with 1–3 tubular sheaths at base, (1 or)2–5-leaved. Leaves cauline, alternate, widely spaced, green, lacking purple spots, linear, oblong-lanceolate, or elliptic, 3–15 × 0.2–3 cm, becoming smaller and bractlike above, glabrous, apex acute or acuminate. Inflorescence erect or slightly curved, 2–20 cm, glabrous; rachis 1.5–9 cm, (1 or)2–20-flowered; floral bracts lanceolate to ovate-lanceolate, 7–22 mm, lower ones foliaceous and exceeding flower, apex acuminate. Flowers often secund, pink, purplish red, or purple, medium-sized; ovary fusiform, 7–15 mm including pedicel, glabrous. Dorsal sepal erect, oblong or ovate-oblong, concave, 5–7(–8) × 2.5–4(–5) mm, 3-veined, apex subobtusate or acute; lateral sepals reflexed, ovate-lanceolate, oblique, 6–8(–9) × 3–5 mm, 3-veined, apex subobtusate to acuminate. Petals erect, forming a hood with dorsal sepal, narrowly ovate, broadly ovate, or narrowly ovate-oblong, oblique, 5–6(–7) × 3–4 mm, glabrous, 3-veined, apex obtuse; lip broadly oblong to obovate, 7–12(–15) × 7–13(–17) mm, spurred, 3- or 4-lobed above middle, margin crenulate, disk tinged white at base, marked with deep purple blotches; lobes variable; lateral lobes broadly oblong to subtriangular, falcate, 2–3(–5) × 2.5–5(–7) mm, apex obtuse or acute; mid-lobe oblong, square, or ovate, 1.8–3.5(–5) × 2–3.5(–6) mm, usually longer than broad, apex truncate to obtuse-rounded, subentire to distinctly notched and forming 2 lobules, often apiculate between 2 lobules; spur slightly pendulous or horizontal, sometimes distinctly curved upward toward apex, cylindrical to cylindrical-conic, often slightly attenuate, 7–15(–19) mm, usually slightly longer than ovary. Fl. Jun–Aug.

Forests, *Rhododendron* scrub, alpine grasslands, limestone outcrops, scree; 500–4500 m. E Gansu, Heilongjiang, Henan, SE and W Hubei, Jilin, Nei Mongol, Ningxia, E Qinghai, S Shaanxi, Sichuan, S and SE Xizang, NE and NW Yunnan [Bhutan, N India, Japan, Korea, N Myanmar, Nepal, Russia (Far East, Siberia)].

**8. *Ponerorchis omeishanica*** (Tang, F. T. Wang & K. Y. Lang) S. C. Chen, P. J. Cribb & S. W. Gale, **comb. nov.**

峨眉小红门兰 e mei xiao hong men lan

Basionym: *Orchis omeishanica* Tang, F. T. Wang & K. Y. Lang, Acta Phytotax. Sin. 18: 416. 1980.

Plants 14–22 cm tall. Tubers ovoid, 8–12 mm. Stem 8–12 cm, with 1 or 2 tubular sheaths at base, 1- or 2-leaved above middle. Leaves cauline, alternate, widely spaced, green, lacking purple spots, narrowly oblong, oblong, or elliptic, 4.5–5 × 1.2–2.8 cm, glabrous, apex acute or shortly acuminate. Inflorescence erect, ca. 6.5 cm, with 1 foliaceous, ovate sterile bract, glabrous; rachis 2.5–3 cm, subdensely 4–8-flowered; floral bracts ovate-lanceolate, to 20 mm, basal ones conspicuously exceeding flowers, apex acuminate. Flowers pale yellowish green, small to medium-sized; ovary and pedicel fusiform, 10–14 mm, glabrous. Sepals similar, ovate-lanceolate, 6–7 × 2–2.8 mm, 3-veined, apex shortly aristate; dorsal sepal erect; lateral sepals spreading, oblique. Petals spreading, not forming a hood with dorsal sepal, narrowly ovate-lanceolate, 4.5–5 × ca. 1.8 mm, slightly shorter than sepals, margin ciliate; lip spreading, suborbicular, 5–6 × 6–7 mm, disk papillose, margin ciliate, base contracted, spurred, 3-lobed toward apex; lateral lobes triangular or rectangular, ca. 2 mm, apex obtuse, truncate; mid-lobe triangular or oblong, ca. 2 mm, apex shortly apiculate; spur pendulous, cylindrical, shorter than ovary, ca. 7 mm, apex obtuse. Fl. Jul–Aug.

• Rocky places along streams, grasslands at forest margins; ca. 2800 m. SC Sichuan (Emei Shan).

**9. *Ponerorchis pugeensis*** (K. Y. Lang) S. C. Chen, P. J. Cribb & S. W. Gale, **comb. nov.**

普格小红门兰 pu ge xiao hong men lan

Basionym: *Orchis pugeensis* K. Y. Lang, Acta Phytotax. Sin. 25: 403. 1987.

Plants ca. 30 cm tall. Tuber oblong, ca. 20 × 0.8 mm. Stem ca. 10 cm, with 2 tubular sheaths at base, 2-leaved. Leaves cauline, alternate, widely spaced, green, lacking purple spots, oblong to oblong-lanceolate, 7.5–10.5 × 2–2.7 cm, glabrous, apex acute or acuminate. Inflorescence erect or slightly curved, ca. 15 cm, glabrous; rachis ca. 7 cm, subdensely 13-flowered; floral bracts foliaceous, ovate-lanceolate, 20–40 mm, conspicuously exceeding flowers, apex acuminate. Flowers purple, medium-sized; ovary cylindrical-fusiform, 12–13 mm including pedicel, glabrous. Dorsal sepal erect, elliptic, ca. 5.5 × 2.5 mm, 3-veined, apex obtuse; lateral sepals spreading, obliquely ovate, ca. 7 × 3.5 mm, 3- or 4-veined, apex obtuse. Petals spreading, obliquely ovate, ca. 5 × 2.5 mm, inner surfaces finely papillose, 3-veined, margin ciliate, apex obtuse; lip reflexed, ovate, ca. 8 × 6 mm, thickened along midvein, disk finely papillose, margin ciliate, spurred, 3-lobed at middle; lateral lobes obliquely rhom-

bic, falcate, ca. 2 × 2 mm, apex obtuse; mid-lobe oblong, 3.5–4 × 2–3 mm, apex acute; spur pendulous, cylindrical, ca. 10 mm, shorter than ovary, apex obtuse. Fl. Jul–Aug.

• Alpine grasslands, slopes; ca. 2800 m. SW Sichuan (Puge).

**10. *Ponerorchis kiraishiensis*** (Hayata) Ohwi, Acta Phytotax. Geobot. 5: 146. 1936.

奇莱小红门兰 qi lai xiao hong men lan

*Orchis kiraishiensis* Hayata, Icon. Pl. Formosan. 9: 116. 1920; *Chusua kiraishiensis* (Hayata) P. F. Hunt; *O. nanhutanensis* S. S. Ying.

Plants 10–18 cm tall. Tubers subglobose or ovoid, 5–10 mm. Stem pale green, 4–12 cm, with 1 or 2 tubular, membranous sheaths at base, 2- or 3-leaved. Leaves cauline, alternate, clustered to widely spaced, green, lacking purple spots, linear to linear-lanceolate, 4–5 × 0.7–0.8 cm, glabrous, apex acute or acuminate. Inflorescence erect, pale green, 4–10 cm, glabrous; rachis 1–3 cm, 1–3-flowered; floral bracts green or purple, lanceolate, 7–20 mm, lower one usually exceeding ovary, apex acuminate. Flowers purple or rose, medium-sized; ovary fusiform, 10–15 mm including pedicel, glabrous. Dorsal sepal erect, oblong, concave, 6–9 × 3–4 mm, apex acute; lateral sepals ovate-oblong, oblique, 8–11 × 3.5–5 mm, apex acute. Petals forming a loose hood with dorsal sepal, very rarely pure white, ovate-oblong, slightly oblique, 6–8 × 3–3.5 mm, glabrous, margin entire to irregularly serrate, apex obtuse; lip obtriangular to suborbicular, 12–15 × 15–16 mm, spurred, 3- or 4-lobed toward apex, disk white or pale yellow at base, spotted with purple; lateral lobes ovate or triangular, 2–4 × 2–3 mm, apex obtuse, truncate; mid-lobe transversely oblong to ovate, 4–8 × 4–8 mm, usually broader than long, apex truncate, emarginate to distinctly notched and forming 2 lobules, often apiculate between lobules; spur pendulous, cylindrical-conic, 7–13 × 2–3 mm, apex obtuse. Fl. Jul–Aug.

• Alpine grasslands, scree slopes; 3000–3900 m. Taiwan.

This species is clearly closely related to *Ponerorchis chusua* and in need of critical review.

**11. *Ponerorchis sichuanica*** (K. Y. Lang) S. C. Chen, P. J. Cribb & S. W. Gale, **comb. nov.**

四川小红门兰 si chuan xiao hong men lan

Basionym: *Orchis sichuanica* K. Y. Lang, Acta Phytotax. Sin. 25: 401. 1987.

Plants 19–32 cm tall. Tubers oblong or ellipsoid, 10–20 × 5–10 mm. Stem green, 7.5–9 cm, stout, with 2 tubular sheaths at base, 2- or 3-leaved. Leaves cauline, alternate, widely spaced, green, narrowly oblong, oblong, or ovate, lowest one 3.5–7 × 1–4 cm, becoming smaller above, glabrous, apex acute or acuminate. Inflorescence erect, green, 12–17 cm, glabrous; rachis 4.5–11 cm, 2–6-flowered; floral bracts ovate-lanceolate, to 15 mm, shorter than ovary, apex acuminate. Flowers violet, medium-sized; ovary cylindrical, 20–22 mm including pedicel, densely minutely pubescent. Sepals minutely papillose on both surfaces, margin sometimes finely ciliate; dorsal sepal erect, elliptic, 8–10 × 3–4 mm, 3-veined, apex obtuse; lateral sepals

reflexed, obliquely ovate, 9–11 × ca. 5 mm, 3- or 4-veined, apex obtuse to acute. Petals erect, forming a hood with dorsal sepal, obliquely ovate, shorter than dorsal sepal, both surfaces densely minutely papillose, 3-veined, margin conspicuously ciliate, apex acute; lip reflexed, broadly obovate, 12–15 × 10–12 mm, both surfaces densely minutely papillose, spurred, margin ciliate, 3-lobed near middle; lobes variable; lateral lobes recurved, broadly ovate to transversely elliptic, 2.5–3 × 4.5–7 mm, apex obtuse-rounded or obtuse; mid-lobe oblong, square, ovate, or obovate, 3.5–6 × 2–3.8 mm, apex acute, truncate, or emarginate and sometimes apiculate at center; spur pendulous, cylindrical, stout, 18–22 × 2–3 mm, nearly as long as to slightly exceeding ovary, apex obtuse. Fl. May–Jul.

• Alpine grasslands, slopes; 2400–2500 m. W Sichuan (Baoping, Ebian).

**12. *Ponerorchis takasagomontana*** (Masamune) Ohwi, Acta Phytotax. Geobot. 5: 146. 1936 [*“takasago-montana”*].

高山小红门兰 gao shan xiao hong men lan

*Orchis takasagomontana* Masamune, Trop. Hort. 3: 45. 1933 [*“takasago-montana”*]; *Chusua takasagomontana* (Masamune) P. F. Hunt; *O. chingshuishania* S. S. Ying.

Plants 14–33 cm tall. Tubers globose or ovoid, 10–20 mm. Stem purplish, often with dark striations, 8–17 cm, with 1 or 2 tubular sheaths at base, 2–5-leaved. Leaves cauline, alternate, widely spaced, green, lacking purple spots, linear-lanceolate or oblong-lanceolate, 3–9 × 0.5–1.4 cm, becoming smaller and bractlike above, glabrous, apex acute or acuminate. Inflorescence erect, purplish, often with dark striations, 4–13 cm, glabrous; rachis 2–10 cm, 5–17-flowered; floral bracts green or purple, lanceolate, 10–15 mm, shorter than to slightly exceeding ovary, apex acuminate. Flowers pale purple or rose, rarely white, medium-sized; pedicel and ovary fusiform, 6–15 mm. Dorsal sepal ovate or elliptic, concave, 4–5 × 2–3 mm, apex acute or obtuse; lateral sepals ovate-falcate, oblique, 5–6 × 2–4 mm, apex obtuse. Petals forming a loose hood with dorsal sepal, ovate or elliptic, oblique, 4–5 × 2–3 mm, margin ciliate, apex obtuse; lip tinged pale yellow toward base and spotted with purple, oblong to obovate, 6–10 × 6–8 mm, spurred, 3-lobed below middle; lateral lobes ovate to suboblong, 2–4 × 2–3 mm, apex obtuse; mid-lobe oblong to obovate-oblong, 4–6 ×

3.5–4.5 mm, longer than narrow, ridged at base, apex truncate, entire to shallowly emarginate; spur pendulous, cylindrical, 8–12 × 2.5–3 mm, usually shorter than ovary. Fl. Apr.

• Cliffs, crevices in limestone rocks; 1500–2000 m. C and E Taiwan.

**13. *Ponerorchis taiwanensis*** (Fukuyama) Ohwi, Acta Phytotax. Geobot. 5: 146. 1936.

台湾小红门兰 tai wan xiao hong men lan

*Orchis taiwanensis* Fukuyama, Bot. Mag. (Tokyo) 49: 290. 1935; *Chusua taiwanensis* (Fukuyama) P. F. Hunt; *Orchis taitungensis* S. S. Ying; *O. taitungensis* var. *alboflorens* S. S. Ying; *Ponerorchis taitungensis* (S. S. Ying) S. S. Ying; *P. taitungensis* var. *alboflorens* (S. S. Ying) S. S. Ying.

Plants 9–25(–40) cm tall. Tubers ellipsoid or subglobose, 5–30 × 5–20 mm. Stem green with purple striations or purple, ca. 12.5 cm, with 1 or 2 tubular sheaths at base, 2–5-leaved. Leaves cauline, alternate, widely spaced, green, lacking purple spots, linear to linear-lanceolate, 4–9(–15) × 0.4–2 cm, becoming smaller and bractlike above, glabrous, apex acuminate. Inflorescence erect, green with purple striations or purple, 5–12 cm, glabrous; rachis 3–10 cm, 5–20-flowered; floral bracts erect, green or purple, lanceolate, 10–15 mm, almost as long as ovary, apex acuminate. Flowers secund, pale purple or rose, rarely white, medium-sized; ovary purple or green spotted with purple, cylindrical, 10–15 mm including pedicel, glabrous. Dorsal sepal erect, elliptic, concave, 5–7 × 2.5–4 mm, apex obtuse; lateral sepals ovate to oblong, oblique, 6–7 × 3–3.5 mm, apex obtuse. Petals erect, forming a loose hood with dorsal sepal, obliquely elliptic, 5–6 × 2.5–4 mm, margin ciliate, apex obtuse; lip ovate-orbicular, 9–15 × 8–12 mm, spurred, 3-lobed near middle, margin subentire to irregularly serrate, disk tinged white or pale yellow at base, with red or purple dots or patches; lateral lobes transversely oblong to subsquare, oblique, ca. 1.8 × 2 mm, apex obtuse, truncate; mid-lobe suborbicular, 4–5.5 × 4–6 mm, usually broader than long, margin irregularly undulate-serrate, apex obtuse or slightly emarginate; spur pendulous, cylindrical, 12–20 mm, ca. as long as to slightly exceeding ovary, inside pubescent, apex obtuse. Fl. Jul–Aug.

• Cliffs, crevices of rocks, alpine grasslands; 1500–3400 m. C and S Taiwan (Hualian, Nantou, Taidong).

#### Incompletely known species

***Ponerorchis exilis*** (Ames & Schlechter) S. C. Chen, P. J. Cribb & S. W. Gale, **comb. nov.**

细茎小红门兰 xi jing xiao hong men lan

Basionym: *Orchis exilis* Ames & Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 40. 1919.

Plants 20–35 cm tall. Tubers oblong. Stem ca. 10 cm, 2- or 3-leaved. Leaves cauline, alternate, widely spaced, linear to linear-ligulate, 5–10 × 0.5–0.8 cm, glabrous, apex acute. Inflorescence to 10 cm, with 1 or 2 foliaceous sterile bracts; rachis laxly 5–12-flowered; floral bracts suberect, lanceolate, nearly as long as ovary, apex acuminate. Flowers purplish red, small to medium-sized; ovary cylindrical, ca. 8 mm including pedicel,

glabrous. Dorsal sepal erect, elliptic, ca. 4 mm, apex obtuse; lateral sepals reflexed, oblique, elliptic-oblong, ca. 5 mm, apex obtuse. Petals erect, forming a hood with dorsal sepal, oblong-ovate, oblique, slightly shorter than dorsal sepal, margin ciliate, apex obtuse; lip 3-lobed above middle, ca. 6.5 × 6 mm, disk minutely papillose, base broadly cuneate; lateral lobes obliquely rhombic, apex obtuse; mid-lobe spreading, ovate-triangular, larger than lateral lobes, margin subentire, apex obtuse; spur pointing backward, cylindrical, ca. 8 × 1.5 mm, ca. as long as ovary. Fl. unknown.

• C and NE Yunnan (Dongchuan, Kunming).

Although we accept this species, it is known only from the protologue; the type has not been seen by us.

## 29. HEMIPILIA Lindley, Gen. Sp. Orchid. Pl. 296. 1835.

舌喙兰属 she hui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small to medium-sized. Tuber subspherical to ellipsoid, fleshy. Stem erect, abbreviate, with 1 short sheathing cataphyll at base and 1 solitary leaf (rarely 2 leaves). Leaf basal, usually appressed to substrate, green, often with purple markings, cordate to ovate-cordate, directly sheathing stem at base, fleshy, glabrous. Inflorescence elongate, with 2–4 scattered sterile bracts and a few to several flowers in a lax to subdense terminal raceme, glabrous; floral bracts lanceolate, usually shorter than ovary. Flowers resupinate, purple, purplish red, pink, or nearly white, medium-sized; pedicel and ovary often slightly arcuate, narrowly cylindrical-fusiform, glabrous. Sepals free; dorsal sepal often erect; lateral sepals spreading, oblique. Petals usually connivent with dorsal sepal and forming a hood over column, slightly smaller than sepals; lip spreading, spurred at base, 3-lobed or entire, adaxially finely papillate, with 2 prominent ridges below mouth of spur; spur cylindrical to conic, rather long, often papillate inside. Column stout; anther hoodlike, with 2 divergent locules and a broad connective; rostellum conspicuous, to 2 mm, protruding between anther cells, lateral lobes fleshy, apically infolded; pollinia 2, granular-farinaceous, sectile, attached to viscidia via long caudicles; viscidia cymbiform, enclosed by folded apices of rostellum lateral lobes; stigma lobes confluent, slightly concave, posterior to rostellum; auricles 2, one on either side of anther base. Capsule narrowly ellipsoid.

About ten species: from Nepal, through Bhutan and S China, to Myanmar and Thailand; seven species (five endemic) in China; one additional species (endemic) is incompletely known.

- 1a. Lip 3-lobed, though lateral lobes sometimes reduced.
- 2a. Mid-lobe of lip rectangular to ovate-orbicular, margins usually diverging, apex not divided ..... 1. *H. cordifolia*
- 2b. Mid-lobe of lip subsquare to rectangular, margins often tapering slightly toward apex, apex divided into 2 rounded lobules ..... 2. *H. henryi*
- 1b. Lip simple.
- 3a. Spur ca. 10 mm or more.
- 4a. Lip 8–10 mm, basally contracted into short claw, blade flabellate to orbicular; spur conic-cylindric, attenuate, 13–18 mm ..... 3. *H. flabellata*
- 4b. Lip ca. 13 mm, not clawed, blade suboblong; spur cylindrical, uniformly thick (not attenuate), 10–12 mm ..... 4. *H. crassicalcarata*
- 3b. Spur to 8 mm.
- 5a. Lip ovate to orbicular, broadest below middle ..... 5. *H. limprichtii*
- 5b. Lip obovate to oblong, broadest above middle.
- 6a. Lip 12–13 mm wide ..... 6. *H. kwangsiensis*
- 6b. Lip 6–8 mm wide ..... 7. *H. calophylla*

### 1. *Hemipilia cordifolia* Lindley, Gen. Sp. Orchid. Pl. 296. 1835.

心叶舌喙兰 xin ye she hui lan

*Hemipilia bulleyi* Rolfe; *H. cordifolia* var. *yunnanensis* Finet; *H. cruciata* Finet; *H. formosana* Hayata; *H. yunnanensis* (Finet) Schlechter.

Plants 13–27 cm tall. Tubers ovoid to subspherical, 1.5–4.5 cm. Stem with 1 tubular cataphyll at base, 1-leaved. Leaf abaxially purplish, adaxially dark green with purple spots, suborbicular to cordate, 2.5–8 × 2–6.5 cm, fleshy, base cordate, apex acute or obtuse. Inflorescence 11–25 cm, with 2 or 3 lanceolate sterile bracts; rachis 5–10 cm, laxly to subdensely 3- to more than 10-flowered; floral bracts lanceolate, apex acuminate. Flowers purplish red to pink; pedicel and ovary erect, often arcuate toward apex, 7–15 mm. Dorsal sepal oblong to ovate-lanceolate, 4–6 × 2–3.2 mm, 5-veined, apex obtuse; lateral sepals spreading to reflexed, oblong-ovate, falcate, 6–7 × 3.5–4 mm, 5-veined, apex acuminate. Petals connivent with dorsal sepal and forming a hood, ovate, slightly oblique, 3.2–4.5 × 2–3 mm, 3-veined, apex subacute; lip variable in outline, 7–9 × ca. 5 mm, 3-lobed though lateral lobes sometimes reduced, adaxially finely papillate, apical margin usually fimbri-

ate; lateral lobes short, rectangular, triangular, or suborbicular, margin entire to minutely incised; mid-lobe rectangular to ovate-orbicular, margins usually diverging, entire to slightly serrate, apex not divided; spur straight and horizontal or slightly upcurved toward apex, to strongly downcurved, cylindrical to attenuate, 10–15 mm, apex obtuse. Column ca. 2.5 mm; rostellum ca. 1 mm. Capsule ca. 2.5 cm. Fl. Jun–Sep.  $2n = 42$ .

Forests, rocky slopes; 1500–3500 m. SW Sichuan, Taiwan, S Xizang, NW Yunnan [Bhutan, India, Myanmar, Nepal].

### 2. *Hemipilia henryi* Rolfe, Bull. Misc. Inform. Kew 1896: 203. 1896.

裂唇舌喙兰 lie chun she hui lan

*Hemipilia amesiana* Schlechter; *H. cordifolia* Lindley var. *cuneata* Finet; *H. cuneata* (Finet) Schlechter.

Plants 20–32 cm tall. Tubers ellipsoid, ca. 2 cm. Stem with 1 tubular cataphyll at base, 1- or rarely 2-leaved. Leaf abaxially pale green, adaxially green with purple spots, ovate, 4–11 × 3–8 cm, base cordate or rounded, apex acute or cuspidate. Inflorescence 17–30 cm, with 2–4 sterile bracts; rachis 6–11 cm, laxly to subdensely 3–9-flowered; floral bracts lanceolate, to ca. 12 mm, apex acuminate or long acuminate. Flowers purplish

red; pedicel and ovary erect, slightly arcuate, 16–24 mm. Dorsal sepal ovate-elliptic, 6–7 × ca. 3 mm, 3-veined, apex obtuse; lateral sepals broadly ovate, oblique, ca. 8.5 × 5 mm, adaxially finely papillate, 3- or 5-veined, apex obtuse. Petals obliquely rhombic-ovate, ca. 6 × 3.5–4 mm, adaxially inconspicuously papillate, 3-veined, apex obtuse; lip broadly obovate-cuneate, 3-lobed, ca. 12 × 10 mm, adaxially finely papillate; lateral lobes broadly triangular to suboblong, margin sometimes irregularly serrulate, apex obtuse to acute; mid-lobe subsquare to rectangular, margin often tapering slightly toward apex, truncate, apex divided into 2 rounded lobules; spur straight and horizontal or slightly curved downward, narrowly conic, gradually attenuate, 14–18 mm, slightly shorter than ovary, apex sometimes hooked. Column ca. 3 mm; rostellum ovate, ca. 2 mm, apex acute. Fl. Jul–Aug.

• Rocky outcrops; 800–1100 m. W Hubei, NE, SE, and SW Sichuan.

**3. *Hemipilia flabellata*** Bureau & Franchet, J. Bot. (Morot) 5: 152. 1891.

扇唇舌喙兰 shan chun she hui lan

*Hemipilia cordifolia* Lindley var. *subflabellata* Finet; *H. flabellata* var. *grandiflora* Finet; *H. flabellata* var. *leptoceras* Soó; *H. quinquangularis* Tang & F. T. Wang; *H. sikangensis* Tang & F. T. Wang.

Plants 15–28 cm tall. Tubers narrowly ellipsoid, 1.5–4.5 cm. Stem with 1 tubular cataphyll at base, 1-leaved. Leaf abaxially purple, adaxially green with purple spots, cordate to broadly ovate, 2–10 × 2–9 cm, base cordate to rounded, apex acute to cuspidate. Inflorescence 12–24 cm, with 3 or 4 lanceolate sterile bracts; rachis 4–8 cm, laxly to subdensely 3–15-flowered; floral bracts lanceolate, largest to 11 mm. Flowers variable in color, from purplish red to nearly pure white; pedicel and ovary erect, sometimes arcuate toward apex, 12–18 mm. Dorsal sepal oblong to narrowly ovate, concave, 6–9 × 2.5–4 mm, 3- or 5-veined, apex obtuse or acute; lateral sepals obliquely ovate to oblong, falcate, 7–10 × 3.5–5 mm, 3-veined, apex obtuse. Petals broadly ovate, slightly oblique, 5–7 × 3–5 mm, 3-veined, apex subacute; lip simple, 8–10 mm, basally contracted into short claw; claw oblong or cuneate, ca. 2 mm; blade widely dilated, flabellate to orbicular, 6–8 × 6.5–8.5 mm, margin irregularly crenulate, apex truncate or obtuse, sometimes emarginate; spur usually straight and horizontal or sometimes slightly curved downward, conic-cylindric, attenuate, 13–18 mm, apex obtuse or shallowly 2-lobed. Column ca. 3 mm; rostellum ligulate, ca. 1 mm, apex rounded. Capsule ca. 3 mm. Fl. Jun–Aug.

• Forests, crevices on limestone cliffs; 1600–3200 m. NW Guizhou, SW Sichuan, C and NW Yunnan.

**4. *Hemipilia crassicalcarata*** S. S. Chien, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. 6: 80. 1931.

粗距舌喙兰 cu ju she hui lan

*Hemipilia silvestrii* Pampanini.

Plants 15–35 cm tall. Tubers ellipsoid, 1–2 cm. Stem with 1 tubular cataphyll at base, 1- or rarely 2-leaved. Leaf ovate to

ovate-cordate, 5–12 × 4–5.8 cm, base cordate or subcuneate, apex acute. Inflorescence 13–30 cm, with 4 ovate to lanceolate sterile bracts to 2.5 cm; rachis ca. 6 cm, subdensely (2–)7–15-flowered; floral bracts lanceolate, to ca. 11 mm. Flowers purplish red; pedicel and ovary 12–18 mm. Dorsal sepal erect, ovate, cymbiform, 6–6.5 × ca. 3 mm, 3-veined, apex obtuse; lateral sepals obliquely ovate, ca. 7 × 4 mm, 3-veined, apex obtuse. Petals similar to lateral sepals but slightly smaller, oblong-ovate, oblique, ca. 7 × 3.5 mm, 3-veined, margin sometimes irregularly denticulate, apex obtuse to subtruncate; lip simple, suboblong, ca. 13 × 9–10 mm, adaxially finely papillate, base broadly cuneate, margin irregularly crenate, apex truncate, often apiculate or occasionally emarginate; spur straight and horizontal or sometimes slightly curved downward, white, cylindric, uniformly thick (not attenuate), 10–12 mm, apex obtuse and slightly dilated. Column to 4 mm; rostellum oblong-elliptic, ca. 1.5 mm, apex rounded. Fl. Jul.

• Cypress forests, grassy slopes; 1000–1200 m. S Shaanxi, SE Shanxi, N and W Sichuan.

**5. *Hemipilia limprichtii*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 331. 1922.

短距舌喙兰 duan ju she hui lan

*Hemipilia cordifolia* Lindley var. *bifoliata* Finet.

Plants 10–30 cm tall. Tubers narrowly oblong-ellipsoid, 1–1.5 cm. Stem with 1 tubular cataphyll at base, 1- or rarely 2-leaved. Leaf ovate, 3–6 × 2.2–5.5 cm, base cordate, apex subacute. Inflorescence to 28 cm, with 4–9 ovate-lanceolate sterile bracts; rachis to 10 cm, laxly 3- to usually more than 10-flowered; floral bracts ovate-lanceolate, to ca. 9 mm. Flowers purplish red; pedicel and ovary 10–12 mm. Dorsal sepal ovate, cymbiform, 4.5–5.5 × ca. 2.5 mm, apex obtuse; lateral sepals spreading to reflexed, oblong-ovate, oblique, 5–6.5 × ca. 3 mm, apex obtuse or emarginate. Petals erect, triangular-ovate, oblique, subequal in length to lateral sepals, apex subacute; lip ovate to orbicular, 8–10 × 9–11 mm, adaxially papillate-puberulent, basally broadly cuneate, simple, margin irregularly crenulate, apex emarginate; spur often slightly upcurved, conic, 6–7 mm, attenuate toward apex. Column ca. 3 mm; rostellum ovate, ca. 2 mm. Fl. Jul–Aug.

• Limestone meadows, grasslands; 1000–1600 m. C Guizhou, C and NW Yunnan.

**6. *Hemipilia kwangsiensis*** Tang & F. T. Wang ex K. Y. Lang, Guihaia 18: 7. 1998.

广西舌喙兰 guang xi she hui lan

Plants 13–20 cm tall. Tubers ellipsoid, 1.5–2 cm. Stem 1-leaved. Leaf orbicular to suborbicular, 5.5–6 × 5–6 cm, base cordate, apex acute. Inflorescence 11–18 cm, with 3 lanceolate sterile bracts; rachis 5–7 cm, laxly 5–7-flowered; floral bracts ovate or ovate-lanceolate, 7–14 mm, apex long acuminate. Flowers pale red; pedicel and ovary suberect, 14–18 mm. Dorsal sepal ovate-elliptic, 5–7 × ca. 3 mm, 3-veined, apex subacute; lateral sepals ovate-elliptic, slightly oblique, 6–7 × 3–3.5 mm, 3-veined, apex subacute. Petals ovate-triangular, oblique, 5–6 × 2.5–3 mm, 1-veined, margin minutely ciliate, apex acute;

lip obovate, 11–12 × 12–13 mm, adaxially finely papillate, base slightly contracted, simple, apex emarginate; spur cylindrical-conic, ca. 6 × 3 mm, attenuate, apex subacute, usually down-curved. Column ca. 2 mm; rostellum ligulate, ca. 2 mm. Fl. Aug.

• Forests on limestone substrates; 400–1000 m. S Guangxi, SE Yunnan.

**7. *Hemipilia calophylla*** E. C. Parish & H. G. Reichenbach, J. Bot. 12: 197. 1874.

美叶舌喙兰 mei ye she hui lan

*Galearis subrotunda* (King & Pantling) P. F. Hunt; *Hemipilia amethystina* Rolfe ex J. D. Hooker; *Orchis subrotunda* King & Pantling.

Plants 5.5–11 cm tall. Tubers ovoid, ca. 2 cm. Stem with 1 tubular cataphyll at base, 1- or 2-leaved. Leaves abaxially dark greenish purple, adaxially dark green netted with purplish brown, suborbicular to ovate, 1.5–3 × 1–2.5 cm, base cordate to rounded, apex acute. Inflorescence 5–9.5 cm, with 2 or 3 nar-

rowly ovate sterile bracts; rachis 1–3.5 cm, laxly 1–4-flowered; floral bracts ovate, ca. 6 mm, apex acuminate. Flowers white and purple; pedicel and ovary erect, sometimes slightly arcuate, 12–20 mm. Dorsal sepal ovate, 5–6.5 × 2–3 mm, 3-veined, apex acute; lateral sepals ovate-elliptic, oblique, 6–7 × 2.5–3 mm, 1-veined, apex acute. Petals ovate, slightly oblique, 4.5–5 × ca. 2 mm, 1-veined, apex acute; lip oblong to obovate, 9–11 × 6–8 mm, truncate, simple, margin undulate and slightly crenulate toward apex, apex obtuse or occasionally emarginate; spur conic to urceolate, 6–8 mm, slightly downcurved toward apex. Column ca. 2 mm; rostellum ligulate, ca. 1.5 mm. Fl. Oct.

About 1500 m. Yunnan [Myanmar, Thailand, N Vietnam].

A single, somewhat dwarf collection at K (*Henry 13815*) is referable to this taxon, though material from neighboring countries in SE Asia indicates that overall dimensions, as well as those for the leaf and flower parts, can sometimes be greater. When these larger plants are taken into consideration, lip dimensions in *Hemipilia calophylla* become continuous with those of *H. kwangsiensis*, making the distinction given in the key somewhat artificial. More material from China is required to assess the stability of floral characters within either taxon.

#### Incompletely known species

***Hemipilia forrestii*** Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 27. 1913.

长距舌喙兰 chang ju she hui lan

*Hemipilia forrestii* var. *macrantha* Handel-Mazzetti.

Plants ca. 20 cm tall. Tubers ellipsoid, 3–4(–5) cm. Stem 1-leaved. Leaf ovate-oblong, ca. 4.5 × 2.5 cm, base subcordate, apex acute. Inflorescence ca. 17 cm; rachis ca. 6 cm, several flowered; floral bracts lanceolate or ovate-lanceolate, 10–12 mm, apex acuminate. Flowers rose-purple; pedicel and ovary ca. 20 mm. Dorsal sepal erect, cymbiform, ovate-oblong, ca. 6

mm, apex obtuse; lateral sepals ovate, oblique, concave, ca. 12 mm, apex subobtuse, recurved. Petals ovate-oblong, ca. 5 mm, apex obtuse; lip sessile, quadrate-obovate, ca. 13 × 10 mm, margin irregularly crenate, apex truncate; spur attenuate, ca. 30 mm, slightly incurved, apex subacute. Column ca. 5 mm; rostellum ovate-oblong, ca. 3 mm. Fl. Sep.

• Crevices on rocky slopes; 1200–3000 m. SW Sichuan, SE Xizang, NW Yunnan.

This species is clearly a close ally of *Hemipilia flabellata*, though with larger flower parts and a longer spur. No specimens have been seen by us to confirm its identity.

### 30. BRACHYCORYTHIS Lindley, Gen. Sp. Orchid. Pl. 363. 1838.

苞叶兰属 bao ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Diplacorchis* Schlechter; *Gyaladenia* Schlechter; *Phyllophax* Schlechter; *Schwartzkopffia* Kraenzlin.

Herbs, terrestrial or epiphytic, leafy (or rarely holomycotrophic). Tubers ellipsoid to subglobose, fleshy, neck with several slender roots. Stem erect, leafy (or covered with scales in holomycotrophic species). Leaves alternate, often densely arranged and imbricate, sheathing at base. Inflorescence terminal, racemose, often many flowered; floral bracts foliaceous, often as long as or exceeding flowers. Flowers resupinate, purple to white, often with fine dark spots or markings. Sepals free; dorsal sepal erect, ± concave; lateral sepals spreading or reflexed, often larger than dorsal sepal. Petals usually adnate at their base to side of column, ascending or erect; lip protruding, 2-partite, lateral margins reflexed, often longer than sepals and petals; hypochile concave with basal sac or spur; epichile 2- or 3-lobed. Column erect, short, with 2 prominent auricles (on either side of anther base); anther ovoid, usually obtuse at base, with 2 parallel locules; pollinia 2, oblong, granular-farinnaceous, sectile, attached via short caudicles to a large, naked viscidium; rostellum 3-lobed; stigma lobes confluent.

About 33 species: mainly in S and tropical Africa and Madagascar, with a few species extending to tropical and subtropical Asia; three species (one endemic) in China.

- 1a. Plants (21–)24–54 cm tall; leaves 6–15 cm; lip entire at apex ..... 1. *B. henryi*  
 1b. Plants 8–25 cm tall; leaves 1.2–4.5 cm; lip emarginate at apex.  
 2a. Dorsal sepal ca. 7.5 mm, 3-veined; spur 3–4(–6) mm, not curved, not divided at apex ..... 2. *B. galeandra*  
 2b. Dorsal sepal 12–13 mm, 5-veined; spur 10–12 mm, curved, shallowly 2-lobed at apex ..... 3. *B. menglianensis*

**1. *Brachycorythis henryi*** (Schlechter) Summerhayes, Kew Bull. 10: 235. 1955.

长叶苞叶兰 chang ye bao ye lan

*Phyllomphax henryi* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 45. 1919; *Platanthera dielsiana* Soó.

Plants (21–)24–54 cm tall. Tubers oblong, 1.5–2 cm. Stem with several overlapping tubular sheaths at base, densely 4- or 5-leaved above. Leaves oblong-elliptic or sometimes elliptic, 6–15 × 2–4 cm, apex subacute. Inflorescence with 4–10 or more well-spaced flowers; floral bracts ca. as large as leaves or slightly smaller, much longer than flowers. Flowers white or pale purple, rather large; ovary slightly arching toward apex, twisted, cylindrical, ca. 1.5 cm including pedicel. Dorsal sepal narrowly ovate-lanceolate, ca. 13 × 5 mm, 5-veined, apex obtuse; lateral sepals similar to dorsal sepal, slightly oblique, ca. 13 × 5 mm, 5-veined. Petals oblique, ovate-lanceolate, ca. 12.5 × 6 mm, 3- or 4-veined, apex obtuse; lip much larger than sepals and petals, suborbicular, 1.5–2.5 × 1.5–2 cm, base spurred, apex entire; spur subcylindric-conic, 6.5–15 mm, apex shallowly 2-lobed and then abruptly contracted, often hooked. Fl. Aug–Sep.

Forests, open grassy slopes; 500–1800(–2300) m. S Guizhou, S and SW Yunnan [Myanmar, Thailand, Vietnam].

**2. *Brachycorythis galeandra*** (H. G. Reichenbach) Summerhayes, Kew Bull. 10: 241. 1955.

短距苞叶兰 duan ju bao ye lan

*Platanthera galeandra* H. G. Reichenbach, Linnaea 25: 226. 1852; *Brachycorythis truncatolabellata* (Hayata) S. S. Ying; *Gymnadenia galeandra* (H. G. Reichenbach) H. G. Reichenbach; *Habenaria galeandra* (H. G. Reichenbach) Ben-  
tham; *H. galeandra* var. *annamica* Gagnepain; *Phyllomphax championii* (Lindley) Schlechter; *P. galeandra* (H. G. Reichenbach) Schlechter; *P. truncatolabellata* (Hayata) Schlechter; *Platanthera championii* Lindley; *P. truncatolabellata* Hayata.

Plants 8–24(–30) cm tall. Tubers oblong, 1.5–2 cm. Stem

with 2 or 3 tubular sheaths at base, densely 4–6-leaved above. Leaves elliptic or ovate, sometimes oblong-elliptic, 2–4.5 × 0.7–2 cm, apex acute. Inflorescence with 3–10 well-spaced flowers; floral bracts ca. as large as leaves or slightly smaller, much longer than flowers. Flowers pink, pale purple, or bluish purple, small; ovary slightly arching toward apex, twisted, cylindrical, to 1.5 cm including pedicel. Dorsal sepal erect, linear-lanceolate, ca. 7.5 × 1.5 mm, 3-veined, apex acute; lateral sepals broadly lanceolate, ca. 8 × 3.5 mm, slightly oblique, 3-veined, apex obtuse. Petals obliquely ovate, ca. 6.5 × 2.2 mm, 3-veined, apex slightly obtuse; lip orbicular-obovate, 0.7–1.2 × 0.6–1 cm, base shortly spurred, apex often emarginate; spur conic, 3–4(–6) mm, apex undivided. Fl. May–Jul.  $2n = 42$ .

Scrubby slopes, grasslands, hilltops, in damp areas along gullies; 1200–2100 m. Guangdong, Guangxi, Guizhou, W Hunan, Sichuan, Taiwan, NW Yunnan [NE India, Myanmar, Thailand, Vietnam].

**3. *Brachycorythis menglianensis*** Y. Y. Qian, Acta Phytotax. Sin. 39: 278. 2001.

孟连苞叶兰 meng lian bao ye lan

Plants 14–25 cm tall. Tubers oblong, 2–3 cm. Stem with 2–4 sheaths at base, 4–7-leaved above, densely pubescent. Leaves ovate, 1.2–4.5 × 1–2.8 cm, pubescent along margin and abaxial veins at base, apex acute or obtuse. Inflorescence with 4–7 well-spaced flowers; floral bracts ca. as large as leaves or slightly smaller, slightly pubescent abaxially and on margin. Flowers white, marked with purple-red, rather large; ovary slightly arching toward apex, twisted, cylindrical, slightly pubescent along ridges, ca. 2 cm including pedicel. Dorsal sepal narrowly ovate or oblong, 12–13 × 4–4.5 mm, 5-veined, apex obtuse; lateral sepals ovate, 14–16 × 5–6 mm, 5-veined, apex obtuse. Petals lanceolate, 12–14 × 2.4–2.6 mm, 3-veined, apex obtuse; lip suborbicular, 18–20 × 20–23 mm, densely papillate adaxially, spurred, apex emarginate and somewhat 2-lobed; spur white, conic, 10–12 mm, curved, shallowly 2-lobed at apex. Fl. Jul.

• Grasslands; ca. 1600 m. SW Yunnan.

### 31. *PLATANTHERA* Richard, De Orchid. Eur. 20, 26, 35. 1817, nom. cons.

舌唇兰属 she chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Blephariglottis* Rafinesque; *Gymnadeniopsis* Rydberg; *Limnorchis* Rydberg; *Lysiella* Rydberg; *Perularia* Lindley; *Piperia* Rydberg; *Tulotis* Rafinesque.

Herbs, terrestrial, small to medium-sized. Rootstock composed of a slender, creeping stolon, or of a fusiform or ovoid tuber, fleshy, sometimes fascicled, usually with several filiform roots at neck. Stem erect or ascending, with 1 to several leaves. Leaves basal or cauline, alternate or rarely subopposite, elliptic, ovate-elliptic, or linear-lanceolate, sheathing at base. Inflorescence terminal, glabrous; peduncle cylindrical, with 1 or more often foliaceous bracts; rachis few to many flowered, lax or dense; floral bracts usually lanceolate, herbaceous. Flowers often sweetly scented, resupinate, white, green, yellow-green, rose-pink, or orange, variable in size; pedicel and ovary twisted, arcuate toward apex, cylindrical to fusiform, glabrous. Dorsal sepal usually connivent with petals and forming a hood, concave, short, margin ciliate or glabrous; lateral sepals spreading or reflexed, longer than dorsal sepal, margin ciliate or glabrous. Petals usually narrower than sepals; lip spreading or pendulous, sometimes strongly deflexed, entire and ligulate, sometimes with small lateral lobes at base, or divided and fimbriate to varying degrees, usually slightly fleshy, sometimes with a central thickening, sometimes with a callus on disk, spurred at base; spur usually very long and filiform or narrowly cylindrical, rarely short and conic. Column short, stout, with a pair of staminodes at base of anther; anther erect, broad, with 2 parallel or divergent locules, connective conspicuous; pollinia 2, sectile, clavate, granular-farinoaceous, each with conspicuous caudicle and naked vis-

cidium; rostellum triangular, with 2 divergent arms at base; stigma lobes confluent, concave, lying below rostellum and fused with its lower part, or on a convex surface surrounded by rostellum, or sometimes of 2 separate, raised lobes placed in front of mouth of spur. Capsule erect.

About 200 species: throughout Europe and N Africa, north temperate Asia, the Malay Archipelago, and New Guinea, and Central and North America; 42 species (19 endemic) in China.

Placement of some of the small-flowered and shortly spurred species here as opposed to in *Peristylus* is questionable, though critical re-evaluation currently is hampered by the very limited material (particularly of the endemic Chinese species) available for study.

- 1a. Spur shorter than or subequal in length to lip.
- 2a. Leaves 4 or 5; floral bracts pubescent; lip with a basal callus ..... 34. *P. clavigera*
- 2b. Leaves 1–3; floral bracts glabrous; lip ecallose.
- 3a. Plants less than 5 cm tall; lip 15–20 mm; spur 7–9 mm ..... 42. *P. peichatieniana*
- 3b. Plants more than 5 cm tall; lip 1.5–6 mm; spur 1–4 mm.
- 4a. Flowers white, sometimes flushed with pink.
- 5a. Leaves 1 or 2, oblong to elliptic, 1–3 cm wide; dorsal sepal ovate to suborbicular, 2.5–3 mm ..... 35. *P. brevicealcarata*
- 5b. Leaf solitary, linear to ligulate, 0.4–1 cm wide; dorsal sepal oblong, 5–6.5 mm ..... 36. *P. roseotincta*
- 4b. Flowers green, pale green, or yellowish green.
- 6a. Leaf solitary; spur ca. 1 mm ..... 37. *P. minutiflora*
- 6b. Leaves 2; spur 2–3 mm.
- 7a. Leaves linear, at least 5 × as long as broad; disk of lip densely papillose ..... 41. *P. kwangsiensis*
- 7b. Leaves ovate, ovate-oblong, oblong, or elliptic, less than 4 × as long as broad; lip glabrous.
- 8a. Leaves 5–7 × 2–3 cm; lip more than 4 mm ..... 40. *P. taiwanensis*
- 8b. Leaves 3–3.5 × 1–1.6 cm; lip to ca. 3.6 mm.
- 9a. Lip ca. 3.6 mm; spur clavate, ca. 2.2 mm; leaves oblong, ca. 3 × 1 cm ..... 38. *P. handel-mazzettii*
- 9b. Lip ca. 2.5 mm; spur cylindrical to ovoid, ca. 2 mm; leaves elliptic, ca. 3.5 × 1.6 cm ..... 39. *P. herminoides*
- 1b. Spur conspicuously longer than lip.
- 10a. Leaves always 2, basal and subopposite.
- 11a. Spur 20–25 mm, slender, not dilated; connective narrow, apex ca. 0.5 mm wide; anther locules parallel ..... 13. *P. bifolia*
- 11b. Spur 25–36 mm, stout, dilated toward apex; connective rather broad, apex ca. 1.5 mm wide; anther locules divergent ..... 14. *P. chlorantha*
- 10b. Leaf solitary and basal, or leaves 2–6, cauline, alternate and usually widely spaced, never basal and subopposite.
- 12a. Lip with a pair of small lateral lobes at base.
- 13a. Lip with a conic callus on disk in front of mouth of spur ..... 28. *P. finetiana*
- 13b. Lip ecallose.
- 14a. Spur 50–64 mm ..... 24. *P. arcuata*
- 14b. Spur 4–14 mm.
- 15a. Spur 4–5 mm, shorter than ovary ..... 23. *P. ussuriensis*
- 15b. Spur 10–14 mm, equal in length to or exceeding ovary.
- 16a. Leaves linear to linear-lanceolate, 1–2.5 cm wide; lip 6–8 mm ..... 15. *P. devolii*
- 16b. Leaves obovate to elliptic, 3–7 cm wide; lip 4–5 mm ..... 19. *P. souliei*
- 12b. Lip simple, lacking lateral lobes.
- 17a. Lip with an oblong or conic callus on disk in front of mouth of spur.
- 18a. Leaves (2 or)3–6; inflorescence laxly flowered; margin of dorsal sepal ciliate ..... 29. *P. latilabris*
- 18b. Leaves 1–4; inflorescence subdensely to densely flowered; dorsal sepal glabrous ..... 20. *P. sachalinensis*
- 17b. Lip ecallose.
- 19a. Leaves usually 4–6 (though *P. japonica* occasionally 3-leaved).
- 20a. Leaves 3–7.5 cm wide; spur 25–60 mm ..... 30. *P. japonica*
- 20b. Leaves 0.8–3 cm wide; spur 10–20 mm.
- 21a. Plants less than 25 cm tall; inflorescence laxly 5–9-flowered ..... 33. *P. sikkimensis*
- 21b. Plants more than 30 cm tall; inflorescence subdensely to densely many flowered.
- 22a. Plants 30–35 cm tall; peduncle robust; flowers green to yellowish green; lip linear, ca. 1 mm wide ..... 31. *P. oreophila*
- 22b. Plants 35–85 cm tall; peduncle slender; flowers white; lip ligulate to ligulate-lanceolate, 2.5–3 mm wide ..... 32. *P. hologlottis*
- 19b. Leaves 1–3.
- 23a. Sepal margins ciliate.
- 24a. Lip ca. 11 mm; petals ca. 8 mm ..... 18. *P. curvata*
- 24b. Lip to 8 mm; petals to 6 mm.

- 25a. Leaf usually solitary, or rarely 2; inflorescence 3–10-flowered.  
 26a. Leaf linear to linear-oblong, 0.7–1.4 cm wide; viscidia suborbicular ..... 8. *P. leptocaulon*  
 26b. Leaf elliptic or oblong-elliptic, 0.7–3.5 cm wide; viscidia narrowly oblong.  
 27a. Petals 2–2.2 mm wide; anther locules divergent; staminodes rectangular ..... 6. *P. chiloglossa*  
 27b. Petals 1–1.5 mm wide; anther locules parallel; staminodes suborbicular ..... 7. *P. exelliana*  
 25b. Leaves usually 2 (though *P. stenantha* occasionally 1-leaved); inflorescence 7- to many flowered.  
 28a. Lip 2–2.5 mm wide; stigma lobes confluent ..... 12. *P. stenantha*  
 28b. Lip 1.5–1.6 mm wide; stigma lobes separate.  
 29a. Spur 17–18 mm; lip strongly deflexed; sepals only ciliate along apical margin ..... 16. *P. deflexilabella*  
 29b. Spur 10–12 mm; lip straight; sepals ciliate along whole margin ..... 17. *P. longiglandula*  
 23b. Sepals glabrous.  
 30a. Leaves 3.  
 31a. Dorsal sepal and petals not connivent, not forming a hood; leaves 13–19 cm ..... 27. *P. likiangensis*  
 31b. Dorsal sepal and petals connivent, forming a hood; leaves 8–13 cm.  
 32a. Lip ca. 14 mm ..... 25. *P. sinica*  
 32b. Lip ca. 6 mm ..... 26. *P. bakeriana*  
 30b. Leaves 1 or 2 (though *P. minor* sometimes 3-leaved).  
 33a. Dorsal sepal and petals not connivent, not forming a hood.  
 34a. Leaf always solitary, basal, broadly elliptic to ovate-elliptic, 2–6 cm wide; sterile bracts small, not foliaceous ..... 1. *P. stenoglossa*  
 34b. Leaves 1 or 2, basal or cauline, narrowly elliptic, oblong, or linear-lanceolate, 1.5–3 cm wide; sterile bracts large, foliaceous ..... 9. *P. mandarinorum*  
 33b. Dorsal sepal and petals connivent, forming a hood.  
 35a. Plants less than 18 cm tall; leaf narrow, to 0.8 cm wide ..... 5. *P. stenophylla*  
 35b. Plants 20–80 cm tall; leaf 0.8–5 cm wide.  
 36a. Spur 6–8 mm, slightly shorter than to ca. as long as ovary; viscidia large, lanceolate ..... 11. *P. longicalcarata*  
 36b. Spur more than 10 mm, usually exceeding ovary; viscidia small, suborbicular.  
 37a. Leaf 0.8–2.2 cm wide.  
 38a. Inflorescence 3–8-flowered; dorsal sepal 4.5–6 × 3–4.5 mm; lip 6–8 mm ..... 3. *P. damingshanica*  
 38b. Inflorescence many flowered; dorsal sepal 2.5–3 × 2–2.5 mm; lip 5–6 mm ..... 4. *P. tipuloides*  
 37b. Leaf 2–5 cm wide.  
 39a. Peduncle usually robust; rachis many flowered.  
 40a. Dorsal sepal 3.5–4 mm wide; spur pendent ..... 21. *P. minor*  
 40b. Dorsal sepal ca. 7 mm wide; spur spreading horizontally ..... 22. *P. densa*  
 39b. Peduncle slender; rachis 4–14-flowered.  
 41a. Spur pendulous, incurved, ca. 11 mm ..... 2. *P. lancilabris*  
 41b. Spur usually spreading horizontally, parallel to ovary, occasionally slightly pendulous and incurved, 17–23 mm ..... 10. *P. yangmeiensis*

**1. *Platanthera stenoglossa*** Hayata, Icon. Pl. Formosan. 4: 123. 1914.

狭瓣舌唇兰 xia ban she chun lan

*Platanthera chingshuishania* S. S. Ying; *P. iriomotensis* Masamune; *P. stenosepala* Schlechter.

Plants 12–40 cm tall. Rootstock tuberous, fusiform, 2–5 × 0.4–0.7 cm. Stem erect or ascending, with a tubular sheath at base, 1-leaved. Leaf basal, broadly elliptic to ovate-elliptic, 3–15 × 2–6 cm, base clasping, apex acute or obtuse. Peduncle ridged, with 1–3 scattered, small, scalelike (non-foliaceous), lanceolate bracts; rachis 5–15 cm, laxly 5–10-flowered; floral bracts lanceolate to ovate-lanceolate, 6–13 mm, shorter than ovary. Flowers pale yellowish green to green; pedicel and ovary arcuate, fusiform, 8–16 mm. Dorsal sepal not connivent with sepals, ovate, concave, 4–5 × 2–4 mm, glabrous, 1-veined, apex acute; lateral sepals strongly reflexed, linear, 6–7 × 0.8–1.5 mm, glabrous, 1-veined, apex obtuse. Petals erect, spreading,

deltoid to ovate-lanceolate, oblique, 4.5–6 × 3–4 mm, 2-veined, apex acute; lip linear-lanceolate, 7–8 × 2–2.5 mm, fleshy, entire, apex obtuse; spur spreading horizontally to slightly pendulous, cylindrical, 12–18 mm, slender, apex obtuse. Column 2.5–3 mm; staminodes conspicuous, ellipsoid; anther locules nearly parallel; connective broad, concave; pollinia ovoid, with slender caudicles and orbicular viscidia; rostellum slightly arched, concave; stigma lobes confluent, transversely oblong. Capsule erect, fusiform. Fl. Mar–May.

Broad-leaved forests, forest margins, moist rocks; 300–1600 m. C and N Taiwan [Japan (Ryukyu Islands)].

**2. *Platanthera lancilabris*** Schlechter, Repert. Spec. Nov. Regni Veg. 17: 25. 1921.

披针唇舌唇兰 pi zhen chun she chun lan

Plants 30–35 cm tall. Rootstock tuberous, narrowly oblong. Stem erect or ascending, with tubular sheaths at base, 1-leaved. Leaf oblong, 7–8 × 2.7–3 cm, base contracted and

clasping, apex obtuse. Peduncle with 2 foliaceous, lanceolate bracts; rachis to 9 cm, subdensely 8–14-flowered; floral bracts lanceolate, basal ones exceeding flowers, apex acuminate. Flowers green; pedicel and ovary cylindrical, ca. 7 mm. Dorsal sepal erect, lanceolate, concave, ca. 4.5 mm, glabrous, 1-veined, apex obtuse; lateral sepals reflexed, ligulate-lanceolate, oblique, ca. 5 mm, glabrous, 1-veined, apex obtuse. Petals ovate-lanceolate, oblique, 1-veined, apex subacute; lip ca.  $5 \times 1.5$  mm, entire, basal margin adnate to petals, free part lanceolate, apex obtuse; spur pendulous, slightly incurved, cylindrical, ca. 11 mm, apex subobtusate; anther locules slightly divergent; rostellum short, broadly triangular.

- Forests on slopes. NE Yunnan.

**3. *Platanthera damingshanica*** K. Y. Lang & H. S. Guo, Fl. Zhejiang 7: 552. 1993.

大明山舌唇兰 da ming shan she chun lan

Plants 32–47 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem slender, with tubular sheaths at base, 1-leaved. Leaf basal, narrowly oblanceolate to oblong,  $7\text{--}15 \times 1\text{--}2.2$  cm, base contracted and clasping, apex obtuse. Peduncle slender, with 1–3 scattered bracts; rachis 6–11 cm, laxly 3–8-flowered; floral bracts lanceolate, 6–13 mm. Flowers yellowish green; pedicel and ovary cylindrical, 6–12 mm. Dorsal sepal erect, forming a hood with petals, broadly ovate, cymbiform,  $4.5\text{--}6 \times 3\text{--}4.5$  mm, glabrous, 3-veined, apex acute; lateral sepals reflexed, narrowly oblong to linear, oblique, ca.  $7 \times 2$  mm, glabrous, 3-veined, apex obtuse. Petals erect, ovate, oblique,  $4\text{--}5.5 \times 2\text{--}3.5$  mm, 2-veined, apex acute; lip linear-ligulate,  $6\text{--}8 \times$  ca. 1 mm, entire, apex obtuse; spur pendulous, cylindrical, 12–14 mm. Column ca. 4 mm; anther locules nearly parallel; pollinia obovoid, with long caudicles and suborbicular viscidia; rostellum rather large; stigma lobes confluent, concave, lying directly below rostellum. Fl. May.

- Dense forests on slopes, shaded and humid places along valleys. Fujian, Guangdong, Guangxi, Hunan, Zhejiang.

**4. *Platanthera tipuloides*** (Linnaeus f.) Lindley, Gen. Sp. Orchid. Pl. 285. 1835.

筒距舌唇兰 tong ju she chun lan

*Orchis tipuloides* Linnaeus f., Suppl. Pl. 401. 1782; *Perularia whangshanensis* S. S. Chien; *Tipularia tipuloides* (Linnaeus f.) Druce; *Tulotis whangshanensis* (S. S. Chien) H. Hara.

Plants 20–40 cm tall. Rootstock tuberous, narrowly fusiform to cylindrical, elongate,  $3.5\text{--}5 \times 0.3\text{--}0.6$  cm. Stem slender, with a tubular sheath at base, 1-leaved. Leaf oblong-elliptic,  $5\text{--}11 \times 0.8\text{--}2$  cm, base clasping, apex obtuse. Peduncle slender, with 2 or 3 foliaceous, ovate-lanceolate bracts; rachis 6–12 cm, sparsely many flowered; floral bracts narrowly lanceolate, 12–15 mm, basal ones exceeding ovary. Flowers yellowish green; pedicel and ovary cylindrical, 9–12 mm, slender. Dorsal sepal erect, forming a hood with petals, broadly ovate, cymbiform,  $2.5\text{--}3 \times 2\text{--}2.5$  mm, glabrous, 3-veined, apex obtuse; lateral sepals reflexed, narrowly elliptic,  $3\text{--}3.5 \times 1.2\text{--}1.3$  mm, glabrous, 3-veined, apex obtuse. Petals erect, ovate to narrowly ovate,

oblique,  $2.5\text{--}3 \times 1\text{--}1.5$  mm, slightly fleshy, 1-veined, apex obtuse; lip spreading horizontally to pendulous, broadly linear,  $5\text{--}6 \times 1.2\text{--}1.5$  mm, entire, apex obtuse; spur slightly pendulous, sometimes incurved, cylindrical, 12–17 mm, slender, apex obtuse. Column ca. 1.5 mm; anther locules nearly parallel; connective slightly concave; pollinia obovoid, with short caudicles and suborbicular viscidia; rostellum rather small; stigma lobes confluent, concave, lying directly below rostellum. Fl. May–Jul.  $2n = 42$ .

Dense forests on slopes, forest margins along valleys; 700–1700 m. Anhui, Fujian, Hong Kong, Hunan, Jiangxi, Zhejiang [Japan, Korea, Russia (Kamchatka, Sakhalin)].

**5. *Platanthera stenophylla*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 59. 1951.

独龙江舌唇兰 du long jiang she chun lan

Plants 15–17.5 cm tall. Rootstock creeping, cylindrical. Stem erect or ascending, rather slender, with 1 tubular sheath at base, 1-leaved. Leaf cauline, narrowly oblong,  $4\text{--}4.5 \times 0.7\text{--}0.8$  cm, base attenuate and clasping, apex obtuse. Peduncle slender; rachis 3.5–4 cm, laxly 3–5-flowered; floral bracts lanceolate, slightly exceeding ovary, apex acuminate. Flowers green; pedicel and ovary cylindrical-fusiform, ca. 8 mm. Dorsal sepal ovate-lanceolate, ca.  $6 \times 1.8$  mm, glabrous, 3-veined, apex obtuse; lateral sepals lanceolate, oblique,  $3.5\text{--}6 \times$  ca. 1.3 mm, glabrous, 1-veined, apex obtuse. Petals ovate-lanceolate, oblique, ca.  $5 \times 1.8$  mm, slightly fleshy, 1-veined, apex obtuse; lip lanceolate-ligulate, ca.  $5 \times 1.4$  mm, entire, apex obtuse; spur pendulous to spreading horizontally, cylindrical, ca.  $9.5 \times 1$  mm, exceeding ovary, tapering slightly toward apex, apex obtuse. Column ca. 1.5 mm. Fl. Aug–Sep.

- *Betula* forests, grasslands on slopes; 2500–3800 m. SE Xizang (Bomi), NW Yunnan (Gongshan).

**6. *Platanthera chiloglossa*** (Tang & F. T. Wang) K. Y. Lang, Vasc. Pl. Hengduan Mts. 2: 2523. 1994.

察瓦龙舌唇兰 cha wa long she chun lan

*Habenaria chiloglossa* Tang & F. T. Wang, Acta Phytotax. Sin. 1: 63. 1951.

Plants 10–31 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect or ascending, slightly stout, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf cauline, oblong-elliptic,  $2.5\text{--}10 \times 0.7\text{--}3.5$  cm, base clasping, apex acute. Peduncle sometimes with 1 small, foliaceous bract; rachis 2–10 cm, 3–10-flowered; floral bracts lanceolate, apex acuminate, basal ones exceeding flowers. Flowers pale yellowish green; pedicel and ovary fusiform, ca. 9 mm. Dorsal sepal erect and connivent with petals, narrowly elliptic, concave,  $5.5\text{--}6 \times$  ca. 2 mm, 3-veined, margin ciliate, apex obtuse; lateral sepals reflexed, obliquely lanceolate,  $5.5\text{--}6 \times$  ca. 2 mm, 1-veined, margin ciliate, apex subacuminate. Petals triangular, oblique, ca.  $5 \times 2\text{--}2.2$  mm, 1-veined, apex obtuse; lip slightly recurved, ligulate, ca.  $6.5 \times 1.5$  mm, entire, apex obtuse; spur pendulous, cylindrical, slightly incurved, ca. 16 mm, exceeding ovary, somewhat dilated toward apex, apex obtuse. Column short; staminodes rectangular, small; anther locules slightly divergent; pollinia ellip-

soid, with long caudicles and narrowly oblong viscidia; rostellum erect, short; stigma lobes separate, raised, elliptic, large, extending on either side of mouth of spur. Fl. Aug.

• Forests, grasslands on slopes and along gullies; 2500–3300 m. W Sichuan, Xizang (Zayü), NW Yunnan.

**7. *Platanthera exelliana*** Soó, Ann. Hist.-Nat. Mus. Natl. Hung. 26: 359. 1929.

高原舌唇兰 gao yuan she chun lan

*Platanthera elachyantha* Tang & F. T. Wang.

Plants 15–25 cm tall. Rootstock tuberous, fusiform, ca. 1.5 cm. Stem erect or ascending, with a tubular sheath at base, 1- or rarely 2-leaved. Leaf basal, elliptic to oblong-elliptic, 2.5–10 × 0.7–3.5 cm, base sheathing, apex obtuse or acute. Peduncle slender, with 1 or 2 small, foliaceous bracts; rachis 2–10 cm, laxly 3–10-flowered; floral bracts lanceolate, 8–22 mm, apex acuminate. Flowers pale yellowish green; pedicel and ovary slightly arcuate, cylindrical-fusiform, 6–7 mm. Dorsal sepal erect, forming a hood with petals, narrowly oblong, 3.5–4.5 × 1.2–1.8 mm, 1- or 3-veined, margin ciliate, apex obtuse; lateral sepals reflexed, narrowly oblong, oblique, 4–5 × 1.5–1.8 mm, 1- or 3-veined, margin ciliate, apex slightly obtuse. Petals erect, narrowly triangular-lanceolate, oblique, 3.5–5 × 1–1.5 mm, fleshy, apex obtuse; lip slightly recurved, ligulate to ligulate-lanceolate, 3.8–5 × ca. 1.3 mm, thickened, entire, apex obtuse; spur pendulous, slightly incurved, cylindrical, 8–10 mm, ca. as long as or exceeding ovary, somewhat dilated toward apex, apex obtuse. Column short; staminodes suborbicular, small; anther locules parallel; connective very narrow; pollinia obovoid, with short caudicles and narrowly oblong viscidia; rostellum rather small; stigma lobes separate, raised, elliptic, extending on either side of mouth of spur. Capsule ovoid. Fl. Aug–Sep.

Alpine and subalpine meadows, scrub; 3300–4500 m. W Sichuan, SE Xizang, NW Yunnan (Dêqên, Gongshan, Zhongdian) [Bhutan, India (Sikkim), Nepal].

**8. *Platanthera leptocaulon*** (J. D. Hooker) Soó, Ann. Hist.-Nat. Mus. Natl. Hung. 26: 360. 1929.

条叶舌唇兰 tiao ye she chun lan

*Habenaria leptocaulon* J. D. Hooker, Fl. Brit. India 6: 154. 1890; *Platanthera silaensis* Handel-Mazzetti.

Plants 19–25 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect, with 1 or 2 sheaths at base, 1- or rarely 2-leaved. Leaf cauline, linear to linear-oblong, 3.5–8.5 × 0.7–1.4 cm, base clasping, apex acute to subobtuse. Peduncle slender, with 1–3 foliaceous, linear-lanceolate bracts; rachis 4.5–9 cm, laxly 3–6-flowered; floral bracts erect, lanceolate to ovate-lanceolate, 10–12 mm, apex acuminate. Flowers yellowish green; pedicel and ovary cylindrical-fusiform, ca. 10 mm. Dorsal sepal erect and forming a hood with petals, sublanceolate, ca. 6 × 2–2.2 mm, 3-veined, margin ciliate, apex obtuse; lateral sepals reflexed, lanceolate, slightly oblique, ca. 6 × 2–2.1 mm, 3-veined, margin ciliate, apex obtuse. Petals triangular-lanceolate, oblique, ca. 6 × 2 mm, fleshy, 1-veined, apex acute; lip ligulate-lanceolate, 5.5–8 × 1–1.3 mm, thickened, entire, apex obtuse; spur pendulous, cylindrical, 12–20 mm, usually much longer than

ovary, slender. Column erect, short; staminodes subelliptic, small; anther locules nearly parallel; pollinia ellipsoid, with short caudicles and suborbicular viscidia; rostellum erect, short; stigma lobes separate, raised, elliptic-oblong, extending on either side of mouth of spur. Fl. Aug–Oct.

Forests, grasslands on slopes; 3000–4000 m. SW Sichuan, S Xizang, NW Yunnan [Bhutan, NE India, Nepal].

**9. *Platanthera mandarinorum*** H. G. Reichenbach, Linnaea 25: 226. 1852.

尾瓣舌唇兰 wei ban she chun lan

Plants 10–50 cm tall. Rootstock tuberous, ovoid to fusiform, 3–8 × 0.4–0.8 cm. Stem erect, with 2 or 3 tubular sheaths at base, 1- or 2-leaved. Leaves basal or cauline, alternate, narrowly elliptic, oblong, or linear-lanceolate, 3–12 × 0.8–3 cm, base clasping, apex acute or obtuse. Peduncle slender to somewhat robust, distinctly ridged, with several foliaceous, lanceolate bracts; rachis 3–22 cm, laxly to subdensely 3–20-flowered; floral bracts lanceolate to ovate-lanceolate, 8–20 mm, equal to or exceeding ovary. Flowers pale greenish yellow to green; pedicel and ovary arcuate, narrowly fusiform, 10–14 mm. Dorsal sepal not connivent with petals, broadly ovate to cordate or deltoid, concave, 4–7 × 3–5.5 mm, glabrous, 3-veined, apex obtuse or bluntly rounded; lateral sepals spreading or reflexed, oblong-lanceolate to broadly lanceolate or linear-lanceolate, oblique, 5–9 × 1.3–3.5 mm, glabrous, 3-veined, apex acute to acuminate. Petals spreading, ovate-lanceolate or ovate-linear, oblique, 6–9 × 3–4 mm, 3-veined, apex acute or obtuse; lip pendulous, linear-lanceolate to ligulate, 7–10 × 1–2.5 mm, entire, apex obtuse; spur pendulous, spreading horizontally, or curving upward, cylindrical, 8–30 mm, obtuse to acute. Column 3–4 mm; staminodes ellipsoid, conspicuous; anther locules divergent or parallel, connective 2–3 mm wide, apex emarginate; pollinia ellipsoid, with long caudicles and suborbicular viscidia; rostellum broadly triangular; stigma lobes confluent, transversely oblong, concave, lying directly below rostellum.

Forests, forest margins, alpine or moist grasslands; 300–3200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, NE Yunnan, Zhejiang [Japan, Korea].

- 1a. Lateral sepals linear-lanceolate, 1.3–2 mm wide, dorsal sepal deltoid ..... 9b. subsp. *formosana*
- 1b. Lateral sepals oblong-lanceolate to broadly lanceolate, (1.5–)2–3.5 mm wide, dorsal sepal broadly ovate to cordate.
  - 2a. Spur usually spreading horizontally or upcurved, (15–)20–30 mm; anther locules divergent .... 9a. subsp. *mandarinorum*
  - 2b. Spur pendulous, 8–15 mm; anther locules parallel ..... 9c. subsp. *pachyglossa*

**9a. *Platanthera mandarinorum*** subsp. *mandarinorum*

尾瓣舌唇兰(原亚种) wei ban she chun lan (yuan ya zhong)

*Habenaria mandarinorum* (H. G. Reichenbach) Herklots; *Platanthera cornu-bovis* Nevski; *P. delavayi* Schlechter; *P. mandarinorum* var. *cornu-bovis* (Nevski) Kitagawa; *P. man-*

*darinorum* var. *delavayi* (Schlechter) Soó; *P. mandarinorum* var. *neglecta* (Schlechter) F. Maekawa; *P. mandarinorum* var. *ophryodes* Finet; *P. mandarinorum* subsp. *winkleriana* (Schlechter) Soó; *P. minax* Schlechter; *P. neglecta* Schlechter; *P. winkleriana* Schlechter.

Leaves elliptic to oblong, rarely linear-lanceolate, 4.5–10 × 0.8–2.5 cm. Dorsal sepal broadly ovate to cordate, 4–4.5 × 3–4 mm; lateral sepals oblong-lanceolate to broadly lanceolate, 5–7 × (1.5–)2–3 mm; spur 15–30 mm. Anther locules divergent. Fl. Apr–Jun.

Forests, grasslands; 300–2100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, NE Yunnan [Japan, Korea].

**9b. *Platanthera mandarinorum* subsp. *formosana*** T. P. Lin & K. Inoue, J. Phytogeogr. Taxon. 28: 12. 1980.

宝岛舌唇兰 bao dao she chun lan

*Platanthera mandarinorum* var. *formosana* (T. P. Lin & K. Inoue) S. S. Ying.

Leaves ovate, oblong, or lanceolate, 3–6 × 1.2–3 cm. Dorsal sepal deltoid, 5–7 × 4–4.5 mm; lateral sepals linear-lanceolate, oblique, 7–9 × 1.3–2 mm; spur 12–18 mm. Anther locules slightly divergent. Fl. May–Jul.

• Moist grasslands, forest margins; 1200–1600 m. Taiwan (Taibei, Taidong).

**9c. *Platanthera mandarinorum* subsp. *pachyglossa*** (Hayata) T. P. Lin & K. Inoue, J. Phytogeogr. Taxon. 28: 10. 1980.

厚唇舌唇兰 hou chun she chun lan

*Platanthera pachyglossa* Hayata, Icon. Pl. Formosan. 4: 123. 1914; *Habenaria pachyglossa* (Hayata) Masamune.

Leaves oblong to lanceolate, 5–12 × 2–3 cm. Dorsal sepal broadly ovate, 5–6 × 4.5–5.5 mm; lateral sepals oblong-lanceolate, oblique, 7–9 × 3–3.5 mm; spur 8–15 mm. Anther locules parallel. Fl. Jun–Aug.

• Alpine grasslands; 2000–3200 m. C and N Taiwan.

**10. *Platanthera yangmeiensis*** T. P. Lin, J. Phytogeogr. Taxon. 28: 7. 1980.

阴生舌唇兰 yin sheng she chun lan

*Platanthera lalashaniana* S. S. Ying.

Plants 22–40 cm tall. Rootstock tuberous, fusiform, 2–5 × 0.3–0.5 cm. Stem erect, with a tubular sheath at base, 1- or 2-leaved. Leaves basal or cauline, alternate, elliptic-oblong, 10–15 × 3–5 cm, base clasping, apex obtuse or acute. Peduncle slender, with several scattered, foliaceous, lanceolate bracts; rachis 2–7 cm, laxly 4–8-flowered; floral bracts lanceolate, 8–30 mm. Flowers pale yellowish white to light whitish green; pedicel and ovary arcuate, cylindrical, 12–15 mm, slender, glabrous. Dorsal sepal forming a hood with petals, suborbicular, concave, ca. 4.5 × 3.5 mm, glabrous, 3-veined, apex obtuse; lateral sepals reflexed, linear-falcate, ca. 6.5 × 1.8 mm, glabrous, 2-veined, apex acuminate. Petals deltoid, oblique, ca. 5.5 × 1.8 mm, 2-veined, apex acuminate; lip broadly linear, ca. 7 ×

1.6 mm, entire, apex obtuse; spur usually spreading horizontally and parallel to ovary, occasionally slightly pendulous and incurved, cylindrical, 17–23 mm, slender, gradually tapering toward apex. Column ca. 3 mm; staminodes conspicuous; anther locules nearly parallel; pollinia obovoid, with slender caudicles and suborbicular viscidia; rostellum slightly arched, concave; stigma lobes confluent, flat to slightly concave. Fl. Jun–Aug.

• Shaded humid places in forests; 1000–1700 m. Taiwan.

**11. *Platanthera longicalcarata*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 350. 1911.

长距舌唇兰 chang ju she chun lan

*Habenaria longicalcarata* (Hayata) S. S. Ying; *Plantaginorchis longicalcarata* (Hayata) Szlachetko & Kras-Lapinska; *Tulotis longicalcarata* (Hayata) T. S. Liu & H. J. Su.

Plants 20–45 cm tall. Rootstock elongate, creeping, tapering, 3–8 × 0.3–0.6 cm, stoloniferous. Stem erect, with 1 or 2 tubular sheaths at base, 1- or 2-leaved. Leaves cauline, alternate, widely spaced, oblong-oblong, 8–12 × 3–3.5 cm, base cuneate, apex subacute. Peduncle slender, ridged, with 2 foliaceous, lanceolate bracts; rachis 8–18 cm, 5–20-flowered; floral bracts lanceolate, 6–16 mm. Flowers greenish; pedicel and ovary fusiform, 6–9 mm. Dorsal sepal forming a hood with petals, ovate-triangular, 3–3.5 × 2.8–3.3 mm, glabrous, 1-veined, apex obtuse; lateral sepals reflexed, ovate-lanceolate, oblique, 4.5–5.5 × 2–3 mm, glabrous, 1-veined, apex obtuse. Petals lanceolate, oblique, 4–4.5 × 1.8–2 mm; lip ovate-triangular, 4.5–5 × 1.8–2.5 mm, entire, apex obtuse; spur pendulous, incurved, 6–8 mm, apex obtuse. Column 1.5–2 mm, with 2 small projections linking to lip at base; staminodes conspicuous; anther locules slightly divergent; connective narrow; pollinia ellipsoid, with slender caudicles and large, oblong viscidia; rostellum curved; stigma lobes confluent, flat, anterior margin protruding beyond anther locules. Fl. Jul–Sep.

• *Tsuga chinensis* and *Picea morrisonicola* forests on slopes; 2400–3000 m. Taiwan.

**12. *Platanthera stenantha*** (J. D. Hooker) Soó, Ann. Hist.-Nat. Mus. Natl. Hung. 26: 363. 1929.

条瓣舌唇兰 tiao ban she chun lan

*Habenaria stenantha* J. D. Hooker, Fl. Brit. India 6: 153. 1890; *Hemihabenaria stenantha* (J. D. Hooker) Finet.

Plants 25–32 cm tall. Rootstock elongate, cylindrical, stoloniferous. Stem erect, with 1 or 2 tubular sheaths at base, 1- or 2-leaved. Leaves cauline, alternate, widely spaced, elliptic or broadly elliptic, 4–15 × 2–5.5 cm, base contracted and clasping, apex acute. Peduncle slender, with 2–4 foliaceous bracts; rachis 6–15 cm, 7–17-flowered; floral bracts linear-lanceolate, 10–20 mm, basal ones exceeding flowers, apex acuminate. Flowers yellowish green; pedicel and ovary cylindrical, 8–12 mm. Dorsal sepal erect, forming a hood with petals, ovate, cymbiform, 4–5 × 2–2.6 mm, 3-veined, margin ciliate, apex obtuse; lateral sepals reflexed, oblong, oblique, 5–6 × 1.5–1.7 mm, 3-veined, margin ciliate, apex obtuse. Petals yellow, erect, linear, oblique, 4–5 × ca. 1 mm, slightly fleshy, 1-veined, apex obtuse; lip yellow, narrowly ovate to ligulate-lanceolate, 5–6 × 2–2.5 mm, en-

tire, apex obtuse; spur pendulous, slightly incurved, cylindrical, 12–18 mm, exceeding ovary, slender, slightly dilated toward apex. Column short; staminodes small; anther locules slightly divergent; pollinia obovoid, with long caudicles and lanceolate viscidia; rostellum rather large; stigma lobes confluent, raised, elliptic, placed above mouth of spur. Fl. Aug–Sep.

Evergreen broad-leaved forests, coniferous (*Abies* and *Tsuga*) forests; 1500–3100 m. S and SE Xizang (Mêdog, Yadong), Yunnan (Bijiang, Gongshan) [Bhutan, India (Sikkim), N Myanmar, Nepal].

**13. *Platanthera bifolia*** (Linnaeus) Richard, *De Orchid.* Eur. 35. 1817.

细距舌唇兰 xi ju she chun lan

*Orchis bifolia* Linnaeus, Sp. Pl. 2: 939. 1753; *Habenaria bifolia* (Linnaeus) R. Brown; *Platanthera metabifolia* F. Maekawa.

Plants 28–42 cm tall. Rootstock tuberous, ovoid-fusiform, tapering at base, 2.5–3 × 0.8–1.4 cm. Stem erect, with 1 or 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, spatulate-elliptic, oblong, or elliptic, 9–12 × 1.8–3.5 cm, gradually contracted at base, apex obtuse. Peduncle slender to robust, with 2–4 scattered, lanceolate bracts; rachis 9–19 cm, laxly to subdensely 7–17-flowered; floral bracts lanceolate, 15–20 mm, basal ones exceeding ovary. Flowers fragrant, white, greenish white, or green; pedicel and ovary arcuate, cylindrical, 14–15 mm. Dorsal sepal erect and forming a hood with petals, ovate to broadly ovate, cymbiform, 5.5–6 × 4–4.5 mm, glabrous, apex obtuse; lateral sepals spreading, ovate-lanceolate, oblique, 6–7 × 3.5–4 mm, glabrous, apex subacute. Petals linear-lanceolate, oblique, 5.5–6 × ca. 1 mm, apex acute; lip spreading, ligulate, 9–10 × 1–1.5 mm, thickened, entire, apex obtuse; spur pendulous, cylindrical, slender, 20–25 × 1.5–1.8 mm, apex subacute. Column stout; staminodes conspicuous; anther locules slightly divergent; pollinia ellipsoid, with long caudicles and suborbicular viscidia; rostellum belt-shaped; stigma lobes confluent, concave, lying directly below rostellum. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 42$ .

Forests on slopes, damp meadows; 200–2800 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Qinghai, Shandong, Shanxi, Sichuan [Japan, Korea, Mongolia, Russia; N Africa, W Asia, Europe].

The Chinese plants do not differ significantly from the widespread Eurasian *Platanthera bifolia*. Its sister and equally widespread species, *P. chlorantha*, is also found in China. The distinctness of *P. metabifolia*, originally described from Japan, is questionable once the full range of variation in *P. bifolia* is considered.

The extensive extra-Chinese synonymy is not cited here.

**14. *Platanthera chlorantha*** (Custer) Reichenbach in Mössler, *Handb. Gewächsk.*, ed. 2, 2: 1565. 1829.

二叶舌唇兰 er ye she chun lan

*Orchis chlorantha* Custer, *Neue Alp.* 2: 400. 1827; *Gymnadenia chlorantha* (Custer) Ambrosi; *Habenaria chlorantha* (Custer) Babington; *H. subulifera* W. W. Smith; *Platanthera sigmoidea* Maekawa; *P. subulifera* (W. W. Smith) Schlechter.

Plants 30–54 cm tall. Rootstock tuberous, ovoid-fusiform, 2–4 × 0.8–1.5 cm. Stem erect, with a tubular sheath at base, 2-

leaved. Leaves basal, subopposite, spatulate-elliptic or oblanceolate-elliptic, 10–20 × 3–8 cm, gradually contracted and sheathing at base, apex obtuse or acute. Peduncle slender to robust, with 1–4 scattered, lanceolate bracts; rachis 7–23 cm, laxly to subdensely 9–32-flowered; floral bracts lanceolate, 10–22 mm, basal ones exceeding ovary, apex acuminate. Flowers fragrant, greenish white or white; pedicel and ovary arcuate, cylindrical, 12–18 mm. Dorsal sepal erect, forming a hood with petals, ovate to orbicular-cordate, cymbiform, 5–7 × 5–6 mm, glabrous, 5-veined, apex obtuse; lateral sepals spreading, ovate, oblique, 7.5–8 × 4–4.5 mm, glabrous, 3–5-veined, apex acute. Petals narrowly ovate-lanceolate, oblique, 5–6 × 2.5–3 mm, 1–3-veined, apex acute; lip spreading to pendulous, ligulate, gradually tapering toward apex, 8–13 × ca. 2 mm, entire, apex obtuse; spur pendulous to spreading horizontally or sometimes arching upward, clavate-cylindrical, 16–36 mm, exceeding ovary, conspicuously thickened toward apex, apex obtuse. Column stout; staminodes conspicuous; anther locules divergent; pollinia ellipsoid, with slender caudicles and orbicular viscidia; rostellum broad, tapelike; stigma lobes confluent, concave, lying directly below rostellum. Fl. Jun–Aug, fr. Jul–Sep.  $2n = 42$ .

Forests on slopes, grasslands; 400–3300 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xizang, Yunnan [Japan, Korea, Russia; W Asia, Europe].

**15. *Platanthera devolii*** (T. P. Lin & T. W. Hu) T. P. Lin & K. Inoue, *J. Phytogeogr. Taxon.* 28: 5. 1980.

长叶舌唇兰 chang ye she chun lan

*Tulotis devolii* T. P. Lin & T. W. Hu, *Quart. J. Chin. Forest.* 9: 53. 1976; *Platanthera longicalcarata* Hayata var. *devolii* (T. P. Lin & T. W. Hu) S. S. Ying.

Plants 20–35 cm tall. Rootstock creeping, slender, stoloniferous. Stem erect, with 2 tubular sheaths at base, 2-leaved. Leaves cauline, alternate, widely spaced, linear to linear-lanceolate, 8–18 × 1–2.5 cm, base clasping, apex acute. Peduncle slender, with 2 or 3 small, lanceolate bracts; rachis 10–25 cm, 8–16-flowered; floral bracts lanceolate, 10–14 mm, apex acuminate. Flowers yellowish green; pedicel and ovary fusiform-cylindrical, 8–15 mm. Dorsal sepal erect, forming a hood with petals, broadly ovate, concave, 2.5–3 × 2.5–3 mm, glabrous, 3-veined, apex obtuse; lateral sepals spreading or reflexed, oblique, ovate to narrowly elliptic, 4–5 × 2–3 mm, glabrous, 3-veined, apex obtuse. Petals ovate-lanceolate, oblique, ca. 3 × 1.5–2 mm, 1-veined, apex obtuse; lip pendulous and strongly deflexed, ligulate-lanceolate, 6–8 × ca. 2 mm, with small lateral lobes at base, apex obtuse; basal lobes square or obtusely triangular, to 2 mm, apex acute; spur pendulous, cylindrical, 10–14 mm, exceeding ovary, slender, apex acute. Fl. Jun–Sep.

• Shaded places and wet mossy rocks in forests, forest margins, roadsides; 1900–2400 m. C and N Taiwan.

**16. *Platanthera deflexilabella*** K. Y. Lang, *Acta Phytotax. Sin.* 20: 186. 1982.

反唇舌唇兰 fan chun she chun lan

Plants 30–47 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect or ascending, with 2 tubular sheaths at base, 2-leaved. Leaves cauline, widely spaced, elliptic, narrowly elliptic, or narrowly oblong, 9–15 × 1.5–5 cm, base contracted and clasping, apex subobtuse or subacute. Peduncle slender, with 1 or 2 foliaceous, lanceolate bracts; rachis cylindrical, 6.5–12 cm, laxly many flowered; floral bracts narrowly lanceolate, margin ciliate, apex long acuminate. Flowers fragrant, yellowish green; pedicel and ovary cylindrical-fusiform, 5–6 mm. Dorsal sepal erect, connivent with petals, ovate-oblong, ca. 4 × 1.8 mm, 3-veined, apical margin ciliate, apex obtuse; lateral sepals spreading, linear-lanceolate, oblique, ca. 4.5 × 1.2 mm, 3-veined, apical margin ciliate, apex obtuse. Petals triangular-ovate, oblique, ca. 5 × 2 mm, 1- or rarely 2-veined, apex obtuse; lip strongly deflexed, ligulate-linear, ca. 6 × 1.5 mm, entire, apex obtuse; spur pendulous, cylindrical, 17–18 mm, exceeding ovary, slender, tapering slightly toward apex, apex obtuse. Column ca. 1.5 mm, stout; staminodes small; anther locules nearly parallel; pollinia obovoid, with short caudicles and elliptic viscidia; rostellum erect, short; stigma lobes separate, raised, clavate, protruding. Fl. Jul–Aug.

• Forests on slopes, roadsides; 2500–2600 m. SC Sichuan (Emei Shan).

**17. *Platanthera longiglandula*** K. Y. Lang, Acta Phytotax. Sin. 20: 188. 1982.

长粘盘舌唇兰 chang zhan pan she chun lan

Plants 28–33 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect or ascending, with 2 tubular sheaths at base, 2-leaved. Leaves cauline, widely spaced, narrowly oblong, narrowly lanceolate, or spatulate, 12–17 × 1.5–3 cm, base attenuate and clasping, apex obtuse or acute. Peduncle slender, with 2 or 3 foliaceous bracts; rachis cylindrical, 8–10 cm, subdensely many flowered; floral bracts lanceolate, margin ciliate, apex acuminate, basal ones exceeding flowers. Flowers fragrant, yellowish green; pedicel and ovary slightly arcuate, fusiform, 6–7 mm, glabrous. Dorsal sepal erect and connivent with petals, ovate, cymbiform, ca. 4 × 2.2 mm, 1-veined, margin ciliate, apex obtuse; lateral sepals spreading, ovate, slightly oblique, ca. 4 × 2 mm, 1-veined, margin ciliate, apex obtuse. Petals ovate, oblique, ca. 3.5 × 2 mm, 1-veined, apex slightly obtuse; lip straight, ligulate-ovate, ca. 3.5 × 1.6 mm, entire, apex obtuse; spur pendulous, cylindrical, 10–12 mm, exceeding ovary, slender, apex obtuse. Column ca. 1.5 mm, stout; staminodes small; anther locules nearly parallel; pollinia obovoid, with short caudicles and narrowly lanceolate viscidia; rostellum erect, short; stigma lobes separate, raised, clavate, protruding, apex obtuse. Fl. Jul.

• Bamboo forests on slopes; ca. 2800 m. SC Sichuan (Emei Shan).

**18. *Platanthera curvata*** K. Y. Lang, Fl. Xizang. 5: 697. 1987.

弓背舌唇兰 gong bei she chun lan

*Habenaria platantheroides* Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 133. 1936, not Schlechter (1918); *Platanthera platantheroides* K. Y. Lang.

Plants 24–32 cm tall. Rootstock creeping, cylindrical, sto-

loniferous. Stem erect or ascending, with 1 or 2 tubular sheaths at base, usually 2-leaved. Leaves elliptic to obovate, 5–8 × 2–3.5 cm, base clasping, apex acute or acuminate. Peduncle slender, sometimes with 1 or 2 foliaceous bracts; rachis 5.5–12 cm, 4–10- or more flowered; floral bracts lanceolate, apex acuminate or acute. Flowers yellowish green; pedicel and ovary strongly arcuate, cylindrical-fusiform, ca. 12 mm. Dorsal sepal erect and connivent with petals, broadly ovate, cymbiform, ca. 7 × 5 mm, 3-veined, margin ciliate, apex obtuse; lateral sepals reflexed, lanceolate, oblique, ca. 9 × 3 mm, 3-veined, margin ciliate, apex obtuse. Petals erect, narrowly lanceolate, falcate, ca. 8 × 2 mm, 1- or rarely 3-veined, apex acute; lip ligulate-lanceolate, ca. 11 × 2.3 mm, 3-veined, entire, apex obtuse; spur spreading horizontally, cylindrical-clavate, ca. 18 mm, much longer than ovary, slightly thickened toward apex, apex obtuse. Column erect, short; staminodes square, small; anther locules slightly divergent; pollinia ellipsoid, with slender caudicles and large, orbicular viscidia; rostellum erect, short; stigma lobes separate, clavate, large, protruding obliquely on either side of mouth of spur. Fl. Jul–Aug.

• Forests, scrub, grasslands on slopes; 1900–3600 m. SW and W Sichuan, SE Xizang (Médog), SW Yunnan (Menglian).

**19. *Platanthera souliei*** Kraenzlin, Repert. Spec. Nov. Regni Veg. 5: 199. 1908.

蜻蜓舌唇兰 qing ting she chun lan

*Habenaria pugionifera* W. W. Smith; *Orchis fuscescens* Linnaeus; *Perularia fuscescens* (Linnaeus) Lindley; *P. souliei* (Kraenzlin) Schlechter; *Platanthera fuscescens* (Linnaeus) Kraenzlin; *P. pugionifera* (W. W. Smith) Schlechter; *Tulotis asiatica* H. Hara; *T. fuscescens* (Linnaeus) Rafinesque; *T. souliei* (Kraenzlin) H. Hara.

Plants 20–60 cm tall. Rootstock slender, stoloniferous. Stem erect, stout, with 1 or 2 tubular sheaths at base, 2(or 3)-leaved. Leaves cauline, obovate to elliptic, 6–15 × 3–7 cm, base clasping, apex obtuse. Peduncle with several lanceolate bracts; rachis elongate, many flowered; floral bracts narrowly lanceolate, exceeding ovary. Flowers yellowish green; pedicel and ovary cylindrical-fusiform, ca. 10 mm. Dorsal sepal erect, forming a hood with petals, ovate, concave, ca. 4 × 3 mm, glabrous, 3-veined, apex acute or obtuse; lateral sepals spreading, elliptic, oblique, slightly longer and narrower than dorsal sepal, glabrous, 3-veined, margin slightly reflexed, apex obtuse. Petals elliptic-lanceolate, oblique, 5.5–6.5 × 1.5–1.8 mm, slightly fleshy, 1-veined, apex obtuse; lip pendulous, ligulate-lanceolate, 4–5 × ca. 1.5 mm, with small lateral lobes at base, apex obtuse; basal lobes triangular-falcate, ca. 1 mm, apex acute; spur pendulous, slightly arcuate, cylindrical, ca. 10 mm, ca. equal in length to ovary, slender, slightly dilated toward apex. Fl. Jun–Aug, fr. Sep–Oct. 2n = 42.

Forests along gullies; 400–4300 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, NW Yunnan [Japan, Korea, Russia (Siberia)].

**20. *Platanthera sachalinensis*** F. Schmidt, Reis. Amur-Land., Bot. 181. 1868.

高山舌唇兰 gao shan she chun lan

*Habenaria transnokoensis* (Ohwi & Fukuyama) S. S. Ying; *Platanthera longibracteata* Hayata; *P. transnokoensis* Ohwi & Fukuyama; *Tulotis transnokoensis* (Ohwi & Fukuyama) S. S. Ying; *T. ussuriensis* (Regel) H. Hara var. *transnokoensis* (Ohwi & Fukuyama) T. S. Liu & H. J. Su.

Plants 25–60 cm tall. Rootstock tuberous, clavate-fusiform, 1.5–6 × 0.4–0.9 cm. Stem erect, stout, with several tubular sheaths, 1–3-leaved. Leaves cauline, alternate, widely spaced, ovate-oblong to lanceolate, 8–15 × 2.5–5 cm, base clasping, apex obtuse. Peduncle with several scattered, foliaceous, lanceolate bracts; rachis 10–30 cm, subdensely to densely 10–40-flowered; floral bracts lanceolate, 8–27 mm, exceeding ovary. Flowers whitish green to nearly white; pedicel and ovary arcuate, cylindrical-fusiform, 6–18 mm. Dorsal sepal forming a hood with petals, narrowly ovate, concave, 3–3.5 × ca. 2 mm, glabrous, 3-veined, apex obtuse; lateral sepals reflexed or spreading, ovate-lanceolate, falcate, 4–4.5 × ca. 2 mm, glabrous, 3-veined, apex obtuse. Petals oblong, oblique, 3–3.5 × 1.5–2 mm, 2-veined, apex obtuse; lip strongly deflexed, broadly linear, 5–7 × 1–1.2 mm, entire, apex obtuse; disk with an oblong callus in front of mouth of spur; spur spreading horizontally, slightly arcuate, cylindrical, 10–20 mm, slender, apex obtuse. Column 2–2.5 mm; staminodes ellipsoid, small, inconspicuous; anther locules parallel; connective narrow; pollinia ellipsoid, with long caudicles and small, narrowly triangular viscidia; rostellum concave, V-shaped; stigma lobes confluent, concave, anterior margin slightly protruding. Fl. Jul–Sep.  $2n = 42$ .

Alpine grasslands, sparse forests; 2000–3000 m. C and N Taiwan [Japan, Russia (Sakhalin)].

**21. *Platanthera minor*** (Miquel) H. G. Reichenbach, Bot. Zeitung (Berlin) 36: 75. 1878.

小舌唇兰 xiao she chun lan

*Habenaria japonica* (Thunberg) A. Gray var. *minor* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 207. 1865; *H. henryi* Rolfe; *H. multibracteata* W. W. Smith; *Platanthera henryi* (Rolfe) Kraenzlin; *P. interrupta* Maximowicz; *P. multibracteata* (W. W. Smith) Schlechter; *P. sigeyosii* Masamune.

Plants 20–60 cm tall. Rootstock tuberous, fusiform, elongate, 1.5–6 × 0.4–1.5 cm. Stem erect, stout, with 1 or 2 tubular sheaths at base, 1- or 2(or 3)-leaved. Leaves cauline, alternate, usually widely spaced, elliptic, ovate-elliptic, or oblong-lanceolate, 6–15 × 2–5 cm, base clasping, apex acute or obtuse-rounded. Peduncle robust, ridged, with 2–5 foliaceous, lanceolate bracts; rachis 10–18 cm, laxly many flowered; floral bracts ovate-lanceolate, 8–20 mm, basal ones exceeding flowers, apex acuminate. Flowers yellowish green; pedicel and ovary slightly arcuate, cylindrical-fusiform, 10–15 mm. Dorsal sepal erect, forming a hood with petals, broadly ovate, concave, 4–5 × 3.5–4 mm, glabrous, 3-veined, apex obtuse or acute; lateral sepals reflexed, elliptic, oblique, 5–6(–7) × 2.5–3 mm, glabrous, 3-veined, apex obtuse. Petals ovate, oblique, 4–5 × 2–2.5 mm, 2-veined, apex obtuse; lip spreading horizontally to slightly pendulous, ligulate, 5–8 × 1.5–2.5 mm, entire, apex obtuse; spur pendulous, cylindrical, 11–18 mm, apex obtuse or acute. Column 3–4 mm; staminodes conspicuous; anther locules slightly

divergent; connective broad, apex concave; pollinia obovoid, with slender caudicles and suborbicular viscidia; rostellum broad, short; stigma lobes confluent, concave, large, lying directly below rostellum. Fl. May–Jul.  $2n = 42$ .

Forests on slopes, alpine meadows; 200–3000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

**22. *Platanthera densa*** Freyn, Oesterr. Bot. Z. 46: 96. 1896.

多叶舌唇兰 duo ye she chun lan

*Platanthera chloranthella* Nakai; *P. chlorantha* var. *orientalis* Schlechter; *P. densa* subsp. *orientalis* (Schlechter) Efimov.

Plants ca. 30 cm tall. Rootstock narrowly fusiform, shortly 2-lobed, ca. 4 × 1.3 cm. Stem erect, with 2 tubular sheaths at base, 2-leaved. Leaves cauline, elliptic, 6–7 × 2–3 cm, contracted and clasping at base, apex obtuse. Peduncle with 1 lanceolate bract; rachis ca. 6 cm, subdensely 15-flowered; floral bracts ovate-lanceolate, ca. 15 × 5 mm, slightly exceeding ovary. Flowers green; pedicel and ovary ca. 8 mm. Dorsal sepal erect, forming a hood with petals, cordate-ovate, ca. 5 × 7 mm, apex obtuse; lateral sepals elliptic, oblique, shorter and narrower than dorsal sepal. Petals lanceolate, ca. 3 mm, apex abruptly cuspidate; lip spreading forward, ligulate, ca. 10 × 2.5 mm, entire, apex obtuse; spur spreading horizontally, ca. 20 mm, much longer than ovary. Fl. Jun.

Alpine meadows. China (without precise locality) [Korea, Russia (Far East)].

Material of this species has not been seen. It is possibly conspecific with *Platanthera minor*.

**23. *Platanthera ussuriensis*** (Regel) Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 31: 107. 1887.

东亚舌唇兰 dong ya she chun lan

*Platanthera tipuloides* Lindley var. *ussuriensis* Regel, Tent. Fl. Ussur. 157. 1861; *Habenaria shensiana* Kraenzlin; *H. ussuriensis* (Regel) Miyabe; *Perularia shensiana* (Kraenzlin) Schlechter; *P. ussuriensis* (Regel) Schlechter; *Platanthera herbiola* Lindley var. *japonica* Finet; *P. shensiana* (Kraenzlin) Tang & F. T. Wang; *Tulotis shensiana* (Kraenzlin) H. Hara; *T. ussuriensis* (Regel) H. Hara.

Plants 20–55 cm tall. Rootstock creeping, 2–4 cm, slender, stoloniferous. Stem erect, slender, with 1 or 2 tubular sheaths at base, 2- or 3-leaved. Leaves cauline, widely spaced, spatulate to narrowly oblong, 6–14 × 1.2–2.5(–3) cm, base clasping, apex obtuse or acute. Peduncle slender, with 1 to several small, lanceolate bracts; rachis 6–10 cm, laxly 10–20-flowered; floral bracts narrowly lanceolate, 8–11 mm, apex acuminate. Flowers pale yellowish green; pedicel and ovary cylindrical, 8–9 mm. Dorsal sepal erect, forming a hood with petals, broadly ovate, concave, 2.5–3 × 2–2.5 mm, glabrous, 3-veined, apex obtuse; lateral sepals spreading or reflexed, narrowly elliptic, slightly oblique, ca. 3 × 1 mm, glabrous, 3-veined, apex obtuse. Petals narrowly oblong-lanceolate, 2.5–3 × ca. 1 mm, slightly fleshy, 1-veined, apex obtuse or subtruncate; lip pendulous, slightly deflexed, narrowly ligulate-lanceolate, ca. 4 × 1 mm, with small lateral lobes at base, apex obtuse; basal lobes suborbicular, apex rounded; mid-lobe ligulate-lanceolate or ligulate, apex obtuse;

spur pendulous, slightly incurved, cylindric, 4–5 mm, shorter than ovary, slender, apex acute. Fl. Jul–Aug, fr. Sep–Oct.  $2n = 42$ .

Forests, forest margins, shaded places along gullies; 400–2800 m. Anhui, N Fujian, NE Guangxi (Ziyuan), Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Shaanxi, Sichuan, Zhejiang [Japan, Korea, Russia (Far East)].

**24. *Platanthera arcuata*** Lindley, Gen. Sp. Orchid. Pl. 289. 1835.

弧形舌唇兰 hu xing she chun lan

*Habenaria arcuata* (Lindley) J. D. Hooker.

Stem erect, robust, 2- or more leaved. Leaves cauline, oblong or oblong-lanceolate, 6.5–10.2 cm, base clasping, apex acute. Rachis laxly many flowered; floral bracts foliaceous, linear-lanceolate, 15–38 mm, lower ones exceeding flowers, apex acuminate. Flowers large; pedicel and ovary arcuate, ca. 35 mm. Dorsal sepal cymbiform, ca. 8 mm; lateral sepals deflexed, oblong, slightly larger than dorsal sepal, 3-veined, apex obtuse. Petals linear, 1-veined; lip linear-ligulate, entire, with small lateral lobes at base, margin reflexed; disk puberulous; basal lobes rounded; spur cylindric, slender, 50–64 mm, exceeding ovary, incurved, apex acute. Column stout; anther locules divergent; pollinia obovoid, with stout, short caudicles and large, ovate viscidia; rostellum broadly triangular.

Grasslands. Xizang [Bhutan, NE India, Nepal].

The present authors saw no Chinese specimens of this species. It was reported from Xizang by Press et al. (Annot. Checkl. Fl. Pl. Nepal, 223. 2000).

**25. *Platanthera sinica*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 59. 1951.

滇西舌唇兰 dian xi she chun lan

Plants 35–50 cm tall. Rootstock creeping, cylindric, to 4 cm, stoloniferous. Stem erect, stout, with 2 or 3 tubular sheaths at base, usually 3-leaved. Leaves cauline, oblong or elliptic, 8–11 × 3–4.5 cm, base contracted and clasping, apex obtuse or acute. Peduncle slender, with several scattered, lanceolate bracts; rachis 10–12 cm, laxly 8–12-flowered; floral bracts lanceolate, basal ones exceeding flowers, apex acuminate. Flowers fragrant, yellowish green, petals and lip white and sometimes tinged yellow; pedicel and ovary cylindric, 14–15 mm. Dorsal sepal erect, forming a hood with petals, elliptic, cymbiform, 6–6.5 × 3–3.5 mm, glabrous, 3-veined, apex obtuse; lateral sepals reflexed, ovate, oblique, 6.5–7 × 3.5–4.5 mm, glabrous, 3-veined, apex obtuse. Petals erect, linear, oblique, 5.5–6 × 1.4–1.5 mm, 1-veined, apex truncate and slightly emarginate; lip linear-subulate, ca. 14 × 1–1.8 mm, base slightly dilated, entire, apex emarginate; spur pendulous, cylindric, 16–18 × ca. 1.5 mm, slightly thickened toward apex, apex obtuse. Column short; staminodes conspicuous; anther locules parallel; connective rather broad, apex slightly concave; pollinia obovoid, with short caudicles and linear-ellipsoid viscidia; rostellum erect, short; stigma lobes confluent, concave, elliptic, lying directly below rostellum. Fl. Jun–Jul.

• Forests, grassy slopes; 2500–3500 m. NW Yunnan (Gongshan to Zhongdian).

**26. *Platanthera bakeriana*** (King & Pantling) Kraenzlin, Orchid. Gen. Sp. 1: 632. 1899.

滇藏舌唇兰 dian zang she chun lan

*Habenaria bakeriana* King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 132. 1896.

Plants 30–58 cm tall. Rootstock tuberous, cylindric-fusiform, tapering, 2–7 × 0.5–1 cm. Stem erect, stout, with 2 or 3 tubular sheaths at base, usually 3-leaved. Leaves cauline, alternate, clustered to widely spaced, broadly elliptic, 8–13 × 1.5–5.5 cm, base contracted and clasping, apex acute. Peduncle slender to robust, with 2–4 foliaceous bracts; rachis 4–25 cm, subdensely many flowered; floral bracts linear-lanceolate, 10–25 mm, basal ones exceeding flowers, apex acuminate. Flowers faintly fragrant, yellowish green or green; pedicel and ovary cylindric-fusiform, 8–14 mm. Dorsal sepal erect, forming a hood with petals, oblong-ovate, cymbiform, 4–5.5 × 1.5–2.2 mm, glabrous, 3-veined, apex obtuse; lateral sepals reflexed, oblong-lanceolate, 4–5.5 × ca. 2 mm, glabrous, 3-veined, apex obtuse. Petals erect, obliquely ovate, 4.5–5 × 1.5–2.2 mm, apex obtuse; lip spreading to slightly pendulous, linear to ligulate, ca. 6 × 1.5 mm, entire, apex obtuse; spur pendulous, incurved, cylindric, 8–16 mm, much longer than ovary, slender, apex acuminate. Column short, staminodes small; anther locules slightly divergent; pollinia obovoid, with long caudicles and linear viscidia; rostellum rather large; stigma lobes confluent, raised, transversely elliptic, deeply 2-lobed, somewhat saddle-shaped, placed above mouth of spur. Fl. Jun–Aug.

Forests, scrub; 2200–4000 m. Sichuan (Miyi), SE Xizang (Médog), N Yunnan (Baoshan, Luquan) [Bhutan, India, Nepal].

**27. *Platanthera likiangensis*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 58. 1951.

丽江舌唇兰 li jiang she chun lan

Plants 28–30 cm tall. Rootstock tuberous, narrowly ellipsoid, 1.5–1.7 × 0.4–0.5 cm. Stem erect, stout, with 2 or 3 tubular sheaths at base, 3-leaved. Leaves cauline, spatulate, 13–19 × 2.8–5.3 cm, base attenuate and sheathing, apex acute. Peduncle with 1 or 2 lanceolate bracts; rachis 5–8 cm, laxly 9–12-flowered; floral bracts lanceolate, 12–13 mm, exceeding ovary, apex acuminate. Flowers yellowish green; pedicel and ovary cylindric-fusiform, 12–13 mm. Dorsal sepal erect, not connivent with petals, cymbiform, cordate-ovate, ca. 5 × 5 mm, glabrous, 7-veined, apex obtuse; lateral sepals spreading, ovate-lanceolate, oblique, ca. 7.5 × 3.5 mm, glabrous, 3(–5)-veined. Petals erect, linear-lanceolate, oblique, ca. 6 × 1.5 mm, slightly fleshy, apex obtuse; lip pendulous, linear, ca. 10 × 1 mm, entire, apex obtuse; spur pendulous, cylindric-clavate, 20–21 × ca. 1 mm, slightly dilated toward apex, apex obtuse. Fl. Jul.

• Forests on slopes; 2800–3000 m. NW Yunnan (Lijiang, Weixi).

**28. *Platanthera finetiana*** Schlechter, Repert. Spec. Nov. Regni Veg. 9: 23. 1910.

对耳舌唇兰 dui er she chun lan

*Habenaria stenantha* J. D. Hooker var. *auriculata* (Finet) S. Y. Hu; *Hemihabenaria stenantha* (J. D. Hooker) Finet var. *auriculata* Finet.

Plants 30–60 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect, stout, with tubular sheaths at base, 3- or 4-leaved. Leaves cauline, widely spaced, oblong, elliptic, or elliptic-lanceolate, 10–16 × 2.3–5 cm, base clasping, apex obtuse or acute. Peduncle with several lanceolate bracts; rachis 10–18 cm, subdensely to densely 8–26-flowered; floral bracts lanceolate, basal ones exceeding flowers, apex acuminate. Flowers pale yellowish green to whitish green; pedicel and ovary slightly arcuate, cylindrical, 12–13 mm. Dorsal sepal erect, forming a hood with petals, ovate-elliptic, cymbiform, 4.5–5.5 × 3–3.5 mm, glabrous, 3-veined, apex obtuse; lateral sepals reflexed, broadly ovate, oblique, 4.5–5.5 × 3.2–3.6 mm, glabrous, 3-veined, apex obtuse. Petals linear, oblique, 4–5 × ca. 1.5 mm, 1-veined, apex truncate-obtuse; lip pendulous, linear-ligulate, 9–10.5 × ca. 1.5 mm, with small lateral lobes at base, margin reflexed, apex obtuse; disk with a conic callus in front of mouth of spur; basal lobes square, apex truncate; spur pendulous, cylindrical, exceeding ovary, tapering gradually toward apex, apex acute and slightly hooked. Column short; staminodes conspicuous; anther locules parallel; connective somewhat broad, apex subretuse; pollinia obovoid, with long, slender caudicles and linear-elliptic viscidia; rostellum erect, broadly triangular, short; stigma lobes confluent, concave, elliptic, lying directly below rostellum. Fl. Jul–Aug.

• Forests on slopes or along valleys; 1200–3500 m. SE Gansu, W Hubei, Sichuan.

**29. *Platanthera latilabris*** Lindley, Gen. Sp. Orchid. Pl. 289. 1835.

白鹤参 bai he shen

*Habenaria bonatiana* Schlechter; *H. latilabris* (Lindley) J. D. Hooker; *Habenella latilabris* (Lindley) Szlachetko & Kras-Lapinska; *Pecteilis latilabris* (Lindley) Mitra; *Platanthera acuminata* Lindley; *Platantheroides latilabris* (Lindley) Szlachetko.

Plants 18–55 cm tall. Rootstock tuberous, ellipsoid or ovoid, 1–2.5 cm. Stem stout, with 2 or 3 tubular sheaths at base, (2 or)3–6-leaved. Leaves cauline, widely spaced, ovate to oblong, 5–13 × 2–5 cm, base clasping, apex acuminate. Peduncle elongate, with 1–4 foliaceous bracts; rachis cylindrical, 7–30 cm, laxly several to 40-flowered; floral bracts lanceolate or ovate-lanceolate, apex acuminate. Flowers yellowish green; ovary and pedicel cylindrical-fusiform, 10–16 mm. Dorsal sepal erect and connivent with petals, broadly ovate to orbicular, cymbiform, 5–7 × 3–4.5 mm, 3-veined, pubescent, margin ciliate, apex obtuse-rounded; lateral sepals reflexed or spreading, ovate, slightly oblique, 5.5–8 × ca. 3.5 mm, 3-veined, pubescent, margin ciliate, apex obtuse. Petals oblong, slightly oblique, 4–7 × (2.5–)4–5 mm, fleshy, 1- or rarely 2-veined, apex obtuse to subacute; lip linear-lanceolate to oblong, 5.5–13 × ca. 1 mm, entire, apex obtuse; disk with a conic callus in front of mouth of spur; spur spreading horizontally to slightly pendulous, cylindrical, 8–18 mm, usually longer than ovary, slender, apex obtuse to slightly acuminate. Column erect, short; staminodes subsquare, small; anther locules nearly parallel; pollinia obovoid, with very short caudicles and small, orbicular viscidia; rostellum erect, short; stigma lobes separate, raised, oblong to nar-

rowly oblong, parallel, spreading on either side of base of lip. Capsule fusiform, shortly beaked. Fl. Jul–Aug.

Forests, scrub, grasslands; 1600–3500 m. SW Sichuan, S and SE Xizang, NE and NW Yunnan [Bhutan, NE India, Kashmir, Nepal].

**30. *Platanthera japonica*** (Thunberg) Lindley, Gen. Sp. Orchid. Pl. 290. 1835.

舌唇兰 she chun lan

*Orchis japonica* Thunberg in Murray, Syst. Veg., ed. 14, 811. 1784; *Habenaria japonica* (Thunberg) A. Gray; *H. omeiensis* Rolfe; *Platanthera manubriata* Kraenzlin; *P. omeiensis* (Rolfe) Schlechter; *P. setchuenica* Kraenzlin; *P. stenantha* (J. D. Hooker) Soó subsp. *omeiensis* (Rolfe) Soó.

Plants 35–80 cm tall. Rootstock tuberous, cylindrical to narrowly ovoid. Stem erect, stout, with several tubular sheaths at base, (3 or)4–6-leaved. Leaves cauline, alternate, widely spaced, elliptic to narrowly elliptic, 10–18 × 3–7.5 cm, base sheathing, apex obtuse or acute. Peduncle robust, with 3 or 4 foliaceous, lanceolate bracts; rachis 10–18 cm, 10–28-flowered; floral bracts narrowly lanceolate, 20–45 mm, basal ones exceeding flowers, apex acuminate. Flowers white; pedicel and ovary straight to slightly arcuate, cylindrical, 18–25 mm. Dorsal sepal erect, forming a hood with petals, ovate, cymbiform, 7–8 × 5–6 mm, glabrous, 3-veined, apex obtuse or acute; lateral sepals reflexed, ovate, oblique, 8–9 × 4–5 mm, glabrous, 3-veined, apex acute. Petals linear, 6–7 × ca. 1.5 mm, 1-veined, apex obtuse; lip pendulous or spreading, linear, 13–15(–20) mm, entire, apex obtuse; spur pendulous, cylindrical to filiform, 25–60 mm, much longer than ovary, slender, apex acute. Column 1–2 mm; staminodes conspicuous; anther locules almost parallel; connective rather broad, apex subretuse; pollinia obovoid, with slender caudicles and linear-ellipsoid viscidia; rostellum erect, broadly triangular, short; stigma lobes confluent, concave, lying directly below rostellum. Fl. Mar–Jul, fr. May–Sep.  $2n = 42$ .

Forests, grasslands on slopes; 600–2600 m. Anhui, Chongqing, Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

**31. *Platanthera oreophila*** Schlechter, Repert. Spec. Nov. Regni Veg. 20: 381. 1924.

齿瓣舌唇兰 chi ban she chun lan

*Habenaria oreophila* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 208. 1921, not Greenman (1903).

Plants 30–35 cm tall. Rootstock tuberous, cylindrical. Stem erect, stout, with 1 or 2 tubular sheaths at base, 4-leaved. Leaves cauline, elliptic to lanceolate, 8–9 × 2.5–3 cm, base clasping, apex subacute. Peduncle with 3–5 bracts; rachis 7–10 cm, densely many flowered; floral bracts lanceolate, 10–20 mm, basal ones exceeding flower, apex acuminate. Flowers green to yellowish green; pedicel and ovary cylindrical-fusiform, 11–13 mm. Dorsal sepal erect, forming a hood with petals, ovate, cymbiform, 6–7 × 4–4.5 mm, slightly fleshy, glabrous, 3-veined, apex obtuse; lateral sepals reflexed, narrowly ovate, oblique, 7.5–8 × 3–3.8 mm, slightly fleshy, glabrous, 3-veined, apex subacute. Petals triangular-ovate, oblique, 6–7 × 3–3.2

mm, 1-veined, margin ciliate, apex slightly acute; lip pendulous, linear, 7–10 × ca. 1 mm, entire, apex subobtuse; spur pendulous, cylindric-clavate, 13–20 mm, exceeding ovary, apex obtuse. Column stout; staminodes small; anther locules parallel; connective broad, apex subtruncate; pollinia obovoid, with long caudicles and small, suborbicular viscidium; rostellum deltoid, short; stigma lobes confluent, concave, lying directly below rostellum. Fl. Jun–Jul.

• Forests, scrub, grasslands; 1900–3800 m. SW Sichuan (Muli), NW and W Yunnan (Tengchong, Zhongdian).

**32. *Platanthera hologlottis*** Maximowicz, Mém. Acad. Imp. Sci. St. Pétersbourg Divers Savans 9 [Prim. Fl. Amur.] 268. 1859.

密花舌唇兰 mi hua she chun lan

*Habenaria glossophora* W. W. Smith; *Limnorchis hologlottis* (Maximowicz) Nevski; *Platanthera glossophora* (W. W. Smith) Schlechter; *P. hologlottis* var. *glossophora* (W. W. Smith) K. Inoue.

Plants 35–85 cm tall. Rootstock elongate, creeping, cylindric, narrow, stoloniferous. Stem erect, with 1 or 2 tubular sheaths at base, 4–6-leaved. Leaves cauline, alternate, widely spaced, linear-lanceolate to broadly linear, 7–20 × 0.8–2 cm, base clasping, apex acuminate or acute. Peduncle slender, with several scattered lanceolate bracts; rachis 5–20 cm, subdensely to densely many flowered; floral bracts lanceolate or linear-lanceolate, 10–15 × 2–3 mm, subequal in length to ovary, apex acuminate. Flowers fragrant, white; pedicel and ovary slightly arcuate, cylindric-fusiform, 10–13 mm. Dorsal sepal erect, forming a hood with petals, ovate or elliptic, cymbiform, 4–5 × 3–3.5 mm, glabrous, 5–7-veined, apex obtuse; lateral sepals reflexed, elliptic-ovate, oblique, 5–6(–7) × 1.5–2.5(–3) mm, glabrous, 5–7-veined, apex obtuse. Petals ovate, oblique, 4–5 × 1.5–2 mm, 5-veined, apex obtuse; lip pendulous, ligulate to ligulate-lanceolate, 6–7 × 2.5–3 mm, entire, apex obtuse-rounded; spur pendulous, slightly arcuate, cylindric, 10–20 mm, exceeding ovary, slender, with a conspicuous projection near mouth. Column short; staminodes conspicuous, suborbicular; anther locules parallel; connective broad, apex subtruncate; pollinia obovoid, with long caudicles and lanceolate viscidia; rostellum erect, short; stigma lobes confluent, large, concave, lying directly below rostellum. Fl. Jun–Jul, fr. Aug.  $2n = 42$ .

Forests on slopes, damp grasslands along valleys; 300–3200 m. Anhui, Fujian, Guangdong, Hebei, Heilongjiang, Henan, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shandong, W Sichuan, W Yunnan, Zhejiang [Japan, Korea, Russia (Far East)].

**33. *Platanthera sikkimensis*** (J. D. Hooker) Kraenzlin, Orchid. Gen. Sp. 1: 621. 1898.

长瓣舌唇兰 chang ban she chun lan

*Habenaria sikkimensis* J. D. Hooker, Fl. Brit. India 6: 155. 1890.

Plants 17–21 cm tall. Rootstock tuberous, cylindric to ovoid, 0.5–1.5 × 0.3–0.5 cm. Stem erect, with tubular sheaths at base, 5- or 6-leaved. Leaves cauline, oblong-lanceolate, 4–5 × 1–1.5 cm, base clasping, apex acute. Peduncle slender, with several foliaceous, lanceolate bracts; rachis 4–7 cm, laxly 5–9-

flowered; floral bracts ovate-lanceolate, 10–25 mm, lower ones exceeding ovary, apex acute. Flowers yellowish green with deep yellow-green petals and a brownish red lip; pedicel and ovary slightly arcuate, cylindric-fusiform, 9–13 mm. Dorsal sepal erect, narrowly triangular-ovate, 5–7 × 2.5–4 mm, 1-veined, apex subacute; lateral sepals reflexed, linear-lanceolate, 6.5–8 × 1.2–1.8 mm, glabrous, 1-veined, apex acute. Petals spreading, lanceolate, falcate, 6.5–7 × 2.2–2.5 mm, glabrous, 1-veined, apex obtuse; lip pendulous, lanceolate, ca. 9 × 1.2 mm, 1-veined, entire, apex acuminate; spur curving upward, cylindric, 11–15 mm, exceeding ovary. Column short; staminodes narrowly oblong; anther locules divergent; connective emarginate at apex; pollinia ellipsoid, with long caudicles and small, ovoid viscidia; rostellum large; stigma lobes confluent, large, concave, lying directly below rostellum. Fl. Jul–Aug.

Evergreen broad-leaved forests; ca. 2300 m. NW Yunnan (Gongshan) [India (Sikkim), Nepal].

**34. *Platanthera clavigera*** Lindley, Gen. Sp. Orchid. Pl. 289. 1835.

藏南舌唇兰 zang nan she chun lan

*Habenaria clavigera* (Lindley) Dandy; *H. densa* Wallich ex Lindley; *Habenella clavigera* (Lindley) Szlachetko & Kras-Lapinska; *H. densa* (Wallich ex Lindley) Szlachetko & Kras-Lapinska; *Platanthera densa* (Wallich ex Lindley) Soó (1929), not Freyn (1896); *Platantheroides clavigera* (Lindley) Szlachetko; *P. densa* (Wallich ex Lindley) Szlachetko.

Plants 18–62 cm tall. Rootstock tuberous, ovoid, 1–2 cm. Stem stout, with 2 or 3 tubular sheaths at base, 4- or 5-leaved. Leaves cauline, widely spaced, narrowly ovate to oblong, 3.5–10 × 1.5–3 cm, base clasping, apex acuminate. Peduncle with 1 foliaceous bract; rachis cylindric, 8–30 cm, densely many flowered; floral bracts lanceolate, pubescent, apex acuminate. Flowers yellowish green; pedicel and ovary cylindric-fusiform, 8–12 mm. Dorsal sepal erect and connivent with petals, elliptic-oblong, cymbiform, 3–5 × 2–2.6 mm, pubescent, 3-veined, margin ciliate, apex obtuse; lateral sepals spreading or reflexed, elliptic-oblong to elliptic-lanceolate, oblique, 4–5.5 × 1.8–2.5 mm, pubescent, 3-veined, margin ciliate, apex obtuse. Petals oblong-ovate, oblique, 3.5–5 × 1.8–2.2 mm, fleshy, 3-veined, apex acute; lip linear, 5–5.5 × ca. 1 mm, entire, apex obtuse; disk with a conic callus in front of mouth of spur; spur pendulous, clavate, 5–6 mm, much shorter than ovary. Column erect, short; staminodes small, elliptic; anther locules nearly parallel; pollinia subglobose, with very short caudicles and large, orbicular viscidia; rostellum erect, small; stigma lobes separate, raised, shortly clavate to narrowly oblong, spreading on either side of base of lip. Capsule ovoid, ridged. Fl. Aug–Sep.

Forests, scrub, grasslands along valleys, flooded wastelands; 2300–3400 m. S Xizang [Bhutan, India, Kashmir, Nepal].

**35. *Platanthera brevicarata*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 350. 1911.

短距舌唇兰 duan ju she chun lan

*Habenaria brevicarata* (Hayata) Masamune (1968), not Fukuyama (1932).

Plants 7–20 cm tall. Rootstock elongate, creeping, 2–6 cm, 2–5 mm in diam., stoloniferous. Stem erect or ascending, with 1 or 2 tubular sheaths at base, 1- or 2-leaved. Leaves basal, widely spaced, oblong to elliptic, 2–6 × 1–3 cm, base cuneate, apex acute. Peduncle slender, with 1–4 foliaceous, lanceolate bracts; rachis 3–5 cm, 3–8-flowered; floral bracts lanceolate, 7–11 mm, ca. as long as or slightly exceeding ovary. Flowers white; pedicel and ovary cylindrical-fusiform, 7–10 mm. Dorsal sepal forming a hood with petals, ovate to suborbicular, concave, 2.5–3 × 2–2.3 mm, glabrous, 1-veined, apex obtuse; lateral sepals spreading, obovate-elliptic, slightly oblique, 4–5 × 2–3 mm, glabrous, 1-veined, apex obtuse. Petals ovate, oblique, 2.5–3 × 1.8–2 mm, 1- or 2-veined, apex subobtuse; lip deflexed, oblong, 4–5.5 × 2–2.5 mm, entire, apex obtuse; spur pendulous, slightly incurved, cylindrical, ca. 3 mm, apex rounded. Column short, ca. 1.5 mm; staminodes conspicuous; anther locules nearly parallel; pollinia ellipsoid, with slender caudicles and globose viscidia; rostellum protruding; stigma lobes confluent, slightly raised, anterior margin protruding beyond anther locules. Fl. May–Jul.

Coniferous and mixed broad-leaved forests, grasslands; 1600–3700 m. Taiwan [S Japan].

**36. *Platanthera roseotincta*** (W. W. Smith) Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 30. 1940.

棒距舌唇兰 bang ju she chun lan

*Habenaria roseotincta* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 210. 1921; *Chondradenia doyonensis* (Handel-Mazzetti) Vermeulen; *Galearis doyonensis* (Handel-Mazzetti) P. F. Hunt; *Galeorchis doyonensis* (Handel-Mazzetti) Soó; *Orchis doyonensis* Handel-Mazzetti; *Platanthera altigena* Schlechter.

Plants 8–15 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect or ascending, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf cauline, linear or ligulate, 3–4 × 0.4–1 cm, base clasping, apex obtuse to acute. Peduncle slender, sometimes with 1 foliaceous bract; rachis 2–5 cm, 3–10- or more flowered; floral bracts lanceolate to ovate-lanceolate, 6–25 mm, basal ones exceeding ovary, apex acuminate. Flowers white, sometimes flushed with pink; pedicel and ovary fusiform, 4–7 mm. Dorsal sepal erect, connivent with petals, oblong, 5–6.5 × 2–2.2 mm, glabrous, 1-veined, apex acute; lateral sepals spreading, oblong, 5–6.5 × 1.8–2 mm, glabrous, 1-veined, apex acute. Petals ovate to ovate-lanceolate, 4.5–5.5 × 1.5–1.8 mm, 1-veined, apex acute; lip ligulate-lanceolate, 5–6 × ca. 2 mm, thickened, entire, apex acute; spur pendulous, clavate-fusiform, 3–4 mm, shorter than ovary, neck narrowed, apex obtuse-rounded. Column short; staminodes small; anther locules nearly parallel; pollinia obovoid, with short caudicles and elliptical viscidia; rostellum small; stigma lobes separate, raised, globose, extending on either side of mouth of spur. Fl. Sep.

Alpine grasslands; 3400–3800 m. Xizang (Mêdog, Zayü), Yunnan (Dêqên, Fugong, Gongshan) [N Myanmar].

**37. *Platanthera minutiflora*** Schlechter, Acta Horti Gothob. 1: 138. 1924.

小花舌唇兰 xiao hua she chun lan

*Lysiella nevskii* Averyanov.

Plants 10–30 cm tall. Rootstock creeping, cylindrical, stoloniferous. Stem erect, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal, spatulate or elliptic-spatulate, 5–10 × 1–2.5 cm, base contracted and clasping, apex obtuse or acute. Peduncle slender, ridged, with 1 or 2 foliaceous, lanceolate bracts; rachis 3–8 cm, subdensely 4–12-flowered; floral bracts lanceolate, 8–14 mm, nearly as long as flowers, apex acuminate. Flowers yellowish green; pedicel and ovary cylindrical, ca. 10 mm. Dorsal sepal erect, forming a hood with petals, broadly ovate or nearly orbicular, cymbiform, 2–3 × ca. 2.5 mm, glabrous, 1(–3)-veined, apex obtuse; lateral sepals spreading, ovate, falcate, 2.5–3.5 × 1.2–1.8 mm, glabrous, 1-veined, apex obtuse. Petals ovate to ovate-lanceolate, oblique, 2–3 × 1–1.3 mm, 1-veined, apex obtuse; lip pendulous, slightly recurved, ligulate to ligulate-lanceolate, 2.5–3 × ca. 1 mm, entire, apex obtuse; spur pendulous, conic, very short, ca. 1 mm, apex usually slightly hooked. Column stout; staminodes subelliptic, small; anther locules slightly divergent; connective rather broad, apex subretuse; pollinia obovoid, with short caudicles and suborbicular viscidia; rostellum broadly triangular, short; stigma lobes confluent, concave, lying directly below rostellum. Fl. Jun–Jul.

Forests on slopes; 2700–4100 m. Gansu, Shaanxi, NW and W Sichuan, Xinjiang, SE Xizang, NW Yunnan [Kazakhstan, Kyrgyzstan].

**38. *Platanthera handel-mazzettii*** K. Inoue, J. Jap. Bot. 61: 195. 1986.

贡山舌唇兰 gong shan she chun lan

Plants ca. 16 cm. Rootstock tuberous, narrowly ellipsoid, ca. 2 cm. Stem erect, 1- or 2-leaved. Leaves basal, oblong, ca. 3 × 1 cm, apex acute. Peduncle slender, with 1 small bract; rachis ca. 6 cm, 8- or 9-flowered; floral bracts lanceolate, ca. 8 mm. Flowers green; pedicel and ovary cylindrical, ca. 5 mm. Dorsal sepal forming a hood with petals, narrowly ovate, ca. 2.6 × 1.7 mm, glabrous, 1-veined, apex obtuse; lateral sepals slightly reflexed, narrowly ovate, oblique, ca. 2.6 × 1.3 mm, glabrous, 1-veined, apex obtuse. Petals deltoid, oblique, ca. 2.8 × 1.6 mm, 2-veined, apex obtuse; lip slightly deflexed, narrowly triangular, ca. 3.6 × 1.6 mm, entire, apex obtuse; spur clavate, ca. 2.2 mm. Column ca. 1.3 × 0.5 mm; anther locules nearly parallel; connective narrow; pollinia ca. 1 mm, with short caudicles and oblong-lanceolate viscidia; rostellum well developed, protruding; stigma lobes confluent, triangular, flat. Fl. Aug.

• Bamboo forests on slopes; 3600–3800 m. NW Yunnan (Gongshan).

**39. *Platanthera herminioides*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 58. 1951.

高黎贡舌唇兰 gao li gong she chun lan

Plants ca. 12 cm tall. Stem erect, with 2 tubular sheaths at base, 2-leaved. Leaves basal, elliptic, ca. 3.5 × 1.6 cm, base attenuate and clasping, apex obtuse. Rachis ca. 3 cm, densely 7-flowered; floral bracts lanceolate, ca. 4 mm, exceeding ovary. Flowers green; pedicel and ovary cylindrical-fusiform, ca. 4 mm. Dorsal sepal orbicular, ca. 2.5 × 3 mm, glabrous, 3-veined, apex rounded; lateral sepals oblong, oblique, ca. 3 × 1.5 mm,

glabrous, 3-veined, apex obtuse. Petals rhombic-ovate, ca. 2 × 1.5 mm, 1-veined, apex obtuse; lip ligulate, ca. 2.5 × 1 mm, dilated at base, entire; spur cylindrical to ovoid, ca. 2 × 1 mm, slightly hooked toward apex, apex obtuse. Column ca. 1 mm. Fl. Jul–Aug.

• NW Yunnan (Gaoligong Shan).

**40. *Platanthera taiwanensis*** (S. S. Ying) S. C. Chen, S. W. Gale & P. J. Cribb, **comb. nov.**

台湾舌唇兰 tai wan she chun lan

Basionym: *Tulotis taiwanensis* S. S. Ying, Quart. J. Chin. Forest. 8: 144. 1975.

Plants 15–20 cm tall. Rootstock tuberous, ovoid, 3–5 × ca. 0.4 cm. Stem erect, slender, with basal sheaths, 2-leaved. Leaves basal, ovate to ovate-oblong, 5–7 × 2–3 cm, membranous, base contracted and sheathing, apex acute. Rachis many flowered; floral bracts lanceolate to ovate-lanceolate, 6–9 × 2–3 mm, apex acute. Flowers pale green to yellowish green; pedicel and ovary cylindrical, 4–6 mm. Dorsal sepal ovate, 2–2.5 × ca. 1.5 mm, glabrous, apex obtuse; lateral sepals ovate, 1.5–2 × ca. 1.5 mm, apex obtuse or acute. Petals narrowly ovate, 2–3 × ca. 1 mm, glabrous, apex acuminate; lip ligulate, 4–6 × 2–3 mm, entire, apex obtuse-rounded; spur 2–2.5 × ca. 1 mm.

• Alpine grasslands; 3200–3600 m. C and S Taiwan.

**41. *Platanthera kwangsiensis*** K. Y. Lang, Guihaia 18: 5. 1998.

广西舌唇兰 guang xi she chun lan

Plants 23–28 cm tall. Stem erect or ascending, with tubular sheaths at base, 2-leaved. Leaves cauline, alternate, linear, 10–12 × 1.8–2 cm, base contracted and clasping, apex obtuse or acute. Peduncle slender, with 1 or more lanceolate bracts; rachis 4.5–10.5 cm, densely many flowered; floral bracts lanceolate, ca. 15 mm, basal ones exceeding flowers. Flowers yellowish

green; pedicel and ovary fusiform, 7–8 mm. Dorsal sepal erect, forming a hood with petals, ovate-oblong, cymbiform, 5–6 × ca. 2 mm, glabrous, 3-veined, apex obtuse; lateral sepals spreading, ovate-oblong, oblique, 5–6 × ca. 2 mm, glabrous, 3-veined, apex subobtuse. Petals erect, narrowly ovate, ca. 5.5 × 2.2 mm, 3-veined, apex obtuse; lip deflexed, linear, ca. 5 mm, fleshy, disk densely papillose, entire, apex obtuse; spur clavate, ca. 3 × 1.3 mm, shorter than ovary, apex obtuse. Column stout, ca. 1 mm; staminodes small; anther locules nearly parallel; pollinia obovoid, with short caudicles and elliptic viscidia; rostellum broad; stigma lobes confluent, concave, lying directly below rostellum. Fl. Jul–Aug.

• Alpine grasslands; ca. 2100 m. N Guangxi (Xing'an).

**42. *Platanthera peichatieniana*** S. S. Ying, Coloured Ill. Fl. Taiwan 2: 691. 1987 [*“peichatieniana”* and *“peichiatieniana”*].

北插天山舌唇兰 bei cha tian shan she chun lan

Plants 2–4 cm tall. Stem with tubular sheaths at base, 2- or 3-leaved. Leaves ovate-lanceolate to oblong-lanceolate, 3.5–4.5 × 1.5–2 cm, base obtuse and clasping, apex acute to acuminate. Peduncle short, slender, with a foliaceous, lanceolate bract; rachis 1.5–2 cm, 2–4-flowered; floral bracts lanceolate to linear-lanceolate, 4–8 × 2–2.5 mm, apex acuminate. Flowers pale green to greenish yellow, small; pedicel and ovary fusiform, 4–8 mm. Dorsal sepal erect, forming a hood with petals, ovate to triangular-ovate, strongly concave, 2.5–3 × ca. 1.5 mm, glabrous, 3-veined, apex acute; lateral sepals lanceolate, 5–6.5 × 2–3 mm, glabrous, apex obtuse. Petals narrowly ovate-lanceolate, slightly oblique, ca. 5.5 × 2 mm, apex acute; lip spreading forward, entire, ligulate, elongate, 15–20 × 2.5–3.5 mm, apex obtuse; spur cylindrical, slender, 7–9 × ca. 0.5 mm, tapering toward apex, apex obtuse. Column 2–2.5 × ca. 1.5 mm.

• *Quercus* forests, *Fagus* forests; 1400–1700 m. N Taiwan (Beicha Shan).

## 32. *DACTYLORHIZA* Necker ex Nevski, Fl. URSS 4: 697, 713. 1935, nom. cons.

掌裂兰属 zhang lie lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Coeloglossum* Hartman; *Dactylorchis* (Klinge) Vermeulen; *Orchis* subg. *Dactylorchis* Klinge; *Satyrium* Linnaeus (1753), not Swartz (1800, nom. cons.).

Herbs, terrestrial, small to large, slender to robust. Tubers palmately lobed, fleshy, neck with several slender roots. Stem usually erect, terete, with tubular sheaths near base and several leaves above, glabrous. Leaves cauline, alternate, green, with purple spots or not spotted, glabrous, base attenuate into clasping sheath. Inflorescence erect, terminal, racemose; rachis densely several to many flowered; floral bracts lanceolate to ovate, foliaceous, often exceeding flowers. Flowers resupinate, secund or not, rose-purple, violet, yellow, greenish yellow, or rarely white, small to medium-sized; ovary twisted, cylindrical-fusiform, glabrous. Sepals free, glabrous; dorsal sepal erect, often concave; lateral sepals spreading or reflexed, rarely connivent. Petals often connivent with dorsal sepal and forming a hood; lip simple, entire or 3- or 4-lobed, spurred at base; spur cylindrical, conic, or saccate, much shorter than to subequal in length to ovary. Column stout; anther erect, base firmly adnate to apex of column, with 2 parallel or divergent locules; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium by a slender caudicle; each viscidium enclosed in a sticky globe, both globes enclosed in a common bursicle formed by folding of rostellar arms; rostellum slightly protruding, with 2 arms; stigma lobes confluent, concave, beneath rostellum; auricles 2, usually prominent, on each side of column. Capsule erect.

About 50 species: mainly in Europe and Russia, extending east to Korea, Japan, and North America, and south to alpine areas of subtropical Asia and N Africa; six species in China.

Owing to the occurrence of both hybridization and polyploidy, specific relationships within *Dactylorhiza* are complex. Accordingly, the taxonomy of the genus is problematic, and nomenclature largely remains open to debate.

Several recent molecular studies have shown *Dactylorhiza* to be monophyletic only when re-circumscribed to include the monospecific genus *Coeloglossum* (Pridgeon et al., *Lindleyana* 12: 89–109. 1997; Bateman et al., *Lindleyana* 12: 113–141. 1997; Pillon et al., *Biol. Conserv.* 129: 4–13. 2006).

From observations of many fresh flowers of this genus in the field, we infer that the bursicle formed by the rostellar arms is solitary but later becomes separate.

*Dactylorhiza salina* (Turczaninow ex Lindley) Soó (Nom. Nov. Gen. *Dactylorhiza*, 4. 1962; *Orchis salina* Turczaninow ex Lindley, Gen. Sp. Orchid. Pl. 259. 1835) has been recorded from China (World Checklist of Monocotyledons, <http://www.kew.org/wcsp/monocots/>). However, no material has been seen by the present authors.

- 1a. Flowers greenish yellow to greenish brown; spur saccate-ovoid, 2–4 mm ..... 6. *D. viridis*
- 1b. Flowers magenta, lilac, purplish rose, pink, or white; spur cylindrical or conic, 4.5–15 mm.
  - 2a. Apex of sepals and petals acuminate; spur spreading backward to upcurved ..... 5. *D. aristata*
  - 2b. Apex of sepals and petals obtuse or subacute; spur pendulous.
    - 3a. Leaves uniformly green, lacking purple spots or markings.
      - 4a. Lip ovate to orbicular, broadest below middle ..... 1. *D. hatagirea*
      - 4b. Lip obovate or obcordate, broadest above middle ..... 2. *D. umbrosa*
    - 3b. Leaves green with large purple spots or speckles.
      - 5a. Leaves with small purple spots; lip 5–6 mm, unlobed to obscurely 3-lobed; spur 4.5–6 mm ..... 3. *D. incarnata*
      - 5b. Leaves with large purple blotches; lip 7–9 mm, deeply 3-lobed; spur 6–8 mm ..... 4. *D. fuchsii*

**1. *Dactylorhiza hatagirea*** (D. Don) Soó, Nom. Nov. Gen. *Dactylorhiza*, 4. 1962.

掌裂兰 zhang lie lan

*Orchis hatagirea* D. Don, Prodr. Fl. Nepal. 23. 1825.

Plants slender to robust, 10–40 cm tall. Tubers palmately 3–5-lobed. Stem erect, stout, hollow in robust plants, with 2 or 3 tubular sheaths at base, 3–6-leaved. Leaves erect or spreading, clustered and subopposite near base of stem, widely spaced and alternate above, green, not spotted, oblong to linear-lanceolate, (5–)8–15 × 0.8–3 cm, apex obtuse or acuminate. Rachis 2–15 cm, subdensely several to densely many flowered; floral bracts lanceolate, basal ones to 4 cm, becoming smaller above, exceeding ovary, apex acuminate. Flowers not secund, lilac to purplish rose, medium-sized; ovary and pedicel 8–14 mm. Sepals and petals lilac or purplish rose; dorsal sepal erect, ovate-oblong, concave, 5.5–7(–9) × 3–4 mm, 3-veined, apex obtuse; lateral sepals ovate-lanceolate to ovate-oblong, oblique, 6–8(–9.5) × 4–5 mm, 3–5-veined, apex obtuse. Petals erect, forming a hood with dorsal sepal, ovate-lanceolate, slightly oblique, 5.5–7 × 3–5 mm, 2- or 3-veined, apex obtuse; lip ovate to suborbicular, 6–9 × 6–10 mm, usually slightly broader than long, base spurred, margin entire to shallowly 3-lobed toward apex, margin slightly crenulate, apex or mid-lobe obtuse, disk minutely papillose, purplish red to rose, sometimes whitish toward base with a spoon-shaped patch of dark purple spots or lines; spur pendulous, ± straight to slightly curved forward, cylindrical to conic, to 12 mm, equaling to slightly shorter than ovary, apex obtuse. Fl. Jun–Aug.  $2n = 40, 80$ .

Shrubby slopes, grasslands along ravines; 600–4100 m. Gansu, Heilongjiang, Jilin, Nei Mongol, Ningxia, Qinghai, W Sichuan, Xinjiang, E Xizang [Bhutan, Kashmir, Mongolia, Nepal, Pakistan].

This entity has been widely known as *Dactylorhiza latifolia* (Linnaeus) Soó, a name that can no longer be used because its basionym, *Orchis latifolia* Linnaeus, has been rejected outright (see *Vienna Code*, p. 477). In Europe, the name *D. latifolia* has been applied in the sense of what is now generally known as *D. incarnata*. We regard *D. hatagirea* as an Asian species that is taxonomically distinct from *D. incarnata*.

**2. *Dactylorhiza umbrosa*** (Karelin & Kirilov) Nevski, Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast. 4: 332. 1937.

阴生掌裂兰 yin sheng zhang lie lan

*Orchis umbrosa* Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 504. 1842; *Dactylorchis umbrosa* (Karelin & Kirilov) Wendelbo; *Dactylorhiza chuhensis* Renz & Taubenheim; *D. incarnata* (Linnaeus) Soó subsp. *turkestanica* (Klinge) H. Sundermann; *D. knorringiana* (Kraenzlin) Ikonnikov; *D. kotschyi* (H. G. Reichenbach) P. F. Hunt & Summerhayes; *D. merovensensis* (Grossheim) Averyanov; *D. persica* (Schlechter) Soó; *D. renzii* Averyanov; *D. sanasunitensis* (H. Fleischmann) Soó; *D. umbrosa* var. *chuhensis* (Renz & Taubenheim) Kreutz; *D. umbrosa* var. *knorringiana* (Kraenzlin) Soó; *D. umbrosa* var. *longibracteata* Renz; *D. umbrosa* var. *ochroleuca* (Bornmüller) Renz; *O. hatagirea* D. Don var. *afghanica* Soó; *O. incarnata* Linnaeus var. *knorringiana* Kraenzlin; *O. incarnata* var. *kotschyi* H. G. Reichenbach; *O. incarnata* f. *ochroleuca* Bornmüller; *O. knorringiana* (Kraenzlin) Czerniak; *O. kotschyi* (H. G. Reichenbach) Schlechter; *O. merovensensis* Grossheim; *O. orientalis* (H. G. Reichenbach) Klinge subsp. *turkestanica* Klinge; *O. persica* Schlechter; *O. sanasunitensis* H. Fleischmann; *O. turkestanica* (Klinge) Klinge ex B. Fedtschenko.

Plants usually robust, 15–45 cm tall. Tubers palmately 3–5-lobed. Stem erect, stout, hollow, with 2 or 3 tubular sheaths at base, 4–8-leaved. Leaves usually congested at base of stem or sometimes widely spaced, green, not spotted, lanceolate to linear-lanceolate, 7–13 × 1–5 cm, apex acuminate. Rachis 3–15 cm, densely many flowered; floral bracts green, sometimes tinged with purplish red, narrowly lanceolate, basal ones exceeding ovary, apex acuminate. Flowers purplish rose, medium-sized; ovary and pedicel 12–15 mm. Sepals and petals purplish rose to pale purple; dorsal sepal erect, oblong, concave, 7–10 × 2.5–3 mm, 3-veined, apex obtuse; lateral sepals reflexed, ovate-lanceolate, oblique, 8–9 × 3–3.5 mm, 3-veined, apex subobtuse. Petals erect, forming a hood with dorsal sepal, narrowly oblong,

oblique, 7–9 × 1.5–2 mm, 2-veined, apex subobtusely; lip obovate to obcordate, (7–)8–10 × (7–)8–11 mm, base spurred, margin entire to shallowly 3-lobed, apex or mid-lobe obtuse-rounded, disk densely minutely papillose, purplish rose to pale purple with a spoon-shaped patch composed of dark purple lines and dots; spur pendulous, slightly curved forward, cylindrical, 12–15 mm, almost as long as ovary, apex obtuse. Fl. May–Jul.

Swampy meadows, riverbanks, damp grasslands in valleys, mountain slopes; 600–4000 m. N Xinjiang [Afghanistan, Kazakhstan, Pakistan, Russia (SW Siberia), Turkmenistan, Uzbekistan; SW Asia].

**3. *Dactylorhiza incarnata*** (Linnaeus) Soó subsp. ***cruenta*** (O. F. Müller) P. D. Sell, *Watsonia* 6: 317. 1967.

紫点掌裂兰 *zi dian zhang lie lan*

*Orchis cruenta* O. F. Müller, Fl. Dan. t. 876. 1782; *Dactylorhiza cruenta* (O. F. Müller) Soó; *O. latifolia* Linnaeus var. *cruenta* (O. F. Müller) Lindley.

Plants slender to robust, 11–30 cm tall. Tubers palmately 3- or 4-lobed. Stem erect, cylindrical, stout, hollow, with 2 or 3 tubular sheaths at base, 3–5-leaved. Leaves widely spaced, green, with fine purple spots on both surfaces, broadly lanceolate, lanceolate, or oblong-lanceolate, 6–11 × 1.5–2.5 cm, apex obtuse-acute. Rachis 3–10 cm, densely many flowered; floral bracts often tinged with pale purple and marked with purplish speckles, lanceolate, basal ones exceeding ovary, apex acuminate. Flowers not secund, purplish rose, medium-sized; ovary and pedicel 9–10 mm. Sepals purplish rose, oblong-ovate, 3-veined, apex obtuse, outer surface marked with a few dark speckles; dorsal sepal erect, concave, 5–6 × 2–2.5 mm; lateral sepals spreading to reflexed, oblique, 5.5–7 × 2–2.5 mm. Petals erect, forming a hood with dorsal sepal, purplish rose, obliquely lanceolate to oblong-ovate, 5–5.5 × ca. 2 mm, 3-veined, apex obtuse; lip broadly rhombic-ovate, 5–6 × 4.5–6 mm, base spurred, margin entire to obscurely 3-lobed near apex, margin slightly crenate, apex obtuse or sometimes apiculate, disk minutely papillose, purplish rose, marked with dark purplish dots and lines; spur pendulous, straight or slightly curved forward, conic to cylindrical-conic, 4.5–6 mm, shorter than ovary, 1.5–2 mm in diam. at base, attenuate toward apex, apex obtuse. Fl. Jun–Jul.

Humid grasslands, along streams, slopes; 1400–2800 m. NW Xinjiang (Fuhai to Zhaosu) [Russia; Europe].

**4. *Dactylorhiza fuchsii*** (Druce) Soó, Nom. Nov. Gen. *Dactylorhiza*, 8. 1962.

紫斑掌裂兰 *zi ban zhang lie lan*

*Orchis fuchsii* Druce, Rep. Bot. Exch. Club Brit. Isles 4: 105. 1915; *Dactylorhiza fuchsii* (Druce) Vermeulen; *D. maculata* (Linnaeus) Soó subsp. *fuchsii* (Druce) Hylander.

Plants often slender, 18–45 cm tall. Tubers palmately 3- or 4-lobed. Stem erect, stout, nearly solid, with 2 or 3 tubular sheaths at base, 5- or 6-leaved. Leaves usually widely spaced, green, with large purple blotches adaxially, narrowly obovate, oblong-obovate, or oblong-lanceolate, 4–12 × 1.5–2.5(–4) cm, apex subobtusely or acuminate. Rachis 3–6(–10) cm, densely

many flowered; floral bracts linear-lanceolate, shorter than flowers, apex acuminate. Flowers pale to deep pink, medium-sized; ovary and pedicel 9–10 mm. Sepals pale to deep pink, lanceolate to broadly lanceolate, apex slightly obtuse; dorsal sepal erect, 6–9 × ca. 2 mm, 3-veined; lateral sepals with dark spots on veins, oblique, 7–8 × ca. 2.5 mm, 3-veined. Petals erect, forming a hood with dorsal sepal, pink, sublanceolate, 6–9 × ca. 2 mm, 3-veined, apex subacute; lip pink with deep purple spots that sometimes form thick stripes along adaxial veins, orbicular-rhombic, 7–8(–9) × 8–10 mm, deeply 3-lobed at or above middle; mid-lobe oblong-ovate to ovate-triangular, 3–4 × 1.5–2.5 mm, apex obtuse or acute; lateral lobes rhombic to broadly triangular, broader than mid-lobe, margin crenate or obtusely toothed; spur pendulous, straight, cylindrical, 6–8 mm, slightly shorter than ovary, 1–1.5 mm in diam., apex obtuse. Fl. Jun–Jul. *2n* = 40.

Forests, grasslands, valleys; 900–2300 m. N Xinjiang (Altay, Fuyun, Hababe) [N Mongolia, Russia; Europe].

**5. *Dactylorhiza aristata*** (Fischer ex Lindley) Soó, Nom. Nov. Gen. *Dactylorhiza*, 5. 1962.

芒尖掌裂兰 *mang jian zhang lie lan*

*Orchis aristata* Fischer ex Lindley, Gen. Sp. Orchid. Pl. 262. 1835; *Dactylorhiza aristata* f. *alba* P. M. Brown; *D. aristata* var. *kodiakensis* Luer & G. M. Luer; *D. aristata* f. *perbracteata* (Lepage) Catling; *D. aristata* f. *rosea* P. M. Brown; *O. aristata* var. *immaculata* Makino; *O. aristata* var. *maculata* Makino; *O. aristata* var. *perbracteata* Lepage; *O. beeringiana* (Chamisso) Kudô; *O. latifolia* Linnaeus var. *beeringiana* Chamisso.

Plants robust, 10–35 cm tall. Tuber palmately 3- or 4-lobed. Stem erect, stout, with 2 or 3 tubular sheaths at base, 3–6-leaved. Leaves usually congested at base of stem, uniformly green or occasionally with small purple spots or speckles adaxially, ovate-elliptic to oblong-elliptic, 5–15 × 0.8–4 cm, apex obtuse to acute. Rachis 3–13 cm, densely many flowered; floral bracts lanceolate, basal ones exceeding flowers, apex acuminate. Flowers white, pink, or magenta, medium-sized; ovary and pedicel 4–8 mm. Sepals white, pink, or magenta, ovate to ovate-lanceolate, apex long acuminate; dorsal sepal erect, 9–12 × 3–5 mm; lateral sepals erect or spreading forward, concave, oblique, 8–11 × 3–5 mm. Petals erect, forming a hood with dorsal sepal, white, pink, or magenta, narrowly ovate-lanceolate, 6–8 × 2–3.5 mm, apex acuminate; lip white, pink, or magenta with deep purple spots usually forming 2 distinct arcs, suborbicular to obcordate, 8–12 × 8–12 mm, 3-lobed near apex; mid-lobe narrowly deltoid, 2.2–3.5 × 1–1.8 mm, apex acuminate; lateral lobes ovate, much broader than mid-lobe, apex rounded-obtusely; spur spreading backward to upcurved, cylindrical, 6–9 mm, subequal in length to or slightly exceeding ovary, ca. 1.8 mm in diam., apex obtuse. Fl. Jun–Aug.

Grasslands. Hebei, Henan, Shandong, Shanxi [Japan, Korea, Russia (Far East); North America (Alaska)].

The present authors have seen no Chinese specimens of this species. The Chinese distribution is based on H. P. Wood (*Orchid Digest* 73: 52–55. 2009).

**6. *Dactylorhiza viridis*** (Linnaeus) R. M. Bateman, Pridgeon & M. W. Chase, *Lindleyana* 12: 129. 1997.

凹舌掌裂兰 ao she zhang lie lan

*Satyrium viride* Linnaeus, Sp. Pl. 2: 944. 1753; *Coeloglossum bracteatum* (Muhlenberg ex Willdenow) Parlatores; *C. nankotaizanense* (Masamune) S. S. Ying; *C. taiwanianum* S. S. Ying; *C. viride* (Linnaeus) Hartman; *C. viride* var. *bracteatum* (Muhlenberg ex Willdenow) A. Gray; *Gymnadenia viridis* (Linnaeus) Richard; *Habenaria viridis* (Linnaeus) R. Brown; *H. viridis* var. *bracteata* (Muhlenberg ex Willdenow) A. Gray; *Herminium nankotaizanense* Masamune; *Orchis bracteata* Muhlenberg ex Willdenow; *Peristylus bracteatus* Lindley; *P. viridis* (Linnaeus) Lindley; *Platanthera nankotaizanensis* (Masamune) Masamune; *P. viridis* (Linnaeus) Lindley.

Plants slender to robust, 14–45 cm tall. Tuber palmately 2- or 3-lobed. Stem erect, with 2 or 3 tubular sheaths at base, 3–5-leaved. Leaves usually widely spaced and alternate, green, not spotted, narrowly obovate-oblong or elliptic to elliptic-lanceolate, 5–12 × 1.5–5 cm, apex obtuse or acute, uppermost leaf

often smaller and bractlike. Rachis 3–15 cm, ± laxly to densely many flowered; floral bracts linear to narrowly lanceolate, 2–3 cm, lower ones exceeding flowers. Flowers greenish yellow to greenish brown, small; ovary and pedicel ca. 10 mm. Dorsal sepal erect, concave, ovate-elliptic, 4.2–8 × 2.5–3.5 mm, 3-veined, apex obtuse; lateral sepals oblique, ovate-elliptic, slightly longer than dorsal sepal, 4 or 5-veined, apex obtuse. Petals straight, forming a hood with dorsal sepal, linear-lanceolate, 5–6 × 1–1.2 mm, 1-veined; lip deflexed, oblong-lanceolate, 5–9 × 3–4 mm, fleshy, disk with a short, central, longitudinal keel, 3-toothed toward apex; lateral teeth 1.5–2 mm; mid-tooth smaller, less than 1 mm; spur saccate-ovoid, 2–4 mm. Fl. Jun–Aug.  $2n = 40, 41, 42$ .

Forests, thickets, alpine grasslands; 1200–4300 m. Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xinjiang, NE Xizang, NW Yunnan [Bhutan, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Turkmenistan; SW Asia, Europe, North America].

The extensive extra-Chinese synonymy is not cited here.

### 33. SMITHORCHIS Tang & F. T. Wang, *Bull. Fan Mem. Inst. Biol. Bot.* 7: 139. 1936.

反唇兰属 fan chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small. Rhizome creeping, slender, fleshy, neck with several slender roots. Stem erect, glabrous, 2–4-leaved. Leaves cauline, narrowly lanceolate. Inflorescence a terminal raceme, up to 10-flowered. Flowers not resupinate, small; ovary twisted, fusiform. Sepals free, similar, subequal in size. Petals smaller than sepals; lip slipper-shaped, entire, base saccate-spurred. Column short, with 2 lateral appendages; anther sessile, hooded, erect, with 2 nearly parallel and contiguous locules; rostellum and stigma combined into a solitary orbicular structure at posterior margin of anther; pollinia 2, granular-farinaceous, sectile, attached via very short caudicles to orbicular viscidia.

• One species: China.

This monospecific genus is distinguished from its closest allies *Herminium* and *Diphylax* by its long creeping rhizome, non-resupinate flowers, and undifferentiated rostellum.

**1. *Smithorchis calceoliformis*** (W. W. Smith) Tang & F. T. Wang, *Bull. Fan Mem. Inst. Biol. Bot.* 7: 140. 1936.

反唇兰 fan chun lan

*Herminium calceoliforme* W. W. Smith, *Notes Roy. Bot. Gard. Edinburgh* 13: 211. 1921.

Plants 5–10 cm tall. Stem with 2 or 3 tubular sheaths at base. Leaves spreading, narrowly lanceolate, ca. 20 × 4 mm, base contracted into an amplexicaul sheath, apex acute or acu-

minate. Inflorescence 7-flowered; rachis ca. 1.5 cm; floral bracts lanceolate, slightly longer than ovary, margin denticulate. Flowers fragrant, deep yellow; ovary and pedicel ca. 3 mm. Sepals similar, membranous, 1-veined; dorsal sepal obovate, ca. 1 × 0.7 mm, apex obtuse; lateral sepals spreading, oblong-ovate, oblique, ca. 1.5 × 1 mm, apex subacute. Petals spreading, rhombic-ovate, smaller than sepals, slightly fleshy, 1-veined, apex obtuse; lip ca. 1.5 mm, fleshy, much thicker than sepals, saccate-spurred at base; rostellum and stigma undifferentiated.

• Open alpine grasslands; 3200–4000 m. NW Yunnan.

### 34. DIPHYLAX J. D. Hooker, *Hooker's Icon. Pl.* 19: ad t. 1865. 1889.

尖药兰属 jian yao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small. Tubers ovoid to cylindrical, fleshy. Stem erect, terete, short, glabrous, with 1 to several basal sheaths and 1–3 subradical leaves. Leaves lanceolate to elliptic, adaxially often with yellow or white reticulate veins, basally contracted into a petiole-like amplexicaul sheath. Inflorescence with 1 to several foliaceous sterile bracts, and with several to more than 20 secund flowers in a terminal raceme; floral bracts ovate to lanceolate. Flowers resupinate, small to medium-sized; ovary twisted, shortly pedicellate. Sepals and petals similar; sepals not widely spreading, narrowly ovate to lanceolate, subequal in size. Petals linear-

oblong to lanceolate; lip usually decurved, linear-lanceolate or linear-ligulate, nearly as long as sepals, base concave, spurred, margin entire, lateral margins involute, apex acuminate; spur pendulous, urn-shaped, ellipsoid, or conic, shorter than ovary, contracted at neck. Column very short with 2 elongate lateral appendages; anther erect, 2-locular, locules contiguous, parallel; connective distinct; rostellum small to elongate; pollinia 2, clavate, granular-farinaceous, sectile, each attached by short caudicle to naked viscidia; stigma entire, large, raised. Capsule ovoid.

Three species: SW China to the Himalayas; three species (two endemic) in China.

- 1a. Leaf oblong to oblong-lanceolate; sepals to 5 mm; lip ca. 4.5 mm; spur urn-shaped; staminodes linear, elongate, extending as far as or beyond apex of anther locules ..... 1. *D. urceolata*  
 1b. Leaves spatulate, ovate, or elliptic; sepals ca. 7 mm or more; lip ca. 8 mm; spur ellipsoid or ellipsoid-cylindric; staminodes oblong, ovate, or obovate, relatively short, terminating below apex of anther locules.  
 2a. Leaves usually 2 or 3, spatulate or lorate-spatulate, 7–13 cm; floral bracts lanceolate, longer than ovary; connective oblong at apex, clearly protruding from anther apex; lateral appendages oblong ..... 2. *D. contigua*  
 2b. Leaf usually solitary, elliptic to ovate, 3–6 cm; floral bracts shorter than ovary; connective slightly convex at apex of anther; lateral appendages ovate to obovate ..... 3. *D. uniformis*

**1. *Diphylax urceolata*** (C. B. Clarke) J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1865. 1889.

尖药兰 jian yao lan

*Habenaria urceolata* C. B. Clarke, J. Linn. Soc., Bot. 25: 73. 1889.

Plants 8–10 cm tall. Stem often slightly curved, slender, with 1 or 2 tubular sheaths at base and 1 large leaf above. Leaf oblong to oblong-lanceolate, 3–3.5 × 1–1.2 cm, adaxially with white venation, apex acute. Inflorescence with several to 12 secund flowers; foliaceous sterile bracts 1 or 2, lanceolate, 0.8–1 × 0.1–0.4 cm, apex acute; rachis 2.5–3 cm; floral bracts ovate or lanceolate, ca. as long as ovary. Flowers white, greenish white, or pink, small; ovary fusiform, 4–5 mm including pedicel. Sepals lanceolate, ca. 5 × 1.5 mm, 1-veined, apex acute. Petals connivent with dorsal sepal and forming a hood, linear-oblong, ca. 4.5 × 1.5 mm, 1-veined, apex obtuse; lip decurved, linear-lanceolate, ca. 4.5 mm, lateral margins above middle to apex involute and forming a tube, concave at base, apex acuminate; spur urn-shaped, 2.5–3 mm, shorter than ovary. Column 1–2 mm; apex of connective lanceolate, protruding from anther; rostellum very small; lateral appendages linear, extending as far as or beyond apex of anther locules. Fl. Aug–Oct.

Forests; 1900–3800 m. W Sichuan, NW Yunnan [Bhutan, NE India, N Myanmar, Nepal].

**2. *Diphylax contigua*** (Tang & F. T. Wang) Tang, F. T. Wang & K. Y. Lang, Vasc. Pl. Hengduan Mts. 2: 2526. 1994.

长苞尖药兰 chang bao jian yao lan

*Platanthera contigua* Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 28. 1940.

Plants 20–24 cm tall. Stem sometimes slightly curved, ca. 2 mm in diam., with up to 5 tubular sheaths at base and (1 or) 2 or 3 leaves above. Leaves spatulate to lorate-spatulate, 7–13 × 1.2–2.2 cm, apex acute. Inflorescence with more than 10 often secund flowers; foliaceous sterile bracts 2 or 3, lanceolate, 1.5–5 × 0.4–0.7 cm, apex acuminate; rachis to 5.5 cm; floral bracts lanceolate, longer than ovary, apex acuminate. Flowers greenish white, medium-sized; ovary fusiform, 8–10 mm including pedicel, glabrous. Sepals lanceolate, 1-veined, apex acuminate; dor-

sal sepal ca. 8 × 2.5 mm; lateral sepals slightly oblique, ca. 8.5 × 2.8 mm. Petals ± connivent with dorsal sepal and forming a hood, obliquely lanceolate, ca. 7.5 × 2 mm, 1-veined, apex subacute; lip slightly decurved, linear-oblong, ca. 8 × 2 mm, fleshy, lateral margins above middle to apex involute and forming a tube, slightly dilated at base, apex subacute; disk pubescent on central veins; spur ellipsoid, ca. 5 × 2.5 mm, inner surface densely pubescent, apex obtuse. Column ca. 3 mm; anther ca. 2 mm; apex of connective oblong, protruding from anther; rostellum very small; lateral appendages oblong, short, terminating below apex of anther locules. Fl. Sep.

• Bamboo forests; ca. 3200 m. NW Yunnan.

**3. *Diphylax uniformis*** (Tang & F. T. Wang) Tang, F. T. Wang & K. Y. Lang, Bot. Res. Acad. Sin. 4: 11. 1989.

西南尖药兰 xi nan jian yao lan

*Platanthera uniformis* Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 31. 1940; *P. opsimantha* Tang & F. T. Wang.

Plants 10–18.5 cm tall. Stem with 1 or 2 tubular sheaths at base and 1(or 2) leaves above. Leaf elliptic to ovate, 3–6 × 1.5–3 cm, apex acute. Inflorescence with several to more than 20 secund flowers; foliaceous sterile bracts 4, lanceolate, 0.7–1.5 × 0.3–0.6 cm, apex acute; rachis 3–7 cm; floral bracts lanceolate, shorter than ovary, apex acuminate. Flowers white, medium-sized; ovary fusiform, ca. 7 mm including pedicel, glabrous. Dorsal sepal linear-lanceolate, ca. 8 × 2 mm, 1-veined, base concave, apex obtuse; lateral sepals linear-lanceolate, slightly falcate, ca. 7 × 1.5 mm, 1-veined, apex obtuse. Petals firmly adnate to sepals, nearly as long as lateral sepals, 1-veined, apex obtuse; lip slightly decurved, linear-oblong, ca. 8 × 1.5 mm, slightly dilated at base, lateral margins above middle to apex involute and forming a tube, apex obtuse; spur ellipsoid-cylindric, ca. 4.5 × 2.5 mm, apex obtuse. Column ca. 2 mm; anther ca. 1 mm; apex of connective slightly convex at anther apex; rostellum very small; lateral appendages ovate to obovate, terminating at or slightly below apex of anther locules. Fl. Aug–Sep.

• Rocky slopes, mossy outcrops in dense forests; 1800–3200 m. Guizhou (Fanjing Shan), Sichuan (Min Jiang), NW Yunnan.

**35. HERMINIUM** Linnaeus, Opera Var. 251. 1758.角盘兰属 *jiao pan lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Aopla* Lindley; *Monorchis* Séguier.

Herbs, terrestrial, slender. Tubers globose to oblong-ellipsoid, undivided, fleshy, neck with several slender roots. Stem erect, with tubular sheaths at base, 1- to several leaved, glabrous. Leaves basal, green, elliptic to lanceolate, base contracted into amplexicaul sheath. Inflorescence erect, terminal, racemose, glabrous; peduncle often with 1 or more foliaceous sterile bracts; rachis laxly to densely many flowered; floral bracts lanceolate. Flowers erect, horizontal, or nodding, small, often spiderly, resupinate or rarely not, usually yellowish green; ovary and pedicel straight, arcuate or sometimes distinctly hooked toward apex, twisted or rarely not, cylindric-fusiform, glabrous. Sepals subequal; dorsal sepal free or loosely connivent with petals and forming a hood; lateral sepals spreading. Petals smaller and narrower than sepals, usually thickened and fleshy; lip adnate to base of column, base shallowly concave or shortly spurred, margin entire, 3- or rarely 5-lobed. Column very short; anther adnate to apex of column, 2-locular, locules parallel; pollinia 2, oblong to ellipsoid, granular-farinaceous, sectile, each attached to a viscidium via a short caudicle; viscidia often involute and hornlike, naked; rostellum small, 3-lobed; stigma lobes 2, raised, clavate; auricles 2, usually prominent, placed laterally at base of anther. Capsule usually erect, oblong.

About 25 species: Europe, parts of SW and C Asia, extending to E and SE Asia and the Himalayas; 18 species (ten endemic) in China.

*Herminium kamengense* A. N. Rao (J. Econ. Taxon. Bot. 25: 287. 2001) was described from the region of the border of NE India and SE Xizang.

- 1a. Lip entire.
- 2a. Plants 1-leaved.
- 3a. Floral bracts exceeding flowers; petals forming a hood to weakly spreading, linear-oblong, ca. 2.8 × 0.5 mm; lip spurless ..... 13. *H. angustilabre*
- 3b. Floral bracts much shorter than to slightly exceeding ovary; petals erect, ovate, ca. 1.8 × 1–1.5 mm; lip shortly spurred; spur cylindric-obovoid, ca. 1.5 × 0.75 mm ..... 16. *H. singulum*
- 2b. Plants 2-leaved.
- 4a. Flowers not secund; lip spurless, base dilated and shallowly concave.
- 5a. Peduncle with several triangular-lanceolate sterile bracts, lower one often foliaceous; flowers white ..... 14. *H. tangianum*
- 5b. Peduncle ebracteate; flowers green to yellowish green ..... 15. *H. josephii*
- 4b. Flowers usually secund; lip shortly spurred; spur conic, 0.7–0.8 mm.
- 6a. Leaves uniformly green; lip ovate-lanceolate, ca. 2 × 1 mm ..... 17. *H. carnosilabre*
- 6b. Leaves green with white reticulate markings; lip orbicular-ovate, ca. 1.5 × 1.2 mm ..... 18. *H. orbiculare*
- 1b. Lip 3- or 5-lobed (though sometimes only obscurely so).
- 7a. Plants 1-leaved.
- 8a. Flowers not resupinate; ovary not twisted ..... 1. *H. glossophyllum*
- 8b. Flowers resupinate; ovary twisted.
- 9a. Peduncle ebracteate or with 1 sterile bract; ovary distinctly hooked toward apex; dorsal sepal 3.5–5 mm; lip furcately 3-lobed below middle, 6–7 mm ..... 2. *H. ophioglossoides*
- 9b. Peduncle with 2–7 sterile bracts; ovary straight; dorsal sepal 1.5–2 mm; lip apex 3-toothed to shallowly 3-lobed, 1.8–2.5 mm.
- 10a. Rachis sublaxly several to subdensely many flowered; lip 0.8–1 mm wide; lateral lobes triangular-falcate ..... 3. *H. coiloglossum*
- 10b. Rachis densely many flowered; lip ca. 1.8 mm wide; lateral lobes triangular ..... 4. *H. yunnanense*
- 7b. Plants 2–4-leaved (though *H. chloranthum* rarely 1-leaved).
- 11a. Peduncle narrowly winged; lip 5-lobed ..... 5. *H. quinquelobum*
- 11b. Peduncle cylindric; lip 3-lobed (though sometimes only obscurely so).
- 12a. Lip obscurely to shallowly 3-lobed; lateral lobes of lip ovate-triangular to triangular.
- 13a. Dorsal sepal ca. 3.2 mm; petals rhombic to narrowly elliptic, ca. 4 × 1.8 mm; lip ca. 3.2 × 2.8 mm ..... 6. *H. chloranthum*
- 13b. Dorsal sepal 0.8–1.5 mm; petals ovate or ovate-lanceolate, 1.2–2 × 0.8–1.2 mm; lip 1.8–2.2 × 0.8–1.2 mm.
- 14a. Leaves basal, clustered, 3–10 cm; peduncle ebracteate or sometimes with 1 sterile bract; flowers yellowish green; lip shortly saccate-spurred ..... 7. *H. macrophyllum*
- 14b. Leaves cauline, widely spaced, alternate, 10–12 cm; peduncle with 1–4 sterile bracts; flowers white; lip spurless ..... 8. *H. ecalcaratum*

- 12b. Lip furcately 3-lobed; lateral lobes of lip linear, linear-triangular, or linear-falcate.  
 15a. Petals rhombic; mid-lobe of lip 1.5–3.2 mm, longer than lateral lobes ..... 9. *H. monorchis*  
 15b. Petals ovate-lanceolate or linear; mid-lobe of lip 0.5–1.5 mm, shorter than lateral lobes.  
 16a. Petals ovate-lanceolate, abruptly narrowed above middle, apex cuspidate;  
 lip shortly spurred ..... 10. *H. alaschanicum*  
 16b. Petals linear, apex obtuse to subacute; lip spurless.  
 17a. Lip 4–10 mm; lateral lobes 2–7 mm ..... 11. *H. lanceum*  
 17b. Lip 3.2–4.5 mm; lateral lobes 1–2 mm ..... 12. *H. souliei*

**1. *Herminium glossophyllum*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 127. 1936.

雅致角盘兰 ya zhi jiao pan lan

*Herminium ophioglossoides* Schlechter var. *minus* Handel-Mazzetti.

Plants 8–12 cm tall. Tubers oblong-ellipsoid, 10–15 × 5–8 mm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal, arising from within basal sheaths, oblong-elliptic or oblong-ovate, 2.5–5 × 0.7–1.6 cm, apex subacute. Inflorescence 7–10 cm; peduncle cylindrical, ebracteate; rachis 2–4 cm, laxly to subdensely many flowered; floral bracts lanceolate to ovate-lanceolate, ca. 3 mm, shorter than ovary, apex acuminate. Flowers not resupinate, nodding, yellowish green; ovary distinctly hooked toward apex, not twisted, 3.5–5 mm including pedicel. Dorsal sepal erect, oblong-ovate, 2.5–3.5 × 1–1.6 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong-elliptic, oblique, 3–4 × 1.2–1.8 mm, 1-veined, apex acute. Petals spreading, narrowly ovate-lanceolate, oblique-falcate, 3.5–5 × 0.8–1 mm, somewhat fleshy, 1-veined, apex acute; lip spreading, oblong-ovate, 3-lobed above middle, 3–3.5 × 2–2.2 mm, base dilated and concave, somewhat fleshy; lateral lobes linear, ca. 0.8 mm; mid-lobe narrowly triangular-lanceolate, 1–1.2 mm, slightly broader than lateral lobes, apex acute. Column ca. 1 mm; pollinia globose; viscidia involute, hornlike. Fl. Jun–Aug.

- Grassy slopes; 3100–3600 m. SW Sichuan, NW Yunnan.

**2. *Herminium ophioglossoides*** Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 96. 1912.

长瓣角盘兰 chang ban jiao pan lan

*Monorchis ophioglossoides* (Schlechter) O. Schwarz.

Plants 6–26 cm tall. Tubers ellipsoid or ovoid, 10–20 × 5–12 mm. Stem with 2 or 3 tubular sheaths at base, 1-leaved. Leaf basal, arising from within basal sheaths, elliptic-ligulate, 2–9 × 0.5–2.5 cm, apex acute or obtuse. Inflorescence 5–20 cm; peduncle cylindrical, ebracteate or with 1 occasionally foliaceous sterile bract 0.5–3 cm; rachis 1–12.5 cm, laxly to subdensely many flowered; floral bracts lanceolate, 2.5–5 mm, much shorter than to almost as long as ovary, apex acuminate. Flowers nodding, yellowish green; ovary distinctly hooked toward apex, 4–7 mm including pedicel. Dorsal sepal erect, suberect, oblong-lanceolate, 3.5–5 × ca. 2 mm, 1-veined, apex obtuse; lateral sepals oblong-lanceolate, 3.5–5 × ca. 2 mm, 1-veined, apex obtuse. Petals narrowly ovate, 5–7 × 0.6–1.4 mm, somewhat fleshy, 2-veined, apex obtuse; lip decurved or spreading, oblong-ovate, 6–7 × 1.5–2.4 mm, base concave, furcately 3-lobed below middle; lateral lobes linear, 3–4 mm; mid-lobe

linear, 4–5 mm, slightly broader than lateral lobes, apex acute. Column ca. 1 mm; pollinia globose; viscidia involute, hornlike. Fl. Jun–Jul.

- Grassy slopes; 2100–3500 m. SW and W Sichuan, C and NW Yunnan.

**3. *Herminium coiloglossum*** Schlechter, Repert. Spec. Nov. Regni Veg. 3: 15. 1906.

条叶角盘兰 tiao ye jiao pan lan

*Monorchis coiloglossa* (Schlechter) O. Schwarz.

Plants 8–30 cm tall. Tubers ovoid to ovoid-oblong, 5–20 × 3–10 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf basal, arising from within basal sheaths, linear to linear-oblong, 4–12 × 0.4–0.8 cm, apex acute. Inflorescence 7–27 cm; peduncle cylindrical, with 2–7 lanceolate sterile bracts 0.2–0.8 cm; rachis 2–11 cm, ± laxly several to subdensely many flowered; floral bracts ovate, 1.5–3 mm, much shorter than ovary, apex acute to acuminate. Flowers erect, yellowish green; ovary straight, 3–5 mm including pedicel. Dorsal sepal erect, ovate, concave, ca. 1.5 × 1–1.2 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong-ovate, slightly oblique, 1.8–2 × 1–1.2 mm, 1-veined, apex obtuse. Petals forming a loose hood with dorsal sepal to spreading, oblong, slightly oblique, concave, ca. 1.2 × 0.8 mm, 1-veined, apex obtuse; lip horizontal to slightly pendulous, oblong, 1.8–2.4 × 0.8–1 mm, concave, contracted at middle, somewhat fleshy, base shallowly concave, apex shallowly 3-lobed; lateral lobes triangular-falcate, to ca. 0.3 mm, apex subacute; mid-lobe triangular, ca. 0.3 mm, slightly wider than lateral lobes, apex acute. Column ca. 1 mm; pollinia globose; viscidia ovoid. Fl. Aug–Sep.

- Forests, grassy slopes; 1600–2800 m. C, S, and W Yunnan.

**4. *Herminium yunnanense*** Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 24. 1913.

云南角盘兰 yun nan jiao pan lan

*Monorchis yunnanensis* (Rolfe) O. Schwarz.

Plants 15–26 cm tall. Tubers ovoid to ovoid-oblong, 5–15 × 5–10 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf basal, linear to linear-oblong, 4.5–13 × 0.4–1 cm, apex acute. Inflorescence 12–22 cm; peduncle cylindrical, with a few ovate-lanceolate sterile bracts; rachis 4–6.5 cm, densely many flowered; floral bracts ovate, 3–4 mm, shorter than ovary, apex acuminate. Flowers erect, yellowish green; ovary straight, ca. 5 mm including pedicel. Dorsal sepal suberect, ovate, concave, ca. 2 × 1.2 mm, 1-veined, apex obtuse; lateral sepals spreading, subovate, ca. 2.5 × 1.2–1.5 mm, 1-veined, apex obtuse. Petals forming a loose hood with dorsal sepal, ovate, ca. 1.5 × 1.2

mm, 1-veined, apex subacute; lip horizontal to slightly pendulous, oblong, 2.2–2.5 × ca. 1.8 mm, somewhat fleshy, base concave, apex 3-toothed to shallowly 3-lobed; lateral lobes triangular, small, apex acute; mid-lobe triangular, broader than lateral lobes, apex acute. Column ca. 1 mm; pollinia globose; viscidia ovoid; rostellum clavate-oblong, 2-lobed. Fl. Aug–Sep.

- Grassy slopes; 2200–3300 m. C and W Yunnan.

This species seems very close to Schlechter's *Herminium coiloglossum*. More material on which to base a critical comparison is needed.

**5. *Herminium quinquelobum*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 130. 1896.

秀丽角盘兰 xiu li jiao pan lan

*Monorchis quinqueloba* (King & Pantling) O. Schwarz.

Plants 25–29 cm tall. Tubers oblong to subglobose, 15–20 × 5–15 mm. Stem with 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, arising from within basal sheaths, linear-lanceolate to linear-oblong, 13–18 × 1.5–2 cm, apex acute or acuminate. Inflorescence 13–20 cm; peduncle narrowly winged, with 1 linear-lanceolate sterile bract to 7 cm; rachis ca. 13 cm, subdensely many flowered; floral bracts lanceolate, 3–8 mm, exceeding ovary, apex acuminate. Flowers erect or horizontal, green; ovary straight, 2–4 mm including pedicel. Dorsal sepal erect, oblong to oblong-elliptic, 1.8–2 × 0.5–0.8 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong, 1.8–2 × 0.8–1 mm, 1-veined, apex subacute. Petals spreading, linear, 1.6–1.8 × ca. 0.3 mm, 1-veined, apex acute or acuminate; lip pendulous, oblong, 5-lobed, ca. 2.2 × 0.6 mm, usually slightly longer than sepals, base shallowly concave; basal lobes triangular, small; lateral lobes triangular, small, apex obtuse; mid-lobe triangular-lanceolate, ca. 0.6 mm, apex acuminate. Column ca. 0.5 mm; anther ca. 0.3 mm; pollinia obovoid; viscidia small, disklike; auricles oblong. Fl. Aug–Sep.  $2n = 38$ .

Evergreen broad-leaved forests; ca. 2200 m. NW Yunnan [Bhutan, India, Nepal].

**6. *Herminium chloranthum*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 34. 1940.

矮角盘兰 ai jiao pan lan

Plants 4–15 cm tall. Tubers ellipsoid to subglobose, 7–20 × 4–12 mm. Stem with 2 or 3 tubular sheaths at base, usually (1 or)2(or 3)-leaved. Leaves basal, subopposite, arising from within basal sheaths, oblong, elliptic, or spatulate, 3–7 × 0.4–2 cm, apex obtuse or acute. Inflorescence 3.5–13 cm; peduncle cylindrical, ebracteate; rachis 1–6 cm, laxly few to subdensely many flowered; floral bracts ovate, smaller than ovary, apex obtuse. Flowers nodding, pale green; ovary distinctly hooked toward apex, 3–5 mm including pedicel. Dorsal sepal erect, broadly ovate, concave, ca. 3.2 × 2.5 mm, 3-veined, apex obtuse; lateral sepals spreading, elliptic, oblique, ca. 3 × 1.2 mm, 1- or 2-veined, apex obtuse. Petals spreading, narrowly rhombic to narrowly elliptic, ca. 4 × 1.8 mm, somewhat fleshy, 2-veined, apex obtuse; lip spreading, pandurate, ca. 3.2 × 2.8 mm, somewhat fleshy, base attenuate and shallowly concave, shallowly 3-lobed above middle; lateral lobes triangular, small, apex obtuse; mid-

lobe triangular, slightly longer than lateral lobes. Column short; pollinia globose; viscidia involute, hornlike. Fl. Jul–Aug.

- Alpine grasslands; 2500–4100 m. W Sichuan, S and SE Xizang, NW Yunnan.

**7. *Herminium macrophyllum*** (D. Don) Dandy, J. Bot. 70: 328. 1932.

耳片角盘兰 er pian jiao pan lan

*Neottia macrophylla* D. Don, Prodr. Fl. Nepal. 27. 1825; *Herminium congestum* Lindley; *Spiranthes macrophylla* (D. Don) Sprengel.

Plants 6–22 cm tall. Tubers ovoid or ellipsoid, 6–15 × 5–10 mm. Stem with 2 or 3 tubular sheaths at base, 2- or 3-leaved. Leaves basal, clustered, arising from within basal sheaths, narrowly oblong-elliptic to oblanceolate, 3–10 × 0.6–2 cm, apex subacute to obtuse. Inflorescence 5–19 cm; peduncle cylindrical, ebracteate or sometimes with 1 foliaceous sterile bract; rachis 1.5–8 cm, subdensely several to many flowered; floral bracts ovate-lanceolate, 1–3 mm, much shorter than ovary, apex acute to acuminate. Flowers horizontal or nodding, yellowish green; ovary distinctly hooked toward apex, 3–6 mm including pedicel. Dorsal sepal erect, ovate, 0.8–1.5 × 0.8–1 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong-lanceolate, 1.5–2 × 0.5–1 mm, 1-veined, apex acute to acuminate. Petals spreading, ovate-lanceolate, oblique, 1.2–2 × 0.8–1.2 mm, somewhat fleshy, 1-veined, apex acuminate; lip slightly decurved, ovate-lanceolate, 1.8–2.2 × 0.8–1 mm, fleshy, shortly saccate-spurred, base dilated and concave, gradually attenuate, obscurely 3-lobed; disk slightly warty; lateral lobes obscure, ovate-triangular, margin crenulate, apex obtuse; mid-lobe ovate-triangular, ca. 0.5 mm, apex acute or obtuse; spur globose, ca. 0.5 mm. Column ca. 1 mm; pollinia subglobose; viscidia involute, hornlike. Fl. Jun–Aug.  $2n = 40$ .

Alpine *Quercus-Abies* mixed forests, open places in forests, scrub, grassy slopes; 2400–4100 m. S Xizang [Bhutan, India, Kashmir, Nepal, Pakistan].

**8. *Herminium ecalcaratum*** (Finet) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 101. 1919.

无距角盘兰 wu ju jiao pan lan

*Peristylus ecalcaratus* Finet, Rev. Gén. Bot. 13: 520. 1901; *Monorchis ecalcarata* (Finet) O. Schwarz.

Plants 10–20 cm tall. Tubers oblong-ovoid, 10–15 × ca. 5 mm. Stem with 2 tubular sheaths at base, 2-leaved. Leaves cauline, widely spaced, alternate, oblong, 10–12 × 0.8–1 cm, apex obtuse. Inflorescence 7–14 cm; peduncle cylindrical, with 1–4 ovate-lanceolate sterile bracts 0.2–0.4 cm; rachis 3–8 cm, densely many flowered; floral bracts ovate-lanceolate to lanceolate, ca. 2 mm, shorter than ovary, apex acuminate or acute. Flowers erect or horizontal, white; ovary straight to slightly arcuate, 3–4 mm including pedicel. Dorsal sepal erect, ovate, concave, ca. 1.5 × 1.2 mm, 1-veined, apex obtuse; lateral sepals spreading, ovate, slightly oblique, ca. 1.6 × 1 mm, 1-veined, apex obtuse to subacute. Petals forming a hood to spreading, ovate, slightly oblique, ca. 1.5 × 0.8 mm, 1-veined, apex obtuse; lip obovate, 1.8–2.2 × ca. 1.2 mm, base shallowly concave, apex

shallowly 3-lobed; lateral lobes incurved to erect, subtriangular, small, apex obtuse; mid-lobe spreading, broadly ovate, slightly longer and wider than lateral lobes. Column ca. 0.8 mm; anther ca. 0.6 mm; pollinia globose; viscidia elliptic. Fl. Sep.

- Alpine grasslands; 2500–3200 m. W Sichuan, NW Yunnan.

**9. *Herminium monorchis*** (Linnaeus) R. Brown in W. T. Aiton, Hortus Kew., ed. 2, 5: 191. 1813.

角盘兰 jiao pan lan

*Ophrys monorchis* Linnaeus, Sp. Pl. 2: 947. 1753; *Arachnites monorchis* (Linnaeus) Hoffmann; *Epipactis monorchis* (Linnaeus) F. W. Schmidt; *Herminium alaschanicum* Maximowicz var. *tanguticum* Maximowicz; *H. tanguticum* (Maximowicz) Rolfe; *Monorchis herminium* O. Schwarz; *Orchis monorchis* (Linnaeus) Allioni; *Satyrium monorchis* (Linnaeus) Persoon.

Plants 5.5–35 cm tall. Tubers globose to ellipsoid, 6–10 × 5–10 mm. Stem with 1 or 2 tubular sheaths at base, 2-leaved. Leaves basal and subopposite to cauline, widely spaced and alternate, elliptic to elliptic-lanceolate, 1.5–10 × 0.5–2.5 cm, apex acute. Inflorescence 3.5–24 cm; peduncle cylindrical, with 1 or 2 ovate-lanceolate sterile bracts 0.5–5.5 cm, lower one occasionally foliaceous; rachis 1–11 cm, densely or occasionally ± laxly many flowered; floral bracts linear-lanceolate, 2–3 mm, shorter than ovary, apex acuminate-cuspidate. Flowers fragrant, nodding, yellowish green; ovary distinctly hooked toward apex, 3–5 mm including pedicel. Dorsal sepal suberect, oblong-ovate, ca. 2.2 × 1.2 mm, 1-veined, apex obtuse; lateral sepals weakly spreading, oblong-ovate, ca. 2 × 1 mm, 1-veined, apex subacute. Petals forming a hood, rhombic, ca. 2.5 × 1 mm, somewhat fleshy, 1-veined, sometimes obscurely 3-lobed near middle, apex acute; lip spreading to decurved, oblong-obovate, 2.2–5 × 1.2–1.5 mm, slightly fleshy, base attenuate and shallowly concave, furcately 3-lobed near middle; lateral lobes linear-triangular, 0.8–1.5 mm, apex acute; mid-lobe linear-triangular, 1.5–3.2 mm, longer and broader than lateral lobes, apex acute. Column to 1 mm; pollinia subglobose; viscidia large, involute, hornlike. Fl. Jul–Aug.  $2n = 38, 40, 42$ .

Broad-leaved forests, coniferous forests, thickets, grasslands, grassy swamps, flood lands; 600–4500 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xizang, N and NW Yunnan [India (Sikkim), Japan, Kashmir, Korea, Mongolia, Nepal, Pakistan, Russia; C and W Asia, Europe].

**10. *Herminium alaschanicum*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 31: 105. 1887.

裂瓣角盘兰 lie ban jiao pan lan

*Herminium altigenum* Schlechter; *Monorchis alaschanica* (Maximowicz) O. Schwarz; *Peristylus alaschanicus* (Maximowicz) N. Pearce & P. J. Cribb.

Plants 13–30 cm tall. Tubers oblong, 1–1.5 × ca. 0.8 cm. Stem with 2 or 3 tubular sheaths at base, 2–4-leaved. Leaves clustered toward base of stem, narrowly elliptic-lanceolate, 4–15 × 0.4–1 cm, apex acute or acuminate. Inflorescence 14–27

cm; peduncle cylindrical, with 3–5 lanceolate sterile bracts 5–15 mm; rachis 4–8 cm, subdensely many flowered; floral bracts ovate-lanceolate, 5–9 mm, exceeding ovary, apex cuspidate. Flowers nodding, green; ovary distinctly hooked toward apex, 5–6 mm including pedicel. Dorsal sepal ovate, 3–4 × 2–3 mm, 3-veined, apex obtuse; lateral sepals weakly spreading, ovate-lanceolate to lanceolate, 3–4 × 1.5–2 mm, 1-veined, apex subacute. Petals connivent with dorsal sepal and forming a hood, ovate-lanceolate, 3.2–4.5 × ca. 1.5 mm, abruptly narrowed above middle, fleshy, 3-veined, apex cuspidate; lip decurved, suboblong, 4–5.5 × ca. 1.5 mm, slightly fleshy, base concave, shortly saccate-spurred, furcately 3-lobed near middle; lateral lobes linear, 1.5–2.5 mm; mid-lobe narrowly linear-triangular, 1–1.5 mm, slightly broader than lateral lobes, apex acute; spur pendulous, slightly incurved, oblong, 0.8–1 mm, apex obtuse. Column ca. 1 mm; pollinia obovoid; viscidia involute, hornlike. Fl. Jun–Sep.

Alpine *Quercus* forests or scrubby grasslands along valleys; 1800–4500 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, W Sichuan, Xizang, NW Yunnan [Mongolia].

**11. *Herminium lanceum*** (Thunberg ex Swartz) Vujik, Blumea 11: 228. 1961.

叉唇角盘兰 cha chun jiao pan lan

*Ophrys lancea* Thunberg ex Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 223. 1800; *Aceras angustifolium* Lindley; *A. angustifolium* var. *longicrura* (C. Wright ex A. Gray) Miquel; *A. lanceum* (Thunberg ex Swartz) Steudel; *A. longicrura* C. Wright ex A. Gray; *Herminium altigenum* Schlechter; *H. angustifolium* (Lindley) Ridley; *H. angustifolium* var. *brevilabre* Tang & F. T. Wang; *H. angustifolium* var. *longicrura* (C. Wright ex A. Gray) Makino; *H. angustifolium* var. *nematolobum* Handel-Mazzetti; *H. lanceum* var. *longicrura* (C. Wright ex A. Gray) H. Hara; *H. longicrura* (C. Wright ex A. Gray) Tang & F. T. Wang (1951), not Bentham & Hooker (1883); *H. minutiflorum* Schlechter; *H. stenostachyum* Tang & F. T. Wang; *Monorchis angustifolia* (Lindley) O. Schwarz; *M. minutiflora* (Schlechter) O. Schwarz; *Platanthera angustifolia* (Lindley) H. G. Reichenbach; *Satyrium lanceum* (Thunberg ex Swartz) Persoon; *Spiranthes lancea* (Thunberg ex Swartz) R. C. Bakhuizen & Steenis.

Plants 14–83 cm tall. Tubers subglobose to ellipsoid, 10–15 × 5–12 mm. Stem with 2 tubular sheaths at base, 2–4-leaved. Leaves cauline, often widely spaced, alternate, linear to linear-lanceolate, 6–20 × 0.5–1.4 cm, apex acute or acuminate. Inflorescence 12–43 cm; peduncle cylindrical, with 1 to a few linear-lanceolate sterile bracts 1–6 cm; rachis 6–31 cm, laxly to subdensely many flowered; floral bracts lanceolate, 2–8 mm, shorter than or occasionally exceeding ovary, apex acuminate. Flowers erect or horizontal, pale yellowish green to green; ovary straight to slightly arcuate, 5–7 mm including pedicel. Dorsal sepal suberect, ovate to oblong, concave, 2–4 × 1–1.5 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong to ovate-oblong, oblique, 2.2–4 × 1–2 mm, 1-veined, apex subobtuse or acute. Petals forming a hood, linear, 2–4 × 0.2–1 mm, 1-veined, apex obtuse to subacute; lip often pendulous, oblong,

4–10 × 1–2 mm, base dilated and concave, furcately 3-lobed near middle; disk ridged; lateral lobes linear, 2–7 mm; mid-lobe oblong to triangular, to ca. 1 mm, apex acute to obtuse. Column ca. 0.8 mm; pollinia globose; viscidia orbicular. Fl. Jun–Aug.  $2n = 38, 40, 42, 76$ .

Mixed forests, coniferous forests, bamboo forests, thickets, grasslands; 700–3600 m. Anhui, N Fujian, SE Gansu, Guangdong, Guangxi, Guizhou, S Henan, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Kashmir, Korea, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

**12. *Herminium souliei*** (Finet) Rolfe, J. Linn. Soc., Bot. 36: 51. 1903.

宽萼角盘兰 kuan e jiao pan lan

*Herminium angustifolium* (Lindley) Ridley var. *souliei* Finet, Rev. Gén. Bot. 13: 518. 1901; *H. limprichtii* Schlechter; *H. souliei* var. *lichiangense* W. W. Smith; *Monorchis limprichtii* (Schlechter) O. Schwarz; *M. souliei* (Finet) O. Schwarz.

Plants 12–40 cm tall. Tubers oblong-ellipsoid, 10–20 × 6–10 mm. Stem with 2 or 3 tubular sheaths at base, 2–4-leaved. Leaves basal and subopposite or cauline, widely spaced and alternate, narrowly oblong, 4.5–20 × 0.5–2 cm, apex acute. Inflorescence 8–25 cm; peduncle cylindrical, with 1 or 2 lanceolate sterile bracts 0.5–2.4 cm; rachis 4–12 cm, subdensely many flowered; floral bracts ovate-lanceolate, 2–5 mm, shorter than ovary, apex acuminate. Flowers erect or horizontal, pale green; ovary straight to slightly arcuate, 4–5 mm including pedicel. Dorsal sepal erect, ovate, concave, 2.5–3 × ca. 2 mm, 3-veined, apex obtuse; lateral sepals spreading, ovate, oblique, ca. 3.5 × 2.5 mm, 1-veined, apex obtuse. Petals erect, linear, 2.5–3 × ca. 0.6 mm, 1-veined, apex obtuse; lip pendulous, narrowly oblong, 3.2–4.5 × 0.8–1.2 mm, slightly contracted at middle, base slightly dilated and shallowly concave, furcately 3-lobed toward apex; lateral lobes linear-falcate, incurved, 1–2 mm; mid-lobe oblong-lanceolate to obtusely triangular, ca. 0.5 mm, apex obtuse. Column ca. 1 mm; pollinia ovoid; viscidia ovoid. Fl. Jul–Aug.

• Broad-leaved forests, coniferous forests, grassy slopes; 1400–4200 m. W Sichuan, SE Xizang, NE and W Yunnan.

This species is clearly closely allied to *Herminium lanceum*, though the typically longer lateral lobes of the lip in the latter give its flowers a more spidery appearance.

**13. *Herminium angustilabre*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 131. 1896.

狭唇角盘兰 xia chun jiao pan lan

*Monorchis angustilabris* (King & Pantling) O. Schwarz.

Plants 7–18 cm tall. Tubers oblong-ellipsoid, 6–15 × 3–7 mm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal or cauline, usually distant from basal sheath, oblong-elliptic, 1.8–2.5 × 0.4–1 cm, apex obtuse. Inflorescence 4–14 cm; peduncle somewhat angled, with 1–5 linear to oblong-lanceolate sterile bracts 0.5–1.5 cm; rachis 3–5 cm, laxly 8–12-flowered; floral bracts lanceolate, 4–6 mm, exceeding flowers, apex acuminate. Flowers horizontal to slightly nodding, green to yellowish green; ovary arcuate, ca. 3.5 mm including pedicel. Dorsal sepal suberect, broadly ovate, concave, 2–2.6 × 1.2–

mm, 1-veined, apex acute; lateral sepals reflexed, narrowly oblong, slightly oblique, 2.8–3 × ca. 0.7 mm, 1-veined, apex acute. Petals forming a hood to weakly spreading, linear-oblong, slightly oblique, ca. 2.8 × 0.5 mm, 1-veined, apex acute; lip pendulous, linear-oblong, 3–3.5 × ca. 0.7 mm, base slightly dilated and shallowly concave, margin entire, apex acute and reflexed. Column ca. 0.5 mm; pollinia globose; viscidia elliptic; auricles oblong, narrow. Fl. Jul.

Scrub, grassy slopes; ca. 3500 m. NW Yunnan [India (Sikkim)].

**14. *Herminium tangianum*** (S. Y. Hu) K. Y. Lang, Acta Phytotax. Sin. 25: 458. 1987.

宽叶角盘兰 kuan ye jiao pan lan

*Peristylus tangianus* S. Y. Hu, Quart. J. Taiwan Mus. 27: 461. 1974, based on *P. ecalcaratus* Tang & F. T. Wang, Acta Phytotax. Sin. 1: 64. 1951, not Finet (1901), based on *Herminium latifolium* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 3: 325. 1931, not (A. Richard) Lindley (1832).

Plants 20–30 cm tall. Tubers subglobose to oblong-ellipsoid, 10–20 mm. Stem with 2 or 3 tubular sheaths at base, 2-leaved. Leaves basal, orbicular or elliptic, 2.5–5 × 2–2.5 cm, apex subacuminate. Peduncle cylindrical, with several triangular-lanceolate sterile bracts, lower one often foliaceous; rachis 4–10 cm, many flowered; floral bracts lanceolate, 6–7 mm, slightly shorter than ovary, apex acuminate. Flowers white; ovary ca. 8 mm including pedicel. Dorsal sepal ovate, ca. 2.5 × 1.6 mm, 1-veined, apex obtuse; lateral sepals oblanceolate, ca. 2.6 × 1 mm, 1-veined, apex obtuse. Petals ovate, oblique, 1.2–2.4 × ca. 1.2 mm, 1-veined, apex obtuse; lip decurved, ovate-pandurate, ca. 2.5 × 1.4 mm, somewhat fleshy, base dilated and shallowly concave, contracted near middle, margin entire, apex dilated and obtuse. Column short; viscidia elliptic, ca. 0.8 mm. Fl. unknown.

• Moist grasslands. C Yunnan.

**15. *Herminium josephii*** H. G. Reichenbach, Flora 55: 276. 1872 [“*josephi*”].

宽卵角盘兰 kuan luan jiao pan lan

*Herminium forrestii* Schlechter; *Monorchis forrestii* (Schlechter) O. Schwarz; *M. josephii* (H. G. Reichenbach) O. Schwarz.

Plants 11–27 cm tall. Tubers ovoid or ellipsoid, 10–20 × 7–10 mm. Stem with 2 or 3 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, linear-oblong to oblong-elliptic, 3.5–10 × 0.5–1.5 cm, apex acute. Inflorescence 9–24 cm; peduncle cylindrical, ebracteate; rachis 3.5–8.5 cm, subdensely several to many flowered; floral bracts ovate-lanceolate to lanceolate, ca. 3 mm, shorter than ovary, apex acute. Flowers fragrant, erect or horizontal, green to yellowish green; ovary straight, 7–8 mm including pedicel. Dorsal sepal suberect, broadly ovate, ca. 3 × 2 mm, 1-veined, apex obtuse; lateral sepals weakly spreading, ovate-lanceolate, slightly oblique, 3–4.5 × ca. 1.5 mm, 1-veined, apex obtuse. Petals ovate-lanceolate, oblique, 3–3.5 × ca. 1.2 mm, somewhat fleshy, 1-veined, apex subobtuse; lip pendulous, broadly ovate, 4–5 × 3–3.5 mm, somewhat fleshy, base shallowly concave, entire; disk with 2 short ridges below mid-

dle. Column ca. 1.5 mm; pollinia obovoid; viscidia involute, hornlike. Fl. Jul–Aug.  $2n = 38$ .

*Abies* forests, forest margins, scrub, alpine meadows; 1900–4000 m. W Sichuan, S and SE Xizang, NE and NW Yunnan [Bhutan, India (Sikkim), Nepal].

**16. *Herminium singulum*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 35. 1940.

披针唇角盘兰 pi zhen chun jiao pan lan

Plants 8–30 cm tall. Tubers subglobose, ca. 10 mm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal, elliptic, 2–4 × 1–2.5 cm, apex obtuse or acute. Inflorescence 6.5–27 cm; peduncle cylindrical, with 2 lanceolate sterile bracts 1–1.5 cm; rachis 2.5–10 cm, subclaxly 4- to many flowered; floral bracts lanceolate, much shorter than to slightly exceeding ovary, apex acuminate. Flowers erect, held close to rachis, color not recorded; ovary straight, 4–7 mm including pedicel. Dorsal sepal erect, ovate, ca. 1.5 × 1 mm, 1-veined, concave at base, apex acute or obtuse; lateral sepals reflexed, oblong-ovate, oblique, ca. 1.5 × 0.8 mm, 1-veined, apex obtuse. Petals erect, ovate, oblique, ca. 1.8 × 1–1.5 mm, somewhat fleshy, 1-veined, apex obtuse or acute; lip lanceolate, ca. 2.5 × 1 mm, base dilated, gradually attenuate from middle toward apex, somewhat fleshy, shortly spurred, margin entire, apex obtuse or acute; spur cylindrical-obovoid, ca. 1.5 × 0.75 mm, slightly dilated toward apex, apex obtuse. Column short; anther relatively small. Fl. Aug–Sep.

• Forests; 2600–2800 m. SW Sichuan, NW Yunnan.

**17. *Herminium carnosilabre*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 32. 1940.

厚唇角盘兰 hou chun jiao pan lan

Plants 10–22 cm tall. Tubers ovoid, ca. 10 mm. Stem with 1 or 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite to somewhat spaced and alternate, elliptic to oblong-lanceolate, 1.5–3 × 0.5–1.5 cm, apex obtuse. Peduncle cylindrical,

with 2 or 3 lanceolate sterile bracts; rachis 1.5–3.5 cm, subdensely many flowered; floral bracts ovate, shorter than ovary, apex acute. Flowers usually secund, erect, pale green; ovary ca. 3.2 mm including pedicel. Dorsal sepal erect, oblong, concave, ca. 1.6 × 0.8 mm, 1-veined, apex obtuse; lateral sepals oblong-ovate, oblique, ca. 1.5 × 0.8 mm, 1-veined, apex obtuse. Petals erect-ascending, oblong, falcate, ca. 1.2 × 0.5 mm, 1-veined, apex obtuse; lip ovate-lanceolate, ca. 2 × 1 mm, somewhat fleshy, base dilated, shortly spurred, margin entire, apex obtuse; spur conic, ca. 0.8 mm. Column short. Fl. Aug–Sep.

• Bamboo forests; 3200–3600 m. NW Yunnan.

**18. *Herminium orbiculare*** J. D. Hooker, Fl. Brit. India 6: 130. 1890.

西藏角盘兰 xi zang jiao pan lan

*Monorchis orbicularis* (J. D. Hooker) O. Schwarz.

Plants 6–15 cm tall. Tubers subglobose to ovoid, 4–8 × 4–6 mm. Stem with 1 tubular sheath at base, 2-leaved. Leaves basal and subopposite, or cauline, somewhat spaced and alternate, oblanceolate to elliptic-oblong, 1.2–3 × 0.3–1.5 cm, adaxially with white reticulate markings, apex obtuse or acute. Inflorescence 4–14 cm; peduncle cylindrical, with 1 to several lanceolate sterile bracts 2–6 mm; rachis 1–4 cm, laxly few to subdensely many flowered; floral bracts ovate-lanceolate, 1–2.5 mm, shorter than ovary, apex acute. Flowers usually secund, erect or horizontal, green; ovary straight to slightly arcuate, 2–4 mm. Dorsal sepal suberect, broadly ovate, ca. 0.8 × 0.5 mm, 1-veined, apex obtuse; lateral sepals weakly spreading, broadly orbicular-ovate, ca. 1.2 × 0.8 mm, 1-veined, apex obtuse. Petals forming a hood to weakly spreading, oblong-ovate, ca. 0.8 × 0.5 mm, 1-veined, apex obtuse; lip slightly decurved, orbicular-ovate, ca. 1.5 × 1.2 mm, fleshy, shortly spurred, entire, apex obtuse; disk slightly warty; spur conic, ca. 0.7 mm. Column ca. 0.4 mm; pollinia clavate; viscidia orbicular. Fl. Jul–Sep.

Valleys; ca. 3700 m. Xizang [Bhutan, India (Sikkim)].

### 36. AMITOSTIGMA Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 91. 1919.

无柱兰属 wu zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Mitostigma* Blume, Mus. Bot. 2: 189. 1856, not Decaisne (1844).

Herbs, terrestrial, slender. Tubers subglobose to ovoid, undivided, fleshy, neck with several slender roots. Stem erect, 1- or occasionally 2-leaved, glabrous or occasionally pubescent. Leaves basal or cauline, usually green and unspotted, rarely with purple-brown blotches, oblong, lanceolate, elliptic, or ovate, base contracted into amplexicaul sheath. Inflorescence a terminal raceme, glabrous; peduncle elongate, with 1 or more sterile bracts; rachis 1- to several flowered. Flowers often secund, resupinate, white, pink, mauve, or purple, rarely yellow; ovary usually straight, twisted, shortly pedicellate, cylindrical-fusiform, glabrous. Sepals free, oblong to ovate, 1-veined. Petals free, often connivent with dorsal sepal and forming a hood, usually wider than sepals; lip spreading, spurred at base, 3-lobed; disk often papillose; mid-lobe often divided, forming 2 lobules; spur cylindrical to narrowly conic, short to elongate. Column very short; anther usually erect, oblong-ellipsoid to obovoid, 2-locular, locules parallel or slightly divergent; pollinia 2, oblong, sectile, granular-farinaceous; caudicles straplike; viscidia naked, oblong-ovate; rostellum rather small, 3-lobed, base with ± ascending arms on both sides, margin adnate to column; stigma ventral, 3-lobed, lobes confluent, relatively large, flat to somewhat raised; auricles 2, large, stout, placed laterally at base of anther. Capsule suberect.

About 30 species: E Asia and adjacent areas; 22 species (21 endemic) in China.

The generic affinity of several of the entities presently referred to *Amitostigma* remains questionable and in need of re-examination; many of the endemic Chinese taxa are poorly known.

- 1a. Plants 2-leaved (*A. alpestre* rarely 1-leaved).
  - 2a. Leaves cauline, widely spaced.
    - 3a. Lip obovate, 3-lobed near middle, 4.5–5.5 mm wide, longer than broad; lateral lobes ovate-oblong, ca. 0.5 mm wide; spur 4–4.5 mm ..... 17. *A. alpestre*
    - 3b. Lip orbicular to transversely elliptic, 3-lobed toward apex, ca. 8.5 mm wide, broader than long; lateral lobes quadrate, ca. 2.5 mm wide; spur 5–7 mm ..... 18. *A. yuanum*
  - 2b. Leaves basal, subopposite.
    - 4a. Rachis 1-flowered ..... 19. *A. papilionaceum*
    - 4b. Rachis 3- to more than 10-flowered.
      - 5a. Leaves usually appressed to substratum; petals ca. 5 × 3 mm; lip ca. 9 mm ..... 22. *A. physoceras*
      - 5b. Leaves erect or prorect; petals 3–3.5 × 1.5–2 mm; lip 4.5–6 mm.
        - 6a. Lip 3-lobed below middle; lateral lobes linear ..... 20. *A. bifoliatum*
        - 6b. Lip 3-lobed above middle; lateral lobes ovate ..... 21. *A. wenshanense*
- 1b. Plants 1-leaved.
  - 7a. Leaf appressed to substratum, adaxially with purplish brown blotches ..... 1. *A. hemipilioides*
  - 7b. Leaf erect or prorect, uniformly green.
  - 8a. Rachis 1- or rarely 2-flowered.
    - 9a. Spur 8–17 mm, ca. as long as to exceeding ovary.
      - 10a. Lip 3-lobed toward apex, 11–15 × 13–19 mm; lateral lobes broadly oblong-ovate, ca. 5 mm wide ..... 6. *A. pinguicula*
      - 10b. Lip 3-lobed below middle, 8–10 × 6–10 mm; lateral lobes linear-oblong or ovate-triangular, 1–3 mm wide.
        - 11a. Dorsal sepal 4–5 mm; spur 11–12 mm ..... 7. *A. dolichocentrum*
        - 11b. Dorsal sepal ca. 7 mm; spur 8–9 mm ..... 8. *A. tibeticum*
    - 9b. Spur 2–4 mm, usually much shorter than ovary.
      - 12a. Stem densely pubescent around leaf base; floral bract much shorter than ovary; lip 5–6 mm ..... 2. *A. amplexifolium*
      - 12b. Stem glabrous; floral bract nearly as long as to exceeding ovary; lip 7–15 mm.
        - 13a. Flower yellow ..... 3. *A. simplex*
        - 13b. Flower pale purple, pink, or white.
          - 14a. Leaf 0.1–0.4 cm wide; petals broadly ovate, 4.5–5.5 mm wide ..... 4. *A. farreri*
          - 14b. Leaf 0.6–1 cm wide; petals ovate, 1.6–2 mm wide ..... 5. *A. monanthum*
    - 8b. Rachis usually 3- or more flowered (*A. faberi* rarely 1- or 2-flowered).
      - 15a. Mid-lobe of lip 4–7 mm wide, nearly as broad as to broader than long.
        - 16a. Ovary and pedicel 15–25 mm; dorsal sepal ca. 7 mm; lip ca. 13 mm ..... 16. *A. gonggashanicum*
        - 16b. Ovary and pedicel 6–10 mm; dorsal sepal 2.5–3.5 mm; lip 5–7.5 mm.
          - 17a. Peduncle ebracteate; spur 2–3 mm ..... 14. *A. basifoliatum*
          - 17b. Peduncle with 1 sterile bract; spur 5–6 mm ..... 15. *A. faberi*
      - 15b. Mid-lobe of lip 0.5–3.5 mm wide, much longer than broad.
        - 18a. Mid-lobe of lip ca. 3.5 mm wide, deeply divided above middle to form 2 distinct lobules ..... 9. *A. parceflorum*
        - 18b. Mid-lobe of lip 0.5–2 mm wide, apex truncate, obtuse-rounded, occasionally emarginate or shallowly notched.
          - 19a. Lateral lobes of lip oblong-obovate, 1.6–2 mm wide; spur 3.5–6 mm ..... 10. *A. tetralobum*
          - 19b. Lateral lobes of lip lanceolate, linear-oblong, ovate-oblong, or triangular, 0.3–0.8 mm wide; spur 1–2.5(–3.5) mm.
            - 20a. Peduncle ebracteate; flowers white; mid-lobe of lip ca. 1.6 mm ..... 11. *A. capitatum*
            - 20b. Peduncle with 1 or 2 sterile bracts; flowers pink, rose-pink, purplish red, or purple; mid-lobe of lip 2–4 mm.
              - 21a. Plants 7–25 cm tall; leaf usually basal; lip 3-lobed above middle ..... 12. *A. gracile*
              - 21b. Plants 24–36 cm tall; leaf cauline; lip 3-lobed below middle ..... 13. *A. trifurcatum*

**1. *Amitostigma hemipilioides*** (Finet) Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 5. 1936.

卵叶无柱兰 *luan ye wu zhu lan*

*Gymnadenia hemipilioides* Finet, Rev. Gén. Bot. 13: 515. 1901; *Amitostigma microhemipilia* Schlechter; *Chusua hemi-*

*pilioides* (Finet) P. F. Hunt; *Hemipilia silvatica* Kraenzlin; *Orchis microhemipilia* (Schlechter) Soó; *Ponerorchis hemipilioides* (Finet) Soó.

Plants 8–12 cm tall. Tubers oblong, 8–12 × 5–10 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf basal, ap-

pressed to substratum, adaxially with purplish brown blotches, ovate-orbicular to oblong, 1.5–2.2 × 0.8–2.5 cm, apex acute. Peduncle with 1 or 2 lanceolate sterile bracts; rachis to 5.5 cm, subdensely (2 or) 3–12-flowered; floral bracts ovate, much shorter than ovary, apex acute. Flowers pinkish white, with pinkish purple spots on lip; ovary and pedicel ca. 7 mm. Dorsal sepal oblong-ovate, concave, 3–3.5 × 1.5–1.8 mm, 1-veined, apex obtuse; lateral sepals oblong-ovate, slightly oblique, ca. 3.5 × 1.7 mm, apex subobtuse. Petals connivent with dorsal sepal and forming a hood, oblong, slightly oblique, 2.7–3 × 1.2–1.5 mm, 1-veined, margin irregularly serrulate, apex obtuse; lip obovate, 5–7 × 4–4.5 mm, base cuneate, margin 3-lobed above middle, margin irregularly serrulate; disk finely papillate; lateral lobes oblong-quadrangle, oblique, ca. 1 × 1 mm, 3- or 4-veined, apex subacute; mid-lobe quadrate, ca. 2 × 2 mm, apex obtuse; spur horizontal and curving downward to pendulous, cylindrical, 3–4 mm, apex obtuse; viscidia subovoid; stigma lobes oblong. Fl. Jun–Jul.

• Rocky soils, moist places in forests, crevices; 2400–2500 m. C Guizhou, NW Yunnan.

**2. *Amitostigma amplexifolium*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 3. 1936.

抱茎叶无柱兰 *bao jing ye wu zhu lan*

Plants 6–10 cm tall. Tubers globose, ca. 5 mm in diam. Stem with 1 tubular sheath at base, 1-leaved, densely pubescent around leaf base. Leaf subbasal to cauline, porrect, elliptic to oblong-elliptic, 1–2 × 0.5–1 cm, apex acute. Rachis 1- or 2-flowered; floral bracts oblong-elliptic, much shorter than ovary, apex obtuse or acute. Flower white, with purplish red spots; ovary and pedicel 8–10 mm. Dorsal sepal elliptic, ca. 3.5 × 2–2.3 mm, apex obtuse; lateral sepals elliptic, slightly oblique, ca. 4 × 2.5 mm, apex obtuse. Petals elliptic, slightly oblique, ca. 3 × 2 mm, apex truncate-obtuse; lip obovate, 5–6 × 4–5 mm, base cuneate, 3-lobed below middle; lateral lobes falcate-oblong, apex obtuse; mid-lobe cuneate-oblong, margin erose, shallowly notched near apex to form 2 small lobules, sinus with a small tooth; spur pendulous, cylindrical, curved, ca. 2 mm, much shorter than ovary; viscidia ovate-triangular; stigma lobes oblong. Fl. Jul.

• Forests. W Sichuan.

**3. *Amitostigma simplex*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 25. 1940.

黄花无柱兰 *huang hua wu zhu lan*

Plants 5–14 cm tall. Tubers ovoid to subglobose, 4–5 mm in diam. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal, porrect, linear to oblong-elliptic, 1.5–4 × 0.3–0.6 cm, apex acute or obtuse. Peduncle ebracteate; rachis 1-flowered; floral bracts lanceolate, 6–10 mm, nearly as long as ovary, apex acute or acuminate. Flower erect, yellow, sometimes spotted with brown, rather large; ovary and pedicel 8–9 mm. Dorsal sepal narrowly oblong, concave, 3.8–6 × 1.3–3 mm, 1-veined, apex obtuse; lateral sepals spreading, narrowly oblong-elliptic, falcate, 4.2–8 × 1.5–4 mm, 1-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, ovate, oblique,

3.7–5.5 × 1.8–3.5 mm, 1-veined, apex obtuse; lip broadly obovate, 7–15 × 6–13 mm, deeply 3-lobed near middle; lateral lobes oblong-ovate, falcate, 3–7 × 3–6 mm, apex rounded; mid-lobe obcordate to flabellate, 3–5 × 4–8 mm, margin undulate, apex emarginate to shallowly notched to form 2 small lobules; spur pendulous, cylindrical, 3–4 mm, much shorter than ovary, apex obtuse. Fl. Jul–Aug.

• Grassy slopes; 2300–4400 m. W Sichuan, NW Yunnan.

**4. *Amitostigma farreri*** Schlechter, Repert. Spec. Nov. Regni Veg. 20: 378. 1924.

长苞无柱兰 *chang bao wu zhu lan*

*Orchis farreri* (Schlechter) Soó.

Plants 3.5–9 cm tall. Tubers globose, ca. 5 mm in diam. Stem with 2 tubular sheaths at base, 1-leaved. Leaf subbasal, porrect, linear to narrowly oblong, 1.5–5 × 0.1–0.4 cm, apex acute. Rachis 1-flowered; floral bracts narrowly lanceolate, exceeding ovary, apex acute. Flower pink; ovary and pedicel 4–5 mm. Dorsal sepal erect, ovate-oblong, concave, 5–7.5 × 4–5 mm, 3-veined, apex obtuse; lateral sepals ovate-oblong, slightly oblique, 5.5–8 × 4–5 mm, apex subobtuse. Petals connivent with dorsal sepal and forming a hood, broadly ovate, oblique, 5–7 × 4.5–5.5 mm, 3-veined, margin slightly undulate, apex obtuse; lip obovate, 7–12 × 5–8 mm, base broadly cuneate, 3-lobed below middle; lateral lobes triangular, 2–3 × ca. 1 mm, margin crenulate, apex acute; mid-lobe obcordate-obovate, 5–9 × 5–9 mm, margin crenulate, apex notched to form 2 distinct lobules, sinus with a small acute tooth; spur pendulous, straight, conic-cylindrical, 3–4 mm, slightly shorter than ovary, apex obtuse; viscidia ellipsoid; stigma lobes oblong. Fl. Aug.

• Grassy slopes; 3600–4200 m. SE Xizang, NW Yunnan.

**5. *Amitostigma monanthum*** (Finet) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 94. 1919.

一花无柱兰 *yi hua wu zhu lan*

*Peristylus monanthus* Finet, Rev. Gén. Bot. 13: 523. 1901; *Amitostigma forrestii* Schlechter; *A. monanthum* var. *forrestii* (Schlechter) Tang & F. T. Wang; *A. nivale* Schlechter; *Orchis forrestii* (Schlechter) Soó; *O. monantha* (Finet) Soó; *O. nivalis* (Schlechter) Soó.

Plants 6–10 cm tall. Tubers ovoid to subglobose, ca. 5 mm in diam. Stem with 1 or 2 tubular sheaths at base, 1-leaved, occasionally pubescent. Leaf basal, erect to porrect, lanceolate, narrowly oblong, or oblanceolate-spatulate, 2–3 × 0.6–1 cm, apex acute or obtuse. Peduncle ebracteate; rachis 1-flowered; floral bract linear-lanceolate, 6–12 mm, usually exceeding ovary, apex acute. Flower pale purple, pink, or pure white, with purple spots on lip, rather large; ovary and pedicel 6–11 mm. Dorsal sepal erect, narrowly ovate, concave, 4–4.5 × 1.6–1.8 mm, 1-veined, apex obtuse; lateral sepals spreading to reflexed, narrowly oblong-elliptic, 4.5–5 × ca. 1.6 mm, apex subobtuse. Petals loosely connivent with dorsal sepal and forming a hood, ovate, slightly oblique, 3.8–4.4 × 1.6–2 mm, 1-veined, apex obtuse; lip ovate-orbicular, 8–10 × 8–10 mm, base shortly clawed, deeply 3-lobed below middle; disk finely papillate; lateral lobes suboblong-ovate, 4–5 × 1.8–3 mm, margin often

slightly undulate, apex obtuse; mid-lobe broadly obovate, 6–7.5 × ca. 7 mm, much wider than lateral lobes, margin usually entire or sometimes slightly undulate, apex slightly emarginate to deeply notched to form 2 distinct lobules; spur pendulous, straight, cylindrical, 2.5–4 mm, much shorter than ovary, apex obtuse; viscidia ovate; stigma lobes subsquare. Fl. Jul–Aug.

• Grassy slopes, alpine meadows, rocky soils and gravel along streams; 2800–4100 m. S Gansu, S Shaanxi, NW and W Sichuan, SE Xizang, NW Yunnan.

**6. *Amitostigma pinguicula*** (H. G. Reichenbach & S. Moore) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 94. 1919.

大花无柱兰 da hua wu zhu lan

*Gymadenia pinguicula* H. G. Reichenbach & S. Moore, J. Bot. 16: 135. 1878; *Diplomeris chinensis* Rolfe; *Habenaria pinguicula* (H. G. Reichenbach & S. Moore) Bentham ex Rolfe; *Orchis pinguicula* (H. G. Reichenbach & S. Moore) Soó.

Plants 7–16 cm tall. Tubers ovoid, 10–15 mm in diam. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf subbasal, porrect, linear-oblong, narrowly elliptic, oblong-ovate, or ligulate-oblong, 1.5–8 × 0.6–1.2 cm, apex subacute. Peduncle with 1 or 2 lanceolate sterile bracts; rachis 1- or rarely 2-flowered; floral bract linear-lanceolate, 5–6 mm, much shorter than ovary, apex acuminate. Flower rose-red to purplish red, rather large; ovary 9–17 mm including pedicel, very slender. Dorsal sepal erect, ovate, concave, 5–7 × 3–4 mm, 1-veined, apex acute; lateral sepals spreading to reflexed, ovate-lanceolate, slightly oblique, 6–8 × 3–4 mm, 2- or 3-veined, apex acute. Petals loosely connivent with dorsal sepal and forming a hood, broadly ovate, slightly oblique, 3.5–4.5 × ca. 3 mm, 3-veined, apex obtuse; lip flabellate, 11–15 × 13–19 mm, base cuneate, 3-lobed toward apex; lateral lobes broadly oblong-ovate, ca. 4 × 5 mm, apex truncate; mid-lobe broadly obovate, ca. 4 × 7.5 mm, apex truncate to slightly emarginate; spur horizontal to pendulous, straight to slightly curved, narrowly conic, 15–17 mm, usually exceeding ovary, gradually attenuate, apex acute; viscidia subovate; stigma lobes narrowly oblong. Fl. Apr–May.

• Rocky soils in forests, moist grasslands, valleys; 200–400 m. NE Zhejiang.

*Diplomeris chinensis* is tentatively referred to the synonymy of this species.

**7. *Amitostigma dolichocentrum*** Tang, F. T. Wang & K. Y. Lang, Acta Phytotax. Sin. 20: 84. 1982.

长距无柱兰 chang ju wu zhu lan

Plants 6–8 cm tall. Tubers ovoid, ca. 5.5 mm. Stem with 2 tubular sheaths at base, 1-leaved, pubescent. Leaf subbasal, porrect, elliptic or ovate, 0.7–2 × 0.3–0.8 cm, apex acute. Peduncle with 1 foliaceous, ovate sterile bract; rachis 1-flowered; floral bract ovate-lanceolate, ca. 5 mm, much shorter than ovary, apex acuminate. Flower erect, color not recorded, rather large; ovary and pedicel 10–12 mm. Dorsal sepal erect, oblong-elliptic, 4–5 × 2.5–3 mm, 3-veined, apex obtuse; lateral sepals reflexed, oblong-obovate, oblique, 5–6 × 2–3 mm, 3-veined,

apex obtuse. Petals loosely connivent with dorsal sepal and forming a hood, oblong-ovate, 4–5 × 2.5–3 mm, 3-veined, apex obtuse; lip orbicular-obovate, deeply 3-lobed near base, 8–10 × 8–10 mm; lateral lobes linear-oblong, slightly oblique, 5–6 × 1–1.3 mm, 1- or 2-veined, apex obtuse; mid-lobe spatulate, ca. 7 × 3–5 mm, 3–5-veined, margin slightly crenulate, apex obtuse-rounded; spur pendulous, cylindrical, slightly incurved, 11–12 mm, ca. as long as to slightly exceeding ovary, neck wide, attenuate toward apex, apex obtuse. Fl. Jul.

• W Sichuan.

**8. *Amitostigma tibeticum*** Schlechter, Repert. Spec. Nov. Regni Veg. 20: 379. 1924.

西藏无柱兰 xi zang wu zhu lan

*Orchis tibetica* (Schlechter) Soó.

Plants 6–8 cm tall. Tubers ellipsoid to globose, ca. 5 mm in diam. Stem purple, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf subbasal, erect, purple, ligulate, lanceolate, or oblanceolate, 2.5–3 × 0.5–0.6 cm, apex subacute or subobtuse. Peduncle ebracteate; rachis 1-flowered; floral bract oblong-lanceolate, 8–14 mm, exceeding ovary, apex subacute. Flower suberect, pinkish purple to mauve, rather large; ovary and pedicel 7–10 mm. Dorsal sepal erect, narrowly ovate-oblong, slightly concave, ca. 7 × 2–3 mm, 3-veined, apex obtuse; lateral sepals spreading to reflexed, sometimes twisted, narrowly ovate-oblong, slightly oblique, ca. 7 × 3.5 mm, 3-veined, apex obtuse. Petals loosely connivent with dorsal sepal and forming a hood, narrowly ovate, slightly oblique, ca. 6 × 3 mm, 2-veined; lip obovate to orbiculate, 8–9 × ca. 6 mm, base broadly cuneate, 3-lobed below middle; lateral lobes ovate-triangular, oblique, 1.5–3.5 × 1–3 mm, margin irregularly serrate, apex acute or obtuse; mid-lobe orbiculate, 4.5–6 × 4–5 mm, margin irregularly serrate, apex slightly emarginate; spur pendulous, cylindrical, slightly incurved, 8–9 mm, ca. as long as to slightly exceeding ovary, slightly attenuate, apex obtuse; viscidia ovoid; stigma lobes oblong. Fl. Aug.

• Alpine meadows; 3600–4400 m. SE Xizang, NW Yunnan.

**9. *Amitostigma parceflorum*** (Finet) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 94. 1919.

少花无柱兰 shao hua wu zhu lan

*Peristylus tetralobus* Finet f. *parceflorus* Finet, Rev. Gén. Bot. 13: 525. 1901; *Orchis parceflora* (Finet) Handel-Mazzetti; *O. tetraloba* (Finet) Schlechter var. *parceflora* (Finet) Soó.

Plants 10–15 cm tall. Tubers subglobose, ca. 8 × 6 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf cauline, porrect, linear to elliptic-lanceolate, ca. 3.5 × 0.4 cm, apex acute. Peduncle ebracteate; rachis 2–4 cm, laxly 3–5-flowered; floral bracts lanceolate, ca. 3 mm, much shorter than ovary, apex acute. Flowers rose-red; ovary and pedicel 7–9 mm. Dorsal sepal erect, ovate-oblong, slightly concave, 2–3 × ca. 1.3 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong, slightly oblique, 2.2–3.5 × ca. 1.4 mm, 1-veined, apex obtuse. Petals erect or loosely connivent with dorsal sepal and forming a hood, ovate, oblique, 2–3 × ca. 1.7 mm, 1-veined, apex acute;

lip oblong-obovate, 6–8 × ca. 4 mm, 3-lobed below middle; lateral lobes narrowly oblong, slightly falcate, 3–4 × ca. 1 mm, broadening slightly toward apex, apex truncate-obtuse; mid-lobe oblanceolate, ca. 5 × 3.5 mm, widening gradually from narrow base, deeply divided above middle to form 2 distinct lobules, sinus usually with a small tooth; spur pendulous, straight to slightly incurved, cylindrical, 4–6 mm, shorter than ovary, attenuate toward apex, apex acute; viscidia suborbicular; stigma lobes oblong. Fl. Jul.

- Forests; ca. 2000 m. Chongqing, NE Sichuan.

**10. *Amitostigma tetralobum*** (Finet) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 95. 1919.

滇蜀无柱兰 dian shu wu zhu lan

*Peristylus tetralobus* Finet, Rev. Gén. Bot. 13: 524. 1901; *Amitostigma yunnanense* Schlechter; *Orchis tetraloba* (Finet) Schlechter; *O. tetraloba* var. *yunnanensis* (Schlechter) Soó.

Plants 7–26 cm tall. Tubers subglobose to oblong, 10–15 × 5–10 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf cauline, porrect, linear-lanceolate, 2–8 × 0.3–0.8 cm, apex acute. Peduncle ebracteate or with 1 occasionally foliaceous sterile bract; rachis 1–3.5 cm, laxly to subdensely 3- to more than 10-flowered; floral bracts lanceolate, 3–6 mm, usually shorter than ovary, apex acute. Flowers secund, pink to pale purple; ovary and pedicel 6–9 mm. Dorsal sepal erect, oblong-ovate, concave, 2.5–3.3 × ca. 2 mm, 1-veined, apex obtuse; lateral sepals spreading to reflexed, ovate, slightly oblique, 3–4 × ca. 1.8 mm, 1-veined, apex obtuse. Petals loosely connivent with dorsal sepal and forming a hood, broadly ovate, slightly oblique, 2.8–3.5 × ca. 2 mm, 1-veined, apex obtuse; lip rhombic-obovate, 4.5–6(–8) × 3.5–4 mm, 3-lobed near middle; disk finely papillate; lateral lobes oblong-obovate, 2–3.5 × 1.6–2 mm, apex obtuse-truncate; mid-lobe oblong-obovate, 2.5–4 × ca. 2 mm, base attenuate, apex usually obtuse-truncate, or occasionally emarginate to shallowly notched to form 2 small lobules; spur ± pendulous, slightly incurved, cylindrical, 3.5–6 mm, slightly dilated toward apex, apex obtuse; viscidia narrowly elliptic; stigma lobes clavate. Fl. Jun–Aug.

- Rocky soils in forests, grassy slopes; 1500–2700 m. SW Sichuan, SW and W Yunnan.

**11. *Amitostigma capitatum*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 4. 1936.

头序无柱兰 tou xu wu zhu lan

Plants 8–14 cm tall. Tubers ellipsoid, 6–8 mm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf cauline, porrect, narrowly elliptic to narrowly oblong, 3.5–5 × 0.5–1.5 cm, apex acute. Peduncle ebracteate; rachis 0.8–1 cm, densely several to more than 10-flowered; floral bracts lanceolate, 3–5 mm, nearly as long as ovary, apex acuminate. Flowers white; ovary and pedicel 4–6 mm. Dorsal sepal ovate-elliptic, concave, 2–2.2 × 1.5–1.7 mm, inner surface finely papillate, 1-veined, apex obtuse; lateral sepals ovate-elliptic, oblique, 2.5–3 × 2–2.2 mm, inner surfaces finely papillate, 1-veined, apex obtuse. Petals broadly ovate, oblique, 1.5–1.8 × 1.8–2 mm, inner surfaces finely papillate, 2-veined, apex obtuse; lip obovate, ca. 5 × 3.3

mm, concave at base, 3-lobed near middle; lateral lobes ovate-oblong, slightly oblique, ca. 1.5 × 0.5 mm, apex obtuse; mid-lobe oblong, ca. 1.6 × 0.5 mm, apex truncate and shallowly notched, sinus with a small, acute tooth; spur pendulous, globose, ca. 1 mm, apex rounded; viscidia oblong; stigma lobes clavate. Fl. Jul.

- Rocky soils and damp places in forests; 2600–3600 m. W Hubei, E and W Sichuan.

**12. *Amitostigma gracile*** (Blume) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 93. 1919.

无柱兰 wu zhu lan

*Mitostigma gracile* Blume, Mus. Bot. 2: 190. 1856; *Amitostigma chinense* (Rolfe) Schlechter; *A. formosensis* (S. S. Ying) S. S. Ying; *A. yunkianum* Fukuyama; *Cynosorchis chinensis* Rolfe; *C. gracilis* (Blume) Kraenzlin; *Gymnadenia gracilis* (Blume) Miquel; *G. tryphiiformis* H. G. Reichenbach; *Orchis formosensis* S. S. Ying; *O. gracilis* (Blume) Soó; *O. gracilis* var. *chinensis* (Rolfe) Soó; *O. sooi* S. S. Ying; *O. yunkiana* (Fukuyama) S. S. Ying; *Ponerorchis formosensis* (S. S. Ying) S. S. Ying.

Plants 7–25 cm tall. Tubers ovoid to oblong-ellipsoid, 8–15 × 5–10 cm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf usually basal, porrect, oblong to ovate-lanceolate, 3–12 × 0.8–3 cm, apex obtuse or acute. Peduncle with 1 sterile bract; rachis 0.5–4 cm, subdensely 5- to more than 15-flowered; floral bracts ovate-lanceolate, 2–3 mm, much shorter than ovary. Flowers often secund, pink, purplish red, or purple; ovary and pedicel 4–8 mm, usually straight. Dorsal sepal ovate, concave, 2–3 × 1.2–2 mm, 1-veined, apex obtuse; lateral sepals erect to spreading, ovate to obovate, slightly oblique, 2–3 × 1.2–1.8 mm, 1-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, elliptic to ovate, oblique, 2–3 × ca. 2 mm, 1-veined, apex acute to obtuse; lip obovate, 3.5–5(–7) × 2.5–3.2 mm, 5–7(–9)-veined, base cuneate, 3-lobed above middle; lateral lobes linear-oblong to triangular, often falcate, 1–2 × 0.5–0.8 mm, apex obtuse-truncate or acute; mid-lobe obovate, 2–2.8 × 1.2–1.8 mm, larger than lateral lobes, apex truncate or obtuse-rounded, sometimes emarginate; spur pendulous, straight to very slightly incurved, cylindrical, 1–2.5(–3.5) mm, much shorter than ovary, apex obtuse; viscidia elliptic; stigma lobes subclavate. Fl. Jun–Jul, fr. Sep–Oct.  $2n = 42$ .

Damp rocky soils in forests, crevices, valleys; 200–3000 m. Anhui, N Fujian, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shaanxi, Shandong, Sichuan, Taiwan, Zhejiang [Japan, Korea].

**13. *Amitostigma trifurcatum*** Tang, F. T. Wang & K. Y. Lang, Acta Phytotax. Sin. 20: 80. 1982.

三叉无柱兰 san cha wu zhu lan

Plants 24–36 cm tall. Tubers globose, 7–10 mm in diam. Stem with 2 tubular sheaths at base, 1-leaved. Leaf cauline, porrect, narrowly oblong-lanceolate, 5.5–7.5 × 0.5–0.7 cm, apex acute. Peduncle with 2 occasionally foliaceous sterile bracts; rachis 2–6 cm, subdensely 6–9-flowered; floral bracts lanceolate, 4–5 mm, shorter than ovary, apex acuminate. Flowers

second, rose-pink with darker spots on lip; ovary and pedicel 6–7 mm. Dorsal sepal erect, narrowly elliptic-lanceolate, 3–4 × 1–1.5 mm, 1-veined, apex subacute; lateral sepals spreading to reflexed, narrowly elliptic-lanceolate, slightly oblique, 3.2–4.2 × 1–1.5 mm, apex subacute. Petals forming a hood to erect, narrowly ovate-lanceolate, slightly oblique, 3–3.8 × ca. 1.5 mm, 1-veined, apex subacute; lip narrowly elliptic, 5–7.5 × 2.4–3 mm, with 5 stout, raised veins, 3-lobed below middle; lateral lobes lanceolate to narrowly triangular, 1–1.5 × ca. 0.3 mm, apex obtuse or acute; mid-lobe oblong-ligulate, 3.5–4 × 1–1.5 mm, apex obtuse; spur pendulous, subconic to broadly cylindrical, 1–1.5 mm, apex obtuse; viscidia narrowly ovate, large; stigma lobes subclavate. Fl. Sep.

- Marshes, wet grasslands; ca. 2900 m. NW Yunnan.

**14. *Amitostigma basifoliatum*** (Finet) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 92. 1919.

四裂无柱兰 *si lie wu zhu lan*

*Peristylus tetralobus* Finet f. *basifoliatum* Finet, Rev. Gén. Bot. 13: 525. 1901; *Orchis basifoliata* (Finet) Schlechter.

Plants 10–23 cm tall. Tubers subglobose, 5–10 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf basal or cauline, porrect, narrowly oblong-lanceolate, 3.5–7 × 0.5–1.4 cm, apex acute. Peduncle ebracteate; rachis 0.5–3 cm, ± laxly 4- to densely more than 10-flowered; floral bracts ovate-lanceolate, 3–6 mm, shorter than ovary, apex acute to acuminate. Flowers second, white often tinged pinkish red, with purple spots on lip; ovary and pedicel 6–10 mm. Dorsal sepal erect, ovate-oblong, concave, 3–3.5 × ca. 1.7 mm, 1-veined, apex obtuse; lateral sepals spreading to reflexed, oblong, oblique, 4–4.5 × ca. 2 mm, 1-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, rhombic-ovate, 4–4.5 × ca. 2.5 mm, 1-veined, apex acute; lip broadly obovate, 5–7 × 7–9 mm, 3-lobed below middle; lateral lobes oblong, slightly falcate, 3–5 × 2–3 mm, apex irregularly obtuse-toothed; mid-lobe obovate-flabellate, 4–5 × 4–6 mm, base cuneate, apex truncate, irregularly crenulate to shallowly notched to form 2 small lobules, sinus often with a short obtuse tooth; spur pendulous, straight to slightly incurved, cylindrical, 2–3 mm, apex obtuse; viscidia ovoid; stigma lobes clavate-oblong. Fl. Jun–Jul.

- Damp places in forests, grassy slopes; 2600–3800 m. SW Sichuan, NE and NW Yunnan.

**15. *Amitostigma faberi*** (Rolfe) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 93. 1919.

峨眉无柱兰 *e mei wu zhu lan*

*Habenaria faberi* Rolfe, Bull. Misc. Inform. Kew 1896: 201. 1896; *Gymnadenia faberi* (Rolfe) Rolfe; *Orchis faberi* (Rolfe) Soó.

Plants 3.5–15(–21) cm tall. Tubers ovoid, 5–10 mm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf cauline, porrect, linear-lanceolate to narrowly oblong-elliptic, 3–6 × 0.5–1.3 cm, apex acute or obtuse. Peduncle with 1 sterile bract; rachis 1.5–8 cm, several to more than 10-flowered (rarely 1- or 2-flowered); floral bracts ovate-lanceolate, ca. 3 mm, much shorter than ovary, apex acuminate. Flowers often second,

pinkish purple; ovary and pedicel 8–10 mm. Dorsal sepal broadly oblong-elliptic, concave, 2.5–3.5 × 2–3 mm, 1-veined, apex obtuse; lateral sepals spreading, broadly ovate, slightly oblique, 3–4 × 2–3 mm, 1-veined. Petals connivent with dorsal sepal and forming a hood, broadly ovate-orbicular, slightly oblique, 2–3 × 2.5–3 mm, 1-veined, margin somewhat undulate, apex obtuse; lip broadly ovate-orbicular, 6–7.5 × 6.2–7.5 mm, base cuneate, 3-lobed below middle; disk densely papillate; lateral lobes overlapping mid-lobe, oblong, slightly falcate, 2.5–3.8 × ca. 1.5 mm, apical margin crenate, apex obtuse; mid-lobe obovate, 3–4.2 × 6–7 mm, base cuneate and shortly clawed, apical margin irregularly crenate, deeply notched toward apex to form 2 distinct lobules, sinus with an obtuse tooth; spur pendulous, slightly incurved, cylindrical-clavate, 5–6 mm, slightly dilated toward apex, apex obtuse; viscidia ovate-lanceolate; stigma lobes clavate. Fl. Jul.

- Forests, scrub, valleys, crevices, alpine grasslands, grassy slopes; (600–)2300–4300 m. NE Guizhou, Sichuan, NW Yunnan.

**16. *Amitostigma gonggashanicum*** K. Y. Lang, Acta Phytotax. Sin. 22: 312. 1984.

贡嘎无柱兰 *gong sha wu zhu lan*

Plants 16–30 cm tall. Tubers ovoid to globose, 10–15 × ca. 10 mm. Stem with 2 tubular sheaths at base, 1-leaved. Leaf cauline, erect, narrowly oblong-elliptic, 5.5–8 × 0.6–1.6 cm, apex acute. Peduncle ebracteate; rachis 2.5–5 cm, subdensely 3–14-flowered; floral bracts lanceolate or ovate-lanceolate, shorter than ovary, apex acute. Flowers purplish red, 1–2 cm in diam., lip white; ovary and pedicel 15–20(–25) mm. Dorsal sepal erect, oblong-ovate, ca. 7 × 3.5 mm, 3-veined, apex obtuse; lateral sepals spreading, oblong-ovate, slightly oblique, ca. 7.2 × 3.5 mm, 3-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, ovate, ca. 6 × 4 mm, 3(–5)-veined, apex obtuse; lip broadly ovate, ca. 13 × 13 mm, with a dense cluster of hairs near base, deeply 3-lobed near base; lateral lobes obovate, ca. 4 × 4 mm, margin undulate, apex obtuse; mid-lobe broadly obovate, ca. 7 × 6 mm, margin undulate, deeply notched toward apex to form 2 distinct lobules, sinus with a small obtuse tooth; spur pendulous, cylindrical-conic, ca. 4 mm, apex obtuse; viscidia ovate; stigma lobes elliptic. Fl. Jun–Jul.

- Forests; 2400–3800 m. SW Sichuan.

**17. *Amitostigma alpestre*** Fukuyama, Bot. Mag. (Tokyo) 49: 664. 1935.

台湾无柱兰 *tai wan wu zhu lan*

*Orchis alpestre* (Fukuyama) S. S. Ying.

Plants 5–20 cm tall. Tubers ovoid to subglobose, 5–7 × 3–4 mm. Stem with 2 tubular sheaths at base, (1 or)2-leaved. Leaves cauline, erect to porrect, usually widely spaced, oblanceolate to linear, 3.5–7.5 × 0.5–1 cm, apex acute. Peduncle ebracteate; rachis less than 1 cm, 2–4-flowered; floral bracts green or purple, lanceolate, 5–7 mm, slightly shorter than ovary, apex acuminate. Flowers often second, pale pink to white with darker pink spots on lip; ovary and pedicel 5–8 mm. Dorsal sepal erect, ovate-oblong, concave, 4–5 × 2–2.5 mm, 1-veined,

apex obtuse; lateral sepals spreading, narrowly elliptic or ovate-oblong, slightly oblique, 5–6.5 × 2–3 mm, 3-veined, apex acute. Petals connivent with dorsal sepal and forming a hood, ovate-lanceolate, slightly oblique, 4–5 × 1.4–1.6 mm, 1–3-veined, apex obtuse; lip obovate, 5–6.5 × 4.5–5.5 mm, 3-lobed near middle; disk finely papillate; lateral lobes ovate-oblong, falcate, 2.8–3.5 × ca. 0.5 mm, apex acute or obtuse; mid-lobe obovate-quadrangle, 4–4.5 × ca. 4.5 mm, apex truncate and shallowly notched to form 2 lobules, sinus with a small tooth; spur pendulous, slightly incurved, cylindrical, 4–4.5 mm, shorter than ovary, slightly attenuate toward apex, apex obtuse; viscidia ovate. Fl. Jul.

• Alpine grasslands, rocky patches; 2500–3800 m. C and N Taiwan.

**18. *Amitostigma yuanum*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 26. 1940.

齿片无柱兰 *chi pian wu zhu lan*

Plants 7.5–15 cm tall. Tubers globose, 3–5 mm in diam. Stem with 1 or 2 tubular sheaths at base, 2-leaved. Leaves cauline, erect to prostrate, widely spaced, narrowly ovate, oblong-lanceolate, or oblanceolate, 0.6–3.5 × 0.3–0.6 mm, apex acute. Peduncle ebracteate; rachis 1- or 2-flowered; floral bracts narrowly ovate to oblong-lanceolate, 7–8 mm, ca. as long as ovary, apex acute or acuminate. Flowers pink or white, 1–1.5 cm in diam.; ovary and pedicel 7–8 mm. Dorsal sepal erect, concave, oblong, ca. 4 × 1.5–2 mm, 1-veined, apex obtuse; lateral sepals reflexed, ovate-oblong, slightly oblique, ca. 5 × 2.5 mm, 1-veined, apex acute. Petals loosely connivent with dorsal sepal and forming a hood, ovate, ca. 3 × 2 mm, 3-veined, margin crenulate, apex acute; lip orbicular to transversely elliptic, ca. 7 × 8.5 mm, 3-lobed toward apex; disk finely papillate; lateral lobes quadrate, oblique, ca. 2 × 2.5 mm, slightly widened toward apex, 3-veined, apical margin crenulate, apex truncate; mid-lobe subquadrate, smaller than lateral lobes, ca. 1.3 × 2 mm, 3-veined, apex truncate and shallowly notched, sinus with a small acute tooth; spur pendulous, straight to slightly incurved, cylindrical, 5–7 mm, slightly shorter than ovary, slightly attenuate toward apex, apex obtuse; viscidia ellipsoid; stigma lobes oblong. Fl. Jul–Aug.

• On moss in *Rhododendron* thickets, alpine grasslands; 3000–3700 m. SE Xizang, NW Yunnan.

**19. *Amitostigma papilionaceum*** Tang, F. T. Wang & K. Y. Lang, Acta Phytotax. Sin. 20: 83. 1982.

蝶花无柱兰 *die hua wu zhu lan*

Plants 2–3.5 cm tall. Tubers oblong, 6–10 × ca. 4 mm. Stem with tubular sheaths at base, 2-leaved. Leaves basal, subopposite, prostrate, ovate-orbicular, elliptic, or lanceolate, 0.3–0.7 × 0.1–0.6 cm, slightly fleshy, apex acute. Peduncle ebracteate; rachis 1-flowered; floral bract ovate-lanceolate, ca. 3 mm, much shorter than ovary, apex acute. Flower horizontal to erect, pale purple, with dark purple spots at base of lip, rather large; ovary and pedicel ca. 7 mm. Dorsal sepal erect, ovate-lanceolate, concave, 4–5 × 1.3–1.5 mm, 1-veined, apex subobtusely; lateral sepals spreading, oblong-lanceolate, slightly oblique, 4–5 ×

1.3–1.5 mm, 1-veined, apex subobtusely. Petals connivent with dorsal sepal and forming a hood, ovate, slightly oblique, 4.5–5.5 × 2–2.5 mm, 1- or 2-veined, apex subobtusely; lip broadly elliptic-obovate, 7–9 × 5–8 mm, deeply 3-lobed below middle; lateral lobes linear-oblong, 3–4.5 × 1–2 mm, 1-veined, apex obtuse; mid-lobe spatulate to obovate, 5–5.5 × 4–5 mm, 3-veined, margin denticulate, apex rounded; spur pendulous, globose, 1.5–2 mm, apex rounded. Fl. Jul.

• Rocky soils, cliffs; ca. 2500 m. NW Sichuan.

**20. *Amitostigma bifoliatum*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 127. 1936.

棒距无柱兰 *bang ju wu zhu lan*

Plants 6.5–17 cm tall. Tubers ovoid to ellipsoid, ca. 10 × 5–6 mm. Stem with 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, erect to prostrate, broadly ovate to ovate-lanceolate, 1.5–3 × 0.4–0.8 cm, apex acute to acuminate. Peduncle ebracteate; rachis 2–5 cm, subdensely several to more than 10-flowered; floral bracts lanceolate, shorter than ovary, apex acuminate. Flowers mostly secund, pale purple; ovary and pedicel ca. 8 mm. Dorsal sepal elliptic-ovate, concave, ca. 4 × 2 mm, 1-veined, apex acute; lateral sepals reflexed, ovate-lanceolate, slightly oblique, ca. 4 × 2 mm, 1-veined, apex acute. Petals connivent with dorsal sepal and forming a hood, ovate, oblique, ca. 3.5 × 1.5 mm, 1-veined, apex acute; lip rhombic, ca. 6 × 5–7 mm, 3-lobed below middle; disk finely papillate; lateral lobes linear; mid-lobe cuneate-oblong, ca. 3 mm, apex slightly dilated and irregularly serrulate; spur pendulous, slightly incurved, cylindrical-clavate, ca. 3 mm, neck contracted, apex obtuse; viscidia elliptic; stigma lobes clavate. Fl. Aug–Sep.

• Damp places, shrubby slopes, grasslands; 700–1200 m. S Gansu, N Sichuan.

**21. *Amitostigma wenshanense*** W. H. Chen, Y. M. Shui & K. Y. Lang, Acta Bot. Yunnan. 25: 521. 2003.

文山无柱兰 *wen shan wu zhu lan*

Plants ca. 20 cm tall. Tubers oblong, ca. 40 × 15 mm. Stem with 1 or 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, erect to prostrate, oblong-oblanceolate, 6–6.5 × 1–1.6 cm, apex acute. Peduncle ebracteate; rachis 1.5–2.5 cm, subdensely 6–9-flowered; floral bracts ovate-lanceolate, 1.5–2.5 mm, shorter than ovary, apex acute. Flowers not secund; ovary and pedicel ca. 8 mm. Dorsal sepal oblong-lanceolate, ca. 3 × 2 mm, 1-veined, apex obtuse; lateral sepals reflexed, obovate, oblique, ca. 4 × 2.5 mm, 1-veined, apex acute. Petals connivent with dorsal sepal and forming a hood, ovate, oblique, ca. 3 × 2 mm, 1-veined, apex acute; lip ovate, 4.5–5 × ca. 1.5 mm, 3-lobed above middle; disk with 2 short longitudinal lamellae; lateral lobes ovate; mid-lobe lanceolate, ca. 1.8 mm, apex obtuse; spur pendulous, slightly incurved, subglobose, ca. 1.3 mm, apex rounded. Fl. Aug.

• Damp places in forests; ca. 3000 m. Yunnan.

**22. *Amitostigma physoceras*** Schlechter, Acta Horti Gothob. 1: 133. 1924.

球距无柱兰 *qiu ju wu zhu lan*

*Orchis physoceras* (Schlechter) Soó.

Plants 6–11 cm tall. Tubers subglobose, ca. 10 mm in diam. Stem 2-leaved. Leaves basal, subopposite, usually appressed to substratum, ovate to ovate-lanceolate, 1–2 × 0.7–1.4 cm, apex acute to subacuminate. Peduncle ebracteate; rachis to 6 cm, subdensely 3–10-flowered; floral bracts lanceolate, much shorter than ovary, apex acuminate. Flowers secund, pinkish purple; ovary and pedicel 5–9 mm. Dorsal sepal erect, lanceolate to ovate-lanceolate, concave, ca. 5 × 2 mm, 1-veined, apex acuminate; lateral sepals reflexed, lanceolate to ovate-lanceolate, slightly oblique, concave, ca. 5 × 2 mm, 1-veined, apex

acuminate. Petals ovate-lanceolate, ca. 5 × 3 mm, 1-veined, apex acute; lip ovate, ca. 9 × 7–8 mm, base broadly cuneate, deeply 3-lobed; disk finely papillate; lateral lobes slightly diverging, obovate-subrhombic, oblique, ca. 3 mm, apical margin subcrenulate, apex obtuse; mid-lobe suborbicular-obovate, ca. 5 × 4 mm, margin irregularly denticulate, apex obtuse; spur pendulous, with a short, contracted neck and then dilated and globose, ca. 3 mm, much shorter than ovary; viscidia elliptic; stigma lobes clavate. Fl. Jul–Aug.

• Forests, damp places along cliffs, valleys; 2000–2700 m. NW and W Sichuan.

**37. NEOTTIANTHE** (Reichenbach) Schlechter, *Repert. Spec. Nov. Regni Veg.* 16: 290. 1919.

兜被兰属 *dou bei lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

*Himantoglossum* subg. *Neottianthe* Reichenbach, *Icon. Bot. Pl. Crit.* 6: 26. 1828; *Symphiosepalum* Handel-Mazzetti.

Herbs, terrestrial, slender. Tubers subglobose to ovoid, unlobed, fleshy, neck with several slender roots. Stem erect or ascending, with tubular sheaths at base, (1 or)2-leaved, glabrous. Leaves basal, subopposite, (though cauline, alternate, and widely spaced in *Neottianthe secundiflora*), base contracted into amplexicaul sheath. Inflorescence a terminal raceme, glabrous; peduncle elongate, with 1 to a few scattered sterile bracts; rachis usually several to many flowered, rarely with a solitary flower. Flowers often secund, resupinate, pink, purple, or rarely pale yellow; ovary slightly twisted, cylindrical-fusiform, glabrous. Sepals connivent and forming a hood, narrowly oblong to lanceolate, subequal in size. Petals appressed to dorsal sepal, linear to oblong; lip spreading, spurred at base, 3-lobed; disk densely finely papillate; lobes linear to oblong; mid-lobe longer and wider than lateral lobes; spur straight or curved forward. Column erect, short; anther erect, oblong or ellipsoid, apex obtuse, 2-locular, locules parallel; pollinia 2, oblong, granular-farinaceous, sectile; caudicles short; viscidia small, ovate, orbicular, or elliptic, naked; rostellum small, 3-lobed, raised, deltoid; stigma lobes confluent, raised, lying below rostellum; auricles 2, on either side of anther, small, inconspicuous, suborbicular. Capsule erect.

About seven species: E Europe, through Russia and China to Japan, extending to alpine areas of subtropical Asia; seven species (five endemic) in China.

- 1a. Flowers pale yellow to yellowish green; spur ca. 2.5 mm ..... 6. *N. luteola*
- 1b. Flowers pink, purplish red, or purple; spur 2.8–20 mm.
  - 2a. Rachis 1- or rarely 2-flowered; lip 12–13 × 12–13 mm; spur 15–20 mm ..... 7. *N. camptoceras*
  - 2b. Rachis 2–22-flowered; lip 4–10 × 1–7 mm; spur 2.8–7 mm.
    - 3a. Plants 1-leaved.
      - 4a. Leaf blade ovate or broadly ovate, 1.2–1.6 × 1–1.2 cm; spur ca. 3 × 1.5 mm ..... 4. *N. ovata*
      - 4b. Leaf blade oblong, 4–6 × 1.2–1.8 cm; spur 5–6 × 1.8–2 mm ..... 5. *N. oblonga*
    - 3b. Plants usually 2-leaved.
      - 5a. Leaves cauline, alternate, widely spaced ..... 3. *N. secundiflora*
      - 5b. Leaves basal, subopposite.
        - 6a. Plants 8–9 cm tall; dorsal sepal 9–10 × 3–3.5 mm; lateral sepals 10–11 × 3.5–4 mm ..... 2. *N. compacta*
        - 6b. Plants (4–)8–24 cm tall; dorsal sepal 4–7 × 1.5–2.7 mm; lateral sepals 5–8 × 1.5–2.8 mm ..... 1. *N. cucullata*

**1. Neottianthe cucullata** (Linnaeus) Schlechter, *Repert. Spec. Nov. Regni Veg.* 16: 292. 1919.

二叶兜被兰 *er ye dou bei lan*

Plants (4–)8–24 cm tall. Tubers subglobose to ovoid, 8–15 mm. Stem erect or ascending, with 1 or 2 tubular sheaths at base, (1 or)2-leaved. Leaves basal, subopposite, dark green, adaxially often with purple spots, ovate, elliptic, oblanceolate-spatulate, or narrowly oblong, 2.2–9 × (0.5–)1–3 cm, apex acute to obtuse. Peduncle ebracteate or with 1–4 sterile bracts; rachis 1.5–8 cm, laxly to subdensely 4–22-flowered; floral bracts lanceolate, 5–12 mm, lower ones exceeding ovary, apex acuminate. Flowers often secund, rose-pink to deep purple;

ovary and pedicel slightly arcuate, 5–7 mm. Sepals connivent and forming a hood; hood 5–8 × 3–5 mm; dorsal sepal oblong-lanceolate to lanceolate, (4–)5–7 × 1.5–2.7 mm, 1-veined, apex acute; lateral sepals lanceolate, oblique, 5–8 × 1.5–2.8 mm, 1-veined, apex acute to acuminate. Petals appressed to dorsal sepal, linear-lanceolate, 4–7 × 0.5–1.2 mm, 1-veined, apex acute to acuminate; lip spreading, narrowly oblong, 5–10 × 1.8–3 mm, base cuneate, 3-lobed near middle; lateral lobes linear-lanceolate, 2–6 × 0.3–0.5 mm, 1-veined, apex acute; mid-lobe linear-lanceolate, 4–8 × 1–2 mm, 3-veined, apex obtuse; spur pendulous, straight to strongly curved forward, cylindrical-conic, 4–6 mm, ca. 1 mm in diam. at base, apex obtuse. Fl. Jul–Oct.

Forests, thickets, grassy slopes, alpine grasslands; 400–4500 m.

Anhui, N Fujian, Gansu, NE Guizhou, Hebei, Heilongjiang, Henan, W Hubei, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, NW Yunnan, Zhejiang [Bhutan, N India, Japan, Korea, Mongolia, Nepal, Russia; E Europe].

- 1a. Leaves (0.5–)1–3 cm wide; peduncle with 1–4 sterile bracts; petals 4–5 mm; spur usually strongly curved forward and U-shaped ..... 1a. var. *cucullata*  
 1b. Leaves 0.5–1(–2.2) cm wide; peduncle ebracteate or rarely with 1 sterile bract; petals (4–)5–7 mm; spur straight to slightly curved forward ..... 1b. var. *calvicola*

**1a. Neottianthe cucullata** var. *cucullata*

二叶兜被兰(原变种) er ye dou bei lan (yuan bian zhong)

*Orchis cucullata* Linnaeus, Sp. Pl. 2: 939. 1753; *Gymnadenia cucullata* (Linnaeus) Richard; *G. cucullata* var. *maculata* Nakai & Kitagawa; *G. monophylla* Ames & Schlechter; *G. pseudodiphylax* Kraenzlin; *G. scabrilinguis* Kraenzlin; *Habenaria cucullata* (Linnaeus) Höfft; *Himantoglossum cucullatum* (Linnaeus) H. G. Reichenbach; *Neottianthe angustifolia* K. Y. Lang; *N. cucullata* f. *maculata* (Nakai & Kitagawa) Nakai & Kitagawa; *N. maculata* (Nakai & Kitagawa) Nakai & Kitagawa; *N. monophylla* (Ames & Schlechter) Schlechter; *N. pseudodiphylax* (Kraenzlin) Schlechter; *N. pseudodiphylax* var. *monophylla* (Ames & Schlechter) Soó.

Leaves ovate, elliptic, or sometimes narrowly oblong, (0.5–)1–3 cm wide, base cuneate, apex acute to obtuse. Peduncle with 1–4 small sterile bracts, lowest one sometimes herbaceous; rachis laxly to subdensely 4–22-flowered. Sepals and petals connivent and forming a hood; hood 3–5 mm wide. Dorsal sepal 4–6 × 1.5–2 mm; lateral sepals 1.5–2.5 mm wide. Petals 4–5 × ca. 0.5 mm; spur pendulous, usually strongly curved forward and U-shaped. Fl. Aug–Sep.

Open places in forests, thickets, grassy slopes; 400–4100 m. Anhui, N Fujian, Gansu, Hebei, Heilongjiang, Henan, W Hubei, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, W Sichuan, Xizang, NW Yunnan, Zhejiang [Bhutan, N India, Japan, Korea, Mongolia, Nepal, Russia; E Europe].

**1b. Neottianthe cucullata** var. *calvicola* (W. W. Smith) Soó, Ann. Hist.-Nat. Mus. Natl. Hung. 26: 353. 1929.

密花兜被兰 mi hua dou bei lan

*Gymnadenia calvicola* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 188. 1914; *Neottianthe calvicola* (W. W. Smith) Schlechter; *N. gymnadenioides* (Handel-Mazzetti) K. Y. Lang & S. C. Chen; *Symphiosepalum gymnadenioides* Handel-Mazzetti.

Leaves oblanceolate-spatulate to narrowly oblong, 0.5–1(–2.2) cm wide, base gradually tapering, apex usually acute. Peduncle ebracteate or rarely with 1 sterile bract; rachis subdensely 6–20-flowered. Sepals and petals connivent and forming a hood; hood 4.5–5 mm wide. Dorsal sepal 4–7 × (1.5–)2–2.7 mm; lateral sepals (1.5–)2.5–2.8 mm wide. Petals (4–)5–7 × 0.5–1.2 mm; spur pendulous, straight to slightly curved forward. Fl. Jul–Oct.

Forests, thickets, alpine grasslands; 2100–4500 m. SE Gansu, NE Guizhou, S Qinghai, S and W Sichuan, E and S Xizang, NW Yunnan [Bhutan, India (Sikkim), Nepal].

**2. Neottianthe compacta** Schlechter, Acta Horti Gothob. 1: 136. 1924.

川西兜被兰 chuan xi dou bei lan

Plants 8–9 cm tall. Tubers ellipsoid, 10–20 mm. Stem erect, with 1 or 2 tubular sheaths at base, 2-leaved. Leaves basal, subopposite, narrowly oblong to oblong-lanceolate, 5–6 × 1–1.5 cm, apex obtuse. Rachis 3–3.5 cm, densely 6–8-flowered; floral bracts herbaceous, narrowly lanceolate, slightly longer than ovary, apex acuminate. Flowers pink; ovary and pedicel 6–7 mm. Sepals connivent and forming a hood; hood 10–11 × ca. 10 mm; dorsal sepal narrowly oblong-lanceolate, concave, 9–10 × 3–3.5 mm, 3-veined, apex subacute; lateral sepals lanceolate-falcate, oblique, 10–11 × 3.5–4 mm, 2-veined, apex acuminate. Petals appressed to dorsal sepal, linear-falcate, 8–9 × 1.4–1.5 mm, inner surfaces papillate, 1-veined, apex obtuse; lip reflexed, obovate, 9–10 × ca. 7 mm, base cuneate, 3-lobed below middle; lateral lobes obliquely ligulate, ca. 3 mm, apex obtuse; mid-lobe narrowly ligulate, ca. 6 mm, apex obtuse; spur pendulous, slightly curved forward, cylindric-conic, 6–7 mm, stout, ca. 2.5 mm in diam. at base, apex obtuse. Fl. Aug.

• Alpine meadows; 4000–4100 m. W Sichuan.

**3. Neottianthe secundiflora** Schlechter, Repert. Spec. Nov. Regni Veg. 16: 291. 1919.

侧花兜被兰 ce hua dou bei lan

*Habenaria secundiflora* J. D. Hooker, Fl. Brit. India 6: 165. 1890, not Barbosa Rodrigues (1881); *Gymnadenia secundiflora* Kraenzlin; *Neottianthe mairei* Schlechter; *Peristylus secundiflorus* Kraenzlin.

Plants 10–35 cm tall. Tubers subglobose to ellipsoid, 8–15 mm. Stem erect, with 1 or 2 tubular sheaths at base, 2-leaved. Leaves cauline, alternate, widely spaced, linear to narrowly oblong, 5–14 × 0.4–1 cm, apex acuminate to subacute. Peduncle with 1–4 sterile bracts, lowest one usually large and herbaceous; rachis 7–9 cm, laxly 8- to densely more than 30-flowered; floral bracts linear-lanceolate, to 25 mm, basal ones exceeding flowers, apex acuminate. Flowers mostly secund, pale to dark purple; ovary and pedicel 6–7 mm. Sepals connivent and forming a hood; hood 5–7 × 3–5 mm; dorsal sepal erect, lanceolate, concave, 5–6 × 1.5–1.8 mm, 1-veined, apex acute; lateral sepals lanceolate-falcate, oblique, 6–7 × 1.8–2.8 mm, 1-veined, apex acute. Petals appressed to dorsal sepal, linear to oblong-lanceolate, 5–5.5 × 0.7–1.2(–1.5) mm, 1-veined, apex acute; lip spreading, slightly reflexed, narrowly oblong, 4.5–6.5 × 2–3 mm, base attenuate, 3-lobed toward apex; lateral lobes oblong-ovate to lanceolate, 0.8–1.8 × 0.5–1 mm, apex obtuse or acute; mid-lobe narrowly oblong-ovate, 1.5–2.2 × 0.8–1.5 mm, apex obtuse or acute; spur pendulous, straight to slightly curved forward, conic, stout, 2.8–4 × 1.5–1.8 mm, apex obtuse. Fl. Aug–Oct.

Forests, grassy slopes; 2700–3800 m. W Sichuan, E and S Xizang, NW Yunnan [Bhutan, India, Myanmar, Nepal].

**4. *Neottianthe ovata*** K. Y. Lang, Acta Phytotax. Sin. 35: 542. 1997.

卵叶兜被兰 luan ye dou bei lan

Plants 6–10 cm tall. Tubers subglobose, ca. 10 mm. Stem erect, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal, ovate or broadly ovate, 1.2–1.6 × 1–1.2 cm, base rounded or broadly cuneate, apex acute. Peduncle with 1 small sterile bract; rachis 2–4 cm, subdensely 4–8-flowered; floral bracts lanceolate, 4–6 mm, apex acuminate, basal one ca. as long as ovary. Flowers secund, pale purple or pink; ovary and pedicel slightly arcuate, 4–6 mm. Sepals connivent and forming a hood; hood ca. 6 × 4 mm; dorsal sepal oblong, concave, ca. 6 × 1.6 mm, 1–3-veined, apex obtuse; lateral sepals oblong, ca. 6 × 1.6 mm, 2-veined, apex obtuse. Petals appressed to dorsal sepal, linear, ca. 5.5 × 0.7 mm, 1-veined, apex subobtuse; lip spreading, oblong-ovate, ca. 6 × 3 mm, base cuneate, 3-lobed near middle; lateral lobes linear-lanceolate, ca. 2.5 × 0.4 mm, 1-veined, apex acuminate; mid-lobe oblong, ca. 3.5 × 1 mm, 3-veined, apex subobtuse or rarely notched; spur pendulous, slightly curved forward, conic, ca. 3 mm, stout, ca. 1.5 mm in diam. at base, slightly attenuate, apex obtuse. Fl. Sep.

• Alpine *Pinus* forests, shrubby slopes; 2400–3300 m. W Sichuan.

In the protologue, the specimen *Qinghai-Xizang Exped. 13979* (PE) was indicated as “holotype” and *P. C. Li 207* (PE) was indicated as a “type.” The latter is interpreted as a paratype.

**5. *Neottianthe oblonga*** K. Y. Lang, Acta Phytotax. Sin. 35: 544. 1997.

长圆叶兜被兰 chang yuan ye dou bei lan

Plants 9.5–14 cm tall. Tubers ovoid, ca. 10 mm. Stem erect, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf basal, oblong, 4–6 × 1.2–1.8 cm, apex subobtuse or subacute. Peduncle ebracteate; rachis 4–5 cm, subdensely 5–9-flowered; floral bracts lanceolate, 6–8 mm, shorter than ovary, apex acuminate. Flowers secund, pale purple; ovary and pedicel slightly arcuate, 8–10 mm. Sepals connivent and forming a hood; hood 7–8 × ca. 5 mm; dorsal sepal linear-lanceolate, 6–7.5 × 1.4–1.6 mm, 1-veined, apex acuminate; lateral sepals lanceolate, oblique, 7–8.5 × 2–2.2 mm, 1-veined, apex acuminate. Petals appressed to dorsal sepal, linear, 5–6.5 × 0.8–1 mm, 1-veined, apex acuminate; lip spreading, narrowly oblong-ovate, 8–9 × ca. 4 mm, 3-lobed near middle; lateral lobes linear-lanceolate, 3–3.5 × 0.5–0.7 mm, 1-veined, apex obtuse; mid-lobe lanceolate, 4–4.5 × 1.3–1.5 mm, 3-veined, apex obtuse; spur pendulous, ± straight to slightly curved forward, conic, 5–6 mm, stout, 1.8–2 mm in diam. at base, slightly attenuate, apex obtuse. Fl. Aug.

• *Quercus* forests; ca. 3100 m. NW Yunnan.

**6. *Neottianthe luteola*** K. Y. Lang & S. C. Chen, Acta Phytotax. Sin. 35: 545. 1997.

淡黄花兜被兰 dan huang hua dou bei lan

Plants 13–17 cm tall. Tubers subglobose, 10–15 mm. Stem erect or ascending, with 1 or 2 tubular sheaths at base, 1-leaved. Leaf subbasal, erect-spreading, linear to linear-lanceolate, 9–10 × 0.4–0.6 cm, apex acuminate. Peduncle with 1 small sterile bract above middle; rachis 4–6 cm, densely 9–13-flowered; floral bracts lanceolate, apex acuminate, basal ones exceeding flowers. Flowers not secund, pale yellow to yellowish green, small; ovary and pedicel 5–6 mm. Sepals connivent and forming a hood; hood ca. 4.5 × 4 mm; dorsal sepal erect, oblong, concave, ca. 4.5 × 1.5 mm, 1-veined, apex obtuse; lateral sepals oblong, oblique, ca. 4.5 × 1.5 mm, 1-veined, apex obtuse. Petals appressed to dorsal sepal, oblong, slightly oblique, ca. 4 × 1.4 mm, 1-veined, apex obtuse; lip spreading, obovate, ca. 4 × 2.8 mm, base cuneate, 3-lobed near middle; lateral lobes oblong, ca. 1.5 × 0.7 mm, apical margin irregularly 2- or 3-denticulate, apex obliquely truncate; mid-lobe oblong, ca. 2 × 1 mm, apex notched and forming 2 small teeth; spur pendulous, straight, cylindrical-conic, ca. 2.5 mm, stout, ca. 1.2 mm in diam. at base, apex obtuse. Fl. Sep–Oct.

• Humid grassy slopes; ca. 3000 m. NW Yunnan.

**7. *Neottianthe camptoceras*** (Rolfe) Schlechter, Repert. Spec. Nov. Regni Veg. 16: 292. 1919.

大花兜被兰 da hua dou bei lan

*Habenaria camptoceras* Rolfe, J. Linn. Soc., Bot. 29: 319. 1892; *Amitostigma potaninii* K. V. Ivanova; *A. potaninii* f. *macranthum* K. V. Ivanova; *Galearis constricta* (L. O. Williams) P. F. Hunt; *Galeorchis constricta* (L. O. Williams) Soó; *Gymnadenia camptoceras* (Rolfe) Schlechter; *Orchis constricta* L. O. Williams.

Plants 4.5–10 cm tall. Tubers subglobose, ca. 10 mm. Stem erect, 2-leaved. Leaves basal, subopposite, elliptic to ovate-lanceolate, 2.5–3 × 0.5–1 cm, apex acute. Rachis 1- or rarely 2-flowered; floral bract lanceolate, slightly shorter than ovary, apex acuminate. Flower deep purple, large; ovary and pedicel 12–13 mm. Sepals connivent and forming hood; hood ca. 9 × 8 mm; dorsal sepal narrowly oblong-ovate, concave, ca. 8 × 2.2 mm, 3-veined, apex obtuse; lateral sepals lanceolate-falcate, oblique, ca. 9 × 4 mm, 3-veined, apex obtuse. Petals appressed to dorsal sepal, linear-lanceolate, ca. 7.5 × 1.2 mm, 1- or 2-veined, apex obtuse; lip spreading, broadly oblong-ovate, 12–13 × 12–13 mm, 3-lobed near base; disk with a few white spots; lateral lobes oblong-ligulate, ca. 5 × 2 mm, apex obtuse; mid-lobe ovate-rhombic, ca. 10 × 8 mm, apex rounded-obtuse; spur pendulous, curved forward or hooked near apex, cylindrical, dilated toward apex, 15–20 mm, conspicuously longer than ovary, apex obtuse. Fl. May–Jun.

• Forests, grassy slopes; 2700–3100 m. SW and W Sichuan.

### 38. GYMNADENIA R. Brown in W. T. Aiton, Hortus Kew., ed. 2, 5: 191. 1813.

手参属 shou shen shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Nigritella* Richard.

Herbs, terrestrial, medium-sized, slender to robust. Tubers palmately lobed, fleshy, neck with several slender, slightly fleshy

roots. Stem erect, terete, fleshy, glabrous, leafy. Leaves cauline, alternate, linear-ligulate to elliptic, basally conduplicate and sheathing stem. Inflorescence capitate to elongate, with a few lanceolate sterile bracts proximally and many flowers in a dense terminal raceme; floral bracts shorter than, equal to, or slightly longer than ovary. Flowers resupinate, small to medium-sized; ovary usually twisted, narrowly cylindrical or fusiform, glabrous. Sepals free, spreading; dorsal sepal concave; lateral sepals reflexed. Petals connivent with dorsal sepal and forming a hood, straight, slightly shorter than sepals; lip broadly rhombic to obovate, concave at base, spurred, conspicuously 3-lobed to entire; spur often slightly arcuate, cylindrical, longer or shorter than ovary, apex obtuse or bilobed. Column short; anther oblong or ovoid, 2-locular; pollinia 2, clavate, granular-farinaceous, sectile, each with a slender caudicle attached to a separate viscidium; viscidia naked, narrowly oblong to elliptic; rostellum small to elongate, inconspicuously 3-lobed; staminodes 2, small, subglobose, placed laterally at base of anther; stigma distinctly 2-lobed, rather large, placed at base of column. Capsule erect.

About 16 species: throughout Europe and parts of C and E Asia, the Himalayas, and Japan; five species (three endemic) in China.

- 1a. Spur 7–14 mm, ca. as long as or exceeding ovary.  
 2a. Leaves linear-lanceolate, narrowly oblong, or lorate, 0.8–2(–2.5) cm wide; mid-lobe of lip usually smaller than lateral lobes ..... 1. *G. conopsea*  
 2b. Leaves elliptic to elliptic-oblong, 2.5–4.5 cm wide; mid-lobe of lip equal to or slightly larger than lateral lobes ..... 2. *G. orchidis*  
 1b. Spur 2–5 mm, much shorter than ovary.  
 3a. Plants 50–70 cm tall; flowers yellowish green; spur shallowly 2-lobed at apex ..... 5. *G. bicornis*  
 3b. Plants 7–50 cm tall; flowers white or pink; spur undivided, apex obtuse.  
 4a. Flowers pink, rarely tinged with white; lip broadly obovate, 3-lobed at apex ..... 3. *G. crassinervis*  
 4b. Flowers white; lip rhombic-ovate, obscurely 3-lobed at apex ..... 4. *G. emeiensis*

**1. *Gymnadenia conopsea*** (Linnaeus) R. Brown in W. T. Aiton, Hortus Kew., ed. 2, 5: 191. 1813.

手参 shou shen

*Orchis conopsea* Linnaeus, Sp. Pl. 2: 942. 1753; *Gymnadenia conopsea* var. *latifolia* Schlechter; *G. conopsea* var. *ussuriensis* Regel; *G. sibirica* Turczaninow ex Lindley; *Habenaria conopsea* (Linnaeus) Benth.

Plants slender to robust, 20–60 cm tall. Tubers ovoid, 1–3.5 cm, with many short, slender lobes. Stem stout, with 2 or 3 tubular sheaths at base and 3–5 cauline leaves. Leaves widely spaced or clustered, linear-lanceolate, narrowly oblong, or lorate, 5.5–20 × 0.8–2(–2.5) cm, apex acuminate to subobtuse. Inflorescence 11–26 cm, slender; peduncle with 1 to a few scattered, lanceolate bracts 1.5–6 cm; rachis 4–12 cm, densely many flowered; floral bracts lanceolate, often longer than ovary and flower, apex long acuminate-caudate. Flowers fragrant, pink, rarely pinkish white; ovary 5–8 mm including pedicel. Dorsal sepal broadly elliptic to broadly ovate-elliptic, 3.5–5 × 3–4 mm, 3-veined, slightly concave, apex acute; lateral sepals reflexed, obliquely ovate, 4–5.5 × 3–4 mm, 3-veined, margin revolute, apex acute. Petals obliquely ovate-triangular, 3.5–5 × 3–4 mm, 3-veined, apex acute; lip spreading, broadly cuneate-obovate, 4–5 × 4–5 mm, 3-lobed at apex; lateral lobes elliptic to broadly ovate, 1.8–3 mm wide, apex obtuse or occasionally truncate; mid-lobe triangular, 1–2 mm wide, usually smaller than lateral lobes, apex obtuse to acute; spur pendulous, curved forward, 10–14 mm, exceeding ovary, slender. Column 1–1.5 mm; viscidia linear-oblong. Fl. Jul–Aug.  $2n = 30, 40, 42, 80, 100, 120$ .

Forests, grasslands, waterlogged meadows; 200–4700 m. SE Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, N and W Sichuan, SE Xizang, NW Yunnan [Japan, Korea, Russia; Europe].

The extensive extra-Chinese synonymy is not cited here.

**2. *Gymnadenia orchidis*** Lindley, Gen. Sp. Orchid. Pl. 278. 1835.

西南手参 xi nan shou shen

*Gymnadenia conopsea* (Linnaeus) R. Brown var. *yunnanensis* Schlechter; *G. cylindrostachya* Lindley; *G. delavayi* Schlechter; *G. himalayica* Schlechter; *G. microgymnadenia* (Kraenzlin) Schlechter; *G. souliei* Schlechter; *G. violacea* Schlechter; *Habenaria microgymnadenia* Kraenzlin; *H. orchidis* (Lindley) J. D. Hooker; *H. stoliczkae* Kraenzlin; *Orchis cylindrostachya* (Lindley) Kraenzlin; *Peristylus orchidis* (Lindley) Kraenzlin.

Plants robust, 15–50 cm tall. Tubers ovoid-ellipsoid, 1–3 cm, with many, slender, elongate lobes. Stem stout, with 2 or 3 tubular sheaths at base and 3–6 cauline leaves. Leaves widely spaced or clustered, elliptic to elliptic-oblong, 4–16 × 2.5–4.5 cm, apex obtuse to acute. Inflorescence 8–23 cm, stout; peduncle with 1–3 scattered, lanceolate bracts 2–5 cm; rachis 3–12 cm, densely many flowered; floral bracts lanceolate, apex acuminate, basal ones longer than flowers. Flowers fragrant, purplish red or pink, very rarely tinged with white; ovary 7–8 mm including pedicel. Dorsal sepal erect, ovate, 3–5 × 2–3.5 mm, 3-veined, apex obtuse; lateral sepals reflexed, ovate, oblique, 4–5 × 2.5–4 mm, 3-veined, margin revolute, apex obtuse. Petals straight, broadly ovate-triangular, oblique, 3–5 × 2.5–3.5 mm, 3-veined, apex obtuse; lip spreading, broadly obovate, 3.5–5.5 × 3–4.5 mm, 3-lobed at apex; lateral lobes ovate, 1–2 mm wide, apex obtuse; mid-lobe triangular, 1–2.2 mm wide, equal to or slightly larger than lateral lobes, apex obtuse to subacute; spur pendulous, slightly curved forward, 7–12 mm, equal to or exceeding ovary, slender. Column ca. 2 mm; viscidia lanceolate. Fl. May–Aug.

Forests, thickets, alpine grasslands; 2800–4100 m. SE Gansu, W Hubei, S Qinghai, S Shaanxi, W Sichuan, E and S Xizang, NW Yunnan [Bhutan, NE India, Kashmir, Nepal, Pakistan].

**3. *Gymnadenia crassinervis*** Finet, Rev. Gén. Bot. 13: 514. 1901.

短距手参 duan ju shou shen

Plants stout or slender, 7–20(–40) cm tall. Tubers ellipsoid, 1–2 cm, with a few slender lobes. Stem stout, with 2 or 3 tubular sheaths at base and 3–5 cauline leaves. Leaves clustered, rarely widely spaced, elliptic-oblong, 3.5–7(–11) × 0.8–2 cm, apex acute. Inflorescence 4–10(–26) cm, stout; peduncle with 1 or 2 lanceolate bracts 2–4(–5) cm; rachis 2–4(–7.5) cm, densely or laxly many flowered; floral bracts lanceolate to ovate-lanceolate, much longer than ovary, apex acuminate. Flowers pink, rarely tinged with white; ovary 5–7 mm including pedicel. Dorsal sepal erect, ovate-oblong to ovate-lanceolate, cymbiform, 2.8–3.5 × 1.2–2 mm, 3-veined, apex acute to obtuse; lateral sepals spreading, ovate-lanceolate, oblique, 3.5–4.5 × 1.5–2.2 mm, 3-veined, apex acute. Petals straight, broadly ovate, 3–4 × 1.8–2.5 mm, 2-veined, apex acute; lip spreading forward, broadly obovate, 3–3.5 × 2–2.8 mm, 3-lobed at apex; lateral lobes obovate-orbicular, 0.5–1 mm wide, apex obtuse-rounded or truncate; mid-lobe triangular, 0.8–1.5 mm wide, longer than lateral lobes, apex obtuse; spur pendulous, usually curved forward, 2–4 mm, much shorter than ovary, slightly dilated toward apex, apex obtuse. Column 0.8–1 mm; viscidia lanceolate. Fl. Jun–Jul, fr. Aug–Sep.

• *Rhododendron* thickets, crevices on rocky slopes; 2000–3800 m. W Sichuan, E and S Xizang, NW Yunnan.

- 1a. Plants short, stout, 7–20 cm tall; leaves clustered; inflorescence 4–10 cm; rachis 2–4 cm, densely many flowered ..... 3a. var. *crassinervis*  
 1b. Plants slender, ca. 40 cm tall; leaves widely spaced; inflorescence ca. 26 cm; rachis ca. 7.5 cm, laxly many flowered ..... 3b. var. *elatior*

**3a. *Gymnadenia crassinervis* var. *crassinervis***

短距手参(原变种) duan ju shou shen (yuan bian zhong)

*Herminium chiwui* Tang & F. T. Wang.

Plants 7–20 cm tall, stout. Leaves clustered, 3.5–7 cm. Inflorescence short, 4–10 cm; rachis 2–4 cm, densely many flowered.

• *Rhododendron* thickets, crevices on rocky slopes; 2000–3800 m. W Sichuan, E and S Xizang, NW Yunnan.

**3b. *Gymnadenia crassinervis* var. *elatior*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 131. 1936.

高大手参 gao da shou shen

Plants ca. 40 cm tall, slender. Leaves widely spaced, to 11 cm. Inflorescence elongate, ca. 26 cm; rachis ca. 7.5 cm, laxly 20-flowered.

• “Western China.”

Only the type material for this taxon has been examined. Floral features agree with the typical variety, but the habit is quite different.

**4. *Gymnadenia emeiensis*** K. Y. Lang, Acta Phytotax. Sin. 20: 182. 1982.

峨眉手参 e mei shou shen

Plants robust, 30–50 cm tall. Tubers ellipsoid, 1–3.5 cm, with 4 or 5 elongate lobes. Stem stout, with 3 or 4 tubular sheaths at base and 5 or 6 cauline leaves. Leaves widely spaced, narrowly elliptic to oblong-lanceolate, 9–11 × 2–3 cm, apex subobtuse or acuminate. Inflorescence ca. 14 cm, stout; peduncle with 2 lanceolate bracts 2–4 cm; rachis 6–7 cm, densely many flowered; floral bracts ovate-lanceolate, apex long acuminate, basal ones longer than flowers. Flowers white; ovary 8–9 mm including pedicel. Dorsal sepal erect, ovate, slightly concave, ca. 3 × 2 mm, 3-veined, apex obtuse; lateral sepals spreading, elliptic, oblique, ca. 4 × 2 mm, 3-veined, apex obtuse. Petals straight, broadly rhombic-ovate, oblique, ca. 3 × 2.5 mm, 2-veined, apex obtuse; lip spreading, rhombic-ovate, ca. 3 × 2–2.5 mm, obscurely 3-lobed at apex, apex slightly reflexed; lateral lobes shallow, rounded; mid-lobe ca. 1.5 mm wide, apex obtuse; spur pendulous, curved slightly forward, cylindrical, tapering slightly toward apex, 4–5 mm, much shorter than ovary, apex obtuse. Column ca. 1.5 mm; viscidia lanceolate. Fl. May–Jun.

• Thickets, alpine grasslands; ca. 3100 m. SW Sichuan.

**5. *Gymnadenia bicornis*** Tang & K. Y. Lang, Acta Phytotax. Sin. 16(4): 126. 1978.

角距手参 jiao ju shou shen

Plants somewhat robust, 50–70 cm tall. Tubers ellipsoid, 3–5 cm, with a few slender, elongate lobes. Stem stout, with 2 or 3 tubular sheaths at base and 6–8 cauline leaves. Leaves widely spaced, elliptic, narrowly elliptic, or lanceolate, 9–13 × 2–4 cm, apex acuminate. Inflorescence elongate, ca. 25 cm; peduncle with 2 lanceolate bracts to 5 cm; rachis 8–11.5 cm, densely many flowered; floral bracts ovate-lanceolate to lanceolate, apex acuminate, basal ones longer than flowers. Flowers pale yellowish green, relatively small; ovary 6–7 mm including pedicel. Dorsal sepal erect, broadly ovate, slightly concave, ca. 2.5 × 2 mm, 3-veined, apex obtuse; lateral sepals recurved, broadly ovate, ca. 3 × 2.3 mm, 3-veined, apex obtuse. Petals rhombic-ovate, oblique, ca. 3 × 2.3 mm, 3-veined, apex obtuse; lip rhombic-ovate, ca. 3 × 2.5 mm, almost entire; lateral lobes much reduced; mid-lobe ovate-orbicular, ca. 2 mm wide, apex obtuse; spur pendulous, slightly curved forward, 3–3.5 mm, much shorter than ovary, slender, shallowly 2-lobed at apex. Column ca. 0.8 mm. Fl. Jul–Aug.

• Shrubby slopes; 3200–3600 m. E and SE Xizang.

**39. TSAIORCHIS** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 131. 1936.

长喙兰属 chang hui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, slender. Tubers spreading horizontally, slender, fleshy. Stem erect, terete, glabrous, with (1 or)2 or 3 basal

leaves. Leaves ovate-oblong to oblong-elliptic, base attenuate into short petiole-like sheath. Inflorescence terminal, racemose, with a few secund flowers; floral bracts nearly as long as ovary. Flowers resupinate, small; ovary twisted, cylindric-fusiform, glabrous; sepals and petals free, spreading, subequal in size; lip spreading, 3-lobed near middle, base adnate to column, spurred; spur shorter than ovary; anther erect, sessile, oblong, apex aristate, 2-locular; locules parallel, not protruding at base; pollinia 2, granular-farinaceous, sectile; caudicles very short, attached to a common viscidium; viscidium narrowly oblong-elliptic, enclosed in a chamber formed by lip and column; rostellum flattened, elongate, canaliculate, beaklike, slightly exceeding anther, 1-toothed on either side at middle, basal half entirely united with column; stigma lobes 2, separate, linear; lateral appendages 2, elongate, positioned on either side of anther base, exceeding anther.

- One species: China.

A genus distinguished by its long, bidentate rostellum and 2-lobed stigma, its placement remains a matter of contention. The nature of the column has been thought to affiliate the genus with *Gymnadenia* and *Neottianthe* (Bull. Fan Mem. Inst. Biol. Bot. 7: 133. 1936); however, *Tsaiorchis* has also been considered congeneric with *Diphylax* (Pridgeon et al., Gen. Orchid. 2: 284–286. 2001).

**1. *Tsaiorchis neottianthoides*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 133. 1936.

长喙兰 chang hui lan

Plants 6–10 cm tall. Leaves 3–7 × 1–3.5 cm, 7-veined, apex acute. Rachis 1.5–2 cm, with 5–7 secund flowers; floral bracts ovate, apex acuminate. Flowers pale purple to pink; ovary ca. 5.5 mm including pedicel. Dorsal sepal oblong-elliptic, ca. 4.5 mm, 1-veined, apex acute; lateral sepals narrowly oblong, oblique, ca. 4 mm, 1-veined, apex acute. Petals

obliquely elliptic, ca. 3.8 mm, 1-veined, apex obtuse; lip oblong-ovate, ca. 6 × 3 mm, 3-lobed; disk densely papillose; lateral lobes subelliptic, falcate, ca. 1.5 mm; mid-lobe subobovate, slightly longer than lateral lobes, apex emarginate; spur narrowly obovoid to subcylindric, ca. 2.8 × 1.5 mm, apex obtuse. Column ca. 2 mm; rostellum laterally compressed, elongate, canaliculate, bifid at apex. Fl. Aug–Sep.

- Dense forests, valleys; ca. 1500 m. C and E Guangxi, SE Yunnan.

#### 40. *PECTEILIS* Rafinesque, Fl. Tellur. 2: 37. 1837.

白蝶兰属 bai die lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, medium-sized to large. Tubers solitary or paired, oblong, ellipsoid, or subglobose, undivided, fleshy, neck with several slender roots. Stem erect, often stout, leafy. Leaves cauline and alternate or in a basal rosette, ovate-elliptic or ovate, slightly fleshy, amplexicaul at base. Inflorescence terminal, with 1 to several flowers; floral bracts large, foliaceous. Flowers resupinate, often large, showy, usually white; pedicel and ovary twisted, usually slightly arcuate, narrowly fusiform. Sepals free, similar, broad; dorsal sepal erect; lateral sepals oblique. Petals linear-lanceolate, oblanceolate, or oblong, often narrower and smaller than sepals; lip decurved, irregularly ovate to flabellate, spurred, deeply 3-lobed; lateral lobes spreading, margin fimbriate-lacerate, denticulate, or rarely entire; mid-lobe straight, linear or broadly triangular; spur pendulous, straight to strongly curved, cylindric, often very long, much longer than ovary. Column erect, short; anther erect, 2-locular; locules widely spaced in a very broad connective; pollinia 2, granular-farinaceous, sectile; caudicles slender; viscidia small, each hidden in a tubular fold at end of rostellum arms; lateral appendages 2, elliptic, small, at base of anther; rostellum 3-lobed, lateral arms long, tapering, mid-lobe blunt; stigma lobes adnate to base of lip, connate, convex, sessile.

About five species: E and SE Asia, Himalayas; three species in China.

- 1a. Leaves linear to narrowly lanceolate, to 0.8 cm wide; sepals 7–10 mm; outer margin of petals dentate to shallowly fimbriate ..... 3. *P. radiata*
- 1b. Leaves ovate, ligulate-oblong, oblong, or lanceolate, 2–6 cm wide; sepals 15–40 mm; petals entire.
  - 2a. Leaves 3–6 cm wide, intergrading into foliaceous sheaths above; sepals 25–40 mm; dorsal sepal broadly ovate to orbicular, much longer than petals; lip ecallose ..... 1. *P. susannae*
  - 2b. Leaves 2–3.5 cm wide, usually distinct from bractlike sheaths above; sepals 15–20 mm; dorsal sepal oblong-ovate, subequal in length to petals; lip with a small callus near base ..... 2. *P. henryi*

**1. *Pecteilis susannae*** (Linnaeus) Rafinesque, Fl. Tellur. 2: 38. 1837 [“*susanna*”].

龙头兰 long tou lan

*Orchis susannae* Linnaeus, Sp. Pl. 2: 939. 1753; *Habenaria susannae* (Linnaeus) R. Brown; *Hemihabenaria susannae* (Linnaeus) Finet; *Platanthera robusta* Lindley; *P. susannae* (Linnaeus) Lindley.

Plants robust, 45–120 cm tall. Tubers ovoid-cylindric, 3–6 × 1–2.5 cm. Stem stout, with several tubular sheaths at base and several to many leaves intergrading into amplexicaul sterile bracts above. Leaves ovate, oblong, or lanceolate, 6–10(–12) × 3–6 cm, apex acute. Sterile bracts often foliaceous, ovate-elliptic to lanceolate, 4–7 × 1–3.5 cm, apex acuminate. Rachis 6–15 cm, laxly 2–5-flowered; floral bracts foliaceous, lanceolate, 3–5 cm, shorter than, equal to, or slightly exceeding ovary, apex

acute to acuminate. Flowers fragrant, white, large; pedicel and ovary 40–60 mm, shallowly winged, glabrous. Dorsal sepal erect, broadly ovate to orbicular, 25–30 × 20–28 mm, apex obtuse-rounded; lateral sepals spreading, broadly ovate, slightly oblique, 25–40 × 12–22 mm, usually slightly longer than dorsal sepal, apex obtuse. Petals linear-lanceolate, 7–12 × ca. 2.5 mm; lip irregularly ovate, 25–40 × 25–44 mm; lateral lobes broad, subflabellate, 16–22 × 18–24 mm, lateral margins entire, apical margin lacerate-fimbriate; mid-lobe linear-oblong, 18–30 × 4–6 mm, slightly fleshy, entire; spur straight to gradually curved forward, 6–13 cm × 3–5 mm, apex acute. Fl. Jul–Sep.  $2n = 36, 42, 44$ .

Forests, grassy slopes, damp places in valleys; 500–2500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, SW Sichuan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, S Vietnam].

**2. *Pecteilis henryi*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 45. 1919.

滇南白蝶兰 dian nan bai die lan

*Habenaria bassacensis* Gagnepain; *H. lacei* (Rolfe ex Downie) Gagnepain; *Pecteilis bassacensis* (Gagnepain) Tang & F. T. Wang; *P. lacei* (Rolfe ex Downie) Tang & F. T. Wang; *P. susannae* (Linnaeus) Rafinesque subsp. *henryi* (Schlechter) Soó; *Platanthera lacei* Rolfe ex Downie.

Plants slender to robust, 50–70 cm tall. Tubers oblong, ca. 3.5 × 1.5 cm. Stem stout, with 1 to several tubular sheaths at base, with 4–6 or more leaves and several amplexicaul sterile bracts above. Leaves ligulate-oblong to lanceolate, 7.5–10(–12) × 2–3.5 cm, apex acute. Sterile bracts usually tightly sheathing stem, narrowly elliptic to lanceolate, 6–10 × 1–1.5 cm, apex acute. Rachis 5–8 cm, laxly 4–7-flowered; floral bracts foliaceous, narrowly oblong-lanceolate, 3–4 cm, exceeding ovary, apex acute. Flowers white, large; pedicel and ovary 25–45 mm, shallowly winged, glabrous. Dorsal sepal oblong-ovate, 15–20 × 8–15 mm, apex obtuse; lateral sepals spreading, oblong-ovate, slightly oblique, 15–20 × 6–14 mm, apex obtuse. Petals erect to spreading, oblanceolate to linear, slightly oblique, 12–18 × 1–2.5 mm, apex subacute; lip broadly flabellate, 20–25 × 15–25 mm; disk with 1 small, convex callus near base; lateral

lobes broadly cuneate-ligulate to nearly rhombic, 15–20 × ca. 14 mm, apical margin and outer lateral margins deeply lacerate-fimbriate, inner lateral margins entire; mid-lobe linear-ligulate, 15–22 × ca. 3 mm, slightly fleshy, entire, apex slightly obtuse; spur pendulous, often distinctly curved forward, slender, 8–11.5 cm × 1–1.5 mm, attenuate toward apex. Fl. Jul.

Forests, grasslands, gullies; 1000–1900 m. S Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

**3. *Pecteilis radiata*** (Thunberg) Rafinesque, Fl. Tellur. 2: 38. 1837.

狭叶白蝶兰 xia ye bai die lan

*Orchis radiata* Thunberg, Trans. Linn. Soc. 2: 326. 1794; *Habenaria radiata* (Thunberg) Sprengel; *Hemihabenaria radiata* (Thunberg) Finet; *Plantaginorchis radiata* (Thunberg) Szlachetko; *Platanthera radiata* (Thunberg) Lindley.

Plants slender, 18–37 cm tall. Tubers ellipsoid to subglobose, 0.8–2 × 0.5–1 cm. Stem slender, with 1 or 2 tubular sheaths at base, 3–5 spaced cauline leaves, and 1–3 sterile bracts above. Leaves linear to narrowly lanceolate, 4–10 × 0.3–0.8 cm, apex acuminate. Sterile bracts linear, 1.5–4 × 0.2–0.5 cm, apex acuminate. Rachis to 3.5 cm, 1- or 2-flowered; floral bracts ovate-lanceolate, 7–12 mm, shorter than ovary, apex acuminate. Flowers white, large; pedicel and ovary 10–15 mm, slightly ridged, glabrous. Dorsal sepal suberect, pale green, narrowly ovate, 7–10 × 2–3 mm, 5–7-veined, apex acute; lateral sepals spreading, pale green, narrowly ovate, slightly oblique, 8–10 × 2–4 mm, 5–7-veined, apex acute. Petals erect and loosely connivent with dorsal sepal, white, ovate, oblique, 10–12 × 3.5–6 mm, outer margin toothed to shallowly fimbriate, apex subacute; lip irregularly flabellate, 13–18 × 16–25 mm; lateral lobes obliquely flabellate, 8–12 × 6–10 mm, outer margins deeply fimbriate-laciniate; mid-lobe linear, 5–10 × 1–2 mm, slightly fleshy, entire, apex subobtusely; spur pendulous, straight to slightly curved forward, 25–40 × ca. 1.5 mm, slender, slightly dilated toward apex, apex obtuse. Fl. Jul–Aug.  $2n = 32, 48$ .

Glades in forests; ca. 1500 m. W Henan [Japan].

#### 41. **PERISTYLUS** Blume, Bijdr. 404. 1825, nom. cons.

阔蕊兰属 kuo rui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Glossaspis* Sprengel; *Glossula* Lindley.

Herbs, terrestrial, slender to robust, medium-sized. Tubers subglobose to ellipsoid-oblong, undivided, fleshy, neck with several slender roots. Stem erect, with 2 or 3 tubular sheaths at base, 1- to many leaved, glabrous. Leaves basal, clustered midway along stem or widely spaced, elliptic, ovate, oblanceolate, or linear, base contracted into amplexicaul sheath. Inflorescence erect, terminal, racemose, glabrous; peduncle often with 1 to several sterile bracts; rachis laxly to densely many flowered. Flowers spirally arranged, resupinate, small, sometimes spidery, green, yellowish green, or white; ovary and pedicel usually erect and held close to rachis, twisted, cylindrical-fusiform, slender, usually glabrous. Sepals free; dorsal sepal erect; lateral sepals usually spreading, rarely reflexed. Petals often connivent with dorsal sepal and forming a hood, slightly fleshy; lip connate with column at base, distally 3-lobed or rarely entire, larger than sepals and petals, slightly fleshy, spurred at base, ecallose or with a fleshy callus above mouth of spur; spur short and scrotiform, or sometimes elongate and cylindrical, usually much shorter than ovary. Column erect, very short, stout; anther

with 2 parallel or slightly divergent locules; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium via a short caudicle; viscidia often small, naked, elliptic, ovate, or suborbicular; rostellum small, with short, inconspicuous arms; stigma lobes 2, basally connate but diverging widely, convex, globose or subclavate, often adnate to base of lip; auricles 2, prominent, placed laterally at base of anther.

About 70 species: E, S, and SE Asia to New Guinea, NE Australia, and the SW Pacific islands; 19 species (five endemic) in China.

- 1a. Lip entire.
- 2a. Leaves linear, 0.2–0.3 cm wide; spur 5.5–6(–8) mm, ca. as long as ovary ..... 17. *P. Forrestii*
- 2b. Leaves oblong, oblong-elliptic, elliptic-lanceolate, or lanceolate, 0.7–2 cm wide; spur 0.7–1.2 mm, much shorter than ovary.
- 3a. Plants 2–5-leaved; floral bracts ca. 8 mm, exceeding flower ..... 18. *P. forceps*
- 3b. Plants 1-leaved; floral bracts 4–5 mm, almost as long as to slightly exceeding ovary ..... 19. *P. nematocaulon*
- 1b. Lip 3-lobed.
- 4a. Lateral lobes of lip filiform or linear, ca. 2 × as long as mid-lobe or much longer, spreading at right angles from axis of lip.
- 5a. Lip lacking a transverse ridge, not clearly demarcated into a hypochile and epichile, deeply 3-lobed near base.
- 6a. Lateral sepals spreading; lip with a large, subglobose callus near base; spur saccate-ovoid, neck contracted, ca. 2 mm ..... 4. *P. formosanus*
- 6b. Lateral sepals reflexed; lip ecallose; spur cylindrical-clavate, ca. 3.5 mm ..... 5. *P. jinchiuanicus*
- 5b. Lip divided near base by a transverse ridge into a short, concave hypochile and a longer, deflexed, deeply 3-lobed epichile.
- 7a. Lateral lobes of lip linear, 4–7 mm, 2–3 × as long as mid-lobe ..... 3. *P. densus*
- 7b. Lateral lobes of lip filiform, 8–18 mm, 4–6 × as long as mid-lobe.
- 8a. Spur fusiform, 3–5 mm ..... 2. *P. calcaratus*
- 8b. Spur globose-saccate, 1–2.5 mm ..... 1. *P. tentaculatus*
- 4b. Lateral lobes of lip oblong, triangular, ovate-triangular, or triangular-lanceolate, shorter than to subequal in length to mid-lobe, spreading at an acute angle to axis of lip.
- 9a. Lip with a large, subglobose callus near base.
- 10a. Ovary 7–10 mm; dorsal sepal 2.8–3.5 mm; lip 3.5–4.2 mm; spur ovoid, apex acute ..... 14. *P. lacertifer*
- 10b. Ovary 4–5 mm; dorsal sepal 2–2.5 mm; lip 2–3 mm; spur globose or saccate, apex obtuse.
- 11a. Flowers white or pale whitish green; callus on lip glabrous ..... 15. *P. coeloceras*
- 11b. Flowers green; callus on lip papillose ..... 16. *P. neotineoides*
- 9b. Lip ecallose.
- 12a. Plants 1-leaved ..... 6. *P. fallax*
- 12b. Plants 2–6-leaved.
- 13a. Leaves linear, to 0.6 cm wide.
- 14a. Petals ca. 3.5 mm; lip 3–4.5 mm; spur cylindrical, curved forward, 4–6 mm, almost as long as ovary ..... 7. *P. bulleyi*
- 14b. Petals 2–2.5 mm; lip 2–2.5 mm; spur scrotiform, 1–1.5 mm, much shorter than ovary ..... 8. *P. mannii*
- 13b. Leaves elliptic-lanceolate, elliptic, oblong-elliptic, ovate-lanceolate, or ovate, 0.8–6.5 cm wide.
- 15a. Petals and lip pure white; dorsal sepal 7–9 mm; lip 9–11 mm ..... 9. *P. constrictus*
- 15b. Petals and lip green, yellowish green, or creamy white; dorsal sepal 2–5.5 mm; lip 2.5–6 mm.
- 16a. Plants usually robust; lip shallowly 3-lobed toward apex, 3.5–4 mm wide, disk with a dark, triangular nectary toward base ..... 10. *P. goodyeroides*
- 16b. Plants slender to somewhat robust; lip 3-lobed near middle, 1–2 mm wide, disk lacking a nectary.
- 17a. Petals and lip creamy white; lip base concave-saccate, papillose in front of spur mouth ..... 11. *P. affinis*
- 17b. Petals and lip green to yellowish green; lip base shallowly concave, glabrous.
- 18a. Leaves narrowly elliptic-lanceolate, 0.8–2 cm wide; floral bracts 5–8 mm, almost as long as ovary; lip ca. 3 mm; spur ca. 1 mm ..... 12. *P. elisabethae*
- 18b. Leaves elliptic-lanceolate to ovate, 2–3.5 cm wide; floral bracts 8–12 mm, exceeding ovary (and sometimes flowers); lip 4–5.5 mm; spur 1.8–2.5 mm ..... 13. *P. parishii*

**1. *Peristylus tentaculatus*** (Lindley) J. J. Smith, Fl. Buitenzorg 6: 35. 1905.

触须阔蕊兰 *chu xu kuo rui lan*

*Glossula tentaculata* Lindley, Bot. Reg. 10: ad t. 862. 1825; *Glossaspis antennifera* H. G. Reichenbach; *G. tentaculata* (Lindley) Sprengel; *Habenaria garrettii* Rolfe ex Downie; *H. tentaculata* (Lindley) H. G. Reichenbach; *Peristylus garrettii* (Rolfe ex Downie) J. J. Wood & Ormerod.

Plants slender to somewhat robust, 16–45(–60) cm tall. Tubers subglobose to ovoid, 1–2.2 × 0.5–1 cm. Stem with 2 or 3 tubular sheaths at base, 2–5-leaved. Leaves basal to somewhat spaced along stem, ovate-oblong to lanceolate, 4–9(–12) × 0.8–1.5(–3) cm, base attenuate, apex acute. Inflorescence 10–34(–48) cm; peduncle cylindrical, slender to stout; sterile bracts several, lanceolate, 5–12 mm; rachis 4.5–17 cm, subdensely many flowered; floral bracts ovate to ovate-lanceolate, 5–8 mm, shorter than to almost as long as ovary, apex acuminate. Flowers erect, green or yellowish green; ovary 6–10 mm including pedicel. Dorsal sepal erect, oblong-ovate, concave, ca. 2.8 × 1–1.5 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong-ovate, slightly oblique, ca. 3 × 1.2 mm, slightly narrower than dorsal sepal, 1-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, ovate-oblong, slightly oblique, ca. 3 × 1.5 mm, 1-veined, apex obtuse; lip oblong, 2.8–3.5 × ca. 0.8 mm, divided near base by a transverse ridge into a short, concave hypochile and a longer, deflexed, deeply 3-lobed epichile, ecallose; lateral lobes spreading at right angles to axis of lip, filiform, 10–18 mm; mid-lobe narrowly oblong-ligulate, ca. 2 mm, apex obtuse; spur pendulous, globose-saccate, 1–2.5 mm, apex usually shallowly 2-lobed, neck contracted. Column ca. 1 mm; viscidia ovate; rostellum with short arms. Fl. Nov–Apr.

Damp places on slopes, beside streams, wastelands; 100–300 m. S Fujian, S Guangdong, E Guangxi, Hainan, SE and W Yunnan [Cambodia, Thailand, Vietnam].

**2. *Peristylus calcaratus*** (Rolfe) S. Y. Hu, Quart. J. Taiwan Mus. 26: 398. 1973.

长须阔蕊兰 *chang xu kuo rui lan*

*Glossula calcarata* Rolfe, Bull. Misc. Inform. Kew 1913: 145. 1913; *Habenaria calcarata* (Rolfe) Schlechter; *H. lilungshania* S. S. Ying; *Platanthera pricei* Hayata.

Plants slender, 17–48 cm tall. Tubers subglobose to oblong-ellipsoid, 0.8–2 × 0.5–1.5 cm. Stem with 2–4 tubular sheaths at base, 3–5-leaved. Leaves clustered near base to somewhat spaced along stem, elliptic-lanceolate, 2.5–12 × 0.6–3.5 cm, base attenuate, apex acute to obtuse. Inflorescence 13–38 cm; peduncle cylindrical, slender; sterile bracts few, lanceolate, to 2 cm; rachis 6–23 cm, laxly to subdensely many flowered; floral bracts ovate-lanceolate, 6–11 mm, shorter than to slightly exceeding ovary, apex acuminate. Flowers erect, pale yellowish green; ovary 7–9 mm including pedicel. Dorsal sepal erect, oblong-ovate, concave, 2–3 × ca. 1.5 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong, 3–3.5 × ca. 1.2 mm, slightly narrower than dorsal sepal, apex obtuse. Petals con-

nivent with dorsal sepal and forming a hood, ovate-oblong, oblique, 3–3.5 × 1.5–2 mm, 1- or 2-veined, apex obtuse; lip narrowly oblong, 3–3.5 × ca. 0.5 mm, divided near base by a transverse ridge into a short, concave hypochile and a longer, deflexed, deeply 3-lobed epichile, ecallose; lateral lobes spreading at right angles to axis of lip, horizontal or ascending, filiform, 8–15 mm; mid-lobe narrowly oblong-lanceolate, 2–3 mm, apex obtuse; spur pendulous, fusiform, 3–5 mm, apex obtuse or sometimes shallowly 2-lobed. Column ca. 1 mm; viscidia ellipsoid. Fl. Jul–Oct.

Forests, grassy slopes; 200–1300 m. Guangdong, Guangxi, Hunan, Jiangsu, Jiangxi, Taiwan, W Yunnan, Zhejiang [Vietnam].

**3. *Peristylus densus*** (Lindley) Santapau & Kapadia, J. Bombay Nat. Hist. Soc. 57: 128. 1960.

狭穗阔蕊兰 *xia sui kuo rui lan*

*Coeloglossum densum* Lindley, Gen. Sp. Orchid. Pl. 302. 1832; *C. flagelliferum* (Makino) Maximowicz ex Makino; *Glossula passerina* Gagnepain; *Habenaria atramentaria* Kraenzlin; *H. burchneroides* Schlechter; *H. dankiaensis* Gagnepain; *H. evrardii* Gagnepain; *H. flagellifera* Makino; *H. neglecta* King & Pantling; *H. passerina* (Gagnepain) Tang & F. T. Wang; *H. stenostachya* (Lindley ex Bentham) Bentham; *H. stenostachya* subsp. *burchneroides* (Schlechter) Soó; *Peristylus flagellifer* (Makino) Ohwi; *P. neglectus* (King & Pantling) Kraenzlin; *P. stenostachyus* (Lindley ex Bentham) Kraenzlin; *P. xanthochlorus* Blatter & McCann; *Platanthera stenostachya* Lindley ex Bentham.

Plants slender to somewhat robust, 15–50(–65) cm tall. Tubers subglobose to oblong-ovoid, 0.8–2 × 0.6–1.5 cm. Stem with 2 or 3 tubular sheaths at base, 4–6-leaved. Leaves widely spaced along stem, ovate, oblong, or oblong-lanceolate, 2.5–10 × 0.6–2.5 cm, apex acute or acuminate. Inflorescence 11–38(–47) cm; peduncle cylindrical to slightly ridged, slender to stout; sterile bracts several, ovate-lanceolate, to 3.5 cm; rachis 4–24 cm, laxly to subdensely many flowered; floral bracts ovate-lanceolate, 5–15 mm, basal ones often exceeding ovary, apex acuminate. Flowers erect to horizontal, yellowish green or pale green to whitish; ovary 6–10 mm including pedicel. Dorsal sepal forming a hood to erect, narrowly oblong-ovate, concave, 3–4 × 0.8–1.2 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong-lanceolate, oblique, 3–4 × 0.8–1 mm, 1-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, narrowly ovate-oblong, ca. 3 × 0.8–1 mm, 1-veined, apex obtuse; lip narrowly oblong-ovate, ca. 4.5 × 0.8 mm, divided near base by a transverse ridge into a short, concave hypochile and a longer, deflexed, deeply 3-lobed epichile, ecallose; lateral lobes spreading at right angles to axis of lip, linear, 4–7 mm; mid-lobe oblong-lanceolate, ca. 2.5 mm, apex obtuse; spur pendulous, cylindrical-clavate, 3–4 mm, apex sometimes shallowly 2-lobed. Column ca. 1.5 mm; viscidia ellipsoid; rostellum with short arms. Fl. May–Oct.  $2n = 25 \pm 2, 42 + 0-2B, 44, 46, 48, 50$ .

Forests, moist grasslands; 300–2100 m. N Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Yunnan, Zhejiang [Bangladesh, Cambodia, India, Japan, Korea, Myanmar, Thailand, Vietnam].

**4. *Peristylus formosanus*** (Schlechter) T. P. Lin, Native Orchids Taiwan 2: 274. 1977.

台湾阔蕊兰 tai wan kuo rui lan

*Habenaria formosana* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 127. 1919, based on *H. tentaculata* (Lindley) H. G. Reichenbach var. *acutifolia* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 354. 1911; *H. brevicealcarata* Fukuyama (1932), not (Hayata) Masamune (1968); *Peristylus flagellifer* (Makino) Ohwi var. *acutifolius* (Hayata) Hatusima; *P. lacertifer* (Lindley) J. J. Smith var. *formosanus* (Schlechter) S. S. Ying, nom. superfl.

Plants slender, 15–45 cm tall. Tubers subglobose, 1–2 × 0.8–1.5 cm. Stem with 2 or 3 tubular sheaths at base, 3- or 4-leaved. Leaves forming a basal rosette to somewhat spaced along stem, elliptic to ovate-lanceolate, 5–10 × 2–3 cm, apex obtuse or acute. Inflorescence 13–36 cm; peduncle cylindrical, slender; sterile bracts 2 or 3, lanceolate, to 1.5 cm; rachis 6–20 cm, densely many flowered; floral bracts ovate-lanceolate, 8–12 mm, basal ones exceeding flowers, apex acuminate. Flowers erect to horizontal, whitish green; ovary 8–10 mm including pedicel. Dorsal sepal erect, ovate, concave, 3.5–4 × 2.2–2.5 mm, apex obtuse-rounded; lateral sepals spreading, oblong-elliptic, 3.8–4.8 × ca. 1.8 mm, apex subobtusely to acute. Petals connivent with dorsal sepal and forming a hood, ovate-rhombic, 3.8–4.8 × ca. 2.5 mm, apex acute; lip narrowly ovate, ca. 4 × 1.8 mm, deeply 3-lobed near base; disk with a large, subglobose callus near base; lateral lobes diverging widely from axis of lip, filiform, 5–12 mm; mid-lobe ligulate, 1.7–3 mm, apex obtuse; spur saccate-ovoid, neck contracted, ca. 2 mm, apex subacute. Column ca. 1.5 mm; viscidia oblong; rostellum with short arms. Fl. Aug–Dec.

Open places, grasslands; below 300 m. Taiwan [Japan (Ryukyu Islands)].

“*Caeloglossum formosanum*” [sic] (Makino & Hayata, J. Coll. Sci. Imp. Univ. Tokyo 22: 420. 1906) belongs here but is a nomen nudum and was therefore not validly published.

The identity and placement of this species within the genus remains contentious. Garay and Sweet (Orchids S. Ryukyu Islands, 37. 1974) considered it conspecific with *Habenaria lacertifera*, a position followed by Seidenfaden (Dansk Bot. Ark. 31(3): 58. 1977, as *Peristylus lacertifer*). More recently, however, Su (Fl. Taiwan 5: 994. 2000) maintained the two taxa as distinct on account of differences in lip shape and flower color. A re-assessment of type material and of fresh material is clearly required.

**5. *Peristylus jinchuanicus*** K. Y. Lang, Acta Phytotax. Sin. 25: 447. 1987.

金川阔蕊兰 jin chuan kuo rui lan

Plants slender, 17–50 cm tall. Tubers oblong, 2–4 × 1–2 cm. Stem with 2 tubular sheaths at base, 4- or 5-leaved. Leaves widely spaced along stem, oblong-lanceolate, 5–10 × 0.8–2 cm, apex acute or acuminate. Inflorescence 11–33 cm; peduncle cylindrical, slender; sterile bracts 4–8, lanceolate, to 2.4 cm; rachis 5–21 cm, subdensely many flowered; floral bracts lanceolate, to 9 mm, basal ones sometimes exceeding flowers, apex acuminate. Flowers erect, yellowish green; ovary ca. 7 mm including pedicel. Dorsal sepal erect, ovate, concave, ca. 4 × 2.5

mm, 3-veined, apex obtuse; lateral sepals reflexed, oblong, oblique, ca. 4 × 2 mm, 3-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, ovate-lanceolate, slightly oblique, 4.5–5 × ca. 1.5 mm, 1-veined, apex acute; lip narrowly oblong, ca. 6 × 1 mm, deeply 3-lobed near base, ecallose; lateral lobes spreading almost at right angles to axis of lip, linear, 5–6 mm; mid-lobe narrowly oblong, ca. 3 mm, apex obtuse; spur pendulous, cylindrical-clavate, ca. 3.5 mm, apex obtuse or sometimes shallowly 2-lobed. Column ca. 1 mm; viscidia ellipsoid; rostellum with short arms. Fl. Jul–Sep.

• *Picea* forests, thickets, grasslands; 1700–3900 m. W Sichuan, NW Yunnan.

**6. *Peristylus fallax*** Lindley, Gen. Sp. Orchid. Pl. 298. 1835.

盘腺阔蕊兰 pan xian kuo rui lan

*Habenaria fallax* (Lindley) King & Pantling; *Herminium fallax* (Lindley) J. D. Hooker; *Monorchis fallax* (Lindley) O. Schwarz; *Peristylus fallax* var. *dwarikae* Deva & H. B. Naitani; *Platanthera fallax* (Lindley) Schlechter.

Plants slender to somewhat robust, 14–30 cm tall. Tubers subglobose to oblong-ellipsoid, 1–1.5 × ca. 0.8 cm. Stem with 2 or 3 tubular sheaths at base, 1-leaved. Leaf basal or cauline, narrowly oblong-elliptic to oblanceolate, 6–13 × 0.8–2 cm, apex acute. Inflorescence 11–22 cm; peduncle cylindrical to slightly ridged, slender to stout, ebracteate or with 1 lanceolate sterile bract to 20 mm; rachis 5–14 cm, subaxially to densely many flowered; floral bracts lanceolate, 6–15 mm, basal ones exceeding flowers, apex acuminate. Flowers horizontal, yellowish green; ovary 6–7 mm including pedicel. Dorsal sepal suberect, oblong-ovate, concave, 3–4 × 1.5–1.8 mm, 1-veined, apex obtuse; lateral sepals spreading, ovate-lanceolate, oblique, slightly concave, 3.5–4.2 × ca. 1.4 mm, 1-veined, apex subacute. Petals ascending, ovate-lanceolate, 3.2–4 × ca. 1.2 mm, 1-veined, apex acute; lip spreading, ovate, 3.2–5.5 × 1–1.3 mm, ecallose, 3-lobed near middle; lateral lobes diverging at an acute angle from axis of lip, oblong, 0.8–1.5 mm, apex obtuse; mid-lobe oblong, 1–2 mm, broader than lateral lobes; spur pendulous, scrotiform to oblong-clavate, 0.8–1.5 mm, apex obtuse or sometimes shallowly 2-lobed. Column ca. 1 mm; viscidia disklike; rostellum broad, with short arms. Fl. Jul–Sep.  $2n = 30$ , 34, 42.

Forests, forest margins, alpine grasslands; 3000–3300 m. SW Sichuan, S Xizang, NW Yunnan [Bhutan, India, Nepal].

**7. *Peristylus bulleyi*** (Rolfe) K. Y. Lang, Acta Phytotax. Sin. 25: 448. 1987.

条叶阔蕊兰 tiao ye kuo rui lan

*Habenaria bulleyi* Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 25. 1913; *H. beesiana* W. W. Smith; *Herminium bulleyi* (Rolfe) Tang & F. T. Wang; *Peristylus gracillimus* (J. D. Hooker) Kraenzlin f. *lankongensis* Finet; *Platanthera praeus-tipetala* Kraenzlin.

Plants slender, 15–35 cm tall. Tubers oblong, 1–2 × ca. 0.5 cm. Stem with 2 tubular sheaths at base, 2–4-leaved. Leaves somewhat spaced to clustered midway along stem, linear, 4–10 × 0.2–0.6 cm, apex acute or acuminate. Inflorescence 13–30

cm; peduncle cylindrical to slightly ridged, slender; sterile bracts 1–3, linear-lanceolate, 5–7 mm; rachis 5–15 cm, subaxly several to subdensely many flowered; floral bracts ovate-lanceolate, 4–6 mm, shorter than ovary, apex acuminate. Flowers erect, yellowish green; ovary 5–8 mm including pedicel. Dorsal sepal erect, ovate-oblong, concave, 2–3.5 × 0.8–1.2 mm, 1-veined, apex obtuse; lateral sepals spreading to reflexed, oblong, slightly oblique, 3–4 × 0.8–1.2 mm, 1-veined, apex obtuse. Petals erect-spreading to reflexed, narrowly ovate-lanceolate, ca. 3.5 × 1(–1.5) mm, slightly fleshy above middle, 3-veined, apex acute; lip narrowly oblong, 3–4.5 × ca. 0.4 mm, ecallose, 3-lobed near middle; lateral lobes diverging at an acute angle from axis of lip, narrowly oblong, 0.8–2.5 mm; mid-lobe linear-oblong, 2–3 mm, slightly longer and wider than lateral lobes, apex obtuse; spur pendulous, curved forward, cylindrical, 4–6 mm, almost as long as ovary, apex obtuse. Column ca. 0.8 mm; viscidia ellipsoid. Fl. Jul–Aug.

• *Pinus* forests, grassy slopes; 2500–3300 m. SW and W Sichuan, N and NW Yunnan.

**8. *Peristylus manni*** (H. G. Reichenbach) Mukerjee, Notes Roy. Bot. Gard. Edinburgh 21: 153. 1953.

纤茎阔蕊兰 xian jing kuo rui lan

*Coeloglossum manni* H. G. Reichenbach, Linnaea 41: 54. 1877; *Habenaria duclouxii* Rolfe; *H. gracillima* J. D. Hooker; *H. spiranthiformis* Ames & Schlechter; *Herminium manni* (H. G. Reichenbach) Tang & F. T. Wang; *H. spiranthiforme* (Ames & Schlechter) Tang & F. T. Wang; *H. yuenum* Tang & F. T. Wang; *Peristylus gracillimus* (J. D. Hooker) Kraenzlin; *Platanthera manni* (H. G. Reichenbach) Schlechter.

Plants slender, 15–40 cm tall. Tubers subglobose to oblong-elliptic, 1–1.5 × 0.4–1 cm. Stem with 2 tubular sheaths at base, 2–4-leaved. Leaves clustered at base of stem, linear, 3.5–15 × 0.2–0.4 cm, apex acuminate. Inflorescence 14–37 cm; peduncle cylindrical, slender; sterile bracts 1–5, lanceolate, to 20 mm; rachis 4–20 cm, subaxly few to many flowered; floral bracts ovate-lanceolate, 2–4 mm, shorter than ovary, apex acuminate. Flowers horizontal, green to pale yellowish green; ovary 3–5 mm including pedicel. Dorsal sepal oblong-ovate, concave, ca. 2.5 × 0.8 mm, 1-veined, apex obtuse; lateral sepals weakly spreading, ligulate to narrowly oblong, ca. 2.5 × 0.8 mm, 1-veined, apex obtuse. Petals loosely connivent with dorsal sepal and forming a hood, narrowly ovate-lanceolate, 2–2.5 × ca. 0.8 mm, slightly fleshy above middle, 2-veined, apex obtuse; lip spreading, narrowly ovate, 2–2.5 × ca. 0.8 mm, ecallose, 3-lobed near middle; lateral lobes diverging at an acute angle from axis of lip, narrowly oblong, 0.8–1.2 mm; mid-lobe oblong, slightly attenuate, 1–1.5 mm, slightly broader than lateral lobes, 3-veined; spur pendulous, scrotiform, 1–1.5 mm, apex obtuse. Column ca. 0.5 mm; viscidia ellipsoid. Fl. Sep–Oct.

Open forests, thickets, grassy slopes; 1700–2900 m. S Sichuan, C and W Yunnan [India].

**9. *Peristylus constrictus*** (Lindley) Lindley, Gen. Sp. Orchid. Pl. 300. 1835.

大花阔蕊兰 da hua kuo rui lan

*Herminium constrictum* Lindley, Edwards's Bot. Reg. 18:

ad t. 1499. 1832; *Habenaria constricta* (Lindley) J. D. Hooker; *Platanthera constricta* (Lindley) Wallich.

Plants robust, (30–)45–77 cm tall. Tubers oblong, 3–4 × 0.8–1.5 cm. Stem with 4–6 tubular sheaths at base, 4–6-leaved. Leaves basal and clustered to somewhat spaced along stem, broadly elliptic, 5–13 × 3.5–6.5 cm, apex acute. Inflorescence 21–42 cm; peduncle cylindrical, stout; sterile bracts several, lanceolate, to 30 mm; rachis 5–18 cm, densely many flowered; floral bracts ovate-lanceolate, 9–15 mm, exceeding ovary, apex acuminate. Flowers horizontal; sepals pale brown; petals and lip pure white; ovary 8–10 mm including pedicel. Dorsal sepal forming a hood, concave, 7–9 × 2–3 mm, 1-veined, apex obtuse; lateral sepals spreading, narrowly oblong-lanceolate, oblique, 7–9 × ca. 2.5 mm, 1-veined, margin incurved, apex acute to mucronate. Petals ovate-lanceolate, oblique, 9–11 × 3.5–4 mm, 3- or 4-veined, apex obtuse; lip spreading, oblong-obovate, 9–11 × 4–5 mm, ecallose, base shallowly concave, 3-lobed near middle; lateral lobes diverging at an acute angle from axis of lip, triangular to shortly oblong, slightly falcate, 2.8–5.8 mm, apex acute; mid-lobe 3–5.5 mm, slightly broader than lateral lobes, apex obtuse; spur pendulous, globose, 2–3 mm, apex rounded, neck contracted. Column ca. 1.8 mm; viscidia ovoid; rostellum deltoid, with short arms. Fl. Jun–Aug. 2n = 38, 42.

Scrubby slopes; 1500–2800 m. SW and W Yunnan [Bhutan, Cambodia, India, Myanmar, Nepal, Thailand, Vietnam].

**10. *Peristylus goodyeroides*** (D. Don) Lindley, Gen. Sp. Orchid. Pl. 299. 1835.

阔蕊兰 kuo rui lan

*Habenaria goodyeroides* D. Don, Prodr. Fl. Nepal. 25. 1825; *H. goodyeroides* var. *formosana* Hayata; *H. hayatana* Schlechter; *H. pandurilabia* Schlechter; *H. tenii* Schlechter; *Herminium goodyeroides* (D. Don) Lindley; *Peristylus sphaerocentron* Tang & F. T. Wang.

Plants usually robust, (17–)28–60(–90) cm tall. Tubers oblong, 1.5–4 × 0.5–2 cm. Stem with 2–4 tubular sheaths at base, 4–6-leaved. Leaves usually clustered midway along stem, ovate to oblong-elliptic, 3.5–17 × 2.5–6.5 cm, apex obtuse or acute. Inflorescence (10–)22–44(–60) cm; peduncle cylindrical, stout; sterile bracts 1 to many, occasionally foliaceous, lanceolate, 8–35 mm; rachis 4–21 cm, subaxly to densely many flowered; floral bracts lanceolate, 6–15 mm, ca. as long as to slightly exceeding ovary, apex acuminate. Flowers erect to horizontal; sepals olive to brownish green; petals and lip pale yellowish green to creamy white; ovary 6–11 mm including pedicel. Dorsal sepal erect, ovate-lanceolate to broadly ovate, concave, 4–5.5 × 2.5–3.5 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong, oblique, 4–6 × 2–2.8 mm, 1-veined, apex acute to obtuse. Petals spreading, broadly ovate, oblique, 4–5.5 × 3–4(–5) mm, 2- or 3-veined, base concave, apex obtuse; lip spreading, oblong-obovate, 4–6 × 3.5–4 mm, shallowly 3-lobed toward apex; disk ecallose but with a dark, triangular nectary toward base; lateral lobes ovate-triangular, 0.8–1.8 mm, apex obtuse; mid-lobe ovate, 1–1.8 mm, slightly broader than lateral lobes, apex obtuse; spur pendulous, globose-scrotiform, ca. 2 mm, apex rounded, neck contracted. Col-

umn ca. 1.5 mm; viscidia ellipsoid; rostellum with short arms. Fl. Jun–Aug.  $2n = 23 + 2f, 42, 46, 47$ .

Broad-leaved forests, scrub, grassy slopes; 500–2300 m. Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, N India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam].

**11. *Peristylus affinis*** (D. Don) Seidenfaden, Dansk Bot. Ark. 31(3): 48. 1977.

小花阔蕊兰 xiao hua kuo rui lan

*Habenaria affinis* D. Don, Prodr. Fl. Nepal. 25. 1825; *Gymnadenia affinis* (D. Don) H. G. Reichenbach; *H. cavaleriei* Schlechter; *H. goodyeroides* D. Don var. *affinis* (D. Don) King & Pantling; *H. sampsonii* (Hance) Hance; *Peristylus goodyeroides* (D. Don) Lindley var. *affinis* (D. Don) Cooke; *P. sampsonii* Hance; *Phyllomphax affinis* (D. Don) Schlechter.

Plants slender, 21–54 cm tall. Tubers oblong-ellipsoid, 1–2 × 0.4–1 cm. Stem with 2–4 tubular sheaths at base, 3–5-leaved. Leaves clustered to somewhat spaced along stem, elliptic to ovate-lanceolate, 2.5–9 × 1–3.5 cm, apex acute. Inflorescence 14–25 cm; peduncle cylindric, slender; sterile bracts 1 or 2, lanceolate, ca. 15 mm; rachis 8–15 cm, subdensely several to many flowered; floral bracts ovate-lanceolate, 8–10 mm, ca. as long as to slightly exceeding ovary, apex acuminate. Flowers erect; sepals olive to brownish green, petals and lip creamy white; ovary 8–10 mm including pedicel. Dorsal sepal erect, oblong, slightly concave, ca. 3 × 1.5–1.8 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong, ca. 3 × 1.2 mm, 1-veined, apex obtuse. Petals forming a loose hood with dorsal sepal, ovate, oblique, ca. 2.5 × 2 mm, 1-veined, apex obtuse; lip spreading, oblong-obovate, 2.5–3 × ca. 1.8 mm, ecallose, papillose near mouth of spur, base concave-saccate, 3-lobed near middle; lateral lobes diverging at an acute angle from axis of lip, oblong, to ca. 1 mm, apex obtuse; mid-lobe oblong, ca. 1.2 mm, broader than lateral lobes, apex obtuse; spur pendulous, saccate, 0.8–1.2 mm, apex rounded. Column ca. 0.8 mm; viscidia subellipsoid; rostellum small, with short arms on both sides. Fl. Jun–Sep.  $2n = 28, 42, 44, 46 + 0–3B$ .

Evergreen broad-leaved forests, open scrub along valleys, roadsides, grassy slopes; 400–3000 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan [NE India, Laos, Myanmar, Nepal, Thailand].

**12. *Peristylus elisabethae*** (Duthie) R. K. Gupta, Fl. Nainital. 351. 1968.

西藏阔蕊兰 xi zang kuo rui lan

*Habenaria elisabethae* Duthie, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 71: 44. 1902; *Herminium elisabethae* (Duthie) Tang & F. T. Wang.

Plants slender, 9–36 cm tall. Tubers oblong-ellipsoid, 1.5–2 × 0.5–1.2 cm. Stem with 1 or 2 tubular sheaths at base, 2- or 3-leaved. Leaves basal to somewhat spaced along stem, narrowly elliptic-lanceolate, 4.5–12 × 0.8–2 cm, apex acute or acuminate. Inflorescence 8–32 cm; peduncle cylindric, slender; sterile bracts 1 or 2, occasionally foliaceous, lanceolate, to 40 mm; rachis 3.5–22 cm, subdensely many flowered; floral bracts

lanceolate, 5–8 mm, almost as long as ovary, apex acuminate. Flowers horizontal, green to yellowish green; ovary 6–9 mm including pedicel. Dorsal sepal broadly ovate, concave, ca. 2 × 1.8 mm, 1-veined, apex obtuse; lateral sepals weakly spreading, ovate, oblique, ca. 2.2 × 1.5 mm, 1-veined, apex acute. Petals loosely connivent with dorsal sepal and forming a hood, ovate-lanceolate, oblique, 1.5–1.8 × ca. 1.2 mm, 1-veined, apex obtuse; lip slightly deflexed, oblong, ca. 3 × 1 mm, ecallose, base shallowly concave, 3-lobed near middle; lateral lobes triangular to shortly oblong, ca. 1.2 mm, diverging at an acute angle from axis of lip, apex obtuse; mid-lobe oblong, 1.2–1.5 mm, slightly broader than lateral lobes, apex obtuse; spur pendulous, oblong-clavate, ca. 1 mm, apex obtuse or shallowly 2-lobed. Column ca. 1 mm; viscidia ellipsoid. Fl. Jul–Sep.  $2n = 42$ .

Coniferous and broad-leaved mixed forests, glades in forests, flooded meadows, grasslands; 3100–4100 m. C and S Xizang [Bhutan, India, Nepal].

**13. *Peristylus parishii*** H. G. Reichenbach, Trans. Linn. Soc. London 30: 139. 1874.

滇桂阔蕊兰 dian gui kuo rui lan

*Habenaria parishii* (H. G. Reichenbach) J. D. Hooker.

Plants slender to somewhat robust, 26–57 cm tall. Tubers ovoid-oblong, 1–2.5 × 0.8–1.5 cm. Stem with 3–5 tubular sheaths at base, 4- or 5-leaved. Leaves clustered near middle of stem, elliptic-lanceolate to ovate, 4–9 × 2–3.5 cm, apex acute. Inflorescence 17–41 cm; peduncle cylindric to slightly ridged, slender to stout, ebracteate or with 1 lanceolate sterile bract ca. 10 mm; rachis 7–25 cm, densely many flowered; floral bracts ovate-lanceolate, 8–12 mm, exceeding ovary (and sometimes flowers), apex acuminate. Flowers horizontal, green; ovary 6–9 mm including pedicel. Dorsal sepal erect, ovate, concave, 3.2–4.5 × 1.8–2 mm, 1-veined, apex obtuse; lateral sepals spreading, oblong, oblique, 3.5–5 × ca. 1.5 mm, 1-veined, apex obtuse. Petals spreading, ovate, oblique, 3.5–4.8 × 1.8–2.2 mm, 1- or 2-veined, apex obtuse; lip spreading to deflexed, ovate, 4–5.5 × ca. 2 mm, ecallose, base shallowly concave, 3-lobed near middle; lateral lobes oblong-triangular, ca. 0.8 mm, apex obtuse; mid-lobe oblong, ca. 1.5 mm, slightly broader than lateral lobes, apex obtuse; spur pendulous, fusiform, 1.8–2.5 mm, apex acute, neck contracted. Column ca. 1 mm; viscidia oblong; rostellum with short arms. Fl. Jun–Aug.

Broad-leaved forests, thickets; 700–1800 m. N Guangxi, S and SE Yunnan [India, Myanmar, Nepal, Thailand, Vietnam].

**14. *Peristylus lacertifer*** (Lindley) J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 3, 9: 23. 1927.

撕唇阔蕊兰 si chun kuo rui lan

Plants slender, 16–45 cm tall. Tubers subglobose to oblong, 0.6–1.5 × 0.5–1 cm. Stem with 2 or 3 tubular sheaths at base, 2- or 3-leaved. Leaves subopposite or clustered at base of stem, oblong-lanceolate to ovate-lanceolate, 2.5–12 × 1–3.5 cm, apex acute. Inflorescence 14–40 cm; peduncle cylindric, slender; sterile bracts 3 or more, occasionally foliaceous, lanceolate, to 30 mm; rachis 5–16 cm, subdensely many flowered; floral bracts lanceolate, 6–12 mm, ca. as long as to slightly exceeding

ovary, apex acuminate. Flowers erect, green to pale yellowish green or white; ovary 7–10 mm including pedicel, glabrous. Dorsal sepal erect, ovate-oblong, concave, 2.8–3.5 × ca. 1.8 mm, 1-veined, apex acute; lateral sepals erect to obliquely spreading, 2.8–3.5 × ca. 1.4 mm, 1-veined, apex acute. Petals connivent with dorsal sepal and forming a hood, ovate, 2.8–3.5 × ca. 1.5 mm, 1-veined, apex obtuse; lip usually deflexed, oblong-obovate, 3.5–4.2 × 1.8–2 mm, base concave, 3-lobed toward apex; disk with a large, subglobose callus near base; lateral lobes triangular-lanceolate, 1–1.6 mm, apex acute; mid-lobe ovate-ligulate, 0.8–1.4 mm, broader than lateral lobes, apex obtuse; spur pendulous, somewhat incurved, ovoid, ca. 1 mm, apex acute. Column 1–1.2 mm; viscidia elliptic, small. Fl. Jul–Oct.  $2n = 44, 88$ .

Forests, thickets, grassy slopes; 100–1300 m. S Fujian, S and SW Guangdong, C and SE Guangxi, S Hainan, SW Sichuan, C Taiwan, S Yunnan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Philippines, Thailand, Vietnam].

- 1a. Flowers green to pale yellowish green ..... 14a. var. *lacertifer*  
 1b. Flowers white ..... 14b. var. *taipoensis*

#### 14a. *Peristylus lacertifer* var. *lacertifer*

撕唇阔蕊兰(原变种) *si chun kuo rui lan* (yuan bian zhong)

*Coeloglossum lacertiferum* Lindley, Gen. Sp. Orchid. Pl. 302. 1835; *Choeradoplectron spiranthes* Schauer; *Coeloglossum acuminatum* Lindley; *Habenaria lacertifera* (Lindley) Benth.; *H. maingayi* King & Pantling; *H. meyenii* Merrill; *Peristylus chloranthus* Lindley ex Benth.; *P. spiranthes* (Schauer) S. Y. Hu.

Flowers green to pale yellowish green. Lateral lobes of lip shorter than to subequal in length to mid-lobe.

Forests, thickets, grassy slopes; 600–1300 m. S Fujian, S and SW Guangdong, C and SE Guangxi, S Hainan, SW Sichuan, C Taiwan, S Yunnan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Philippines, Thailand, Vietnam].

#### 14b. *Peristylus lacertifer* var. *taipoensis* (S. Y. Hu & Barretto) S. C. Chen, S. W. Gale & P. J. Cribb, **comb. nov.**

短裂阔蕊兰 *duan lie kuo rui lan*

Basionym: *Peristylus spiranthes* (Schauer) S. Y. Hu var. *taipoensis* S. Y. Hu & Barretto, Chung Chi J. 13(2): 2. 1976; *P. taipoensis* (S. Y. Hu & Barretto) T. C. Hsu & S. W. Chung.

Flowers white. Lateral lobes of lip always shorter than mid-lobe.

- Forests, grasslands; 100–800 m. Hong Kong, C Taiwan.

#### 15. *Peristylus coeloceras* Finet, Rev. Gén. Bot. 13: 519. 1901.

凸孔阔蕊兰 *tu kong kuo rui lan*

*Herminium coeloceras* (Finet) Schlechter; *H. tenianum* Kraenzlin; *H. unicorne* Kraenzlin; *Monorchis coeloceras* O. Schwarz; *M. teniana* (Kraenzlin) O. Schwarz.

Plants slender, 6–35 cm tall. Tubers oblong-ovoid, 1–2 × 0.5–1 cm. Stem with 1 or 2 tubular sheaths at base, 1–3-leaved.

Leaves clustered at base of stem, narrowly elliptic-lanceolate to oblong-elliptic, 2–10 × 0.8–2 cm, apex obtuse or acute. Inflorescence 5–27 cm; peduncle cylindrical, slender; sterile bracts 1–3, occasionally foliaceous, ovate-lanceolate, 4–32 mm; rachis 2–10 cm, subdensely to densely many flowered; floral bracts lanceolate, 4–6 mm, slightly longer than ovary, apex acuminate. Flowers horizontal, white or pale whitish green; ovary 4–5 mm including pedicel. Dorsal sepal broadly erect, ovate, concave, 2–2.2 × ca. 1.8 mm, 1-veined, apex obtuse; lateral sepals spreading, cuneate-ovate, ca. 2.3 × 1.5 mm, 1-veined, apex obtuse. Petals ovate, oblique, 2–2.2 × ca. 1.4 mm, slightly fleshy above middle, 3-veined, apex obtuse; lip spreading, cuneate, ca. 3 × 2 mm, 3-lobed toward apex; disk with a large, glabrous, subglobose callus near base; lateral lobes oblong-ovate, ca. 0.5 mm, apex obtuse; mid-lobe oblong-ovate, ca. 0.8 mm, apex obtuse; spur pendulous, globose-saccate, very small, ca. 1 mm, apex obtuse. Column ca. 0.8 mm; viscidia elliptic; rostellum with short arms. Fl. Jun–Aug.

Coniferous and broad-leaved mixed forests, thickets, alpine grasslands; 2000–3900 m. W Sichuan, E and SE Xizang, NE and NW Yunnan [N Myanmar].

#### 16. *Peristylus neotineoides* (Ames & Schlechter) K. Y. Lang, Acta Phytotax. Sin. 25: 453. 1987.

川西阔蕊兰 *chuan xi kuo rui lan*

*Herminium neotineoides* Ames & Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 42. 1919; *Monorchis neotineoides* (Ames & Schlechter) O. Schwarz.

Plants slender, 20–38 cm tall. Tubers oblong-ovoid, 1.5–2 × 1–1.5 cm. Stem with 2 or 3 tubular sheaths at base, 2-leaved. Leaves basal, oblong to oblong-lanceolate, 4–14 × 0.8–3 cm, apex acute to acuminate. Peduncle cylindrical, with 1 sterile bract; rachis 8–16 cm, densely many flowered; floral bracts lanceolate, basal ones ca. as long as flowers, apex acuminate. Flowers green; ovary ca. 5 mm including pedicel. Dorsal sepal erect, elliptic, 2–2.5 × ca. 1.5 mm, 1-veined, apex obtuse; lateral sepals spreading, elliptic, 2–2.5 × ca. 1.1 mm, 1-veined, apex obtuse. Petals connivent with dorsal sepal and forming a hood, ovate-lanceolate, oblique, 2–2.5 × ca. 1 mm, 1–3-veined, basal half concave, apex obtuse; lip ovate, 2–3 × 2–2.5 mm, base concave, 3-lobed toward apex; disk with a large, papillose, subglobose callus near base; lateral lobes lanceolate, falcate, apex obtuse; mid-lobe ovate-lanceolate, slightly longer and broader than lateral lobes, apex obtuse; spur saccate, very small; viscidia ovate. Fl. Jul.

- Grassy slopes; 3100–4000 m. W Sichuan.

#### 17. *Peristylus forrestii* (Schlechter) K. Y. Lang, Acta Phytotax. Sin. 25: 454. 1987.

条唇阔蕊兰 *tiao chun kuo rui lan*

*Habenaria forrestii* Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 101. 1912; *Herminium suave* Tang & F. T. Wang.

Plants slender, 20–25 cm tall. Tubers oblong, 1.5–2 × 0.5–1 cm. Stem with 2 or 3 tubular sheaths at base, 2- or 3-leaved. Leaves basal, linear, 2–6 × 0.2–0.3 cm, ± conduplicate, apex acute. Inflorescence 16–22 cm; peduncle cylindrical, slender;

sterile bracts 1–3, lanceolate, 4–5 mm; rachis 6–15 cm, laxly many flowered; floral bracts ovate-lanceolate, ca. 3 mm, much shorter than ovary, apex acuminate. Flowers horizontal to nodding, green; ovary 5–8 mm including pedicel. Dorsal sepal erect, broadly ovate, ca.  $2.5 \times 2$  mm, 1-veined, apex obtuse; lateral sepals reflexed, oblong-ligulate, falcate, ca.  $2.5 \times 1.2$  mm, 1-veined, apex obtuse. Petals ovate-lanceolate to ovate, oblique, ca.  $3 \times 1$  mm, 1-veined, apex obtuse; lip deflexed, ligulate, ca. 3 mm, with an oblong groove near base, ecallose, entire, apex obtuse; spur pendulous, curving forward, cylindrical, 5.5–6(–8) mm, ca. as long as ovary, slightly dilated toward apex; pollinia ovoid; caudicles short; viscidia slightly curled, ovate. Fl. Aug–Sep.

• Forests, grassy slopes; 1700–3900 m. SW Sichuan, NE and NW Yunnan.

**18. *Peristylus forceps*** Finet, Rev. Gén. Bot. 13: 521. 1901.

一掌参 *yi zhang shen*

*Habenaria forceps* (Finet) Schlechter; *H. herminoides* Ames & Schlechter; *Herminium forceps* (Finet) Schlechter; *H. liguliforme* Tang & F. T. Wang; *H. tsoongii* Tang & F. T. Wang.

Plants slender, 15–45 cm tall. Tubers ovoid-oblong, ca. 1 cm. Stem with 2 or 3 tubular sheaths at base, 2–5-leaved. Leaves widely spaced along stem, elliptic-lanceolate to lanceolate, 4–10  $\times$  0.8–2 cm, apex acute or acuminate, intergrading into sterile bracts above. Inflorescence 10–30 cm; peduncle cylindrical, slender; sterile bracts several, often foliaceous, lanceolate, to 35 mm; rachis 8–18 cm, densely many flowered; floral bracts ovate-lanceolate, ca. 8 mm, exceeding flower, apex acuminate. Flowers horizontal, green; ovary ca. 5 mm including pedicel, glabrous to slightly pubescent. Dorsal sepal erect, ovate, 2–3  $\times$  ca. 2 mm, 3-veined, apex obtuse; lateral sepals spreading, oblong, slightly oblique, 2–3  $\times$  ca. 1.5 mm, 1- or 3-veined, apex obtuse. Petals ovate-lanceolate, slightly oblique, 2–3  $\times$  ca. 1.5 mm, fleshy above middle, 1-veined, apex obtuse; lip deflexed,

ligulate-lanceolate, entire, 2.5–3.5  $\times$  1.5–1.8 mm, sometimes abruptly narrowed above middle, abaxially carinate, ecallose, margin incurved, apex obtuse; spur pendulous, obovoid, 0.7–1 mm, much shorter than ovary, apex obtuse. Column ca. 0.8 mm; viscidia disklike; rostellum with short arms. Fl. Jun–Aug.

• *Abies* forests, *Quercus* forests along valleys, grassy slopes; 1200–4000 m. S Gansu, Guizhou, W Hubei, Sichuan, SE Xizang, Yunnan.

**19. *Peristylus nematocaulon*** (J. D. Hooker) Banerji & P. Pradhan, Orchids Nepal Himalaya 106. 1984.

小巧阔蕊兰 *xiao qiao kuo rui lan*

*Habenaria nematocaulon* J. D. Hooker, Fl. Brit. India 6: 154. 1890; *H. juncea* King & Pantling; *Platanthera juncea* (King & Pantling) Kraenzlin; *P. nematocaulon* (J. D. Hooker) Kraenzlin.

Plants slender, 7.5–25 cm tall. Tubers oblong-cylindrical, 1.5–2  $\times$  0.5–0.7 cm. Stem with 1 or 2 tubular sheaths at base, 1-leaved. Leaf subbasal, oblong to oblong-elliptic, 1.2–8  $\times$  0.7–2 cm, apex subacute. Inflorescence 7–20 cm; peduncle cylindrical, slender, ebracteate or with 1 or 2 linear-lanceolate sterile bracts 7–13 mm; rachis 1.2–10 cm, laxly few to several flowered; floral bracts lanceolate, 4–5 mm, almost as long as to slightly exceeding ovary, apex subacute. Flowers horizontal, pale green; ovary 3–5 mm including pedicel. Dorsal sepal erect, ovate-lanceolate, 1.5–2  $\times$  0.8–1 mm, 1-veined, apex acute; lateral sepals weakly spreading, ovate-lanceolate, slightly oblique, 1.5–2  $\times$  ca. 0.8 mm, apex acute. Petals narrowly oblong, 1.5–2  $\times$  0.8–1 mm, 1-veined, apex subobtusely; lip horizontal, oblong-lanceolate, 1.5–2.2  $\times$  ca. 0.7 mm, ecallose, entire, apex subacute; spur pendulous, slightly curving forward, cylindrical-clavate, ca. 1.2 mm, much shorter than ovary, apex obtuse. Column ca. 0.6 mm; caudicles very short; viscidia elliptic. Fl. Jul–Aug.

Alpine scrub, meadows; 3500–3800 m. SE Xizang [Bhutan, NE India, Nepal].

## 42. HABENARIA Willdenow, Sp. Pl. 4: 5, 44. 1805.

玉凤花属 *yu feng hua shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Phillip J. Cribb

*Fimbrorchis* Szlachetko; *Habenaria* sect. *Kryptostoma* Summerhayes; *Habenorkis* Thouars; *Kryptostoma* (Summerhayes) Geerinck; *Medusorchis* Szlachetko; *Ochrorchis* Szlachetko; *Senghasiella* Szlachetko; *Smithanthe* Szlachetko & Margońska.

Herbs, terrestrial. Tubers subglobose, ellipsoid, or oblong, fleshy, unlobed, neck with several slender roots. Stem erect, base often with tubular sheaths, above sheaths with leaves and sometimes several bractlike leaves above. Leaves 1 to several, loosely arranged or tufted, base contracted into amplexicaul sheaths. Inflorescence racemose, terminal, few to many flowered. Flowers resupinate. Sepals free; dorsal sepal connivent with petals forming a hood; lateral sepals spreading and reflexed. Petals simple or bilobed; lip often 3-lobed, base often spurred, sometimes saccate or spurless. Column short, both sides often with auricles (staminodes); anther erect, with distinct connective and 2 divergent locules, base of each often protruding and grooved; pollinia 2, granular-farinaceous, sectile, usually each by a long caudicle attached to a viscidium; viscidium naked, relatively small; stigmas 2, separate, convex or elongate,  $\pm$  clavate, at base of column; rostellum usually stout and large, with arms parallel to basal grooves of anther,  $\pm$  embracing caudicles.

About 600 species: worldwide, mainly in tropical and subtropical areas; 54 species (19 endemic) in China.

The recent fragmentation of *Habenaria* by Szlachetko and his co-workers (Szlachetko & Olszewski, Fl. Cameroun 34: 231. 1998; Olszewski & Szlachetko, Ann. Bot. Fenn. 37: 299. 2000; Szlachetko, Orchidee (Hamburg) 55: 489. 2004; Szlachetko, Richardiana 4: 55. 2004; Szlachetko &

Margońska, *Orchidee* (Hamburg) 55: 174. 2004) has not been widely taken up. Although Szlachetko et al. retain many species in *Habenaria*, they also recognize the genera *Fimbrorchis*, *Kryptostoma*, *Medusorchis*, *Ochrorchis*, *Senghasiella*, and *Smithanthe* as represented in China and have placed some Chinese *Habenaria* species in these genera. *Habenaria* is almost certainly polyphyletic and some reorganization of it is undoubtedly necessary. We await the results of molecular studies that are currently underway before adopting a different generic classification from that proposed here.

- 1a. Leaves basal, appressed to substrate, often 2, rarely 1 or more than 2, often cordate, orbicular, or ovate.
- 2a. Petals simple.
- 3a. Flowers white; sepals ciliate or not.
- 4a. Leaves 3 or 4(–6), in a rosette; lip with a conic appendage at base; spur longer than pedicel and ovary ..... 1. *H. delavayi*
- 4b. Leaves 2, subopposite; lip lacking an appendage; spur shorter than pedicel and ovary ..... 2. *H. siamensis*
- 3b. Flowers green or greenish white; sepals not ciliate.
- 5a. Spur 8–13 mm, ca. as long as or longer than ovary; leaves 2–3 × as long as wide ..... 5. *H. humidicola*
- 5b. Spur indistinct or 1–7 mm, shorter than ovary; leaves slightly longer than wide.
- 6a. Stem and ovary pubescent ..... 3. *H. diplomema*
- 6b. Stem and ovary glabrous.
- 7a. Leaves 2, subopposite; spur ca. 7 mm ..... 6. *H. diphylla*
- 7b. Leaves 1 or 2, not as above; spur less than 2 mm.
- 8a. Inflorescence 10–20-flowered; spur ca. 1.5 mm ..... 4. *H. acianthoides*
- 8b. Inflorescence 4- or 5-flowered; spur indistinct or absent ..... 7. *H. reniformis*
- 2b. Petals bilobed, anterior lobe sometimes small and obscure.
- 9a. Leaves with yellowish white markings adaxially.
- 10a. Leaves thinly textured; sepals ciliate; petals deeply 2-lobed, lower lobe linear, 9(–13) mm ..... 8. *H. fargesii*
- 10b. Leaves relatively thickly textured; sepals not ciliate; petals shallowly 2-lobed, lower lobe ca. 0.5 mm ..... 9. *H. wolongensis*
- 9b. Leaves lacking yellowish white markings adaxially.
- 11a. Dorsal sepal 3–6(–7) mm; petals not ciliate.
- 12a. Spur 6–9 mm, shorter than pedicel and ovary ..... 10. *H. aitchisonii*
- 12b. Spur 11–13 mm, longer than pedicel and ovary ..... 11. *H. balfouriana*
- 11b. Dorsal sepal 7–13 mm; petals ciliate.
- 13a. Leaves glaucous adaxially; base of peduncle densely pubescent; dorsal sepal 10–13 mm; spur nearly as long as pedicel and ovary ..... 12. *H. glaucifolia*
- 13b. Leaves green adaxially; base of peduncle sparsely pubescent or glabrous; dorsal sepal 7–9 mm; spur longer than pedicel and ovary.
- 14a. Leaves with 5–7 white veins adaxially; lip lacking an appendage in mouth of spur ..... 13. *H. tibetica*
- 14b. Leaves with 5–7 green veins adaxially; lip with a conic appendage in mouth of spur ..... 14. *H. szechuanica*
- 1b. Leaves cauline, well spaced or tufted, never appressed to substrate, various in shape but never cordate nor orbicular.
- 15a. Petals bilobed.
- 16a. Petals shallowly bilobed; lip ± cross-shaped.
- 17a. Flowers small; petals ca. 4 mm; lateral lobes of lip obovate-oblanceolate, spreading at a right angle to mid-lobe; spur 1.4–1.5 cm, ca. as long as pedicel and ovary ..... 15. *H. schindleri*
- 17b. Flowers rather large, petals 5–5.5 mm; lateral lobes of lip linear, spreading at an acute angle to mid-lobe; spur 2.5–3.5 cm, longer than pedicel and ovary ..... 16. *H. linearifolia*
- 16b. Petals deeply bilobed; lip not cross-shaped.
- 18a. Petals usually with 6 or 7 filiform laciniae; lip with many filiform laciniae ..... 17. *H. polytricha*
- 18b. Petals and lip lacking filiform laciniae.
- 19a. Sepals long acuminate or caudate-aristate at apex.
- 20a. Petals with anterior (lower) lobe ca. 2.5 mm, shorter than posterior (upper) lobe ..... 18. *H. stenopetala*
- 20b. Petals with anterior (lower) lobe 18–25 mm, longer than posterior (upper) lobe ..... 19. *H. pantlingiana*
- 19b. Sepals neither long acuminate nor caudate-aristate at apex.
- 21a. Petals and lip not ciliate on margins of lobes; petal lobes of unequal size, with posterior lobe shorter and wider than anterior lobe ..... 20. *H. coulousii*
- 21b. Petals and/or lip ciliate, or lip pubescent along apical margins of lobes; petal lobes of equal size.
- 22a. Petals and lip with ciliate lobes; spur not lobed ..... 21. *H. petelotii*
- 22b. Petals lacking ciliate lobes; spur deeply bilobed at apex ..... 22. *H. hosokawae*

- 15b. Petals simple.
- 23a. Lateral lobes of lip with many long laciniae along outside margins.
- 24a. Petals linear, ca. 0.5 mm wide; spur thickened and geniculate-curved near middle ..... 23. *H. medioflexa*
- 24b. Petals not linear, 3–8 mm wide; spur not as above.
- 25a. Petals falcate, subovate, ca. 8 mm wide.
- 26a. Sepals not ciliate; connective ca. 8 mm wide; staminodes spatulate, ca. 2 mm; spur shorter than ovary ..... 28. *H. yuana*
- 26b. Sepals ciliate; connective 2–4 mm wide; staminodes elliptic, ca. 1 mm; spur ca. as long as or longer than ovary.
- 27a. Inflorescence 1–4-flowered; spur 7–8.5 cm, much longer than ovary; connective ca. 2 mm wide ..... 29. *H. intermedia*
- 27b. Inflorescence 5- or more flowered; spur 3.5–4 cm, ca. as long as or slightly longer than ovary; connective 3–4 mm wide ..... 30. *H. arietina*
- 25b. Petals oblong or lanceolate, 4–5 mm wide.
- 28a. Spur 4.5–6.5 cm, much longer than pedicel and ovary ..... 26. *H. davidii*
- 28b. Spur 1.7–3.5 cm, shorter than or nearly as long as pedicel and ovary.
- 29a. Connective 10–12 mm wide ..... 24. *H. limprichtii*
- 29b. Connective 2–5 mm wide.
- 30a. Petals ± hairy adaxially; spur 17–18 mm; connective ca. 2 mm wide ..... 25. *H. pectinata*
- 30b. Petals glabrous adaxially; spur 20–35 mm; connective ca. 5 mm wide ..... 27. *H. mairei*
- 23b. Lateral lobes of lip sometimes serrate but lacking long laciniae along outside margins.
- 31a. Lateral sepals strongly oblique.
- 32a. Lip with a ring-shaped or cupular structure, or sometimes a lamella near entrance of spur.
- 33a. Lateral lobes of lip much shorter than mid-lobe.
- 34a. Spur 10–17 mm, shorter than pedicel and ovary; petals oblong, 3–4 mm ..... 36. *H. acuífera*
- 34b. Spur 20–29 mm, longer than pedicel and ovary; petals narrowly ovate or narrowly elliptic, 4–5 mm ..... 37. *H. linguella*
- 33b. Lateral lobes of lip nearly as long as mid-lobe.
- 35a. Flowers white, with a brown vein on lateral sepals; spur 20–22 mm, slightly longer than pedicel and ovary ..... 38. *H. rostellifera*
- 35b. Flowers red-orange, with pale green sepals, without a brown vein on lateral sepals; spur 11–12 mm, shorter than pedicel and ovary ..... 39. *H. rostrata*
- 32b. Lip lacking a ring-shaped, cupular structure or lamella near entrance of spur.
- 36a. Dorsal sepal much smaller than lateral sepals.
- 37a. Lateral sepals obliquely axe-shaped, ca. 7 × 13 mm; petals ca. 4 mm wide; spur 5–8 cm, pendulous, longer than pedicel and ovary; ovary glabrous ..... 31. *H. commelinifolia*
- 37b. Lateral sepals obliquely triangular, ca. 5 × 8 mm; petals ca. 1 mm wide; spur 2–2.2 cm, ca. as long as or shorter than pedicel and ovary; ovary pubescent ..... 32. *H. austrosinensis*
- 36b. Dorsal sepal not or slightly smaller than lateral sepals.
- 38a. Dorsal sepal with 3 serrulate keels on abaxial surface ..... 33. *H. ciliolaris*
- 38b. Dorsal sepal without keels on abaxial surface.
- 39a. Rachis villous on ridges; petals triangular-lanceolate, ca. 6 mm; lip with a conic callus at base; spur 1.6–2 cm, ca. as long as pedicel and ovary ..... 34. *H. hystrix*
- 39b. Rachis glabrous; petals linear-lanceolate, 13–15 mm; lip without callus at base; spur 3–6 cm, much longer than pedicel and ovary ..... 35. *H. fordii*
- 31b. Lateral sepals not or slightly oblique.
- 40a. Flowers orange to red; lip mid-lobe bilobed ..... 40. *H. rhodocheila*
- 40b. Flowers not orange to red; lip or its mid-lobe simple.
- 41a. Lip often unlobed; spur often absent ..... 41. *H. malintana*
- 41b. Lip deeply 3-lobed; spur present.
- 42a. Lateral lobes of lip broad, subrhombic or suborbicular, apical margin serrate.
- 43a. Plants 9–25 cm tall; leaves cordate or ovate; spur 17–20 mm, slightly shorter or nearly as long as pedicel and ovary ..... 42. *H. finetiana*
- 43b. Plants 35–87 cm tall; leaves oblong to narrowly elliptic; spur to 4 cm, longer than pedicel and ovary ..... 43. *H. dentata*
- 42b. Lateral lobes of lip narrow, not as above, margins never serrate.

- 44a. Mid-lobe of lip suberect or curved upward, apex adnate to tip of hood formed by dorsal sepal and petals.
- 45a. Floral bracts shorter than pedicel and ovary; lateral sepals reflexed; spur cylindric, to 21 mm, much longer than pedicel and ovary ..... 44. *H. lucida*
- 45b. Floral bracts longer than flower; lateral sepals spreading, not reflexed; spur clavate, 3–6 mm, shorter than pedicel and ovary ..... 45. *H. shweliensis*
- 44b. Mid-lobe of lip never suberect or curved upward, apex never adnate to hood formed by dorsal sepal and petals.
- 46a. Leaves tufted at base of stem; spur longer than ovary.
- 47a. Leaves narrowly elliptic or broadly oblanceolate, 18–20 mm wide; flowers pale green ..... 46. *H. iyoensis*
- 47b. Leaves linear or linear-lanceolate, 4–15 mm wide; flowers yellowish green or white.
- 48a. Leaves 4 or 5, 4–6 mm wide; dorsal sepal ca. 2 mm; spur narrowly cylindric ..... 47. *H. viridiflora*
- 48b. Leaves 6–13, 8–15 mm wide; dorsal sepal ca. 5 mm; spur narrowly cylindric-clavate.
- 49a. Dorsal sepal broadly ovate; lateral sepals narrowly ovate; petals ovate-ligulate; lip with lateral lobes narrower than mid-lobe ..... 48. *H. plurifoliata*
- 49b. Dorsal sepal elliptic; lateral sepals elliptic; petals linear; lip with lateral lobes and mid-lobe equal in width ..... 49. *H. tonkinensis*
- 46b. Leaves not tufted at base of stem; spur longer or shorter than ovary.
- 50a. Dorsal sepal 7–8 mm.
- 51a. Spur narrowly cylindric, 3–5 mm, shorter than pedicel and ovary; dorsal sepal narrowly ovate, ca. 4 mm wide; petals ca. 2.5 mm wide; flowers yellow .... 50. *H. fulva*
- 51b. Spur clavate, 8–13 mm, ca. as long as pedicel and ovary; dorsal sepal cordate or broadly ovate, 5–6 mm wide; petals obliquely ovate-triangular, 3–3.8 mm wide; flowers yellowish green ..... 51. *H. marginata*
- 50b. Dorsal sepal 3–4 mm.
- 52a. Floral bracts longer than ovary; flowers pale yellowish green ..... 52. *H. leptoloba*
- 52b. Floral bracts shorter or nearly as long as ovary; flowers pinkish white or pale green.
- 53a. Floral bracts much shorter than pedicel and ovary; flowers pinkish white; lateral sepals 2-veined; petals obliquely oblong-ovate; spur ca. 21 mm ..... 53. *H. nematocera*
- 53b. Floral bracts nearly as long as pedicel and ovary; flowers pale green; lateral sepals 3-veined; petals lanceolate; spur ca. 17 mm ..... 54. *H. furcifera*

**1. *Habenaria delavayi*** Finet, Rev. Gén. Bot. 13: 527. 1901.

厚瓣玉凤花 hou ban yu feng hua

*Habenaria yunnanensis* Rolfe.

Plants 9–35 cm tall. Tubers oblong or ovoid, 1–2 × 1–1.5 cm, fleshy. Stem erect, terete, 3–5 mm in diam., glabrous, base with 1 or 2 tubular sheaths, with 3 or rarely 4(–6) leaves in a dense basal rosette, and with 1–5 bractlike leaves above. Leaf blade orbicular or ovate, 1.5–5 × 1.5–4 cm, slightly fleshy, base obtuse-rounded, abruptly narrowed and amplexicaul, apex obtuse or acute. Raceme 6–15 cm, loosely 7–20-flowered; floral

bracts lanceolate, ca. 1/2 length of ovary, apex aristate; ovary twisted, slightly arching, fusiform, glabrous, including pedicel 1.3–1.8 cm. Flowers white. Dorsal sepal erect, broadly elliptic, ca. 4 × 4 mm, concave, abaxially keeled and toward apex pubescent, 3-veined; lateral sepals reflexed, lanceolate, 4–5 × ca. 2.5 mm, 3-veined, apex acute, abaxially and along margin pubescent. Petals linear, ca. 6 × 0.8 mm, base twisted, 1-veined, apex acute; lip spurred, deeply 3-lobed above base; lobes narrow, equal in width, stout; lateral lobes linear-cuneate, 8–9 × 0.8–1 mm; mid-lobe linear, ± subcylindric, ca. 7 × 0.7 mm, adaxially channeled; spur pendulous, slightly curved, clavate, 1.2–1.4 cm, longer than ovary, with 1 slightly incurved, subu-

late appendage at front margin of mouth; pollinia obovoid; caudicles nearly oblong, slender; viscidium ovate; stigmas clavate, apex papillate. Fl. Jun–Aug.

• Forests, grassy places in forests, shrubby grasslands; 1500–3000 m. Guizhou, W Sichuan, NW to SE Yunnan.

**2. *Habenaria siamensis*** Schlechter, Repert. Spec. Nov. Regni Veg. 2: 82. 1906.

中泰玉凤花 zhong tai yu feng hua

Plants 14–16 cm tall. Tubers oblong, 2–3 cm × 8–10 mm, fleshy. Stem erect, terete, 2–3 mm in diam., glabrous, often with 2 spreading basal leaves, with 3–5 bractlike leaves above. Leaf blade ovate or ovate-oblong, 4–4.5 × 2.5–3.5 cm, base amplexicaul-sheathing, apex acute or acuminate. Raceme several to more than 10-flowered, erect or arching, 4–6 cm; floral bracts lanceolate, ca. 13 mm, shorter than ovary, margin finely ciliate, apex acuminate; ovary twisted, slightly arching, cylindrical, including pedicel to 15 mm, glabrous. Flowers white. Sepals 3-veined, margin finely ciliate; dorsal sepal forming a hood with petals, erect, ovate, concave, ca. 8 × 4 mm; lateral sepals reflexed, obliquely ovate-lanceolate, ca. 9 × 4 mm. Petals obliquely falcate-lanceolate, ca. 8 × 2.5 mm, 2-veined; lip spurred at base, deeply 3-lobed above base; lateral lobes linear-filiform, ± curved, 17–21 × ca. 0.5 mm, attenuate toward apex; mid-lobe straight, linear, 6–9 × 0.8–1.5 mm; spur pendulous, cylindrical-clavate, 9–10 mm, conspicuously shorter than ovary, dilated from middle to end, near end ca. 2.2 mm in diam., apex obtuse; connective narrow, ca. 1 mm wide; rostellum short; stigmas oblong-clavate, ca. 4 mm. Fl. Aug.

Grassy slopes; ca. 600 m. SE Guizhou [Thailand].

**3. *Habenaria diplonema*** Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 100. 1912.

小巧玉凤花 xiao qiao yu feng hua

Plants 8–13 cm tall. Tubers oblong, ca. 1 cm × 5 mm, fleshy. Stem erect or ascending, slender, pubescent, with 2 nearly opposite leaves near middle. Leaf blade orbicular, 1.5–2 × 1.4–1.7 cm, adaxially with yellowish white venation, densely finely papillate, base narrowed and amplexicaul-sheathing, margin white ciliate, apex acute. Raceme 4–14-flowered; rachis pubescent; floral bracts lanceolate, much shorter than ovary, apex acuminate; ovary twisted, terete, pubescent, including pedicel ca. 7 mm. Flowers green, small. Dorsal sepal erect, broadly ovate, ca. 3.5 × 3 mm, glabrous, 1-veined, apex obtuse-rounded; lateral sepals reflexed, obliquely ovate-elliptic, ca. 4 × 2.5 mm, glabrous, 1-veined, apex subobtuse. Petals erect, obliquely falcate-ovate, ca. 3.5 × 2.3 mm, glabrous, 1-veined, unlobed; lip spurred at base, above base 3-lobed; lateral lobes filiform, 6–7 mm, much longer than mid-lobe; mid-lobe linear-ligulate, ca. 2 mm, apex subacute; spur pendulous, clavate, ca. 4 mm. Fl. Aug.

• Forests, soil-covered rocks; 2800–4200 m. N Fujian, SW Sichuan, NW Yunnan.

**4. *Habenaria acianthoides*** Schlechter, Acta Horti Gothob. 1: 138. 1924.

小花玉凤花 xiao hua yu feng hua

Plants 18–20 cm tall. Tubers ovoid, ca. 1.5 cm, fleshy. Stem erect or ascending, slender, glabrous, with 1 leaf at base and 2 or 3 bractlike leaves above. Leaf blade green or purplish red, ovate-orbicular, 1.5–3 × 2.2–2.8 cm, slightly fleshy, base subcordate, apex mucronate. Raceme with 10–20 secund flowers, 8–12 cm; floral bracts ovate-lanceolate, much shorter than ovary, apex acuminate; ovary twisted, fusiform, including pedicel ca. 4.5 mm, glabrous. Flowers green, very small. Dorsal sepal forming a hood with petals, erect, ovate, ca. 1.5 × 1.2 mm, 1-veined, apex obtuse; lateral sepals reflexed, obliquely ovate, ca. 1.75 × 1 mm, 1-veined, apex obtuse. Petals obliquely ovate, ca. 1.5 × 1.5 mm, 1-veined; lip spurred at base, 3-veined, deeply 3-lobed below middle; lateral lobes divaricate, ± curved, filiform, ca. 3.5 mm; mid-lobe straight, linear, ca. 2 mm; spur pendulous, oblong-cylindric, ca. 1.5 mm, apex obtuse. Fl. Jul.

• Forests, thickets; 900–1900 m. S Gansu, E Qinghai, W Sichuan.

**5. *Habenaria humidicola*** Rolfe, Bull. Misc. Inform. Kew 1896: 202. 1896.

湿地玉凤花 shi di yu feng hua

Plants 15–20 cm tall. Tubers cylindrical, 1–4 cm × 5–15 mm, fleshy. Stem erect, terete, glabrous, with 3 or 4 rosette leaves at base and with a few bractlike leaves above. Leaf blade lanceolate-oblong, 4–6 × 1–1.5 cm, base amplexicaul, apex subacute or acuminate. Raceme laxly few to many flowered, 5–20 cm; floral bracts ovate-lanceolate, 5–14 mm, shorter to longer than ovary, apex acuminate; ovary twisted, cylindrical-fusiform, including pedicel 8–10 mm, glabrous. Flowers green, small. Dorsal sepal forming a hood with petals, erect, ovate-oblong, concave, 3.2–4 × 2–2.8 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate-oblong, 3.5–4.5 × 1.8–2 mm, 3-veined, apex obtuse. Petals straight, linear-oblong, 3.2–4 × ca. 1 mm, 1-veined, apex obtuse; lip 5–9 mm, spurred at base, deeply 3-lobed above base; lateral lobes linear-lanceolate, attenuate and filiform above middle, 4.5–9 mm; mid-lobe linear, 3.2–6 mm, apex obtuse; spur pendulous, cylindrical, 8–15 mm, ca. as long as or longer than ovary, slender, apical half slightly dilated; stigmas oblong-clavate, ca. 1.5 mm. Fl. Sep.

Forests, damp places on shaded rocks; 600–1500 m. SW Guizhou, S Yunnan, E Zhejiang [Myanmar].

**6. *Habenaria diphylla*** Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 262. 1850.

二叶玉凤花 er ye yu feng hua

*Habenaria humistrata* Rolfe ex Downie; *Liparis diphyllus* Nimmo.

Plants 7–25 cm tall. Tubers ovoid or ellipsoid, 0.5–1.5 cm, fleshy. Stem erect or ascending, terete, glabrous, with 2 nearly opposite leaves at base and 2–5 bractlike leaves above. Leaf blade cordate or nearly reniform, 1.2–3.5 × 1–5 cm, base contracted into amplexicaul sheath, apex acute. Raceme loosely 1- to several flowered; rachis glabrous; floral bracts ovate-lanceolate, 4–7 mm, shorter than ovary, apex acuminate; ovary twisted, terete, including pedicel 10–11 mm, glabrous. Flowers greenish white, small. Dorsal sepal forming a hood with petals, erect, ovate, concave, ca. 5 × 4 mm, 1-veined, apex obtuse-rounded; lateral sepals reflexed, oblong, ca. 6 × 3 mm, 3-

veined, apex acute. Petals straight, linear-lanceolate, ca. 5 × 1 mm, 1-veined, apex acute; lip 13–15 mm, from base deeply 3-lobed, lobes filiform; lateral lobes longer than mid-lobe, 13–15 mm, often curled upward toward apex; spur pendulous, subclavate, 5.5–9 mm, shorter than ovary, apex subacute; stigmas narrowly clavate. Fl. Jun.  $2n = 42, 42 + 2B, 108$ .

Damp places and on rocks in forests along valleys; 1000–1400 m. S Yunnan [N India, Thailand].

**7. *Habenaria reniformis*** (D. Don) J. D. Hooker, Fl. Brit. India 6: 152. 1890.

肾叶玉凤花 shen ye yu feng hua

*Listera reniformis* D. Don, Prodr. Fl. Nepal. 28. 1825; *Aopla reniformis* Lindley; *Herminium reniforme* (D. Don) Lindley; *Neottia reniformis* (D. Don) Sprengel.

Plants 18–20 cm tall. Tubers globose, ca. 1 cm in diam., fleshy. Stem rather slender, with 1 or 2 leaves at base and 3 or 4 bractlike leaves above. Leaf blade almost spreading horizontally, orbicular, ovate-cordate, or broadly ovate-orbicular, 1.8–2.5 × 1.5–2.7 cm, fleshy, base often cordate, amplexicaul, apex obtuse. Raceme sparsely 4- or 5-flowered, 7–8 cm, glabrous; floral bracts lanceolate, small, 6–8 mm, much shorter than ovary; ovary twisted, cylindric-fusiform, including pedicel 13–16 mm, glabrous. Flowers green, small. Dorsal sepal erect, concave, narrowly ovate-oblong, ca. 5 × 1.7 mm, 3-veined, apex obtuse; lateral sepals spreading or reflexed, obliquely ovate-lanceolate, ca. 6 × 1.5 mm, 3-veined, apex acuminate. Petals oblique, narrowly lanceolate, falcate, ca. 4.5 × 1 mm, 1-veined, apex subobtuse; lip linear, slightly longer than or ca. as long as sepals, usually with 1 tooth on either side below middle; spur often absent; stigmas subcylindric or clavate, ca. 1.5 mm. Fl. Oct.

Grassy places in forests. Guangdong, S Hainan [Cambodia, India, Nepal, Thailand, Vietnam].

**8. *Habenaria fargesii*** Finet, Rev. Gén. Bot. 13: 528. 1901.

雅致玉凤花 ya zhi yu feng hua

Plants 13–24 cm tall. Tubers ovoid or oblong, 1.5–3 × 1–1.5 cm, fleshy. Stem erect or ascending, terete, slender, 1–2 mm in diam., finely papillate-pubescent, with 2 nearly opposite leaves at base, and 1–3 bractlike leaflets above leaves. Leaf blade spreading horizontally, adaxially with yellowish white markings, ovate-orbicular or orbicular, 4–4.5 × 4–5 cm, slightly fleshy, base abruptly narrowed and amplexicaul, apex acute. Raceme 4–9-flowered, 5–15 cm; rachis finely papillate-pubescent; floral bracts lanceolate, much shorter than ovary, apex acuminate; ovary twisted, cylindric, including pedicel 7–8 mm, papillate-pubescent. Flowers yellowish green. Dorsal sepal ovate, concave, 3–3.5 × ca. 2.5 mm, 3-veined, ciliate, apex acute; lateral sepals strongly reflexed, obliquely ovate, 5–5.5 × ca. 4 mm, 4-veined, ciliate, apex acute. Petals connivent with dorsal sepal, deeply 2-lobed; upper lobe falcate-oblong, ca. 4 mm; lower lobe linear, ca. 8 mm; lip spurred at base, deeply 3-lobed above base; lateral lobes divaricate, filiform, ca. 1.5 cm, apex curled; mid-lobe linear, much shorter than lateral lobes; spur pendulous, cylindric, clavate below middle, longer than

ovary; connective broad; pollinia obcuneate; caudicles curved, linear, slender; viscidia subglobose; rostellum with slender lateral lobes. Fl. Aug.

• Forests, along valleys; 1400–3000 m. N Chongqing, SE Gansu, Sichuan.

**9. *Habenaria wolongensis*** K. Y. Lang, Acta Phytotax. Sin. 22: 314. 1984.

卧龙玉凤花 wo long yu feng hua

Plants 21–30 cm tall. Tubers oblong, 1.5–2.5 × 1–1.5 cm, fleshy. Stem erect, pubescent, with 2 nearly opposite leaves at base, and sometimes 1–6 bractlike leaflets above leaves. Leaf blade spreading horizontally, adaxially with yellowish white markings, cordate or ovate, 4–8.5 × 3.5–9 cm, slightly fleshy, base abruptly narrowed and amplexicaul, apex acute. Raceme many flowered, 7–10 cm; rachis pubescent; floral bracts lanceolate, shorter than ovary, ciliate, apex acuminate; ovary twisted, cylindric-fusiform, including pedicel 8–10 mm. Flowers yellowish green. Dorsal sepal erect, broadly ovate, concave, ca. 5 × 3.5 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate, ca. 6 × 3 mm, 3-veined, apex obtuse. Petals basally 2-lobed; upper lobe falcate-lanceolate, ca. 6 mm; lower lobe a tooth at base of upper lobe, ca. 0.5 mm; lip spurred at base, near base deeply 3-lobed, lobes linear, ca. 6.5 mm; lateral lobes lanceolate-filiform, slightly narrower than linear mid-lobe; spur pendulous, subclavate, ca. as long as ovary, apex obtuse; pollinia ovoid; viscidia elliptic; stigmas clavate. Fl. Aug.

• Forests; ca. 2200 m. W Sichuan.

**10. *Habenaria aitchisonii*** H. G. Reichenbach, Trans. Linn. Soc. London, Bot. 3: 113. 1886.

落地金钱 luo di jin qian

*Habenaria bihamata* Kraenzlin; *H. dicerias* Schlechter; *H. dicerias* var. *pubicaulis* (Schlechter) Soó; *H. pubicaulis* Schlechter.

Plants 12–33 cm tall. Tubers oblong or ellipsoid, 1–2.5 × 0.8–1.5 cm, fleshy. Stem erect, terete, papillate-pubescent, with 2 nearly opposite leaves at base. Leaf blade spreading horizontally, ovate or ovate-orbicular, 2–5 × 1.5–4 cm, adaxially sometimes with 5 yellowish white veins, base narrowed and amplexicaul, apex acute. Raceme several to many flowered, 5–15 cm; rachis papillate; floral bracts ovate-lanceolate, ca. as long as or shorter than ovary, apex acuminate; ovary twisted, terete, including pedicel 7–10 mm, papillate-hairy. Flowers yellowish green or green, small. Dorsal sepal forming a hood with petals, erect, ovate, concave, 3–5 × 2.5–3.5 mm, 3-veined, apex obtuse or acute; lateral sepals reflexed, obliquely ovate-oblong, 3.5–5.5 × 2–3 mm, 3-veined, apex obtuse or acute. Petals indistinctly 2-lobed; upper lobe obliquely falcate-lanceolate, 3–5 × 1.5–2 mm; lower lobe a tooth at base of upper lobe; lip longer than sepals, above base deeply 3-lobed; lateral lobes retrorse, almost embracing erect sepals, subulate, 6–12 mm, apex slightly hooked; mid-lobe reflexed, straight, linear, 5–9 × 1–1.2 mm; spur pendulous, cylindric-clavate, 6–9 mm, shorter than ovary; connective relatively narrow; stigmas subclavate. Fl. Jul–Sep.  $2n = 42$ .

Forests, thickets, grasslands; 2100–4300 m. Guizhou, S Qinghai, W Sichuan, S and SE Xizang, C and NW Yunnan [Afghanistan, Bhutan, India, Kashmir].

**11. *Habenaria balfouriana*** Schlechter, Repert. Spec. Nov. Regni Veg. 20: 381. 1924.

滇蜀玉凤花 dian shu yu feng hua

Plants 15–20 cm tall. Tubers oblong, 1–1.5 × 0.7–1 cm, fleshy. Stem erect, terete, 2–2.5 mm in diam., densely papillate-hairy, with 2 nearly opposite leaves at base. Leaf blade spreading horizontally, sometimes slightly tinged with yellowish white, ovate or broadly elliptic, 3–4 × ca. 3 cm, slightly fleshy, with 5 main veins, base obtuse-rounded, apex acuminate or acute. Raceme 3–7-flowered, erect, ca. 7 cm; rachis papillate; floral bracts lanceolate, apex acuminate; ovary twisted, fusiform, including pedicel 11–12 mm, finely papillate-hairy. Flowers yellowish green. Dorsal sepal forming a hood with petals, erect, ovate, concave, 5–6 × 3.5–4 mm, 3-veined, margin ciliate-denticulate, apex obtuse; lateral sepals reflexed, obliquely ovate-oblong, 6–7 × 3.5–4 mm, 3-veined, apex subacute. Petals 2-lobed; upper lobe obliquely ovate-lanceolate, 5–6 × 2–2.2 mm; lower lobe a tooth at base of upper lobe; lip longer than sepals, deeply 3-lobed above base; lateral lobes retrorse, almost embracing ovary, subulate, 1–1.2 cm; mid-lobe linear, ca. 1 cm; spur pendulous, slightly curved, cylindrical-clavate, ca. 1.3 cm, longer than ovary, apex subobtusely; connective relatively narrow; stigmas suboblong. Fl. Jul–Aug.

• Forests or shrubby grasslands; 2200–3600 m. SW Sichuan, NW Yunnan.

**12. *Habenaria glaucifolia*** Bureau & Franchet, J. Bot. (Morot) 5: 152. 1891.

粉叶玉凤花 fen ye yu feng hua

*Habenaria alexandrae* Schlechter; *H. gnomifera* Schlechter; *Senghasiella glaucifolia* (Bureau & Franchet) Szlachetko.

Plants 15–50 cm tall. Tubers oblong or ovoid, 1.5–3 × 1–1.5 cm, fleshy. Stem erect, terete, 3–5 mm in diam., pubescent, with 2 nearly opposite leaves at base. Leaf blade spreading horizontally, abaxially slightly tinged with grayish white, adaxially purplish green, suborbicular or ovate-orbicular, 3.5–4.6 × 3–4.7 cm, rather stout, base obtuse-rounded and amplexicaul, apex acute or subacuminate. Raceme 5–20 cm, 3–10-flowered; peduncle densely pubescent at base; rachis pubescent; floral bracts lanceolate or ovate, shorter than ovary, apex acuminate; ovary twisted, terete, including pedicel 2.5–3 cm, pubescent. Flowers white or whitish green. Dorsal sepal forming a hood with petals, erect, ovate or oblong, concave, 10–13 × 6–7 mm, 5-veined, apex obtuse; lateral sepals reflexed, obliquely ovate or oblong, 11–14 × 7–7.5 mm, 5-veined, apex acute. Petals deeply 2-lobed; upper lobe spatulate-oblong, ca. 12 × 6 mm, margin ciliate, apex obtuse; lower lobe much smaller, linear-lanceolate, 3–5 × 1–1.5 mm, apex acute or subobtusely; lip reflexed, much longer than sepals, base with a short claw, above base deeply 3-lobed; lateral lobes divaricate, linear-lanceolate, ca. 2.5 cm, circinate toward apex; mid-lobe straight, linear, ca. 1.2 cm, slightly wider than lateral lobes; spur pendulous, cylindrical-subclavate, 2.5–3 cm, nearly as long as ovary, apex slightly

obtusely; connective extremely wide; stigmas lanceolate. Fl. Jul–Aug.

• Forests, thickets, grasslands; 2000–4300 m. S Gansu, Guizhou, S Shaanxi, W Sichuan, SE Xizang, NW to SE Yunnan.

**13. *Habenaria tibetica*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 338. 1922.

西藏玉凤花 xi zang yu feng hua

Plants 18–35 cm tall. Tubers subglobose, oblong, or ellipsoid, 2–3 × 2–2.5 cm, fleshy. Stem erect, terete, papillate-hairy, with 2 nearly opposite leaves at base. Leaf blade spreading horizontally, ovate or orbicular, 3–6.5 × 2.5–7 cm, adaxially with 5–7 white veins, base obtuse-rounded, abruptly narrowed and amplexicaul, apex acute to obtuse. Raceme 4–10 cm, loosely 3–8-flowered; rachis papillate-hairy; floral bracts lanceolate or linear-lanceolate, apex acuminate; ovary twisted, narrowly fusiform, including pedicel 1.5–2 cm, finely papillate-hairy. Flowers yellowish green to whitish. Dorsal sepal forming a hood with petals, erect, ovate, concave, 7–9 × 4.5–5 mm, 3(–5)-veined, apex subobtusely; lateral sepals reflexed, obliquely ovate, 9–11 × 4–5 mm, 3(–5)-veined, apex subacute. Petals shallowly 2-lobed; upper lobe oblique, oblong-lanceolate to ovate-lanceolate, 8–10 × 3–3.5 mm, 2-veined, margin papillate-ciliate, apex subacute; lower lobe a tooth at base of upper lobe, 1.5–2 mm; lip longer than sepals, near base deeply 3-lobed, lobes reflexed; lateral lobes divergent, linear-filiform, 25–40 mm, apically often curled; mid-lobe straight, linear, 10–19 mm, apex obtuse; spur often spreading horizontally, cylindrical-clavate, 2–2.5 cm, much longer than ovary, apex obtuse; connective rather wide; stigmas ligulate. Fl. Jul–Aug.

• Forests, thickets, grasslands; 2300–4300 m. S Gansu, NE Qinghai, W Sichuan, SE Xizang, NW Yunnan.

**14. *Habenaria szechuanica*** Schlechter, Acta Horti Gothob. 1: 140. 1924.

四川玉凤花 si chuan yu feng hua

Plants 20–30 cm tall. Tubers subglobose or ellipsoid, 1–2 × 1–1.5 cm. Stem erect or ascending, terete, 3–5 mm in diam., finely papillate-hairy, with 2 nearly opposite leaves at base. Leaf blade spreading horizontally, broadly ovate or orbicular, 3–4.5 × 3–5 cm, slightly fleshy, with 5(–7) green veins, base obtuse-rounded, abruptly narrowed and amplexicaul, apex shortly acuminate or acute. Raceme erect, with 3–7 often secund flowers, 4–12 cm; rachis finely papillate-hairy; floral bracts linear or lanceolate, apex acuminate; ovary twisted, arching, fusiform, including pedicel 1–1.5 cm, papillate-hairy. Flowers yellowish green. Dorsal sepal forming a hood with petals, erect, ovate, concave, 7–8 × ca. 3.5 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate, 8–9 × 3.5–4 mm, 3-veined, apex subobtusely. Petals shallowly 2-lobed; upper lobe obliquely oblong-lanceolate, 8–9 × 2–2.5 mm, 2-veined, margin papillate-ciliate, apex obtuse; lower lobe a tooth at base of upper lobe, 1.5–2 mm; lip reflexed, longer than sepals, spurred at base, adaxially with an appendage 5–7 mm, above base deeply 3-lobed; lateral lobes linear-filiform, 2.5–2.8(–4) cm, apex often curled; mid-lobe linear, 1.3–1.9 cm; spur cylindrical-clavate, 2–2.5 cm, longer than ovary, apex ob-

tuse; connective rather wide; stigmas narrowly clavate. Fl. Jul–Aug.

• Forests of *Pinus yunnanensis* or *Picea*; 2900–3200 m. S Shaanxi (Taibai Shan), NW Sichuan, NW Yunnan.

**15. *Habenaria schindleri*** Schlechter, Repert. Spec. Nov. Regni Veg. 16: 354. 1920.

十字兰 shi zi lan

*Fimbrorchis linearifolia* (Maximowicz) Szlachetko subsp. *schindleri* (Schlechter) Szlachetko; *Habenaria sagittifera* H. G. Reichenbach f. *lacerata* Matsuda.

Plants 25–70 cm tall. Tubers oblong or ovoid, 5–15 mm in diam., fleshy. Stem erect, terete, with 4–7 leaves below middle. Leaf blade linear, 5–23 × 0.3–0.9 cm, base amplexicaul-sheathing, apex acuminate. Raceme 5.5–18 cm, 6–25-flowered; rachis glabrous; floral bracts linear-lanceolate to ovate-lanceolate, basal ones 15–20 mm, longer than ovary, glabrous; ovary twisted, slightly arching, terete, including pedicel 1.4–1.5 cm. Flowers white, glabrous. Dorsal sepal forming a hood with petals, erect, ovate-orbicular, concave, 4.5–5 × 4–4.5 mm, 5-veined, apex obtuse; lateral sepals strongly reflexed, obliquely oblong-ovate, 6–7 × 4–5 mm, 4(or 5)-veined, apex subacute. Petals 2-lobed; upper lobe ovate-triangular, ca. 4 × 2 mm, 2-veined; lower lobe triangular-lanceolate, 1.5–1.8 mm, apex shallowly bilobed; lip spreading, (11–)13–15 mm, below middle deeply 3-lobed and ± cross-shaped; lobes 7–9 mm; lateral lobes spreading at right angles to mid-lobe, obovate-oblancoate, 1–1.5 mm wide, apex fimbriate; mid-lobe linear, ca. 0.8 mm wide, toward apex contracted; spur pendulous, 1.4–1.5 cm, nearly as long as ovary, abruptly dilated near apex; stigmas oblong. Fl. Jul–Oct.  $2n = 28$ .

Forests or grasslands along valleys; 200–1700 m. Anhui, Fujian, Guangdong, Hebei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Zhejiang [Japan, Korea].

**16. *Habenaria linearifolia*** Maximowicz, Mém. Acad. Imp. Sci. St. Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 269. 1859.

线叶十字兰 xian ye shi zi lan

*Fimbrorchis linearifolia* (Maximowicz) Szlachetko.

Plants 25–80 cm tall. Tubers ovoid or globose, fleshy. Stem erect, terete, with 5–7 leaves below middle. Leaf blade linear, 9–20 × 3–7 cm, base amplexicaul-sheathing, apex acuminate. Raceme 8–20-flowered, 5–16 cm; rachis glabrous; floral bracts lanceolate to ovate-lanceolate, basal ones ca. 1.5 cm, shorter than ovary, apex long acuminate; ovary twisted, slightly arching, cylindrical, including pedicel 1.8–2 cm, glabrous. Flowers white or greenish white, glabrous. Dorsal sepal forming a hood with petals, erect, ovate or broadly ovate, concave, 5.5–6 × 3.5–4 mm, 5-veined; lateral sepals reflexed, obliquely ovate, 6–7 × 4–5 mm, 4- or 5-veined, apex subacute. Petals 2-lobed; upper lobe 5–5.5 × 3.5–4 mm; lower lobe a short tooth, apex shallowly 2-lobed; lip spreading, ca. 15 mm, deeply 3-lobed near middle and ± cross-shaped; lobes linear, 8–9 × 0.5–0.6 mm; lateral lobes spreading at acute angles to mid-lobe, apex fimbriate; mid-lobe entire; spur pendulous, 2.5–3.5 cm, longer than ovary, slightly thickened toward end, apex obtuse; stigmas

oblong. Fl. Jul–Sep.  $2n = 28$ .

Forests or grasslands along valleys; 200–1500 m. Anhui, N Fujian, Hebei, Heilongjiang, Henan, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shandong, Zhejiang [Japan, Korea, Russia (Far East)].

**17. *Habenaria polytricha*** Rolfe, Hooker's Icon. Pl. 25: ad t. 2496. 1896.

丝裂玉凤花 si lie yu feng hua

*Medusorchis polytricha* (Rolfe) Szlachetko.

Plants 40–80 cm tall. Tubers oblong, 3–5 × 1–2.5 cm, fleshy. Stem erect, terete, stout, with 7 or 8(–10) leaves near middle and 3 to many bractlike leaflets above leaves. Leaf blade narrowly elliptic to oblong-lanceolate, 4–20 × 2–6 cm, base contracted into amplexicaul sheath, apex acuminate. Raceme 6–15(–40)-flowered, 15–30 cm; floral bracts lanceolate, 10–12 mm, apex long acuminate; ovary twisted, terete, including pedicel 14–15 mm, glabrous. Flowers greenish white; sepals green. Dorsal sepal elliptic-lanceolate, concave, 8–9 × 3–4 mm, 3-veined, apex aristate; lateral sepals reflexed, obliquely ovate, 9–12 × 5–6 mm, 3-veined, apex aristate. Petals pale green or white, deeply 2-lobed; upper lobe 2-lobed and lower lobe 3–5-lobed once again, lobules all filiform, 14–17 mm; lip pale green or white, above base 3-lobed, each lobe divided once more into more than 20 lobules; lobules filiform, 14–18 mm; spur pendulous, white, cylindrical-clavate, 12–14 mm, shorter than ovary, slightly dilated toward end, apex obtuse; stigmas oblong. Fl. Aug–Oct.

Forests; 300–1100 m. Guangxi, Jiangsu, SW Sichuan, Taiwan, Zhejiang [Japan (Ryukyu Islands), Philippines].

**18. *Habenaria stenopetala*** Lindley, Gen. Sp. Orchid. Pl. 319. 1835.

狭瓣玉凤花 xia ban yu feng hua

*Habenaria amanoana* Ohwi; *H. delessertiana* Kraenzlin; *H. linearipetala* Hayata; *H. rhynchocarpa* (Thwaites) J. D. Hooker; *H. sutepensis* Rolfe ex Downie; *Platanthera rhynchocarpa* Thwaites.

Plants 40–89 cm tall. Tubers oblong or narrowly ellipsoid, 2–5 × 1–2 cm, fleshy. Stem erect, terete, stout, with 5–8 leaves near middle and many bractlike leaves above. Leaf blade elliptic or oblong to oblong-lanceolate, 8–16 × 3–5.5 cm, base contracted into amplexicaul sheath, apex acute or acuminate. Raceme densely many flowered, 10–20 cm; floral bracts lanceolate or ovate-lanceolate, 1.5–2.8 × 0.4–0.6 cm, often longer than flowers, apex aristate; ovary twisted, cylindrical-fusiform, including pedicel 1.5–2.2 cm, glabrous. Flowers green or greenish white. Dorsal sepal erect, ovate-elliptic, concave, 1.4–1.6 × 0.4–0.5 cm, 3-veined, apex long acuminate or caudate-aristate; lateral sepals reflexed, obliquely ovate, 1.6–1.8 × 0.5–0.6 cm, 3-veined, apex long acuminate or caudate-aristate. Petals slightly shorter and narrower than dorsal sepal, 2-lobed; upper lobe linear, 10–13 × 1–1.8 mm, 1-veined, apex acuminate; lower lobe narrowly falcate, small, ca. 2.5 mm; lip brownish, 10–15 mm, deeply 3-lobed from base; lateral lobes linear or subulate, shorter than mid-lobe; mid-lobe linear or

ligulate, wider than lateral lobes; spur pendulous, cylindric, 15–26 mm, ca. as long as or longer than ovary, apex obtuse; stigmas oblong-clavate. Fl. Aug–Oct.  $2n = 40, 42$ .

Broad-leaved forests or forest margins; 300–1800 m. Guizhou, Taiwan, SE Xizang [India, Japan (Ryukyu Islands), Kashmir, Nepal, Philippines, Thailand, Vietnam].

**19. *Habenaria pantlingiana*** Kraenzlin, *Orchid. Gen. Sp.* 1: 892. 1900.

丝瓣玉凤花 si ban yu feng hua

*Habenaria cirrhifera* Ohwi; *H. longitentaculata* Hayata; *H. polytricha* (J. D. Hooker) Pradhan (1979), not Rolfe (1896); *H. stenopetala* Lindley var. *polytricha* J. D. Hooker.

Plants 40–70 cm tall. Tubers oblong, 3–5 × 1–2.5 cm, fleshy. Stem erect, terete, stout, with 6 or 7 leaves near middle and 2–7 bractlike leaves above. Leaf blade oblong-lanceolate or obovate-lanceolate, 13–15 × 3.5–4.5 cm, base contracted into amplexicaul sheath, apex acute or acuminate. Raceme densely many flowered, 8–20 cm; floral bracts lanceolate, 18–24 × 2.5–4 mm, ca. as long as or longer than ovary, apex long acuminate; ovary twisted, cylindric, including pedicel 1.8–2.2 cm, glabrous. Flowers green. Dorsal sepal erect, ovate-lanceolate, concave, 1.2–1.5 × 0.4–0.6 cm, 3-veined, apex long acuminate-caudate; lateral sepals reflexed, slightly oblique, ovate-lanceolate, 1.4–1.5 × 0.4–0.6 cm, 3-veined, apex long acuminate-caudate. Petals deeply 2-lobed from base; lobes divaricate, filiform; upper lobe 1.1–1.4 cm; lower lobe 1.8–2 cm; lip deeply 3-lobed from base; lobes filiform, 1.8–2.5 cm × ca. 0.8 mm, sometimes mid-lobe shorter than lateral lobes; spur pendulous, cylindric, 1.8–2.3 cm, ca. as long as or longer than ovary, slightly thickened toward end; pollinia oblong; viscidia orbicular, small; stigmas clavate. Fl. Aug–Oct.  $2n = 42, 42 + 2B$ .

Broad-leaved forests; 400–700 m. SW Guangxi, SE Hainan, N Taiwan [India (Sikkim), Japan (Ryukyu Islands), Nepal, Vietnam].

**20. *Habenaria coulousii*** Barretto, *Orchadian* 7: 10. 1981.

香港玉凤花 xiang gang yu feng hua

Plants 15–45 cm tall. Tubers oblong, to 3.5 × ca. 1.5 cm, fleshy. Stem erect, terete, slender, with 3 or 4 leaves near middle and 2 or 3 bractlike leaves above. Leaf blade lanceolate or ovate-lanceolate, 2.5–5.2 × 0.8–1.2 cm, base contracted into amplexicaul sheath, margin very narrow and membranous, apex acuminate. Raceme 2–9-flowered; floral bracts ovate-lanceolate, concave, ca. 2.4 cm, often longer than ovary, apex long acuminate; ovary twisted, cylindric-fusiform, including pedicel 18–20 mm, glabrous. Flowers whitish green. Sepals abaxially green, adaxially white, 8–9 × 3.5–4.5 mm, 3-veined, apex acute; dorsal sepal concave-hooded, erect, narrowly ovate; lateral sepals reflexed, obliquely ovate, concave. Petals white, obliquely ovate, 9–11 × ca. 2 mm, deeply 2-lobed from base; upper lobe shorter and broader than lower lobe, basal half connivent with dorsal sepal, apical half spreading, knife-shaped; lower lobe filiform, apex often curved; lip pale green, 9–12 mm, deeply 3-lobed from base; lobes linear-filiform; lateral lobes ca. as long as but narrower than mid-lobe; spur pendulous, yellowish green, base narrow and whitish, 22–24 mm, longer than ovary, slender, with widest part near middle, becoming narrower

toward both ends; pollinia subglobose; caudicles 3.5–4 mm; viscidia narrowly elliptic, ca. 0.5 mm; stigmas yellowish white, broadly bean-shaped. Fl. Oct.

• Forests, along valleys; ca. 300 m. Hong Kong.

**21. *Habenaria petelotii*** Gagnepain, *Bull. Soc. Bot. France* 78: 73. 1931.

裂瓣玉凤花 lie ban yu feng hua

*Habenaria pseudodenticulata* Handel-Mazzetti.

Plants 35–60 cm tall. Tubers oblong, 3–4 × 1–2 cm, fleshy. Stem erect, terete, stout, with 5 or 6 leaves near middle and many bractlike leaves above. Leaf blade elliptic or elliptic-lanceolate, 3–15 × 2–4 cm, base contracted into amplexicaul sheath, apex acuminate. Raceme loosely 3–12-flowered, 4–12 cm; floral bracts narrowly lanceolate, ca. 15 × 3–4 mm, apex acuminate; ovary twisted, slightly arching, cylindric-fusiform, including pedicel 1.5–3 cm, glabrous. Flowers greenish or white. Dorsal sepal concave-hooded, ovate, 10–12 × ca. 6 mm, 3-veined, apex acuminate; lateral sepals spreading, oblong-ovate, 11–13 × ca. 6 mm, 3-veined, apex acuminate. Petals deeply 2-lobed from base; lobes divergent, linear, 1.5–2 mm wide, margin ciliate; upper lobe erect, 14–16 mm; lower lobe ca. 20 mm; lip deeply 3-lobed above base; lobes linear, nearly equal in length and width, 15–20 × 1.5–2 mm, margin ciliate; spur pendulous, slightly bent forward, cylindric-clavate, 1.3–2.5 cm, thickened from middle to end, apex obtuse; stigmas oblong, ca. 2 mm. Fl. Jul–Sep.

Forests, along valleys; 300–1600 m. Anhui, N Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, SE Yunnan, Zhejiang [Vietnam].

**22. *Habenaria hosokawae*** Fukuyama, *Bot. Mag. (Tokyo)* 48: 297. 1934.

毛唇玉凤花 mao chun yu feng hua

Plants 35–40 cm tall. Stem with 5 or 6 leaves near middle and 3 or 4 bractlike leaves above. Leaf blade oblanceolate or oblong, 5–8 × ca. 2 cm, apex acute. Raceme loosely 6-flowered, ca. 5 cm; floral bracts ovate-lanceolate, 5–8 × ca. 2 mm; ovary ca. 3 cm. Flowers nodding, greenish white. Dorsal sepal concave, lanceolate or oblanceolate, ca. 13 × 3.5–4 mm, 3-veined; lateral sepals similar to dorsal sepal, but wider. Petals deeply 2-lobed, ca. 14 × 1.5 mm; lip deeply 3-lobed; mid-lobe linear, ca. 12 × 2 mm; lateral lobes longer than mid-lobe, apical margin densely pubescent; spur ca. 1.4 cm, apex dilated and deeply 2-lobed. Fl. Jul–Aug.

• 1000–1500 m. C and S Taiwan.

**23. *Habenaria medioflexa*** Turrill, *Bull. Misc. Inform. Kew* 1923: 118. 1923.

版纳玉凤花 ban na yu feng hua

*Habenaria trichochila* Rolfe ex Downie.

Plants 30–48 cm tall. Tubers oblong, 2.5–3 × 1.5–2 cm, fleshy. Stem erect, terete, stout, with 4 or 5 leaves and 3–7 bractlike leaves above. Leaf blade narrowly elliptic, oblong, or lanceolate, 5–15 × 1.7–5 cm, base contracted into amplexicaul

sheath, apex acuminate or acute. Raceme 9–18-flowered, 9–15 cm; floral bracts lanceolate to linear-lanceolate, 2–3 cm, apex acuminate; ovary twisted, arching, cylindrical-fusiform, including pedicel 2.2–2.5 cm. Flowers with yellowish green sepals and white petals and lip. Dorsal sepal concave-hooded, ovate, ca. 6 × 4 mm, 3-veined, apex obtuse; lateral sepals spreading, obliquely ovate, ca. 7 × 5 mm, 3-veined, apex acute. Petals forming a hood with dorsal sepal, linear, ca. 5 × 0.5 mm, 1-veined, apex acuminate; lip spurred at base, 3-lobed above base; lateral lobes ca. 1.4 cm, divided into many filiform lobules; mid-lobe linear, ca. 1 cm, unlobed; spur pendulous, yellowish green, cylindrical, to 3.5 cm, much longer than ovary, thickened and geniculate-curved near middle; stigmas globose. Fl. Sep.

Forests; 700–800 m. S Yunnan [Thailand, Vietnam].

**24. *Habenaria limprichtii*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 50. 1919.

宽药隔玉凤花 kuan yao ge yu feng hua

*Habenaria oligoschista* Schlechter; *H. pectinata* D. Don var. *limprichtii* (Schlechter) Pradhan; *Kryptostoma limprichtii* (Schlechter) Szlachetko & Olszewski; *K. oligoschistum* (Schlechter) Szlachetko & Olszewski; *Ochyrorchis limprichtii* (Schlechter) Szlachetko; *O. oligoschista* (Schlechter) Szlachetko.

Plants turning black when dried, 18–60 cm tall. Tubers ovoid-ellipsoid or oblong, 1.5–3 × 1–1.5 cm, fleshy. Stem erect, terete, stout, with 4–7 leaves. Leaf blade ovate to oblong-lanceolate, 4–10 × 1.5–3 cm, base amplexicaul, apex acuminate or acute. Raceme loosely 3–20-flowered, 5–20 cm; floral bracts ovate-lanceolate, 3–4 × ca. 1 cm, apex acuminate, basal ones ca. as long as ovary; ovary twisted, terete, including pedicel 2–2.5 cm. Sepals green or whitish green, apical margin ciliate; dorsal sepal forming a hood with petals, erect, concave, ovate-elliptic, 18–20 × 9–10 mm, 5-veined, apex obtuse; lateral sepals reflexed, obliquely ovate, 19–21 × 9–10 mm, 5- or 6-veined, apex acute. Petals erect, white, obliquely oblong, falcate, 18–20 × 5–7 mm, 3-veined, unlobed, margin ciliate; lip white, slightly longer than sepal, spurred at base, deeply 3-lobed above base; lobes nearly equal in length, hairy; lateral lobes linear, outer margins with 8–10 filiform lobules; mid-lobe linear, ca. 15 × 1 mm, apex obtuse; spur pendulous, cylindrical, 2–3 cm, ca. as long as or shorter than ovary, apex obtuse; connective very broad, 10–12 mm wide; pollinia ovoid; caudicles linear, slender; viscidia orbicular, small, rostellum with elongate arms; stigmas clavate. Fl. Jun–Aug.

Forests, thickets, grasslands; 1900–3500 m. W Hubei, Sichuan, NW to S Yunnan [Vietnam].

**25. *Habenaria pectinata*** D. Don, Prodr. Fl. Nepal. 24. 1825.

剑叶玉凤花 jian ye yu feng hua

*Orchis pectinata* Smith, Exot. Bot. 2: 77. 1806, not Thunberg (1794); *Habenaria ensifolia* Lindley; *Kryptostoma pectinatum* (D. Don) Szlachetko & Olszewski; *Ochyrorchis ensifolia* (Lindley) Szlachetko; *O. pectinata* (D. Don) Szlachetko.

Plants turning black when dried, 55–70 cm tall. Tubers

oblong, 2–3 × 1–1.5 cm, fleshy. Stem erect, terete, stout, glabrous, with several tubular sheaths and many leaves. Leaf blade oblong to linear-lanceolate, 6–15 × 1.5–2 cm, base amplexicaul, apex acuminate. Raceme 6–13-flowered, 10–20 cm; floral bracts lanceolate to linear-lanceolate, 2.5–3.2 cm, much longer than ovary, apex acuminate; ovary twisted, slightly arching, terete, including pedicel 1.8–2 cm. Sepals greenish, 5-veined, apical margin ciliate, apex often recurved; dorsal sepal erect, concave, lanceolate, ca. 17 × 5 mm, apex subacute; lateral sepals spreading, obliquely oblong, subfalcate, ca. 19 × 5 mm, apex acute. Petals forming a hood with dorsal sepal, greenish or white, obliquely falcate, ca. 17 × 3 mm, adaxially ± hairy, margin ciliate, unlobed, apex acute; lip white, slightly longer than sepal, spurred at base, deeply 3-lobed; lateral lobes linear, ca. 2 cm, outer margin with 6 or 7 filiform lobules; mid-lobe linear, ca. 1.8 cm; spur pendulous, cylindrical-clavate, 17–18 mm, slightly dilated toward apex; connective ca. 2 mm wide; pollinia narrowly ellipsoid; caudicles curved, slender; viscidia discoid; stigma thinly clavate. Fl. Aug.  $2n = 42, 42 + 2B$ .

Forests; ca. 1800 m. S Yunnan [India, Nepal].

**26. *Habenaria davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 86. 1888 [“*davidii*”].

长距玉凤花 chang ju yu feng hua

*Habenaria chloropecten* Schlechter; *H. leucopecten* Schlechter; *H. pectinata* D. Don var. *davidii* (Franchet) Finet; *Kryptostoma davidii* (Franchet) Szlachetko & Olszewski; *Ochyrorchis davidii* (Franchet) Szlachetko.

Plants turning black when dried, 65–75 cm tall. Tubers oblong, 2–5 × 0.8–1.5 cm, fleshy. Stem erect, terete, stout, 4–6 mm in diam., with 5–7 leaves. Leaf blade ovate, ovate-oblong, or oblong-lanceolate, 5–12 × 1.5–4.5 cm, base amplexicaul, apex acuminate. Raceme 4–15-flowered, 4–21 cm; floral bracts lanceolate, ca. 4.5 cm, apex acuminate, basal ones longer than ovary; ovary twisted, terete, including pedicel 2.5–3.5 cm. Sepals greenish or white, margin ciliate; dorsal sepal erect, oblong, concave, 15–18 × 6–7 mm, 5-veined, apex obtuse; lateral sepals reflexed, obliquely ovate-lanceolate, 17–20 × 6–8 mm, 5–7-veined, apex acuminate. Petals forming a hood with dorsal sepal, erect, white, obliquely lanceolate, subfalcate, 14–17 × 3–4 mm, 3–5-veined, margin ciliate, unlobed, apex subacute; lip white or yellowish, 2.5–3 cm, spurred at base, deeply 3-lobed above base; lobes linear, margin ciliate; lateral lobes 2–2.5 cm, outer margin with 7–10 filiform lobules, lobules usually branching; mid-lobe nearly as long as lateral lobe, apex acute; spur pendulous, curved inward, cylindrical, 4.5–6.5 cm, longer than ovary, slightly dilated toward apex; connective ca. 4 mm wide; pollinia narrowly ellipsoid, ca. 4 mm; caudicles linear, ca. 5 mm; viscidia suborbicular, small; stigmas clavate, ca. 5 mm. Fl. Jun–Aug.

• Forests, thickets, grasslands; 600–3200 m. Guizhou, Hubei, Hunan, Sichuan, E and S Xizang, C and NW Yunnan.

**27. *Habenaria mairei*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 50. 1919.

棒距玉凤花 bang ju yu feng hua

*Ochyrorchis mairei* (Schlechter) Szlachetko.

Plants turning black when dried, 18–65 cm tall. Tubers oblong or ovoid, 1.5–2.5 × 1–1.5 cm, fleshy. Stem erect, terete, robust, with 2 or 3 tubular sheaths and 5 or 6 leaves. Leaf blade elliptic-ligulate or oblong-lanceolate, 2.5–12 × 1.5–4 cm, base amplexicaul, apex acuminate. Raceme 4–19-flowered, 6–18 cm; floral bracts elliptic-lanceolate, margin ciliate, apex acuminate; ovary twisted, terete, including pedicel 2–3 cm. Sepals yellowish green, margin ciliate; dorsal sepal erect, narrowly ovate, concave, 1.3–1.5 × 0.6–0.7 cm, 5-veined, apex obtuse; lateral sepals spreading, slightly oblique, ovate-lanceolate, 1.4–1.7 × 0.5–0.6 cm, 5-veined, apex acute. Petals forming a hood with dorsal sepal, erect, white, obliquely oblong, 1.3–1.5 × ca. 0.4 cm, 3-veined, margin ciliate, unlobed, apex obtuse; lip white or yellowish white, 20–25 mm, base spurred, deeply 3-lobed above base, lobes ciliate; lateral lobes linear, 19–22 mm, outer margin comblike, with 8–10 filiform lobules; mid-lobe linear, 18–20 mm; spur pendulous, cylindrical-clavate, 20–35 mm, ca. as long as or slightly shorter than ovary, thickened toward end; connective 4–5 mm wide; pollinia narrowly ellipsoid, ca. 4 mm; caudicles linear, ca. 4 mm; viscidia ovate, small; stigmas clavate. Fl. Jul–Aug.

• Forests, shrubby grasslands; 2400–3500 m. W Sichuan, SE Xizang, N Yunnan.

**28. *Habenaria yuana*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 135. 1936.

川滇玉凤花 chuan dian yu feng hua

Plants turning black when dried, 40–57 cm tall. Tubers oblong, ca. 2 × 1 cm, fleshy. Stem erect, terete, stout, with 5 or 6 laxly arranged leaves. Leaf blade ovate or ovate-elliptic, 2.5–9 × 2–4 cm, base amplexicaul, apex acute. Raceme 7–9-flowered, 10–12 cm; floral bracts elliptic-ovate, 2.5–3.5 × 0.7–1.2 cm, longer than ovary, apex acuminate; ovary twisted, cylindrical-fusiform, including pedicel 2–2.5 cm. Flowers greenish, large. Dorsal sepal erect, oblong-elliptic, concave, 2–2.1 × 1–1.1 cm, 5-veined, apex obtuse; lateral sepals spreading, obliquely oblong, 2.1–2.2 × ca. 0.8 cm, 5-veined, apex acute. Petals forming a hood with dorsal sepal, obliquely subovate-falcate, 2–2.1 × ca. 0.8 cm, 5- or 6-veined, margin slightly ciliate, unlobed, apex obtuse; lip ca. 2.5 cm, base spurred, deeply 3-lobed above base, lobes ciliate; lateral lobes linear, 1.8–2 cm, outer margin with more than 10 filiform lobules; mid-lobe linear, 1.5–1.7 cm; spur pendulous, cylindrical-clavate, 1.4–2.5 cm, slightly dilated toward end, shorter than ovary; connective 12–15 mm wide; pollinia narrowly ellipsoid, ca. 3 mm; caudicles linear, ca. 5 mm; viscidia subglobose, small; stigmas clavate. Fl. Aug.

• Forests; 1800–2600 m. W Sichuan, S Yunnan.

**29. *Habenaria intermedia*** D. Don, Prodr. Fl. Nepal. 24. 1825.

大花玉凤花 da hua yu feng hua

*Kryptostoma intermedium* (D. Don) Olszewski & Szlachetko; *Ochyrorchis intermedia* (D. Don) Szlachetko.

Plants turning black when dried, 23–30 cm tall. Tubers ellipsoid, 1.5–3 × 1–2 cm, fleshy. Stem erect, terete, stout, with 3–5 laxly arranged leaves. Leaf blade ovate-lanceolate, 3.5–8 ×

2–4 cm, base amplexicaul, apex acute. Raceme 1–4-flowered, 6–15 cm; floral bracts ovate, 4–5 cm, nearly as long as ovary, apex acuminate; ovary twisted, terete, including pedicel 3.8–4.5 cm. Flowers white or greenish. Sepals ciliate; dorsal sepal erect, ovate-oblong, concave, ca. 2.2 × 1.2 cm, 7-veined, apex acute; lateral sepals reflexed, obliquely falcate-lanceolate, ca. 3 × 0.6 cm, 7-veined, apex acute. Petals forming a hood with dorsal sepal, erect, white, obliquely subovate-falcate, ca. 2.2 × 0.8 cm, 5-veined, margin ciliate, unlobed, apex acute; lip 2.8–3 cm, base spurred, deeply 3-lobed above base, lobes ciliate; lateral lobes linear, outer margin with 10 filiform lobules; mid-lobe linear, 18–20 mm, slightly shorter than lateral lobes, apex acute; spur pendulous, cylindrical, 7–8.5 cm, much longer than ovary, slightly dilated near end, apex obtuse; connective ca. 2 mm wide; pollinia ovoid; caudicles linear; viscidia orbicular, small; rostellum with elongate arms; stigmas clavate. Fl. Jul.  $2n = 42$ .

Forests; 2600–3000 m. S Xizang [India, Kashmir, Nepal].

**30. *Habenaria arietina*** J. D. Hooker, Fl. Brit. India 6: 138. 1890.

毛瓣玉凤花 mao ban yu feng hua

*Habenaria intermedia* D. Don var. *arietina* (J. D. Hooker) Finet; *H. pectinata* D. Don var. *arietina* (J. D. Hooker) Kraenzlin; *Ochyrorchis arietina* (J. D. Hooker) Szlachetko.

Plants turning black when dried, 57–65 cm tall. Tubers oblong, 3–5 × 1–2 cm, fleshy. Stem erect, terete, robust, with 5–7 laxly arranged leaves. Leaf blade ovate-lanceolate or oblong-lanceolate, 5.5–10 × 2–3 cm, base amplexicaul, apex acuminate. Raceme densely many (more than 5-) flowered, to 30 cm; floral bracts ovate-lanceolate, 1.8–2 cm, nearly as long as ovary, apex acuminate; ovary twisted, terete, including pedicel 3–3.5 cm. Flowers white or greenish white. Sepals 5-veined, ciliate; dorsal sepal erect, oblong, concave, ca. 19 × 6 mm, apex acute; lateral sepals reflexed, obliquely falcate-lanceolate, ca. 20 × 6 mm, apex acute. Petals forming a hood with dorsal sepal, obliquely subovate-falcate, ca. 19 × 8 mm, 5-veined, adaxially pubescent, margin ciliate, unlobed; lip ca. 3 cm, base spurred, deeply 3-lobed above base; lobes linear, nearly equal in length, ciliate; lateral lobes ca. 2.2 cm, outer margin with 10 filiform lobules; mid-lobe ca. 2 mm wide; spur pendulous, cylindrical-clavate, 3.5–4 cm, ca. as long as or slightly longer than ovary, slightly dilated below middle, apex obtuse; connective 3.5–4 mm wide; pollinia ovoid; caudicles linear; viscidia orbicular, small; rostellum with elongate arms; stigmas clavate. Fl. Aug.  $2n = 21, 42, 46, 48, 56$ .

Grassy slopes; 2300–2400 m. SE Xizang [Bhutan, India, Nepal].

**31. *Habenaria commelinifolia*** (Roxburgh) Wallich ex Lindley, Gen. Sp. Orchid. Pl. 325. 1835.

斧萼玉凤花 fu e yu feng hua

*Orchis commelinifolia* Roxburgh, Fl. Ind., ed. 1832, 3: 451. 1832 [*“commelinaefolia”*].

Plants 60–75 cm tall. Tubers ellipsoid, 5–8 × 3–5 cm, fleshy. Stem erect, stout, with 4–6 well-spaced leaves and several bractlike leaves above. Leaf blade narrowly oblong-lanceolate to linear-lanceolate, 7–15 × 1.5–2.5 cm, base contracted

into amplexicaul sheath, apex acuminate. Raceme many flowered, 9–11 cm; floral bracts linear-lanceolate, ca. as long as or longer than flowers, margin ciliate, apex acuminate; ovary twisted, slender, including pedicel 3–4 cm. Flowers white. Dorsal sepal concave-hooded, broadly obovate, ca. 7 × 9 mm, 5-veined, apex acute; lateral sepals reflexed, strongly oblique, axe-shaped, ca. 7 mm, strongly dilated toward apex and ca. 13 mm wide, with 3 strongly curved veins. Petals connivent with dorsal sepal, obliquely oblong, subfalcate, ca. 6.5 × 4 mm, 2-veined, apex acute or obtuse; lip ca. 4 cm, with linear base 4–6 mm, then deeply 3-lobed, lobes filiform-linear; lateral lobes 2.5–3.2 cm; mid-lobe pendulous, 1.8–2.2 cm, slightly wider than lateral lobes; spur pendulous, cylindrical-clavate, 5–8 cm, slender, near apex dilated, with a bristle projection on front margin of mouth; pollinia ellipsoid; caudicles linear; viscidia orbicular; stigmas clavate. Fl. Aug.  $2n = 42$ .

Forests; 900–1200 m. SW Yunnan [India, Myanmar, Nepal, Thailand, Vietnam].

**32. *Habenaria austrosinensis*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 134. 1936.

薄叶玉凤花 *bao ye yu feng hua*

Plants 30–60 cm tall. Tubers narrowly ellipsoid, 3–5 × 1–3 cm, fleshy. Stem erect, terete, stout, pubescent, with 3–5 leaves below middle and 9–13 bractlike leaves above. Leaf blade narrowly elliptic to oblong-oblongate, 13–25 × 2.5–6 cm, relatively thin, base contracted into amplexicaul sheath, apex acuminate. Raceme many flowered, 9–14 cm; rachis pubescent; floral bracts lanceolate, ca. 15 mm, shorter than ovary, ciliate, apex acuminate; ovary twisted, cylindrical-fusiform, pubescent, including pedicel 15–27 mm. Flowers white. Dorsal sepal concave-hooded, broadly ovate, ca. 3.5 × 5 mm, abaxially pubescent, 3-veined, apex acute; lateral sepals reflexed, strongly obliquely triangular, ca. 5 mm, toward apex strongly dilated and ca. 8 mm wide, with 3 strongly curved veins. Petals forming a hood with dorsal sepal, obliquely linear, ca. 4 × 1 mm, 1-veined, apex obtuse; lip longer than sepals, above base deeply 3-lobed; lobes similar, linear, ca. 8 mm; spur curving upward above ovary, cylindrical-clavate, 20–22 mm, ca. as long as or slightly shorter than ovary, apex dilated; connective narrow; stigmas elliptic, ca. 1 mm. Fl. Jul–Aug.

Damp places in forests along valleys; 700–1400 m. S Yunnan [Thailand].

**33. *Habenaria ciliolaris*** Kraenzlin, Bot. Jahrb. Syst. 16: 169. 1892.

毛萼玉凤花 *mao ting yu feng hua*

*Habenaria kweitschuensis* Schlechter.

Plants 25–60 cm tall. Tubers narrowly ellipsoid or oblong, 3–5 × 1.5–2.5 cm, fleshy. Stem erect, terete, stout, with 5 or 6 leaves near middle and 5–10 bractlike leaves above. Leaf blade elliptic-lanceolate, obovate-spatulate, or narrowly elliptic, 5–16 × 2–5 cm, base contracted and amplexicaul, apex acuminate or acute. Raceme 6–30-flowered, 9–23 cm; peduncle and rachis ridged, ridges villous; floral bracts ovate, 13–15 mm, shorter than ovary, ciliate, apex acuminate; ovary twisted, cylindrical-fusiform, denticulate-ridged, including pedicel 23–25 mm.

Flowers white or greenish white, rarely tinged with pink. Dorsal sepal forming a concave hood with petals, saccate, broadly ovate, 6–9 × 5.5–8 mm, abaxially 3-keeled, 5-veined, toward apical margin ciliate; lateral sepals reflexed, strongly oblique, ovate, 6.5–10 × 4–7 mm, 3- or 4-veined, apex acute. Petals obliquely lanceolate, 6–7 × 2–3 mm, unlobed, 1-veined, apex acuminate; lip longer than sepals, deeply 3-lobed from base; lobes parallel, filiform; lateral lobes 20–22 mm; mid-lobe pendulous, 16–18 mm; spur pendulous, curved, cylindrical-clavate, 21–27 mm, slightly longer or shorter than ovary, dilated toward end, apex obtuse; stigmas oblong, ca. 1.5 mm. Fl. Jul–Sep.

Shaded places in forests or along valleys; 100–1800 m. N Fujian, SE Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, S Yunnan, Zhejiang [Vietnam].

**34. *Habenaria hystrix*** Ames, Orchidaceae 2: 35. 1908.

粤琼玉凤花 *yue qiong yu feng hua*

Plants 28–45 cm tall. Tubers oblong, ca. 3 × 1 cm, fleshy. Stem erect, terete, stout, with 5 or 6 leaves below middle and 5–8 bractlike leaves above. Leaf blade narrowly elliptic or oblong, 9–16 × 3–5 cm, base contracted and amplexicaul, apex acuminate or acute. Raceme 6–10-flowered, 8–11 cm; peduncle and rachis ridged, ridges villous; floral bracts ovate, ca. 1.5 cm, shorter than ovary, ciliate, apex acuminate; ovary twisted, cylindrical-fusiform, slightly ridged, including pedicel ca. 18 mm. Flowers white or greenish white. Dorsal sepal forming a concave hood with petals, broadly ovate, ca. 6 × 6–6.5 mm, 3-veined; lateral sepals reflexed, strongly oblique, ovate, ca. 7 × 6 mm, 3-veined, apex acute. Petals obliquely triangular-lanceolate, ca. 6 × 2 mm, simple, 1-veined, apex long acuminate; lip longer than sepals, deeply 3-lobed from base; lobes parallel, filiform; lateral lobes 20–22 mm; mid-lobe 20–24 mm, base with 1 obtusely conic callus; spur spreading horizontally, cylindrical-clavate, 16–20 mm, ca. as long as ovary, slightly dilated toward apex; stigmas narrowly elliptic, ca. 1.5 mm. Fl. Aug–Sep.  $2n = 42$ .

Forests, along valleys; 300–400 m. Guangdong, W Hainan [Indonesia (Kalimantan), Philippines].

**35. *Habenaria fordii*** Rolfe, Bull. Misc. Inform. Kew 1896: 202. 1896.

线瓣玉凤花 *xian ban yu feng hua*

Plants 30–60 cm tall. Tubers narrowly elliptic, 3–4 × 2–3 cm, fleshy. Stem erect, stout, base with 4 or 5 ± tufted leaves and above leaves several bractlike leaflets. Leaf blade oblong-lanceolate or narrowly elliptic, 14–25 × 3–6 cm, base contracted and amplexicaul, apex acute. Raceme many flowered, 8–16 cm; floral bracts ovate-lanceolate, 2–4 cm, apex acute or acuminate; ovary twisted, cylindrical-fusiform, including pedicel 1.5–2 cm. Flowers white. Dorsal sepal forming a hood with petals, broadly ovate, concave, 1.3–1.5 cm; lateral sepals spreading or reflexed, obliquely subovate, 14–16 × 6–7 mm. Petals linear-lanceolate, 1.3–1.5 cm, apex acute; lip 2.3–2.5 cm, narrow, below middle deeply 3-lobed; lobes linear, 1.5–1.7 cm; lateral lobes filiform, narrower and slightly longer than linear mid-lobe; spur pendulous, cylindrical-clavate, slightly thickened toward end, 3–6 cm. Fl. Jul–Aug.

• Damp places or soil-covered rocks in forests or along valleys; 600–2200 m. Guangdong, Guangxi, S Yunnan.

**36. *Habenaria acuifera*** Wallich ex Lindley, Gen. Sp. Orchid. Pl. 325. 1835.

凸孔坡参 tu kong po shen

*Habenaria loloorum* Schlechter.

Plants 14–38 cm tall. Tubers oblong or narrowly ellipsoid, 2.5–4 × 1–2.5 cm, fleshy. Stem erect, terete, glabrous, with 3 or 4 leaves and many bractlike leaflets. Leaf blade oblong or oblong-lanceolate, 4–12 × 1–1.5 cm, base amplexicaul, apex acuminate or acute. Raceme 8–20-flowered, 3–8 cm; floral bracts lanceolate, basal ones 1.5–1.7 cm, longer than ovary, ciliate; ovary twisted, cylindric-fusiform, including pedicel 15–18 mm. Flowers yellow, small. Dorsal sepal forming a hood with petals, erect, broadly ovate, concave, 3–4.5 × 3–3.5 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate-elliptic, 5–6 × 3.5–4 mm, 3-veined, apex obtuse. Petals obliquely oblong, 3–4 × 1.8–2 mm, 1-veined, unlobed; lip 9–10 mm, spurred at base, with a cupular structure near mouth of spur, spreading, 3-lobed from base; lateral lobes subulate, 1.5–3.5 mm; mid-lobe straight, linear, 7–8 × ca. 1 mm, apex obtuse; spur pendulous, cylindric-clavate, 10–17 mm, shorter than ovary, near middle geniculate-curved, slightly thickened from middle to apex; connective narrow; pollinia narrowly ellipsoid; caudicles linear, longer than pollinia; viscidia orbicular, small; stigmas suberect, exerted along both sides of spur mouth, oblong, 2–2.5 mm. Fl. Jun–Aug.  $2n = 42 + 0-2B$ .

Forests, thickets, grasslands; 200–2000 m. Guangxi, SW and W Sichuan, Yunnan [NE India, Laos, Malaysia (Peninsular), Myanmar, Thailand, Vietnam].

**37. *Habenaria linguella*** Lindley, Gen. Sp. Orchid. Pl. 325. 1835.

坡参 po shen

*Centrochilus gracilis* Schauer; *Habenaria acuifera* Lindley var. *linguella* (Lindley) Finet; *H. chrysantha* Schlechter; *H. endothis* Miquel; *H. simeonis* Kraenzlin.

Plants 20–50(–75) cm tall. Tubers 3–5 × 1–2 cm, fleshy. Stem erect, terete, glabrous, with 3 or 4 leaves and 3–9 bractlike leaflets. Leaf blade narrowly oblong to narrowly oblong-lanceolate, 5–12(–27) × 1.2–2 cm, base amplexicaul, apex acuminate. Raceme densely 9–20-flowered, 2.5–6 cm; floral bracts linear-lanceolate, 1.2–2.5 cm, ciliate; ovary twisted, cylindric-fusiform, including pedicel 1.8–2.3 cm. Flowers yellow or brownish yellow. Dorsal sepal forming a hood with petals, erect, broadly elliptic, concave, 4–5 × 3–3.5 mm, 3-veined, apex obtuse; lateral sepals reflexed, oblique, broadly obovate, 6–7 × 4–4.5 mm, 3- or 4-veined, apex obtuse or subacute. Petals oblique, narrowly ovate or obliquely narrowly elliptic, 4–5 × 2–2.5 mm, 1-veined, apex obtuse; lip 9–10 mm, spurred at base, with a ring-shaped rim at mouth of spur, 3-lobed from base; lateral lobes subulate, 1.5–2.75 mm, apex acuminate; mid-lobe linear, 8–9 mm, apex obtuse; spur pendulous, cylindric, 2–2.9 cm, longer than ovary, slender, slightly thickened toward end, 1–1.5 mm in diam., apex obtuse; connective narrow; pollinia

narrowly obovoid; caudicles linear, longer than pollinia; viscidia ovate; stigmas oblong, ca. 1.5 mm. Fl. Jun–Aug.

Forests, grasslands; 500–2500 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [Vietnam].

**38. *Habenaria rostelifera*** H. G. Reichenbach, Otia Bot. Hamburg. 2: 34. 1878.

齿片坡参 chi pian po shen

*Habenaria hancockii* Rolfe.

Plants 17–40 cm tall. Tubers oblong, 2–5 × 1–2 cm, fleshy. Stem erect, terete, stout, glabrous, with 4 or 5 leaves and 5–9 bractlike leaflets. Leaf blade narrowly elliptic or oblong to oblong-lanceolate, 5–10 × 1–2 cm, base amplexicaul, apex acuminate. Raceme densely many flowered, 3.5–6 cm; floral bracts lanceolate, 2–2.5 cm, ciliate, apex acuminate; ovary twisted, cylindric-fusiform, including pedicel 1.8–1.9 cm. Flowers white, lateral sepals with brown markings. Dorsal sepal forming a hood with petals, erect, broadly elliptic, concave, ca. 6 × 4 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely elliptic, ca. 9 × 4.5 mm, 4-veined. Petals oblique, narrowly ovate or narrowly elliptic, ca. 6 × 3 mm, 3-veined, unlobed, apical margin ciliate; lip spurred at base, with a 3-toothed, subcylindric lamella near mouth of spur, deeply 3-lobed from base, lobes linear; lateral lobes divaricate, 6–8 × ca. 1 mm, attenuate toward apex; mid-lobe ca. 10 × 2 mm, apex obtuse; spur pendulous, cylindric-clavate, 2–2.2 cm, slightly longer than ovary, apical half slightly dilated, apex obtuse; connective relatively narrow; pollinia narrowly ellipsoid; caudicles linear, longer than pollinia; viscidium elliptic, small; stigmas oblong, ca. 2.5 mm. Fl. Jul–Aug.

Grassy slopes; 1000–2200 m. C Guizhou, C, NW, and SE Yunnan [Cambodia, Malaysia (Peninsular), Thailand, Vietnam].

**39. *Habenaria rostrata*** Lindley, Gen. Sp. Orchid. Pl. 325. 1835.

喙房坡参 hui fang po shen

*Habenaria acuifera* Lindley var. *rostrata* (Lindley) Finet.

Plants 20–30 cm tall. Tubers oblong, 2–3 × 0.8–1 cm, fleshy. Stem erect, terete, glabrous, with 4 or 5 leaves and 4–8 bractlike leaflets. Leaf blade oblong or oblong-lanceolate, 5–10 × 0.7–1 cm, base amplexicaul, apex acute. Raceme many flowered, sometimes nearly corymbiform, 4–6 cm; floral bracts lanceolate, shorter than ovary, ciliate, apex aristate; ovary twisted, arching, cylindric-fusiform, including pedicel 15–16 mm. Flowers reddish orange, with greenish sepals. Dorsal sepal forming a hood with petals, erect, broadly elliptic, concave, ca. 4.5 × 3 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate-elliptic, ca. 6.5 × 4 mm, 3-veined, apex obtuse. Petals obliquely broadly oblong, falcate, ca. 4.5 × 2 mm, 1-veined, margin ciliate, apex obtuse; lip ca. 10 mm, spurred at base, with a 3-lobed, ring-shaped structure near mouth of spur, shortly 3-lobed, lobes linear; lateral lobes extremely bifid, ca. 7 × 0.6 mm, apex acuminate; mid-lobe ca. 8 × 1 mm, apex obtuse; spur pendulous, cylindric-clavate, 11–12 mm, slightly shorter than ovary, slightly dilated toward apex; connective narrow; pollinia

ellipsoid; caudicles linear, slender; viscidia linear; stigmas oblong, ca. 2 mm. Fl. Jul–Aug.

Forests, forest margins, thickets; 900–2000 m. S Sichuan, C and S Yunnan [Laos, Myanmar, Thailand, Vietnam].

**40. *Habenaria rhodocheila*** Hance, Ann. Sci. Nat., Bot., sér. 5, 5: 243. 1866.

橙黄玉凤花 cheng huang yu feng hua

*Smithanthe rhodocheila* (Hance) Szlachetko & Margońska.

Plants 8–35 cm tall. Tubers oblong-cylindric, 2–4 × 1–2 cm, fleshy. Stem erect, terete, stout, with 4–6 leaves below middle and 1–3 bractlike leaflets above leaves. Leaf blade linear-lanceolate to suboblong, 10–15 × 1.5–2 cm, base amplexicaul, apex acuminate. Raceme loosely 2–10-flowered, 3–8 cm; floral bracts ovate-lanceolate, 1.5–1.7 cm, shorter than ovary, apex acuminate; ovary twisted, terete, including pedicel 2–3 cm. Flowers with green sepals and petals and orange-yellow to red lip. Dorsal sepal forming a hood with petals, erect, suborbicular, concave, ca. 9 × 8 mm, 3-veined, apex obtuse; lateral sepals reflexed, oblong, 9–10 × ca. 5 mm, 5-veined, apex obtuse. Petals spatulate-linear, ca. 8 × 2 mm, 1-veined, apex obtuse; lip spreading, ovate in outline, 1.8–2 × ca. 1.5 cm, 4-lobed, with short claw at base, spurred; lateral lobes spreading, oblong, ca. 7 × 5 mm, apex obtuse; mid-lobe bilobed, lobules nearly subovate, ca. 4 × 3 mm, apex obliquely truncate; spur pendulous, dull yellow, cylindric, 2–3 cm × ca. 1 mm, apex often upcurved; rostellum deltoid, large, with elongated arms; stigmas clavate. Capsule fusiform, ca. 1.5 cm, apex beaked. Fl. Jul–Aug, fr. Oct–Nov.  $2n = 38, 42$ .

Shaded places or soil-covered rocks in forests or along valleys; 300–1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi [Cambodia, Laos, Malaysia, Philippines, Thailand, Vietnam].

**41. *Habenaria malintana*** (Blanco) Merrill, Sp. Blancoan. 112. 1918.

南方玉凤花 nan fang yu feng hua

*Thelymitra malintana* Blanco, Fl. Filip. 642. 1837; *Habenaria dentata* (Swartz) Schlechter f. *ecalcarata* (King & Pantling) Tuyama; *H. dentata* subsp. *ecalcarata* (King & Pantling) Panigrahi & Murti; *H. dentata* var. *ecalcarata* (King & Pantling) Handel-Mazzetti; *H. geniculata* D. Don var. *ecalcarata* King & Pantling; *Kraenzlinorchis malintana* (Blanco) Szlachetko.

Plants 40–55 cm tall. Tubers ellipsoid, 2–4 × 1.5–2.5 cm, fleshy. Stem erect, terete, stout, with 3 or 4 leaves and 5 or 6 bractlike leaflets. Leaf blade oblong or oblong-lanceolate, 6–13 × 1.5–4.5 cm, base amplexicaul, apex acute or acuminate. Raceme densely more than 10-flowered; floral bracts narrowly lanceolate, ca. 2 cm, margin ciliate; ovary twisted, cylindric-fusiform, including pedicel 2–2.5 cm. Flowers white, ca. 1.5 cm in diam. Sepals subsimilar, oblong-lanceolate to ovate-lanceolate, 11–13 × 3–5 mm, 3-veined, margin finely ciliate, apex acute; lateral sepals spreading, slightly oblique. Petals narrowly oblong-lanceolate, 7–8 × ca. 2 mm, 1- or rarely 3-veined, unlobed, margin finely ciliate, apex acuminate; lip ligulate-lan-

ceolate, 11–12 mm, margin finely ciliate, usually unlobed, with very small lateral lobes on both basal sides, spurless or rarely with a short spur 2–8 mm. Fl. Oct–Nov.  $2n = 42, 84, 168$ .

Forests, grasslands; 500–1300 m. S Guangxi, Hainan, SW Sichuan, W to SE Yunnan, N Zhejiang [India, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

**42. *Habenaria finetiana*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 126. 1919.

齿片玉凤花 chi pian yu feng hua

*Habenaria geniculata* D. Don var. *yunnanensis* (Finet) Finet; *H. miersiana* Champion ex Benth. var. *yunnanensis* Finet; *H. peyentsinensis* Kraenzlin; *H. tienensis* Tang & F. T. Wang; *Plantaginorchis finetiana* (Schlechter) Szlachetko.

Plants 9–25 cm tall. Tubers oblong, 1.5–2 cm × 8–10 mm, fleshy. Stem erect, glabrous, below middle with 2 or 3 leaves, with 1–4 bractlike leaves above. Leaf blade cordate or ovate, 2.5–5 × 1.8–3.5 cm, with white margin when dried, apex acute. Raceme 2–8-flowered, 3–5 cm; floral bracts lanceolate, ca. 2 cm, nearly as long as ovary, apex acuminate; ovary twisted, terete, including pedicel 1.8–2 cm. Flowers white, sometimes secund. Sepal and petal margins ciliate; dorsal sepal forming a hood with petals, erect, ovate or elliptic, concave, ca. 8 × 5 mm, 5-veined, apex acute; lateral sepals reflexed, obliquely ovate, 9–10 × ca. 5 mm, 5-veined, apex acute. Petals linear, subfalcate, ca. 6 × 2 mm, 1-veined, unlobed, apex obtuse; lip broadly obovate, ca. 12 × 10 mm, 3-lobed; lateral lobes rhombic, ca. 4 mm wide, margins serrate; mid-lobe ligulate, ca. 4 × 2 mm, slightly longer than lateral lobes, apex subobtusate; spur pendulous, cylindric, 17–20 mm, slightly shorter than or nearly as long as ovary, apex slightly dilated, obtuse, slightly curved; stigmas oblong. Fl. Aug–Oct.  $2n = 64^*$ .

• Forests, grasslands; 2000–3500 m. W Sichuan, C and NW Yunnan.

**43. *Habenaria dentata*** (Swartz) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 125. 1919.

鹅毛玉凤花 e mao yu feng hua

*Orchis dentata* Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 207. 1800; *Habenaria dentata* var. *tohoensis* (Hayata) S. S. Ying; *H. geniculata* D. Don; *H. miersiana* Champion ex Benth.; *H. tohoensis* Hayata; *Plantaginorchis dentata* (Swartz) Szlachetko; *Platanthera dentata* (Swartz) Lindley; *P. geniculata* (D. Don) Lindley.

Plants 35–87 cm tall. Tubers oblong-ovoid to oblong, 2–5 × 1–3 cm, fleshy. Stem erect, terete, stout, loosely with 3–5 leaves and several bractlike leaflets. Leaf blade oblong to narrowly elliptic, 5–15 × 1.5–4 cm, base amplexicaul, margin white when dried, apex acute or acuminate. Raceme often many flowered, 5–12 cm; floral bracts lanceolate, 2–3 cm, basal ones ca. as long as ovary, apex acuminate; ovary twisted, terete, including pedicel 2–3 cm. Flowers white. Sepals and petals ciliate; dorsal sepal forming a hood with petals, erect, broadly ovate, concave, 10–13 × 7–8 mm, 5-veined, apex acute; lateral sepals spreading or reflexed, obliquely ovate, 14–16 mm, 5-veined, apex acute. Petals falcate-lanceolate, 8–9 × 2–2.5 mm,

2-veined, unlobed; lip broadly obovate, 15–18 × 12–16 mm, 3-lobed; lateral lobes subrhombic or flabellate, 7–8 mm wide, apical margin serrate; mid-lobe linear-lanceolate or ligulate-lanceolate, 5–7 × 1.5–3 mm, 3-veined, apex obtuse; spur pendulous, green below middle, cylindric-clavate, 3.5–4 cm, longer than ovary, somewhat geniculate in basal half, slightly curved, gradually dilated toward end, apex obtuse, with conspicuously raised structure surrounding mouth; stigmas oblong. Fl. Aug–Oct.  $2n = 64$ .

Forests on slopes or along valleys; 200–2300 m. Anhui, N Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Cambodia, India, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam].

**44. *Habenaria lucida*** Wallich ex Lindley, Gen. Sp. Orchid. Pl. 319. 1835.

细花玉凤花 xi hua yu feng hua

*Habenaria dilatata* (Pursh) Hooker subsp. *lucida* (Wallich ex Lindley) S. S. Ying; *H. longiracema* Fukuyama; *H. recurva* Rolfe ex Downie var. *erectiflora* Tang & F. T. Wang; *Habenella lucida* (Wallich ex Lindley) Szlachetko & Kras-Lapinska; *Hetaeria taiwaniana* S. S. Ying; *Peristylus longiracemus* (Fukuyama) K. Y. Lang; *Platantheroides lucida* (Wallich ex Lindley) Szlachetko; *Rhomboda taiwaniana* (S. S. Ying) Ormerod.

Plants 40–61 cm tall. Tubers oblong or ellipsoid, 3–5 × 1–3 cm, fleshy. Stem erect, terete, slender, with 4–6 ± clustered leaves and 3–6 bractlike leaflets. Leaf blade oblanceolate, subspatulate, or oblong-lanceolate, 8–18 × 2.5–4.5 cm, base contracted into amplexicaul sheath, apex acute or acuminate. Raceme 25–43-flowered, 15–23 cm; floral bracts lanceolate to ovate-lanceolate, 8–10 × 3–4 mm, shorter than ovary, apex acuminate; ovary twisted, cylindric, including pedicel 16–18 mm. Sepals green, 3-veined; dorsal sepal forming a hood with petals, ovate, concave, 3.5–4 × 2.5–3 mm, apex obtuse; lateral sepals reflexed, obliquely ovate or ovate-oblong, 4–4.5 × ca. 2.5 mm, apex obtuse. Petals yellow, narrowly ovate-oblong, 3–3.5 × ca. 1.5 mm, 2-veined, apex obtuse; lip yellow, ca. 5 mm, thickly textured, 3-lobed from base; lobes narrowly oblong; lateral lobes reflexed, 3–4.5 × 1–1.5 mm, apex obtuse; mid-lobe suberect, 3.5–4.5 × 1–1.5 mm, apex adnate to tip of hood formed by dorsal sepal and petals; spur cylindric, ca. 21 × 1 mm, slender; connective narrow; pollinia ovoid; viscidia lanceolate, ca. 1.2 mm. Fl. Jul–Sep.  $2n = 42$ .

Forests; 400–1200 m. Guangdong, Hainan, Taiwan, S Yunnan [Cambodia, E India, Laos, Myanmar, Thailand, Vietnam].

**45. *Habenaria shweliensis*** W. W. Smith & Banerji, Rec. Bot. Surv. India 6: 33. 1913.

中緬玉凤花 zhong mian yu feng hua

*Habenaria crassilabia* Kraenzlin.

Plants 35–50 cm tall. Tubers ellipsoid, 2.5–3 × 1.2–2 cm, fleshy. Stem erect, terete, with 4 or 5(–7) somewhat clustered leaves below and 3 to many bractlike leaves above. Leaf blade elliptic, elliptic-lanceolate, lanceolate, or oblong, 5–10 × 1.8–4 cm, thinly textured, base contracted into amplexicaul sheath, apex acute. Raceme loosely 14–30-flowered, 10–15 cm; floral

bracts ovate-lanceolate, 1.5–2 × 0.3–0.4 cm, longer than flowers, apex acuminate; ovary twisted, slightly arching, cylindric, 1–1.2 cm. Flowers spreading horizontally, yellowish green. Sepals green, 3-veined; dorsal sepal broadly ovate, concave, 3–4 × 2.8–3 mm, apex obtuse; lateral sepals spreading, obliquely ovate, concave, 3–4 × 2.5–2.8 mm, apex obtuse. Petals forming a hood with dorsal sepal, erect, yellow, obliquely ovate, 2.8–3.5 × ca. 2 mm, 3-veined, apex obtuse or emarginate; lip yellowish green, thickly textured, ca. 4 mm, 3-lobed from base; lateral lobes pendulous, narrowly oblong, ca. 3 × 1 mm, apex obtuse, reflexed; mid-lobe suberect, narrowly ovate-lanceolate, ca. 3 × 2 mm, apex adnate to tip of hood formed by dorsal sepal and petals; spur pendulous, slightly curved, cylindric-clavate, 3–6 mm, shorter than ovary, conspicuously dilated toward apex; connective narrow; pollinia ovoid; viscidia linear-oblong, ca. 0.8 mm. Fl. Jul–Sep.

Grassy slopes; 1300–2000 m. SW Guizhou, N Yunnan [Myanmar].

**46. *Habenaria iyoensis*** Ohwi, J. Jap. Bot. 12: 382. 1936.

岩坡玉凤花 yan po yu feng hua

*Habenaria minor* Fukuyama & Masamune; *H. rupestris* T. P. Lin & T. W. Hu.

Plants 15–40 cm tall. Tubers oblong, 2–4 × 1–1.5 cm, fleshy. Stem erect, terete, with 5–7 tufted leaves at base and 2 bractlike leaves above. Leaf blade narrowly elliptic or broadly oblanceolate, 8–10 × 1.8–2 cm, base contracted into amplexicaul sheath, apex acute. Raceme densely many flowered, 8–10 cm; floral bracts ovate-lanceolate, 8–12 × ca. 3 mm, basal ones nearly as long as ovary; ovary twisted, cylindric-fusiform, including pedicel 8–12 mm. Flowers greenish. Dorsal sepal forming a hood with petals, erect, broadly ovate, concave, 5–6 × 3.8–4 mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate, 5–6 × 2.2–3 mm, 3-veined, apex acute. Petals narrowly falcate-lanceolate, 5–6 × ca. 2 mm, 1-veined, apex obtuse; lip spurred, deeply 3-lobed above base; lateral lobes spreading, almost at right angles to mid-lobe, filiform, 7–15 mm; mid-lobe linear, 7–9 mm, apex obtuse; spur pendulous, slightly curved, cylindric, 11–20 mm, longer than ovary, apex obtuse; connective rather broad; stigmas oblong. Fl. Sep–Oct.  $2n = 42$ .

Rocky slopes, sparse forests; below 700 m. C and S Taiwan [Japan].

**47. *Habenaria viridiflora*** (Rottler ex Swartz) R. Brown, Prodr. 312. 1810.

绿花玉凤花 lü hua yu feng hua

*Orchis viridiflora* Rottler ex Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 206. 1800.

Plants 13–20 cm tall. Tubers oblong, 1.5–2 × 0.8–1 cm, fleshy. Stem erect, slender, rigid, glabrous, base with 4 or 5 leaves, with 4 or 5 bractlike leaves above. Leaf blade linear, 5–10 × 0.4–0.6 cm, base amplexicaul, apex acuminate or acute. Raceme several to more than 10-flowered, 2–4 cm, glabrous; floral bracts ovate-lanceolate, ca. 4 mm, much shorter than ovary, apex long acuminate; ovary twisted, terete, slender, in-

cluding pedicel ca. 1 cm. Flowers yellowish green, small, glabrous. Dorsal sepal forming a hood with petals, ovate, concave, ca.  $2 \times 1.3$  mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely ovate-oblong, ca.  $2.8 \times 1.3$  mm, 3-veined, apex obtuse. Petals obliquely ovate, ca.  $2 \times 1.1$  mm, 1-veined, apex acute; lip ca. 3.2 mm, fleshy, near base deeply 3-lobed; lobes linear, apex obtuse; lateral lobes perpendicular to mid-lobe, often ca. 2 mm; mid-lobe ca. 3 mm; spur pendulous, cylindrical, to 1.6 cm, much longer than ovary, slender; pollinia obovoid; caudicles short; stigmas clavate. Fl. Jun.  $2n = 42, 44, 84$ .

Forests. N Guangxi [Cambodia, India, Laos, Sri Lanka, Thailand, Vietnam].

**48. *Habenaria plurifoliata*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 40. 1940.

莲座玉凤花 *lian zuo yu feng hua*

Plants 28–33 cm tall. Tubers cylindrical-oblong, ca.  $2.5$  cm  $\times$   $8$  mm, fleshy. Stem erect, terete, stout, ca. 3 mm in diam., with 1 or 2 tubular sheaths at base, with (4–)6–10 leaves  $\pm$  in a rosette and many bractlike leaves above. Leaf blade linear-lanceolate,  $7$ – $9 \times 0.8$ – $1.1$  cm, base contracted into amplexicaul sheath, apex acute or acuminate. Raceme 10–25-flowered, 6–17 cm; floral bracts lanceolate, basal ones nearly as long as ovary, apex acuminate; ovary twisted, terete, including pedicel 8–12 mm. Flowers yellowish green or white. Dorsal sepal forming a hood with petals, erect, broadly ovate, concave, ca.  $5 \times 2.9$  mm, 3-veined, apex obtuse; lateral sepals reflexed, narrowly ovate, ca.  $6 \times 2.4$  mm, 2-veined, apex subobtuse. Petals obliquely ovate-ligulate, falcate, ca.  $4.5 \times 1.2$  mm, 1-veined, apex acute; lip deeply 3-lobed from base; lateral lobes spreading at right angles to mid-lobe, filiform, ca. 14 mm; mid-lobe linear, ca. 7 mm, wider than lateral lobes; spur pendulous, cylindrical-clavate, ca. 14 mm, longer than ovary, slender, apical half ca. 1.4 mm in diam., slightly thickened toward end, apex acute or obtuse; connective wide; stigmas clavate. Fl. Oct.

• Forests, along rivers; 700–1600 m. S Guangxi, S Yunnan.

**49. *Habenaria tonkinensis*** Seidenfaden, Dansk Bot. Ark. 31(3): 114. 1977.

丛叶玉凤花 *cong ye yu feng hua*

Plants 24–40 cm tall. Tubers oblong,  $3$ – $4 \times 1$ – $1.5$  cm, fleshy. Stem erect, terete, stout, glabrous, with 10–13  $\pm$  clustered leaves at base and 5–13 bractlike leaves above. Leaf blade linear to linear-lanceolate,  $7$ – $13 \times 0.8$ – $1.5$  cm, base contracted, apex acuminate or acute. Raceme many flowered, 11–21 cm; floral bracts lanceolate to ovate-lanceolate, 13–17 mm, apex long acuminate; ovary twisted, cylindrical-fusiform, including pedicel 13–15 mm. Flowers fragrant, white. Dorsal sepal forming a hood with petals, erect, elliptic, concave, ca.  $5 \times 3$ – $3.5$  mm, 3-veined, apex obtuse; lateral sepals reflexed, obliquely elliptic, ca.  $6 \times 2.5$ – $3$  mm, 3-veined, apex obtuse. Petals linear, slightly oblique, ca.  $5 \times 1$  mm, 1-veined, apex acute; lip deeply 3-lobed from base; lobes linear, base ca. 0.5 mm wide; lateral lobes spreading nearly at right angles to mid-lobe, 10–11 mm; mid-lobe 7–8 mm, apex obtuse; spur pendulous, slightly curved, cylindrical-clavate, ca. 17 mm, longer than ovary, thickened toward end; pollinia obovoid; caudicles slen-

der; viscidia orbicular, small; stigmas clavate. Fl. Sep–Oct.

Broad-leaved forests; 600–1200 m. S Guangxi (Dongxing), S Yunnan [Cambodia, Laos, N Vietnam].

**50. *Habenaria fulva*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 138. 1936.

褐黄玉凤花 *he huang yu feng hua*

Plants 21–40 cm tall. Tubers oblong,  $1$ – $2$  cm  $\times$   $5$ – $10$  mm, fleshy. Stem erect, terete, glabrous, with 3–5 leaves below middle, with 3–10 bractlike leaves above. Leaf blade oblong-lanceolate,  $4$ – $8 \times 0.6$ – $1.8$  cm, base amplexicaul, apex acute. Raceme densely many flowered, ca. 6 cm; floral bracts lanceolate, ca. as long as or longer than flower, apex acuminate; ovary twisted, cylindrical-fusiform, including pedicel 8–10 mm. Flowers yellow or yellowish brown. Dorsal sepal erect, narrowly ovate, concave,  $6.5$ – $8 \times 3.5$ – $4$  mm, 3-veined, apex obtuse; lateral sepals obliquely oblong-lanceolate, ca.  $9 \times 3$  mm, 3-veined, apex obtuse. Petals forming a hood with dorsal sepal, falcate-lanceolate, ca.  $8 \times 2.5$  mm, oblique, 2-veined, apex acuminate; lip ca. 1 cm, deeply 3-lobed from base; lobes similar, linear; mid-lobe slightly longer and wider than lateral lobes; spur pendulous, straight, cylindrical, 3–5 mm, apex obtuse; stigmas arching, cylindrical. Fl. Aug–Sep.

Forests; 900–1000 m. SW Guangxi, S Yunnan [Myanmar].

**51. *Habenaria marginata*** Colebrooke in Hooker, Exot. Fl. 2: ad t. 136. 1824.

滇南玉凤花 *dian nan yu feng hua*

*Platanthera marginata* (Colebrooke) Lindley.

Plants 8–37 cm tall. Tubers ellipsoid or narrowly ellipsoid,  $2$ – $4 \times 1$ – $2.5$  cm, fleshy. Stem erect, terete, glabrous, with 1 or 2 tubular sheaths at base, 3–5 leaves below middle, and 3–5 bractlike leaves above. Leaf blade narrowly oblong or oblong-lanceolate,  $4$ – $9 \times 1$ – $2$  cm, base contracted into amplexicaul sheath, margin yellow when dried, apex acuminate or subobtuse. Raceme 3–15-flowered, 2.5–10 cm; floral bracts lanceolate, apex long acuminate; ovary twisted, arching, cylindrical-fusiform, including pedicel 8–13 mm. Sepals green, petals and lip yellow. Dorsal sepal forming a hood with petals, erect, cordate or broadly ovate, concave,  $7$ – $7.5 \times 5$ – $6$  mm, 3-veined, apex acute; lateral sepals reflexed, obliquely ovate or narrowly ovate-oblong,  $7.5$ – $8.5 \times 2.5$ – $3.5$  mm, 3-veined, apex acute. Petals obliquely ovate-triangular,  $6.5$ – $7.3 \times 3$ – $3.8$  mm, 2-veined, apex acute; lip spreading, 11–13 mm, deeply 3-lobed above base; lateral lobes spreading at acute angles to mid-lobe, linear or linear-lanceolate,  $7$ – $8 \times 1$ – $1.4$  mm; mid-lobe ligulate,  $8$ – $9 \times 2$ – $2.3$  mm; spur pendulous, clavate, 8–13 mm, apical half dilated and 1.5–2 mm in diam.; stigmas falcate, long. Fl. Oct–Nov.  $2n = 42$ .

Forests, grasslands at forest margins; 500–1200 m. S Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Thailand].

**52. *Habenaria leptoloba*** Benth, Fl. Hongk. 362. 1861.

细裂玉凤花 *xi lie yu feng hua*

Plants 15–31 cm tall. Tubers oblong, ca.  $2$  cm  $\times$   $8$  mm,

fleshy. Stem erect, terete, slender, near base with 3–6 leaves, with 2–5 bractlike leaves above. Leaf blade lanceolate or linear, 6–15 × 1–1.8 cm, base contracted into amplexicaul sheath, apex acuminate or acute. Raceme 8–19-flowered, 8–14 cm; floral bracts lanceolate, 4–12 mm, longer than ovary, apex acuminate; ovary twisted, cylindrical-fusiform, glabrous, including pedicel 7–8 mm. Flowers yellowish greenish; sepals greenish. Dorsal sepal forming a hood with petals, broadly ovate, concave, ca. 3 × 2.8 mm, 1-veined, apex obtuse; lateral sepals spreading or reflexed, obliquely ovate-lanceolate, ca. 4.5 × 2 mm, 1-veined, apex obtuse. Petals erect, whitish green, obliquely ovate, concave, ca. 3.8 × 2 mm, 1-veined, apex obtuse; lip yellow, relatively long, deeply 3-lobed from base, lobes linear; lateral lobes divergent, ca. 6 mm, narrowed toward apex, apex obtuse; mid-lobe ca. 4 mm, apex obtuse; spur pendulous or slightly curved, cylindrical, 8–11 mm, longer than ovary, slender, slightly thickened near end, apex obtuse. Fl. Aug–Sep.

- Humid places in forests or grasslands. Hong Kong.

**53. *Habenaria nematocera*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 39. 1940.

细距玉凤花 xi ju yu feng hua

Plants 40–45 cm tall. Stem terete, with 3 tubular sheaths at base, 3 or 4 leaves near base, and 6–8 bractlike leaves above. Leaf blade narrowly oblong, narrowly elliptic, or narrowly spatulate, 9–15 × 2–2.5 cm, papery, base attenuate into amplexicaul sheath, apex acuminate or acute. Raceme loosely 15–30-flowered, 10–18 cm; floral bracts lanceolate, much shorter than ovary, apex aristate; ovary twisted, cylindrical-fusiform, glabrous, including pedicel ca. 15 mm. Flowers pinkish white. Dorsal sepal forming a hood with petals, erect, oblong-ovate, concave, ca. 4 × 2.5 mm, 3-veined, apex obtuse; lateral sepals reflexed,

oblique, narrowly ovate, ca. 4.5 × 2 mm, 2-veined, apex obtuse. Petals obliquely oblong-ovate, ca. 4 × 1.7 mm, with 1 vein, apex obtuse; lip deeply 3-lobed above base; lateral lobes divergent, pendulous, filiform, 9–10 mm; mid-lobe narrowly ligulate, 4–5 × ca. 1 mm; spur pendulous, curved, ca. 21 mm, much longer than ovary, slender, slightly dilated toward end; connective very narrow; pollinia inversely pear-shaped; caudicles long; viscidia ovate-elliptic. Fl. Oct.

- Forests; ca. 1200 m. SW Yunnan.

**54. *Habenaria furcifera*** Lindley, Gen. Sp. Orchid. Pl. 319. 1835.

密花玉凤花 mi hua yu feng hua

Plants to 50 cm tall. Tubers oblong, 4–5 × 2–2.5 cm, fleshy. Stem erect, terete, slender, glabrous, with 6 leaves below middle and 11 sparse bractlike leaves above. Leaf blade elliptic to narrowly elliptic, 8–18 × 3–6.5 cm, base contracted into amplexicaul sheath, apex acuminate or acute. Raceme densely many flowered, 9.5–13 cm, glabrous; floral bracts lanceolate, 7–15 mm, slightly shorter than or nearly as long as ovary, apex long acuminate. Flowers greenish, small, glabrous. Dorsal sepal forming a concave hood with petals, ovate, ca. 4 × 3 mm, 3-veined, apex acute; lateral sepals reflexed, obliquely oblong-lanceolate, ca. 4.5 × 2 mm, 3-veined, apex subobtuse. Petals lanceolate, concave, ca. 4 × 1.7 mm, with 1 vein, attenuate toward apex, apex subobtuse; lip 3-lobed from base; lobes linear; lateral lobes slightly curved, ca. 7 mm; mid-lobe erect, ca. 5 mm; spur pendulous, curved, ca. 17 mm, much longer than ovary, slender; stigmas suboblong, small. Fl. Sep.  $2n = 42$ .

Forest margins, forests; 1100–1200 m. S Yunnan [Bhutan, India, Myanmar, Nepal, Thailand].

### 43. *HEMIPILIOPSIS* Y. B. Luo & S. C. Chen, Novon 13: 450. 2003.

紫斑兰属 zi ban lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial. Tubers ellipsoid to subellipsoid, fleshy; roots filiform. Stem erect, spotted with purple, usually with 1 or rarely 2 leaves near base. Leaves elliptic to ovate-oblong, base shortly petiolate and sheathing stem, apex acute or acuminate. Inflorescence a terminal raceme, with several to many well-spaced flowers; peduncle, rachis, floral bracts, pedicel, and ovary all spotted with purple. Flowers resupinate, all parts apart from lip pale purple, spotted with purple. Dorsal sepal connivent with petals and forming a hood, erect, obovate; lateral sepals spreading or reflexed, obliquely ovate-elliptic. Petals ovate; lip subovate to flabellate, base spurred, apex 3-lobed; spur conic, abruptly contracted near tip and then swollen to form a globose apex. Column short, with 2 lateral appendages (1 on either side of anther); anther sessile, erect, with 2 parallel locules; rostellum shallowly 3-lobed; lateral lobes protruding, not converging; pollinia 2, granular-farinaceous, sectile, each attached by a slender caudicle to a viscidium; viscidia small, naked, borne directly above spur mouth at apices of lateral rostellum lobes; stigma 2-lobed, set in cavity at posterior margin of rostellum. Capsule ellipsoid.

One species: SW China, NE India.

The sole species was referred initially to *Habenaria*, but it differs from other members of that genus in habit, structure of the stigma, and lack of obvious anther canals. The shallowly 3-lobed rostellum, the orientation of the rostellum lobes, and the positioning of the viscidia appear to distinguish it from *Hemipilia*, while the shape of the lip, the non-converging lateral rostellum lobes, and various vegetative characters distinguish it also from *Brachycorythis*.

**1. *Hemipiliopsis purpureopunctata*** (K. Y. Lang) Y. B. Luo & S. C. Chen, Novon 13: 450. 2003.

紫斑兰 zi ban lan

*Habenaria purpureopunctata* K. Y. Lang, Acta Phytotax. Sin. 16(4): 127. 1978.

Plants 20–50 cm tall, with purple spots throughout. Tubers

2–4 × 1.5–2 cm. Stem erect, with 2–5 sterile scalelike bracts above leaf. Leaf usually 1, light purple abaxially, green spotted with purple adaxially, elliptic to ovate-oblong, 2–15 × 2–5 cm. Rachis 8–20 cm, 2–20-flowered; floral bracts shorter than ovary. Flowers pale purple; pedicel and ovary 1.3–1.5 cm. Dorsal sepal ca. 5 × 2 mm, 3-veined, apex rounded or obtuse; lateral sepals ca. 6 × 4 mm, apex obtuse. Petals ca. 5 × 4 mm, apex obtuse; lip subovate to flabellate, 10–11 × 9–10 mm, 3-

lobed at apex; lateral lobes oblong, usually larger than mid-lobe, apical margin irregularly undulate; mid-lobe ovate, ca. 3 × 2 mm; spur 9–10 × 2–3 mm, with a large mouth, globose apex 2–3 mm in diam. Capsule with purple spots, ellipsoid, ca. 15 × 2–3 mm. Fl. Jun–Jul, fr. Aug–Sep.

Broad-leaved evergreen forests, grasslands, sandy soils along rivers; 2100–3400 m. SE Xizang [NE India (Assam)].

#### 44. BHUTANTHERA Renz, Edinburgh J. Bot. 58: 99. 2001.

高山兰属 gao shan lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small, slender to stout. Tubers subglobose to ovoid, fleshy, neck with a few filiform roots. Stem erect, short, covered with tubular sheaths and sheathing leaf bases, glabrous. Leaves 2 or more, subopposite or clustered toward apex of stem, ovate, elliptic, or lanceolate, base tapering into amplexicaul sheath. Inflorescence terminal, racemose, 1–20-flowered, glabrous. Flowers resupinate; ovary twisted, fusiform to obovoid. Sepals free, similar. Petals usually smaller than sepals; lip 3-lobed though lateral lobes sometimes reduced and obscure, spurred at base; spur conic to cylindrical. Column short, stout; anther with distinct connective and 2 divergent locules; stigma 2-lobed, conjoined, pulvinate; rostellum with 2 distinct arms; pollinia 2, granular-farinaceous, sectile, each attached by a short caudicle to a small naked viscidium; rostellum relatively large.

Five species: all found in the alpine zone of the E Himalayas; one species in China.

*Bhutanthera albomarginata* (King & Pantling) Renz (Edinburgh J. Bot. 58: 101. 2001; *Habenaria albomarginata* King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 322. 1898) has been noted from Xizang (Press et al., Annot. Checkl. Fl. Pl. Nepal, 217. 2000). However, the present authors found no relevant specimens and therefore could not substantiate the occurrence of this species in China.

**1. *Bhutanthera alpina*** (Handel-Mazzetti) Renz, Edinburgh J. Bot. 58: 102. 2001.

高山兰 gao shan lan

*Habenaria alpina* Handel-Mazzetti, Symb. Sin. 7: 1336. 1936; *Peristylus alpinus* (Handel-Mazzetti) K. Y. Lang.

Plants slender, 4–7 cm tall. Tubers subglobose, to ca. 5 mm in diam. Stem with 1–3 tubular sheaths at base, 2-leaved. Leaves subopposite, elliptic, elliptic-lanceolate, or obovate, 1–2.5 × 0.5–1 cm, apex acute to obtuse. Inflorescence 1–5-flowered; peduncle ridged, 3–5 cm, free of leaf bases and visible beyond stem apex; floral bracts triangular, very small. Flowers suberect, green; sepals and petals tinged white along apical

margin; pedicel and ovary fusiform, 2–3 mm, slender. Dorsal sepal erect, broadly ovate, 2–3 × 1.5–2 mm, apex obtuse to subrounded; lateral sepals spreading, ovate, oblique, 3–3.5 × 2–2.5 mm, apex acute. Petals loosely connivent with dorsal sepal, erect, broadly ovate, 1–1.5 × 0.7–1 mm, fleshy, apex obtuse; lip spreading, ovate-lanceolate, 1–1.5 × ca. 0.5 mm, fleshy, 3-lobed below middle; lateral lobes orbicular-ovate, very small, apex obtuse; mid-lobe ligulate-lanceolate, 0.8–1 mm, apex acute; spur cylindrical, 2–3 mm, apex obtuse. Column ca. 1 mm. Fl. Jul–Aug.

Damp alpine meadows; 4200–4300 m. SE Xizang [Bhutan, India (Sikkim)].

#### 45. FRIGIDORCHIS Z. J. Liu & S. C. Chen, J. Fairylake Bot. Gard. 6(3): 14. 2007.

冷兰属 leng lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale

Herbs terrestrial, small. Tubers rather large. Stem very short. Leaves basal, ovate-elliptic to ovate-lanceolate, base petiolate; petioles enclosed in tubular sheaths forming a pseudostem. Inflorescence ebracteate, ± broadly corymbose, 1–8-flowered; each flower at end of a peduncle, and all peduncles fused with each other in lower part. Flowers resupinate, small, often not fully opening. Sepals and petals free; sepals slightly larger than petals; lip fleshy, spurred, 3-lobed toward base; lateral lobes small; mid-lobe much larger; spur ellipsoidal. Column short; anther erect, with 2 divergent locules; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium; caudicle inconspicuous; viscidium large, naked, attached to both sides of rostellum arms; rostellum shortly armed; stigmas 2, separate, just below rostellum arms, shortly clavate; staminodes 2.

• One species: China.

**1. *Frigidorchis humidicola*** (K. Y. Lang & D. S. Deng) Z. J. Liu & S. C. Chen, J. Fairylake Bot. Gard. 6(3): 17. 2007.

冷兰 leng lan

*Peristylus humidicola* K. Y. Lang & D. S. Deng, Novon 6:

190. 1996; *Bhutanthera humidicola* (K. Y. Lang & D. S. Deng) Ormerod.

Plants 3–4 cm tall. Tuber somewhat calabash-shaped, 1.2–1.5 cm × 6–8 mm. Stem 1–2 mm thick. Leaves 2 or 3, nearly

tufted, ovate-elliptic to ovate-lanceolate, slightly concave, 1.5–3.3 × 1–3 cm, base contracted into a petiole, apex acute; petioles enclosed by 2 tubular sheaths forming a pseudostem 8–12 mm. Inflorescence short, scarcely exceeding leaves, ± broadly corymbose, 1–8-flowered. Flowers green-yellow; sepals white margined apically; petals and lip becoming deep purple after pollination; pedicel 3–5 mm; ovary 4–6 mm. Dorsal sepal suborbicular, 3–4.5 mm, margin denticulate toward apex; lateral

sepals ovate-elliptic, slightly longer than dorsal sepal. Petals orbicular, 2–2.5 mm, fleshy, apex rounded-obtuse; lip 3–3.5 cm, fleshy, spurred, 3-lobed toward its base; lateral lobes triangular, small; mid-lobe ligulate-linear, 2–2.7 mm; spur 1–2 × 0.5–1 mm, rounded-obtuse at end. Fl. Aug.

• Sides of tall sedge tussocks, soil-covered rocks in swampy meadows; 3600–4500 m. SE Qinghai.

#### 46. DIPLOMERIS D. Don, Prodr. Fl. Nepal. 26. 1825.

合柱兰属 he zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Diplochilus* Lindley; *Paragnathis* Sprengel.

Herbs, terrestrial. Tubers subglobose, fleshy, unlobed, neck with several slender roots. Stem short, with 1 or 2 leaves. Leaves basal, ensiform to oblong, pubescent or glabrous. Inflorescence suberect, terminal, 1- or 2-flowered; floral bracts lanceolate, green. Flowers resupinate, large; ovary twisted, cylindrical-fusiform. Sepals spreading, free, lanceolate, nearly equal in size. Petals longer and wider than sepals; lip flabellate, large, unlobed, glabrous, sessile or shortly clawed at base, spurred; spur decurved, elongate, cylindrical, slender. Column very short, with 2 lateral appendages; anther with 2 slightly divergent locules; pollinia 2, clavate, granular-farinaceous, sectile, each attached by a long, slender caudicle to a viscidium; viscidia oblate, small, naked; rostellum erect, large, membranous, protruding between locules of anther; stigma lobes 2, elongate, oblong, convex, basally connate, diverging. Capsule ellipsoid.

Four species: Bhutan, Cambodia, China, NE India, Laos, N Myanmar, Nepal, Thailand, Vietnam; two species in China.

- 1a. Leaves usually 2, ensiform to linear-lanceolate, 0.5–1.8 cm wide; leaf, inflorescence, pedicel, and ovary glabrous ..... 1. *D. pulchella*  
 1b. Leaf usually solitary, oblong, 1.4–3.8 cm wide; leaf, inflorescence, pedicel, and ovary pubescent ..... 2. *D. hirsuta*

##### 1. *Diplomeris pulchella* D. Don, Prodr. Fl. Nepal. 26. 1825.

合柱兰 he zhu lan

*Diplochilus longifolius* Lindley; *Diplomeris boxallii* Rolfe; *Habenaria uniflora* (Roxburgh) Griffith; *Orchis uniflora* Roxburgh; *Paragnathis pulchella* (D. Don) Sprengel.

Plants 7.5–22.5 cm tall. Tubers ellipsoid, ca. 10 × 5 mm. Leaves usually 2, basal, 1 larger than other, ensiform to linear-lanceolate, 3–10 × 0.5–1.8 cm, glabrous, base contracted into amplexicaul sheath, apex acuminate. Inflorescence erect, 6–18 cm, glabrous; floral bract broadly ovate, ca. as long as to slightly exceeding ovary, glabrous, apex acute. Flower usually solitary, erect, white, large; ovary and pedicel 10–12 mm, glabrous. Sepals spreading, oblong-lanceolate or ovate-lanceolate, 15–18 × ca. 6 mm, outer surface carinate, glabrous, apex acute or acuminate. Petals spreading, broadly obovate or ovate-oblong, 1.5–2.5 × 1–1.5 cm, apex acute; lip spreading, broadly obcordate, 1.8–2.8 × 1.5–2.2 cm, apex entire to shallowly emarginate and with a small acute tooth; spur pendulous, strongly incurved, cylindrical, ca. 3.5 cm, slender, slightly thickened from middle toward apex, apex subacute to obtuse. Fl. Jul–Sep, fr. Oct.

Forests, grasslands; 600–2600 m. SW Guizhou, SW Sichuan, SE Xizang, NW Yunnan [NE India, Myanmar, Vietnam].

##### 2. *Diplomeris hirsuta* (Lindley) Lindley, Gen. Sp. Orchid. Pl. 331. 1835.

毛叶合柱兰 mao ye he zhu lan

*Diplochilus hirsutus* Lindley, Edwards's Bot. Reg. 18: ad t. 1499. 1832; *D. hirsutus* var. *biflorus* Pradhan.

Plants 5–7 cm tall. Tubers subglobose to ellipsoid, 7–10 × 5–7 mm. Leaf usually solitary, or occasionally with a second smaller subopposite leaf, basal, oblong, 3.5–8 × 1.4–3.8 cm, pubescent, base directly sheathing stem, apex subacute. Inflorescence erect, 5–6 cm, pubescent; floral bracts broadly ovate, shorter than ovary, pubescent, apex acute. Flower solitary, erect, white, large; ovary and pedicel 11–15 mm, pubescent. Sepals spreading, ovate-oblong, 11–16 × 8–12 mm, outer surface sparsely pubescent, apex acute. Petals spreading, orbicular-reniform, 10–21 × 7–17 mm, apex subacute; lip spreading, broadly obovate, 16–22 × 15–23 mm, apex entire to shallowly emarginate and with a small acute tooth; spur pendulous, strongly incurved, cylindrical, 3.5–4.5 cm, slender, attenuate, apex acute. Fl. Jul–Aug.

Grasslands. S China [NE India, Nepal].

#### 47. ANDROCORYS Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 52. 1919.

兜蕊兰属 dou rui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small. Tuber globose to ovoid, fleshy, pubescent. Stem erect, slender, glabrous, with 1 basal leaf. Leaf ovate to

narrowly elliptic, base attenuate into amplexicaul sheath. Inflorescence erect, terminal, with several to more than 10 flowers arranged in a short, ± dense raceme; floral bracts very small, scalelike. Flowers resupinate, usually yellowish to green, small; ovary twisted, fusiform. Sepals free; dorsal sepal erect, often broad, concave, forming a hood with petals; lateral sepals longer and narrower than dorsal sepal. Petals concave; lip reflexed, ligulate or linear, small, base often dilated, spurless, entire. Column short, with 2 lateral appendages; anther erect, with 2 divergent, hooded locules and broad connective; pollinia 2, clavate, granular-farinate, sectile, each attached to a small viscidium; rostellum triangular; stigma 2-gibbous, attached to base of rostellum.

Six species: from the Himalayas through S China to Japan; five species (three endemic) in China.

- 1a. Lateral sepals pendulous and parallel to lip, lower margins connivent with each other ..... 1. *A. ophioglossoides*  
 1b. Lateral sepals spreading, not parallel to lip, lower margins not connivent with each other.  
 2a. Sepal margins entire; petals shorter than or ca. as long as dorsal sepal.  
 3a. Floral bracts broadly ovate, not spirally twisted; dorsal sepal 1–1.2 mm wide, apex obtuse ..... 2. *A. pugioniformis*  
 3b. Floral bracts linear, spirally twisted; dorsal sepal 1.3–1.8 mm wide, apex apiculate ..... 3. *A. spiralis*  
 2b. Sepal margins denticulate; petals longer than dorsal sepal.  
 4a. Floral bracts ovate, ca. 1.5 mm; petals elliptic or obliquely orbicular, ca. as broad as dorsal sepal ..... 4. *A. pusillus*  
 4b. Floral bracts broadly ovate, ca. 0.8 mm; petals obliquely oblong-lanceolate, narrower than dorsal sepal ..... 5. *A. oxysepalus*

**1. *Androcorys ophioglossoides*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 53. 1919.

兜蕊兰 dou rui lan

Plants 8–21 cm tall. Tuber globose, 5–8 mm in diam. Stem erect, slender, with 2 tubular sheaths and 1 leaf at base. Leaf narrowly elliptic to oblong-spatulate, 3–9 × 0.8–2 cm, apex obtuse. Rachis 2.5–9 cm, 6–20-flowered; floral bracts ca. 1 mm, apex subtruncate. Flowers yellowish green or green; ovary and pedicel 4–4.5 mm. Dorsal sepal erect, broadly ovate, concave, 1–1.2 × 0.9–1.1 mm, 1-veined, entire, apex obtuse or subacute; lateral sepals parallel to lip, pendulous, obliquely elliptic, ca. 2 × 1 mm, entire, lower margins connivent with each other, 1-veined, apex obtuse. Petals erect, oblique, broadly ovate, unequally sided, concave, large, ca. 1.5 × 1.3 mm, apex obtuse; lip linear-ligulate, small, 1.2–1.8 mm, base slightly dilated and ca. 0.7 mm wide, apex obtuse; connective ca. 1 mm wide. Fl. Jul–Aug, fr. Sep.

• Alpine forests, damp alpine grasslands; 1600–3900 m. Gansu, Guizhou, Qinghai, Shaanxi.

**2. *Androcorys pugioniformis*** (Lindley ex J. D. Hooker) K. Y. Lang, Guihaia 16: 105. 1996.

剑唇兜蕊兰 jian chun dou rui lan

*Herminium pugioniforme* Lindley ex J. D. Hooker, Fl. Brit. India 6: 130. 1890; *H. nivale* Schlechter; *Monorchis pugioniformis* (Lindley ex J. D. Hooker) O. Schwarz.

Plants 5.5–18 cm tall. Tuber globose, 6–10 mm in diam. Stem erect or ascending, slender to relatively stout, with 1 or 2 tubular sheaths and 1 leaf at base. Leaf oblanceolate, oblong, narrowly elliptic, or elliptic, 2–4 × 0.4–1.2 cm, apex obtuse or acute. Rachis 0.8–2.5 cm, 3–10-flowered; floral bracts broadly ovate, much shorter than ovary, apex acute. Flowers green; ovary and pedicel 4–5 mm. Dorsal sepal erect, ovate or ovate-orbicular, concave, ca. 1.5 × 1–1.2 mm, 1-veined, entire, apex obtuse; lateral sepals spreading, obliquely obovate to elliptic, 1.7–2.2 × 1–1.2 mm, entire, 1-veined, apex obtuse. Petals obliquely obovate, concave, 1.3–1.5 × 0.5–0.8 mm, 1-veined, entire, apex obtuse or subacute; lip linear-oblong, 1.7–2.5 mm, fleshy, base conspicuously dilated and 0.5–1 mm wide, apex

obtuse; connective ca. 0.6 mm wide; viscidia ellipsoid. Fl. Aug–Sep, fr. Sep.

*Abies* forests, alpine thickets and meadows; 2700–5200 m. E and S Qinghai, NW Sichuan, Xizang, NW Yunnan [Bhutan, India, Kashmir, Nepal].

**3. *Androcorys spiralis*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 10: 38. 1940.

蜀藏兜蕊兰 shu zang dou rui lan

Plants 5–12 cm tall. Tuber globose, 5–8 mm in diam. Stem erect or ascending, slender, with 2 tubular sheaths and 1 leaf at base. Leaf oblong, 2–2.5 × 0.8–1 cm, apex obtuse. Rachis 2–2.5 cm, 3–8-flowered; floral bracts spirally twisted, linear, shorter than ovary, apex acuminate. Flowers green; ovary and pedicel 3–7 mm. Dorsal sepal erect, broadly ovate, concave, 1.5–2 × 1.3–1.8 mm, 1-veined, entire, apex apiculate; lateral sepals spreading, oblong, 2–2.75 × 1–1.2 mm, 1-veined, entire, apex obtuse. Petals obliquely oblong, concave, 1.3–2 × 0.5–0.7 mm, 1-veined, margin incurved, apex obtuse or acuminate; lip linear-ligulate, 1.8–2.1 mm, fleshy, base dilated and ca. 0.8 mm wide, apex obtuse; connective very broad. Fl. Sep.

• Forests; 2800–3500 m. SW Sichuan, SE Xizang, NW Yunnan.

**4. *Androcorys pusillus*** (Ohwi & Fukuyama) Masamune, Hokuriku J. Bot. 12: 88. 1963.

小兜蕊兰 xiao dou rui lan

*Herminium pusillum* Ohwi & Fukuyama, Bot. Mag. (Tokyo) 48: 430. 1934; *Androcorys japonensis* F. Maekawa.

Plants 10–22 cm tall. Tuber ovoid or globose, 5–7 mm in diam. Stem erect, slender, with 1–3 tubular sheaths and 1 leaf at base. Leaf ovate to oblong, 2–4.5 × 1–2.2 cm, apex obtuse. Rachis ca. 2.5 cm, 8–13-flowered; floral bracts ovate, ca. 1.5 mm, shorter than ovary. Flowers green; ovary and pedicel 3–4 mm. Dorsal sepal erect, triangular-ovate, orbicular, or broadly ligulate, concave, 1–1.2 × ca. 1 mm, 1-veined, margin irregularly denticulate, apex obtuse; lateral sepals spreading, narrowly oblong, 2–3 × 0.7–1 mm, 1-veined, margin slightly denticulate, apex obtuse or subacute. Petals elliptic to obliquely orbicular, concave, 1.2–1.5 × ca. 1 mm, 1-veined, base cuneate, margin

entire or slightly denticulate, apex rounded; lip ligulate, 2–2.2 × ca. 0.7 mm, fleshy, base dilated, apex obtuse; connective broad. Fl. Jul.

Forests, alpine meadows; 2500–3500 m. C Taiwan [Japan].

**5. *Androcorys oxyspalus*** K. Y. Lang, *Guihaia* 16: 106. 1996.

尖萼兜蕊兰 *jian e dou rui lan*

Plants 6–7 cm tall. Tuber globose, ca. 5 mm in diam. Stem erect or ascending, slender, with 2 tubular sheaths and 1 leaf at base. Leaf elliptic to oblong, 1.5–1.7 × 0.8–0.9 cm, apex obtuse. Rachis 1.8–2 cm, 6- or 7-flowered; floral bracts broadly

ovate, ca. 0.8 mm, much shorter than ovary, apex acute. Flowers green, small; ovary and pedicel ca. 3 mm. Dorsal sepal erect, broadly ovate, concave, ca. 1.6 × 1.2 mm, 1-veined, margin denticulate, apex acuminate; lateral sepals spreading, narrowly oblong-lanceolate, ca. 3 × 1 mm, 1-veined, margin denticulate, apex acuminate and thickened. Petals erect, obliquely oblong-lanceolate, concave, ca. 2 × 0.8 mm, 1-veined, entire, apex obtuse; lip pendulous, linear-lanceolate, ca. 1.5 mm, fleshy, base dilated and ca. 0.6 mm wide, apex obtuse; connective broad. Fl. Aug.

• *Abies* forests; ca. 3900 m. NW Yunnan.

**48. *POROLABIUM*** Tang & F. T. Wang, *Bull. Fan Mem. Inst. Biol. Bot.* 10: 36. 1940.

孔唇兰属 *kong chun lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small. Tubers subglobose, small. Stem erect, with 2 or 3 sheathing cataphylls at base and 1 cauline leaf. Leaf linear-lanceolate, base vaginate and sheathing stem, apex obtuse. Inflorescence terminal, ebracteate, racemose, 6–8-flowered; floral bracts broadly ovate, small, much shorter than ovary. Flowers resupinate, yellowish green to green. Dorsal sepal connivent with petals, erect, ovate, concave; lateral sepals spreading or deflexed, narrowly ovate, apex obtuse. Petals erect, obliquely ovate, apex obtuse; lip ligulate, entire, apex obtuse, dilated and with 2 glands at base, spurless. Column short; anther large, 2-locular, with narrow connective; pollinia 2; rostellum prominent; lateral lobes spreading; stigma simple, pulvinate, not adnate to rostellum.

• One species: China.

In habit, *Porolabium* is similar to the genus *Herminium* (to which the sole species was referred initially), but it differs in its solitary leaf; its unlobed, ligulate, and spurless lip, which bears 2 depressions at its swollen base; its large rostellum; and its simple, cushionlike stigma. Further analysis of fresh material is required to better resolve generic affinities.

**1. *Porolabium biporosum*** (Maximowicz) Tang & F. T. Wang, *Bull. Fan Mem. Inst. Biol. Bot.* 10: 38. 1940.

孔唇兰 *kong chun lan*

*Herminium biporosum* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg* 31: 106. 1887; *Monorchis biporosa* (Maximowicz) O. Schwarz.

Plants 10–12 cm tall. Tubers globose, ca. 1 cm in diam., fleshy, unlobed. Stem slender, with 2 or 3 tubular sheaths and 1 leaf. Leaf linear-lanceolate, ca. 7 × 0.8 cm, base amplexicaul, apex obtuse. Inflorescence 6–8-flowered; floral bracts small. Flowers yellowish green or greenish, small; ovary twisted,

fusiform, including pedicel 5–6 mm. Dorsal sepal forming a hood with petals, ca. 2.5 × 1.5 mm, 1-veined; lateral sepals ca. 3 × 1.5 mm, 1-veined. Petals ca. 2 × 1 mm, 1-veined; lip spreading, ca. 2.8 × 1.5 mm, base dilated and with 2 concave glands, attenuate toward apex. Column short, with 2 lateral appendages at base of anther; anther cucullate, large, 2-locular; pollinia 2, each attached to a viscidium by a short caudicle; rostellum deltoïd, very large, with spreading lateral lobes; stigma cushionlike. Fl. Jul.

• Montane grasslands and lakesides; 3000–3300 m. E Qinghai, NE Shanxi.

**49. *DISPERIS*** Swartz, *Kongl. Vetensk. Acad. Nya Handl.* 21: 218. 1800.

双袋兰属 *shuang dai lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, slender. Tuber ovoid to globose. Stem erect, unbranched, fleshy, glabrous or pubescent, with a few scattered or clustered leaves. Leaves basal or cauline, lanceolate, ovate, or subcordate, often very small, base amplexicaul, margin entire. Inflorescence terminal, racemose, 1- to several flowered; floral bracts foliaceous, similar to leaves. Flowers resupinate; ovary twisted. Dorsal sepal connate to or connivent with petals and forming a hood, usually erect, narrow; lateral sepals often connate at base, saccate or spurred near middle. Petals falcate, broader than dorsal sepal; lip narrowly clawed; claw adnate to base of column; blade variable in shape, often 3-lobed, smooth, verrucose or pubescent. Column short, sessile; anther 2-locular, attached to column by a short filament; pollinia 2, granular-farinaceous, sectile, attached by slender caudicles to large viscidia, borne at apices of rostellum arms; stigma 2-lobed, confluent or consisting of 2 separate areas, located toward apex of column or dorsally near base of rostellum arms; rostellum with 2 long, twisted arms and flat central lobe. Capsule fusiform.

About 75 species: mainly in S and tropical Africa, with a few species extending to tropical and subtropical Asia; one species in China.

**1. *Disperis neilgherrensis*** Wight, Icon. Pl. Ind. Orient. 5: t. 1719. 1851.

双袋兰 *shuang dai lan*

*Disperis javanica* J. J. Smith; *D. lantauensis* S. Y. Hu; *D. orientalis* Fukuyama; *D. palawensis* (Tuyama) Tuyama; *D. papuana* Micholitz & Kraenzlin; *D. philippinensis* Schlechter; *D. rhodoneura* Schlechter; *D. siamensis* Rolfe ex Downie; *D. teleplana* F. Maekawa; *D. walkerae* H. G. Reichenbach; *D. zeylanica* Trimen; *D. zeylanica* var. *neilgherrensis* (Wight) Pradhan; *Pantlingia palawensis* (Tuyama) Rauschert; *Stigmatodactylus palawensis* Tuyama.

Plants 4–17 cm tall. Tuber ovoid, 0.5–1(–2) cm, puberulent. Subterranean stem with a few sheathing cataphylls. Stem dark green to purple, terete, 3–15 cm, with 1–3 cauline leaves usually above middle. Leaves abaxially purplish, adaxially green, sometimes with large dark green patches, ovate to cordate, 4–17 × 4–13 mm, with anastomosing venation, base directly sheathing stem, apex acute. Rachis 1–3-flowered,

pinkish green, 1–1.5 cm; floral bracts ovate, 4–10 × 2–5 mm. Flowers pink to pale purple; pedicel and ovary cylindric, 8–12 mm. Dorsal sepal forming a hood with petals, erect, lanceolate, 4–7 × 1–1.5 mm, 1-veined, apex acute; lateral sepals pendulous, obliquely ovate, 5–7 × ca. 3.5 mm, connate at base, with conic sac at center. Petals connivent with dorsal sepal, obliquely obovate, 5–6 × 2–3.5 mm; lip whitish, ca. 5 mm, consisting of a narrow claw at base and a narrowly 3-lobed blade, cross-shaped when expanded; claw adnate to base of column, erect, 1–2 mm; lateral lobes spreading at right angles to mid-lobe, adaxially yellow, linear, ca. 2.5 mm, minutely hairy; mid-lobe pendulous, linear, ca. 2 mm, terminating in a swollen papillose appendage. Column ca. 1.2 mm; rostellum rhomboid, stipitate at base, with 2 curved or coiled ribbonlike arms projecting in opposite directions; pollinia attached to apex of rostellum arms; stigma lobes separate. Capsule ca. 14 × 2.5 mm. Fl. May–Aug.

Woodlands, scrub; 200–900 m. Hong Kong, S Taiwan [India, Indonesia, Japan (Ryukyu Islands), New Guinea, Philippines, Sri Lanka, Thailand; SW Pacific islands].

## 50. SATYRIUM Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 214. 1800, nom. cons., not Linnaeus (1753).

鸟足兰属 *niao zu lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, slender or robust. Tubers solitary or paired, ellipsoid, fleshy; roots few, fasciculate, filiform. Stem erect, with a few sheaths at base and 1 to few leaves above, glabrous. Leaves basal or cauline, ovate to lanceolate, membranous to slightly fleshy, amplexicaul at base. Inflorescence terminal, with several scattered, sheathing foliaceous or reduced sterile bracts along peduncle, laxly to densely few to many flowered above; floral bracts reflexed, usually foliaceous, ovate to lanceolate, often longer than ovary. Flowers not resupinate, bisexual or unisexual; ovary fusiform, shortly pedicellate, usually glabrous. Sepals and petals free, spreading, subequal. Petals often slightly smaller than sepals; lip superior, deeply hooded, adnate to column at base, with 2 elongate or saccate spurs at base, or rarely spurless. Column short to elongate, usually incurved, with 2 prominent auricles near anther base; anther on ventral surface of column, with 2 parallel locules, base entirely connate with column, usually with well-developed connective; pollinia 2, granular-farinaceous, sectile, each attached to a viscidium by a short, slender caudicle; rostellum spreading, rather large, 3-lobed; stigma lobes confluent, large, flat or concave.

About 90 species: mainly in Africa (especially S Africa), with a few species also found in S Asia; two species (one endemic) in China.

- 1a. Rachis 2–4.5 cm, subdensely to densely flowered; flowers yellow ..... 2. *S. yunnanense*  
 1b. Rachis 4–20 cm, laxly to subdensely flowered; flowers whitish, pink, or pale rose-purple ..... 1. *S. nepalense*

**1. *Satyrium nepalense*** D. Don, Prodr. Fl. Nepal. 26. 1825.

鸟足兰 *niao zu lan*

Plants (11–)20–70 cm tall. Tubers oblong-ellipsoid to ellipsoid, 2–5 × 0.5–1.5 cm. Stem with 1–3 membranous sheaths at base, 1–3-leaved. Leaves usually basal and subopposite, or sometimes cauline and widely spaced and alternate, broadly ovate, ovate-lanceolate, or lanceolate-oblong, 4–19 × 2–5.5(–8) cm, slightly fleshy, margin somewhat crisped, apex acute or acuminate. Peduncle 6–30 cm, slender to stout, with several large, foliaceous, tubular bracts, glabrous; rachis 4–20 cm, laxly 10- to subdensely more than 20-flowered; floral bracts reflexed, ovate-lanceolate, 8–35 × 4–10 mm. Flowers fragrant, widely spreading, whitish, pink, or pale purple, glabrous, hermaphroditic or with reduced stamen and functionally female; pedicel and ovary 6–10 mm, glabrous. Dorsal sepal narrowly oblong-elliptic, 4–6 × 1–1.8 mm, apex obtuse; lateral

sepals oblong to subovate, slightly oblique, 4–6 × 1.5–2 mm, apex obtuse. Petals narrowly oblong to narrowly elliptic, 3.5–5 × 1–1.2 mm, outer surface carinate, margin sometimes finely ciliate, apex acute to obtuse and sometimes incised; lip hooded, subglobose, 5–6 × 4–6 mm, outer surface carinate, 2-spurred, margin sometimes irregularly dentate, apex acute or obtuse and often deflexed; spurs parallel, slender and cylindric, to stout and conic, curving downward, 3–13 mm, or reduced and saclike, or rarely absent altogether. Column incurved, 4–5 mm.

Open forests, alpine slopes; 1000–4000 m. SW Guizhou, NW Hunan, SW and W Sichuan, S and SE Xizang, NW, S, and SE Yunnan [Bhutan, India, Myanmar, Nepal, Sri Lanka].

- 1a. Spurs slender, cylindric, 8–13 mm, ca.  
 as long as or exceeding ovary ..... 1a. var. *nepalense*  
 1b. Spurs stout, conic, not more than 6 mm,  
 shorter than ovary, rarely saclike or  
 absent altogether ..... 1b. var. *ciliatum*

**1a. *Satyrium nepalense* var. *nepalense***

鸟足兰(原变种) niao zu lan (yuan bian zhong)

*Satyrium albiflorum* A. Richard; *S. henryi* Schlechter; *S. pallidum* A. Richard; *S. perrottetianum* A. Richard.

Plants usually robust, 25–60 cm tall. Stem 2- or 3-leaved. Leaves basal or rarely cauline, broadly ovate to ovate-lanceolate, 7–19 × 2–5.5(–8) cm, apex acute. Peduncle 10–30 cm, stout; rachis 7–20 cm; floral bracts to 35 mm. Flowers hermaphroditic. Dorsal sepal 4–5 × 1–1.8 mm; lateral sepals oblong to subovate, slightly oblique, ca. 4 × 2 mm. Petals narrowly oblong to narrowly elliptic, ca. 3.5 × 1 mm, glabrous; spurs downcurved, cylindric, 8–13 mm, ca. as long as or exceeding ovary, slender. Fl. Sep–Dec.  $2n = 82, 123, 164$ .

Forests, open forests, grassy slopes; 1000–3200 m. SW Guizhou, S Xizang, S and SE Yunnan [Bhutan, India, Myanmar, Nepal, Sri Lanka].

**1b. *Satyrium nepalense* var. *ciliatum*** (Lindley) J. D. Hooker, Fl. Brit. India 6: 168. 1890.

缘毛鸟足兰 yuan mao niao zu lan

*Satyrium ciliatum* Lindley, Gen. Sp. Orchid. Pl. 341. 1838; *S. aceras* Schlechter ex Limpricht; *S. mairei* Schlechter; *S. setchuenicum* Kraenzlin; *S. tenii* Schlechter; *S. tschangii* Schlechter.

Plants usually slender, 12–35 cm tall. Stem slender, 1- or 2-leaved. Leaves basal, lanceolate-oblong to narrowly ovate, 4–15 × 2–5 cm, apex acuminate to acute. Peduncle 6–17 cm; rachis 4–13 cm; floral bracts to 2 cm. Flowers usually hermaphroditic or rarely with stamen abortive or absent. Dorsal sepal 5–6 × ca. 1.3 mm; lateral sepals oblong-spatulate, 5–6 × ca. 1.5 mm. Petals narrowly oblong-ob lanceolate, 4–5 × ca. 1.2 mm, margin often ciliate; spurs conic, 3–6 mm, shorter than ovary, stout,

rarely saclike or absent altogether (in spurless or shortly spurred flowers, male organs reduced to varying degrees; in extreme cases column entirely pistillate and lip absent). Fl. and fr. Aug–Oct.

Alpine *Pinus* forests, open forests, grassy slopes; 1200–4000 m. SW Guizhou, NW Hunan, SW and W Sichuan, S and SE Xizang, NW and SE Yunnan [Bhutan, India (Sikkim), Nepal].

**2. *Satyrium yunnanense*** Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 28. 1913.

云南鸟足兰 yun nan niao zu lan

*Satyrium microcephalum* Kraenzlin; *S. nepalense* D. Don subsp. *yunnanense* (Rolfe) Soó; *S. pycnostachyum* Schlechter.

Plants 11–35 cm tall. Tubers ellipsoid to subovoid, 1–2.5 × 0.5–1.4 cm. Stem with 1 or 2 membranous sheaths at base, 1- or 2-leaved. Leaves basal and subopposite, or cauline, somewhat spaced and alternate, broadly ovate to subelliptic, 3.5–11 × 2–5 cm, margin sometimes crisped, apex obtuse to acute. Peduncle 5–25 cm, stout, with 1 or 2 foliaceous sheathing bracts, glabrous; rachis 2–4.5 cm, subdensely to densely 10- to more than 20-flowered; floral bracts reflexed, ovate, 8–15 × 5–7 mm. Flowers usually widely spreading, yellow to golden yellow, glabrous, hermaphroditic; pedicel and ovary 5–7 mm, glabrous. Dorsal sepal oblong, 4–6 × 1.5–2 mm, apex obtuse; lateral sepals oblong, slightly oblique, ca. 5 × 2 mm, apex obtuse to acute. Petals suboblong-spatulate, ca. 3.5 × 1.2 mm, apex obtuse; lip subglobose, 4–5.5 × 3.5–5 mm, outer surface somewhat carinate, inner surface pubescent at base, 2-spurred, apex obtuse to slightly apiculate; spurs parallel, straight or slightly curved downward, cylindric, 3.5–6 mm, slender. Column erect, 2–3.5 mm. Fl. Jul–Sep, fr. Nov.

• Open forests, rocky places; 2000–3700 m. SW Sichuan, C and NW Yunnan.

#### 4. Subfam. VANILLOIDEAE

香荚兰亚科 xiang jia lan ya ke

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

Small to large terrestrial autotrophic or holomycotrophic, monopodial or sympodial herbs or scrambling or climbing vines. Roots elongate, fleshy; rhizome short to elongate. Stems erect or scrambling, unbranched or branched, very short to long, leafy. Leaves 1 to many, sometimes reduced to scales, alternate, fleshy or leathery, conduplicate, spreading or suberect, ovate, elliptic, lanceolate, ligulate, or oblong, green, glabrous. Inflorescences terminal or lateral, 1- to many flowered, racemose or paniculate, rarely 1-flowered; rachis sometimes pubescent; bracts conduplicate. Flowers often showy; pedicel short; ovary 1-locular or 3-locular, glabrous or pubescent; abscission layer between pedicel and ovary, sometimes with a distinct calyculus present. Sepals free, subsimilar, glabrous or externally pubescent. Petals free, glabrous; lip free or with side margins fused to column, 3-lobed or entire, usually with a callus of hairs, papillae, or backward-facing scales, lacking a nectary. Column elongate, slender, porrect, hooded at tip; anther 1, terminal, mobile; pollinia obscure; pollen loose, shed in monads or rarely tetrads; stigma 3-lobed, concave, viscid. Capsule erect to pendulous, 3-ribbed, cylindrical to almost ellipsoidal, glabrous to pubescent. Seeds spherical with a hard testa.

Twenty-four genera and ca. 185 species: widespread in the tropical regions of Africa, America, and Asia, with a few species reaching temperate areas; six genera and 19 species (five endemic) in China.

Of the six genera in China, four are vines (*Cyrtosia*, *Erythrorchis*, *Galeola*, and *Vanilla*) and the other two are terrestrial herbs (*Lecanorchis* and *Pogonia*).

#### 51. VANILLA Plumier ex P. Miller, Gard. Dict. Abr., ed. 4. 1754.

香荚兰属 xiang jia lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb

Vines, climbing, herbaceous, to several meters long. Stem with an aerial root and a leaf at each node. Leaves large, fleshy, shortly petiolate [sometimes reduced to scales outside Flora area]. Racemes axillary, several to many flowered. Flowers resupinate, often large, often with an abscission layer between ovary and perianth. Sepals and petals similar, free, spreading. Lip often joined to sides of column with its basal margin, sometimes almost to top of column and  $\pm$  trumpet-shaped, free part often dilated, spurless, sometimes 3-lobed, disk often with hairy appendages adaxially. Column long, slender, slightly curved near top; anther inserted pointing downward; pollinia 2 or 4, granular-farinaceous or loosely granular, without caudicle or viscidium; rostellum often broad, below anther. Fruit cylindrical, fleshy, often indehiscent. Seeds with stout testa, often black, wingless.

About 70 species: throughout the tropics; four species (two endemic) in China; one additional species (endemic) is incompletely known.

- 1a. Inflorescence very short, usually 2-flowered ..... 2. *V. somae*
- 1b. Inflorescence 3–20 cm, many flowered.
  - 2a. Sepals and petals 14–20  $\times$  4–6 mm, white tinged with greenish ..... 4. *V. annamica*
  - 2b. Sepals and petals 38–48  $\times$  10–28 mm, yellowish green, sometimes with purple-red lip.
    - 3a. Sepals and petals 10–13 mm wide; lip not purple-red ..... 1. *V. siamensis*
    - 3b. Sepals and petals 16–28 mm wide; lip purple-red ..... 3. *V. shenzhenica*

**1. *Vanilla siamensis*** Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 410. 1925.

大香荚兰 da xiang jia lan

Stem to several meters long, with long internodes, with a root and a leaf at each node. Leaves loosely arranged, fleshy; blade elliptic, 14–25  $\times$  6–8(–13) cm, glabrous, base slightly contracted, apex acuminate; petiole robust, 1.5–2.5 cm, broad. Raceme axillary, 7–14 cm, many flowered; floral bracts broadly ovate, 7–8 mm, fleshy; pedicel and ovary ca. 2 cm. Flowers opening ephemerally; sepals and petals yellowish green. Sepals oblong or narrowly ovate, 3.8–4.5  $\times$  ca. 1.2 cm, apex rounded and slightly involute. Petals obovate-oblong, ca. 4  $\times$  1–1.3 cm, thinly textured; lip rhombic-obovate, ca. 4 cm, basal half adnate to both sides of column,  $\pm$  trumpet-shaped, indistinctly 3-lobed; lateral lobes embracing column; mid-lobe undulate at margin,

with fimbriate papillae near apex; disk with a cup-shaped, shortly hairy appendage centrally. Column 2–2.6 cm, villous on central surface. Fl. Aug.  $2n = 32$ .

Forests; 800–1200 m. S Yunnan [Thailand].

**2. *Vanilla somae*** Hayata, Icon. Pl. Formosan. 6: 88. 1916 [“*somai*”].

台湾香荚兰 tai wan xiang jia lan

*Vanilla griffithii* H. G. Reichenbach var. *formosana* Ito; *V. griffithii* var. *ronoensis* (Hayata) S. S. Ying; *V. ronoensis* Hayata.

Stem climbing, to 3 m, with internodes 7–10 cm. Leaves alternate; blade narrowly ovate or elliptic-lanceolate, 10–20  $\times$  4–8 cm, thickly fleshy, slightly reticulate veined, base obtuse and with a very short petiole, apex acuminate. Inflorescence axillary, very short, usually 2-flowered; floral bracts subtriangu-

lar, 1–1.5 cm; pedicel and ovary 4–5 cm. Flowers 5–6 cm in diam., whitish or tinged with greenish; lip adaxially red-striped, abaxially tinged with pink. Sepals similar, spreading, elliptic-oblongate or oblanceolate, 3.5–4 × 0.8–1 cm, apex recurved. Petals similar to sepals; lip 3.5–4 cm, basally connate for ca. 3/5 length to both sides of column forming a trumpet-shaped tube, margin undulate, apex dilated and slightly 3-lobed; lateral lobes rather large, incurved; mid-lobe subtriangular or orbicular, adaxially with 2 or 3 rows of papillae near apex; disk with a white brushlike appendage centrally. Column 2.5–3 cm, apex with 2 small wings; anther ca. 3 mm, fleshy. Fruit subcylindric, 7–10 cm, with 3 inconspicuous longitudinal ridges. Fl. and fr. Apr–Aug.  $2n = 32^*$ .

- Forests; below 1200 m. Taiwan.

**3. *Vanilla shenzhenica*** Z. J. Liu & S. C. Chen, Acta Phytotax. Sin. 45: 301. 2007.

深圳香荚兰 shen zhen xiang jia lan

Stem scandent, 1–1.5 cm, with internodes 5–10 cm. Leaf blade elliptic, 10–20 × 5.5–9.5 cm, base shortly petiolate. Inflorescence 3–5 cm, usually 4-flowered; floral bracts oblong, 1.8–2.1 cm, leathery. Flowers not fully opening, yellowish green, with purple-red lip and white appendage. Sepals and petals oblong-lanceolate to elliptic, 4.4–4.8 × 1.6–2.8 cm; lip broadly obovate when spreading, 4.4–4.6 cm, basally connate for ca. 3/4 length to both sides of column forming a trumpet-shaped tube, apical margin undulate, adaxially tufted with a

retorse white fimbriate appendage composed of many thin pieces, with 3–5 rows of small horn-shaped appendages above middle, and with 2 lamellae extending from base up to fimbriate appendage. Column 3.8–4.2 cm. Fl. Feb–Mar.

- Forests or cliffs along valleys; below 300 m. S Guangdong.

One of us (Cribb) suggests that *Vanilla shenzhenica* needs to be further compared with *V. somae*, which is very close morphologically.

**4. *Vanilla annamica*** Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 3: 686. 1931.

南方香荚兰 nan fang xiang jia lan

Stem climbing, 6–20 m, ca. 1 cm in diam., swollen noded, with internodes 6–10 cm. Leaf blade elliptic, 18–23 × 5–10 cm; petiole 1–1.5 cm, base amplexicaul. Inflorescence 10–20 cm; floral bracts broadly elliptic or elliptic, concave, 7–12 mm, thickened, obtuse at apex. Flowers white, tinged with greenish. Sepals and petals lanceolate, 14–20 × 4–6 mm; lip 2–2.5 × ca. 1.5 cm, basally connate for ca. 3/4 length to both sides of column forming a tube, apex inconspicuously 3-lobed; lateral lobes broad, margins incised; mid-lobe with dense, fimbriate hairs near apex; disk with scaly appendages. Column ca. 2 cm. Fl. Apr–May.

Cliffs, forests; 1200–1300 m. Fujian, SW Guizhou, Hong Kong, SE Yunnan [Thailand, Vietnam].

Of the Chinese specimens referred to this species, only the one from Hong Kong has flowered, confirming its identity. The other specimens are sterile but are very similar in habit to *Vanilla annamica*.

#### Incompletely known species

***Vanilla taiwaniana*** S. S. Ying, Quart. J. Chin. Forest. 20: 55. 1987.

宝岛香荚兰 bao dao xiang jia lan

Stem scandent, elongate, with long internodes, with a leaf at each node. Leaves alternate; blade narrowly ovate-elliptic or elliptic-lanceolate, 10–15 × 5–7 cm, apex acute or acuminate; petiole 1–1.5 cm, ± amplexicaul. Inflorescence terminal, racemose, 15–30 cm, many flowered; floral bracts reddish or brownish, ovate, 5–6 mm; pedicel and ovary 1–1.8 cm, glabrous. Flowers reddish or brownish, glabrous. Sepals oblanceo-

late, 25–30 × 6–8 mm, base contracted, apex obtuse. Petals linear, 25–28 × 3–4 mm, apex obtuse; lip narrowly elliptic or elliptic, adaxially villous at center, 3-lobed, margin indistinctly serrate; disk with 2 thickened ridges. Column 2–2.5 cm. Fl. unknown.

- Thickets; 800–1600 m. C Taiwan.

No specimen of this species has been seen. According to the original description and the color photograph provided by the author (Coloured Ill. Indig. Orchids Taiwan 2: photo: 109. 1990), this taxon seems to be a member of *Galeola* rather than *Vanilla*.

## 52. CYRTOSIA Blume, Bijdr. 396. 1825.

肉果兰属 rou guo lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb

Herbs, mycotrophic. Rhizome stout, with fleshy or sometimes tuberlike roots. Stems erect, often several arising from 1 rhizome, simple or branched, yellowish brown to reddish brown, fleshy, with scales at nodes. Raceme or panicle terminal or lateral, several or many flowered; rachis shortly hairy or mealy-hairy; floral bracts persistent. Flowers not fully opening, medium-sized. Sepals and petals connivent; sepals often ± hairy abaxially. Petals glabrous; lip erect, unlobed, spurless, base connate to column, ± embracing column. Column slightly curved, stout, upper part enlarged, without a foot; anther terminal, incumbent, 2-locular; pollinia 2, granular-farinaceous, without caudicle or viscidium. Fruit fleshy, indehiscent. Seeds with stout testa, wingless or with a narrow surrounding wing.

Five species: tropical Asia to E Asia; three species in China.

- 1a. Plants rather large, 30–170 cm tall; lateral racemes 3–7(–10) cm; tuberlike roots absent ..... 3. *C. septentrionalis*  
 1b. Plants relatively small, 8–22 cm tall; lateral racemes very short or absent; tuberlike roots conspicuous, 5–12 mm in diam.

- 2a. Inflorescence terminal; lip glabrous ..... 1. *C. javanica*  
 2b. Inflorescence terminal and lateral, latter at least represented by a short raceme; lip with white hairs near  
 adaxial apex ..... 2. *C. nana*

**1. *Cyrtosia javanica*** Blume, Bijdr. 396. 1825.

肉果兰 rou guo lan

*Galeola javanica* (Blume) Bentham & J. D. Hooker.

Plants small, ca. 10 cm tall. Tuberlike roots tufted, cylindrical or clavate, 5–8 cm, stout, 8–12 mm in diam., thick, fleshy. Stems 1–3 arising from 1 rhizome, erect, 6–8 cm tall, with imbricate scales at nodes; scales alternate, yellowish brown, turning dark brown with age, elliptic-ovate, cymbiform or with subspherical base, glabrous. Inflorescence racemose, 5–8-flowered; floral bracts subtriangular, small; pedicel and ovary 1–1.5 cm, mealy-pubescent. Flowers not fully opening, yellowish brown, fleshy. Sepals mealy-pubescent abaxially; dorsal sepal oblong, ca. 16 × 8 mm, slightly concave; lateral sepals broadly ovate, ca. 16 × 9 mm. Petals oblong, ca. 15 × 7 mm, thinly textured; lip adnate to base of column, yellowish at base, whitish near apex, suborbicular, with thickened disk and spongy limb. Column clavate, ca. 8 mm, winged at apex; wing erose-dentate at apex. Fruit sausage-shaped, ca. 5 cm, indehiscent. Fl. May–Jun.

Bamboo forests. C Taiwan [India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam].

**2. *Cyrtosia nana*** (Rolfe ex Downie) Garay, Bot. Mus. Leaflet 30: 233. 1986.

矮小肉果兰 ai xiao rou guo lan

*Galeola nana* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 409. 1925.

Plants small, ± fleshy. Rhizome short, stout. Tuberlike roots pale yellowish white, cylindrical, 2.5–9 cm, 5–8 mm in diam., fleshy. Stem erect, yellowish white, slightly tinged with red, 10–22 cm tall, glabrous or apical half with sparse rust-colored, mealy, short hairs, nodes with lanceolate scales; internodes usually 1–3 cm. Inflorescence terminal and lateral, sometimes lateral inflorescence very short or inconspicuous; terminal raceme 6–11-flowered; rachis rusty mealy-puberulent; floral

bracts ovate-lanceolate, 2–4 mm, abaxially rusty puberulent; pedicel and ovary 8–10 mm, also with rust-colored hairs. Flowers pale yellow, lip with orange-red longitudinal stripes. Sepals elliptic, 1–1.2 × ca. 0.6 cm, abaxially rusty mealy-puberulent, apex acute. Petals similar to sepals, slightly narrower, glabrous; lip ± embracing column, broadly ovate, ca. 1 × 1.2 cm, margin somewhat undulate, disk with a thick longitudinal ridge centrally, adaxially white pilose near apex. Column ca. 6 mm, apex slightly dilated, without conspicuous wing. Fl. Apr–Jun.  $2n = 28$ .

Forests or shaded places along valleys; 500–1400 m. S Guangxi, SW Guizhou [Thailand, N Vietnam].

**3. *Cyrtosia septentrionalis*** (H. G. Reichenbach) Garay, Bot. Mus. Leaflet 30: 223. 1986.

血红肉果兰 xue hong rou guo lan

*Galeola septentrionalis* H. G. Reichenbach, Xenia Orchid. 2: 78. 1865.

Plants rather large. Rhizome nearly creeping, stout, 1–2 cm in diam., with sparse ovate scales. Stem erect, red-brown, 30–170 cm, apical half shortly rusty tomentose. Inflorescence terminal and lateral; lateral raceme 3–7(–10) cm, 4–9-flowered, base with a few ovate-lanceolate sterile bracts 1.5–2.5 cm; floral bracts ovate, 2–3 mm, abaxially with rusty hairs; pedicel and ovary 1.5–2 cm, shortly rusty tomentose. Flowers yellow, ± tinged with red-brown. Sepals elliptic-ovate, ca. 2 cm, abaxially shortly rusty tomentose. Petals similar to sepals, slightly narrower, glabrous; lip nearly broadly ovate, shorter than sepals, adaxially hairy-papillose or occasionally crested-lamellate along main veins, margin irregularly dentate or erose. Column ca. 7 mm. Fruit blood-red, suboblong, 7–13 × 1.5–2.5 cm, fleshy. Seeds with surrounding wing; wing less than 1 mm wide. Fl. May–Jul, fr. Sep.  $2n = 28$ .

Forests; 1000–1300 m. SW Anhui, W Henan, Hunan, Zhejiang [Japan (Ryukyu Islands)].

**53. GALEOLA** Loureiro, Fl. Cochinch. 2: 520. 1790.

山珊瑚属 shan shan hu shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb

Herbs, mycotrophic, erect, or scrambling vines, often with rather stout, tuberous rhizomes. Stem yellowish brown or reddish brown, often stout, slightly fleshy, with scales at nodes. Raceme or panicle terminal and lateral, with many slightly fleshy flowers; rachis pubescent; floral bracts persistent. Flowers usually yellow or tinged with reddish brown, medium-sized. Sepals free, abaxially often hairy. Petals slightly smaller than sepals, glabrous; lip unlobed, usually concave, cup-shaped or saccate, ± embracing column, conspicuously larger than sepals, spurless, with longitudinal ridge or callus adaxially. Column often short and stout, dilated at apex, curved, without column foot, subterminal; pollinia 2, cleft, granular-farinateous, without caudicle or viscidium; stigma large, deeply concave; rostellum short, wide, above stigma. Fruit a dry capsule, rather long, dehiscent. Seeds with stout testa, with broad surrounding wing.

About ten species: mainly in tropical Asia, extending to S China, Japan, New Guinea, and Madagascar; four species (one endemic) in China.

- 1a. Plants climbing vines; stem with 1 aerial root at each node ..... 4. *G. nudifolia*  
 1b. Plants erect, not climbing; lacking aerial roots at nodes.

- 2a. Floral bracts glabrous abaxially; lip with scattered lamellate appendages ..... 2. *G. faberi*  
 2b. Floral bracts conspicuously hairy abaxially; lip without lamellate appendages.  
 3a. Lip not contracted at base, never saccate; floral bracts 5–6(–10) mm ..... 1. *G. lindleyana*  
 3b. Lip narrowed near saccate base; floral bracts (1–)1.2–1.5 cm ..... 3. *G. falconeri*

**1. *Galeola lindleyana*** (J. D. Hooker & Thomson) H. G. Reichenbach, *Xenia Orchid*. 2: 78. 1865.

毛萼山珊瑚 mao e shan shan hu

*Cyrtosia lindleyana* J. D. Hooker & Thomson in J. D. Hooker, Ill. Himal. Pl. t. 22. 1855; *Erythrorchis lindleyana* (J. D. Hooker & Thomson) H. G. Reichenbach; *Galeola kwangsiensis* Handel-Mazzetti; *G. lindleyana* var. *unicolor* Handel-Mazzetti; *G. matsudae* Hayata.

Herbs, tall. Rhizome stout, 2–3 cm in diam., with sparse ovate scales at nodes. Stem erect, reddish brown, 1–3 m tall, base ± ligneous, ± hairy or glabrous with age, nodes with broadly ovate scales. Panicle composed of terminal and lateral racemes; lateral raceme 2–5(–10) cm, several to 10-flowered, usually very shortly pedunculate; sterile bracts at base of raceme ovate-lanceolate, 1.5–2.5 cm, nearly glabrous; floral bracts ovate, 5–6 mm, abaxially rusty pubescent; pedicel and ovary often ± curved, 1.5–2 cm, densely rusty pubescent. Flowers yellow, ca. 3.5 cm in diam. Sepals elliptic to ovate-elliptic, 1.6–2 × 0.9–1.1 cm, abaxially densely shortly rusty tomentose and carinate; lateral sepals often slightly longer than dorsal sepal. Petals broadly ovate to suborbicular, slightly shorter than dorsal sepal, 1.2–1.4 cm wide, glabrous; lip concave, cup-shaped, nearly subglobose, ca. 1.3 cm in diam., adaxially papillate-hairy, near base with 1 smooth callus, unlobed, margin shortly fimbriate. Column clavate, ca. 7 mm; anther cap papillate-spinescent. Fruit pale brown, suboblong, 8–12(–20) × 1.7–2.4 cm; fruiting pedicel 1–1.5 cm. Seeds with broad wing, wings 1–1.3 mm wide. Fl. May–Aug, fr. Sep–Oct.

Sparse forests, sparse thickets, humus-rich and moist rocky places along valleys; 700–3000 m. Anhui, W Guangdong, N Guangxi, Guizhou, Henan, Hunan, S Shaanxi, Sichuan, Taiwan, SE Xizang, W to SE Yunnan [Bhutan, India, Indonesia, Nepal].

**2. *Galeola faberi*** Rolfe, Bull. Misc. Inform. Kew 1896: 200. 1896.

山珊瑚 shan shan hu

*Galeola shweliensis* W. W. Smith.

Herbs, 1–2 m tall. Rhizome nearly creeping, stout, to 2 cm in diam., nodes with sparse broadly ovate scales. Stem erect, reddish brown, base ± ligneous, upper part sparsely shortly rusty tomentose. Panicle composed of terminal and lateral racemes; lateral raceme 5–10 cm, usually 4–7-flowered; peduncle often 2–4 cm; sterile bracts at base of raceme lanceolate, 1–2 cm, glabrous; floral bracts lanceolate or ovate-lanceolate, 1–4 mm, abaxially glabrous; pedicel and ovary often 1–2 cm, ± rusty pubescent. Flowers yellow, ca. 3.5 cm in diam. Sepals narrowly elliptic or suboblong, 2.8–3 × 0.6–0.8 cm, abaxially slightly and very shortly rusty tomentose, apex obtuse. Petals similar to sepals, glabrous; lip obovate, ca. 2 × 1.2 cm, adaxially with many thick longitudinal veins, basal part concave, unlobed, margin incurved and irregularly incised and ± undulate; veins irregularly lamellate or crenate, mostly on distal

part. Column 8–10 mm. Fl. May–Jul.

• Humus-rich and humid places in open forests or bamboo forests; 1800–2300 m. C Guizhou, SW Sichuan, NW to SE Yunnan.

**3. *Galeola falconeri*** J. D. Hooker, Fl. Brit. India 6: 88. 1890.

直立山珊瑚 zhi li shan shan hu

Plants 1–3 m tall. Rhizome 3–5 cm in diam., branched, nodes with many triangular scales. Stem erect, brownish, lower part almost glabrous, upper part sparsely and shortly rusty hairy. Panicle composed of terminal and lateral racemes; raceme (5–)10–20 cm; peduncle and rachis ± shortly tomentose; floral bracts ovate to narrowly elliptic, 1–2 cm, often vertical to rachis, abaxially shortly rusty tomentose; pedicel and ovary 2–2.8 cm, densely rusty tomentose. Flowers bright yellow. Sepals elliptic-oblong, 2.2–3 × 1–1.5 cm, abaxially shortly rusty tomentose. Petals slightly narrower than sepals, glabrous; lip broadly ovate or orbicular, ca. 2 × 1.6–1.8 cm, adaxially densely papillate-hairy especially near margin, unlobed, concave, basal part ± embracing column, near base narrowed and forming a small sac, margin fimbriate and undulate-toothed. Column 7–8 mm. Capsule more than 10 cm. Fl. Jun–Jul.  $2n = 30$ .

Open places in forests, bamboo forests, sunny slopes; 800–2300 m. Anhui, S Hunan, Taiwan [Bhutan, India, Thailand].

The plants of Anhui, Hunan, and Taiwan are similar to each other but show some differences from the Himalayan plants, in which the lip is slightly 3-lobed and petals denticulate along margins. We follow H. J. Su in treating this entity as *Galeola falconeri* here, but further investigation is needed.

**4. *Galeola nudifolia*** Loureiro, Fl. Cochinch. 2: 521. 1790.

蔓生山珊瑚 man sheng shan shan hu

*Cranichis nudifolia* (Loureiro) Persoon; *Erythrorchis kuhlii* H. G. Reichenbach; *Galeola hydra* H. G. Reichenbach; *G. kuhlii* (H. G. Reichenbach) H. G. Reichenbach.

Plants climbing. Rhizome nearly creeping, ca. 1 cm in diam., with many sparse, broadly ovate, fleshy scales. Stem 1–3 m, branched, lower part almost glabrous, upper part slightly pubescent, often with 1 aerial root at each node. Inflorescence large, branched, composed of many racemes and panicles; lateral racemes or panicles 5–16 cm; rachis ± rusty pubescent, bearing flowers in succession near apex; basal sterile bracts ovate, 1–2 cm, glabrous, amplexicaul; floral bracts ovate, 2.5–4 mm, abaxially hairy; pedicel and ovary 1–1.2 cm, with short hairs. Flowers yellow, ± with orange-red veins adaxially. Sepals subelliptic, 1.2–1.4 × 0.6–0.8 cm, lateral sepals obviously wider than dorsal sepal, abaxially ± hairy when young. Petals similar to dorsal sepal, glabrous; lip suborbicular, strongly concave, slightly shorter than sepals, shortly hairy adaxially, near base with 1 callus. Column strongly curved, ca. 5 mm. Fl. Apr–Jun.

Forests or shaded slopes along valleys; 400–500 m. S Hainan [Bhutan, India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**54. ERYTHROCHIS** Blume, Rumphia 1: 200. 1837.倒吊兰属 *dao diao lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

Vines, climbing or scrambling, mycotrophic. Stem climbing, reddish brown or yellowish brown, cylindric, flexuous, much branched, glabrous, with a root and a scale at each node. Raceme or panicle terminal or lateral, densely many flowered; rachis and flower glabrous; floral bracts persistent. Flowers not fully opening, thin. Sepals and petals often connivent; lip nearly unlobed, broad, central part with 1 stout and thick longitudinal ridge, both sides with many transversely parallel ridges composed of small papillae. Column slightly curved, with a short foot, tapering into central longitudinal ridge of lip; anther subterminal; pollinia 2, granular-farinaceous, without caudicle or viscidium; stigma concave, large; rostellum small. Fruit a capsule, oblong-cylindric, dry, dehiscent. Seeds with stout testa and broad surrounding wing.

Three species: mainly in SE Asia, extending north to S Japan (Ryukyu Islands) and southeast to New Guinea and the Pacific islands; one species in China.

**1. Erythrorchis altissima** (Blume) Blume, Rumphia 1: 200. 1837.倒吊兰 *dao diao lan*

*Cyrtosia altissima* Blume, Bijdr. 396. 1825; *Erythrorchis ochobiensis* (Hayata) Garay; *Galeola altissima* (Blume) H. G. Reichenbach; *G. ochobiensis* Hayata; *Haematorchis altissima* (Blume) Blume.

Plants climbing, to several meters long. Stem cylindric, slender, with many branches, curved or twisted, reddish brown or greenish brown, nodes  $\pm$  dilated, with scales. Inflorescence large, much branched, branch 5–15 cm or longer, sometimes lateral racemes branched again; rachis rather slender, glabrous; floral bracts persistent, subtriangular, 2–3 mm, glabrous; pedicel and ovary ca. 8 mm, glabrous. Flowers whitish yellow or

pale yellow, slightly spotted with brown, not opening widely. Sepals suboblong, 1.2–1.5  $\times$  0.3–0.5 cm, glabrous. Petals oblong, slightly shorter and narrower than sepals; lip slightly tinged with brown, subobovate, concave, ca. 1 cm, apex slightly 3-lobed, centrally with 1 longitudinal ridge ca. 5 mm extending from base to middle; longitudinal ridge slightly divergent at apex and then with a woolly callus near its apex, both sides of ridge with many transversely papillary stripes vertical to ridge. Column 6–7 mm. Capsule reddish, narrowly cylindric, 13–22 cm  $\times$  5–10 mm, surface smooth. Seeds with surrounding wing less than 1 mm wide, wing cleft on one side. Fl. Apr–May, fr. Aug.

Bamboo forests, evergreen broad-leaved forests; below 500 m. S Hainan, Taiwan [Cambodia, NE India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**55. LECANORCHIS** Blume, Mus. Bot. 2: 188. 1856.孟兰属 *yu lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Phillip J. Cribb, Stephan W. Gale

Herbs, mycotrophic. Rhizomes creeping or ascending, cylindric, slender, slightly rigid or subfleshy, branched or simple. Stem suberect, slender, branched or simple, with sparse scalelike sheaths. Raceme terminal, usually several to 10-flowered; floral bracts small, membranous. Flowers usually resupinate, small or medium-sized, with 1 small toothed cup (calyculus) between ovary and perianth, with abscission layer above calyculus near perianth base. Sepals and petals free, similar; lip base clawed, usually by canalicate claw connate to column foot forming a tube, rarely free, spurless, upper part 3-lobed or unlobed; disk often hairy or papillose. Column rather slender, slightly dilated toward apex, slightly clavate; anther subterminal, 2-locular; pollinia 2, granular-farinaceous, without caudicle or conspicuous viscidium; rostellum short. Fruit a cylindric capsule.

About ten species: SE Asia to the Pacific islands, north to S China and Japan; four species (one endemic) in China.

Hsu and Chung (Taiwania 54: 83. 2009) recently added three species of *Lecanorchis* to the flora of China based on new discoveries in Taiwan. However, detailed accounts have yet to be published. Two of the three species, *L. suginoana* (Tuyama) Serizawa (Bunrui 5(1): 38. 2005) and *L. virella* T. Hashimoto (Ann. Tsukuba Bot. Gard. 8: 1. 1989), are also known to occur only in Japan, from where they were originally described. The third, *L. triloba* J. J. Smith (Bull. Dep. Agric. Indes Neerl. 19: 26. 1908; *L. javanica* Blume), is more widespread throughout parts of mainland SE Asia, the Malay Archipelago, New Guinea, and S Japan. The present authors have not seen Chinese material for any of these species. In the absence of refutable material, the three taxa are omitted from the following account.

- 1a. Lip simple, ca. 1.5 mm wide ..... 4. *L. nigricans*  
 1b. Lip  $\pm$  3-lobed, more than 3 mm wide.  
 2a. Raceme 13–21-flowered; sepals 9–10 mm ..... 1. *L. multiflora*  
 2b. Raceme 3–9-flowered; sepals 11–25 mm.  
 3a. Sepals 11–14 mm; mid-lobe of lip sparsely hairy adaxially ..... 2. *L. japonica*  
 3b. Sepals 18–25 mm; mid-lobe of lip densely hairy adaxially ..... 3. *L. thalassica*

**1. *Lecanorchis multiflora*** J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 26: 8. 1918.

多花盃兰 duo hua yu lan

Plants 20–30 cm tall, with fleshy rhizomes underground. Rhizomes 3–4 mm in diam., branched, with nodes, nodes with amplexicaul sheaths; sheaths membranous, margin toothed. Stem suberect, slender, noded, nodes with sheaths; sheaths ovate to broadly ovate, 4–6 mm, membranous, base amplexicaul. Raceme terminal, 8–10 cm, 13–21-flowered; floral bracts ovate, 2–3 mm, membranous. Flowers 9–10 mm; lip 3-lobed; mid-lobe hairy adaxially; disk with 2 calli. Capsule (immature) 1.7–2 cm.

Forests in limestone areas; 600–700 m. S Yunnan [Indonesia, Malaysia, Thailand].

**2. *Lecanorchis japonica*** Blume, Mus. Bot. 2: 188. 1856.

盃兰 yu lan

*Lecanorchis cerina* Fukuyama; *L. cerina* f. *albida* (T. P. Lin) S. S. Ying; *L. cerina* var. *albida* T. P. Lin; *L. ohwii* Masamune.

Plants ca. 33 cm tall. Rhizome 5–6 mm in diam., fleshy. Stem tinged with white, black when fruiting, slender, with 4 sheaths below middle; sheaths tubular, 5–7 mm, membranous, amplexicaul. Raceme terminal, 4–5 cm, 3–7-flowered; floral bracts ovate to ovate-lanceolate, 2.5–3 mm; pedicel and ovary 1.4–2 cm, slender; calyculus 0.8–1 mm tall, ca. 1 mm wide, 6-toothed. Sepals oblanceolate, 11–14 × 2–2.5 mm, apex obtuse. Petals similar to sepals; lip base clawed, canaliculate claw connate to column along margin forming a tube; tube 3.5–4 mm; distal free part nearly obovate or obovate-lanceolate, 8–9 mm, 3-lobed; lateral lobes subovate; mid-lobe broadly elliptic or orbicular, ca. 3 × 4 mm, adaxially densely barbate-villous, margin crisped and erose; disk barbate-villous. Column 7–10 mm, apex slightly dilated. Capsule erect, cylindric, 2–4 cm. Fl. May–Jul.

Forests; 800–1000 m. N Fujian, SW Hunan, Taiwan [Japan].

**3. *Lecanorchis thalassica*** T. P. Lin, Native Orchids Taiwan 3: 153. 1987 [*“thalassicus”*].

灰绿盃兰 hui lü yu lan

*Lecanorchis japonica* Blume var. *thalassica* (T. P. Lin) S. S. Ying.

Plants to 50 cm tall. Rhizome ascending. Stem erect, reddish brown, with black dots, unbranched, with several sheaths; sheaths dark brown, 3–4 mm. Raceme terminal, 3–4 cm, 4–10-flowered; floral bracts persistent, ovate, ca. 2 mm; pedicel and ovary 2.5–3.3 cm; calyculus very small, ca. 1 mm tall, margin toothed. Flowers not widely open, margin grayish green and yellowish. Dorsal sepal oblanceolate, ca. 20 × 5 mm, apex obtuse; lateral sepals falcate-oblanceolate, ca. 20 × 3 mm. Petals obovate-lanceolate to spatulate, ca. 20 × 6 mm, apex obtuse or rounded; lip obovate, ca. 1.6 cm, cuneate toward base, distal part 3-lobed, basal half connate to column forming a tube; tube ca. 8 mm, contracted near middle, swollen part ca. 3 mm wide; lateral lobes erect, abaxially purple, suborbicular, adaxially shortly villous; mid-lobe entire, suborbicular, ca. 5.5 mm, abaxially with several purple bands, adaxially densely yellow villous, apex emarginate; disk with yellow hairs extending to mid-lobe. Column ca. 9 mm, apex dilated. Fl. May.

• Broad-leaved forests; 1400–2000 m. C Taiwan.

**4. *Lecanorchis nigricans*** Honda, Bot. Mag. (Tokyo) 45: 470. 1931.

全唇盃兰 quan chun yu lan

*Lecanorchis oligotricha* Fukuyama; *L. purpurea* Masamune; *L. taiwaniana* S. S. Ying.

Plants 12–40 cm tall. Rhizome ascending, ligneous, with short scales at nodes. Stem erect, blackish, slender, often branched, remotely with several sheaths. Raceme terminal, 3–5 cm, 5–8-flowered; floral bracts ovate-triangular, 2–4 mm; pedicel and ovary purplish brown, 1–2 cm, slender; calyculus ca. 0.8 mm tall, denticulate. Flowers almost opening widely; sepals and petals brownish to nearly whitish, sometimes tinged with purple, concave. Sepals narrowly oblanceolate, 10–16 × 2–3 mm, apex acute; lateral sepals somewhat oblique, falcate-lanceolate, 12–14 × ca. 2.5 mm. Petals oblanceolate-linear, similar to sepals in size; lip whitish, tinged with purple, narrowly oblanceolate to obovate-spatulate, nearly as long as sepals, adaxially ± papillose-hairy, unlobed. Column white, 6–10 mm, slender. Fl. Aug–Oct.

Damp places in forests; 600–1000 m. Fujian, N Taiwan [Japan (Ryukyu Islands)].

## 56. POGONIA Jussieu, Gen. Pl. 65. 1789.

朱兰属 zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial. Rhizome ascending, cylindric, slender; roots fascicled, elongate, fibrous, slightly fleshy. Stem erect, slender, 1-leaved. Leaf elliptic to oblong-lanceolate, herbaceous to slightly fleshy, sheathing at base. Inflorescence terminal, slender, usually with a solitary flower, rarely 2- or 3-flowered; floral bract persistent, foliaceous. Flower resupinate, showy. Sepals free, similar, spreading. Petals free, usually deflexed over column, slightly wider and shorter than sepals; lip oblong-obovate, entire to shallowly 3-lobed above middle, not spurred, margin fimbriate; disk densely papillose. Column slender, dilated at apex; clinandrium erose at margin; anther terminal, incumbent; pollinia 2, granular-farinaceous, without caudicles or viscidia; stigma surface large; rostellum short, broad, protruding above stigma. Capsule erect.

Four species: three species in E Asia and one in North America; three species (one endemic) in China.

- 1a. Leaf elliptic, 1–3(–4.5) cm; floral bract positioned up to 2.5 cm above leaf, 5–17 mm; flower suberect ..... 3. *P. yunnanensis*  
 1b. Leaf oblong or oblong-lanceolate, 3–6 cm; floral bract positioned 3–8 cm above leaf, 15–30 mm;  
 flower spreading.  
 2a. Flowers pale pinkish purple to purple; sepals 15–22 mm ..... 1. *P. japonica*  
 2b. Flowers white; sepals 12–13(–15) mm ..... 2. *P. minor*

**1. *Pogonia japonica*** H. G. Reichenbach, *Linnaea* 25: 228. 1852.

朱兰 zhu lan

*Pogonia kungii* Tang & F. T. Wang; *P. ophioglossoides* (Linnaeus) Ker Gawler var. *japonica* (H. G. Reichenbach) Finet; *P. parvula* Schlechter; *P. similis* Blume.

Plants 10–20(–25) cm tall. Rhizome 10–20 × ca. 2 mm, with several, slender, elongate, slightly fleshy roots. Leaf oblong to oblong-lanceolate, 3.5–6(–9) × 0.7–1.7 cm, slightly fleshy, base contracted and amplexicaul, apex acute or obtuse. Floral bract positioned 4–8 cm above leaf, narrowly oblong, linear-lanceolate, or lanceolate, 15–25(–40) × 3–7 mm. Flower solitary, terminal, erect, not opening widely, pale pinkish purple to purple; pedicel and ovary 10–18 mm. Sepals narrowly oblong-ob lanceolate, 15–22 × 2.5–3.5 mm, apex obtuse or acuminate. Petals similar to sepals, 14–22 × 3.5–5 mm, apex acuminate; lip narrowly oblong, 14–20 × 3–4 mm, slightly contracted toward base, obscurely 3-lobed above middle; lateral lobes triangular, ca. 0.8 mm, apical margin irregularly incised or fimbriate; mid-lobe ligulate to obovate, 6–13 × 3–4 mm, with 2 or 3 fimbriate-hairy crests, margin fimbriate-incised; disk with 2 or 3 longitudinal lamellae or ridges extending from base of lip and becoming continuous with hairy crests on mid-lobe. Column erect, 7–10 mm, slender. Capsule oblong, 20–25 × 5–6 mm. Fl. May–Jul, fr. Jul–Oct.  $2n = 18, 20$ .

Grasslands on hilltops, forests along valleys, wet places in thickets, open wet places; 1100–2300 m. Anhui, N Fujian, N Guangxi, Guizhou, Heilongjiang, Hubei, Hunan, Jiangxi, Jilin, Nei Mongol, Shandong, Sichuan, NE Yunnan, Zhejiang [Japan, Korea].

**2. *Pogonia minor*** (Makino) Makino, *Bot. Mag. (Tokyo)* 23: 137. 1909.

小朱兰 xiao zhu lan

*Pogonia japonica* H. G. Reichenbach var. *minor* Makino, *Bot. Mag. (Tokyo)* 12: 103. 1898.

Plants 13–16 cm tall. Rhizome 2–7 × ca. 2 mm, with several, elongate, slender roots. Stem with a sheath below leaf; sheath 7–12 mm. Leaf oblong-lanceolate, 3–7 × 0.4–1.2 cm,

slightly fleshy, base amplexicaul, apex acute or obtuse. Floral bract positioned 3–6 cm above leaf, narrowly lanceolate, 20–30 × 3–4 mm. Flower solitary, terminal, erect, not opening widely, white; pedicel and ovary 10–20 mm. Sepals narrowly oblanceolate, 12–13(–15) × 2–3 mm, apex acute. Petals similar to sepals, narrowly ovate-elliptic, 12–13(–15) × 2.5–4 mm, apex acute; lip oblanceolate, ca. 11 × 2 mm, 3-lobed above middle; lateral lobes triangular, ca. 1 mm, apex acute; mid-lobe oblong, ca. 5 × 2 mm, with 3 crests of fleshy hairs, margin irregularly denticulate; disk with 3 longitudinal ridges extending from base of lip to base of mid-lobe and becoming continuous with hairy crests on mid-lobe. Column erect, nearly straight, white, ca. 7 mm. Capsule oblong-cylindric, ca. 20 mm. Fl. May–Jun.  $2n = 18$ .

Grasslands; 2200–2400 m. S Taiwan [Japan].

**3. *Pogonia yunnanensis*** Finet, *Bull. Soc. Bot. France* 44: 419. 1898.

云南朱兰 yun nan zhu lan

Plants (2–)5–9(–12) cm tall. Rhizome ca. 5 × 1 mm, with several slender roots. Leaf elliptic, 1–3(–4.5) × (0.4–)0.7–1.5(–2) cm, slightly fleshy, base contracted and amplexicaul, apex acute. Floral bract positioned up to 2.5 cm above leaf, narrowly elliptic, narrowly ovate, or narrowly ovate-lanceolate, 5–17(–20) mm. Flower solitary, terminal, suberect, not opening widely, rose-pink with a red-purple lip; pedicel and ovary 5–8(–15) mm. Sepals narrowly oblong, 14–17 × ca. 3 mm, apex acute. Petals narrowly obovate-oblong, 12–16 × 3.5–4 mm, apex obtuse; lip narrowly oblong, 13–15 × ca. 3 mm, usually slightly shorter than sepals, slightly contracted toward base, 3-lobed above middle; lateral lobes narrowly triangular-ovate, 1–2 mm, apex acute; mid-lobe linear-oblong, 5–6 × ca. 2.5 mm, densely papillose-hairy, margin irregularly denticulate; disk with 2 longitudinal ridges extending from base of lip to base of mid-lobe and becoming papillose-hairy toward apex. Column suberect, slightly curved, 6–8 mm. Capsule erect, obovate-elliptic, 10–12 × 3–6 mm. Fl. Jun–Jul, fr. Oct.

• Alpine grasslands, *Abies* forests; 2300–3300 m. SW and W Sichuan, SE Xizang, NW Yunnan.

## 5. Subfam. EPIDENDROIDEAE

树兰亚科 shu lan ya ke

Chen Xinqi (陈心启 Chen Sing-chi), Ji Zhanhe (吉占和 Tsi Zhan-huo),  
Zhu Guanghua (朱光华), Liu Zhongjian (刘仲健), Luo Yibo (罗毅波), Jin Xiaohua (金效华);  
Jeffrey J. Wood, Phillip J. Cribb, Stephan W. Gale, Jaap J. Vermeulen, Paul Ormerod, Howard P. Wood,  
Dudley Clayton, Alexandra Bell

Perennial, terrestrial, epiphytic, or lithophytic herbs or rarely scrambling climbers, either sympodial or monopodial, with short to long rhizomes; plants rarely heteromycotrophic, achlorophyllous and with leaves absent or reduced to scales. Roots slender and wiry to stout and shoelacelike, rarely coralloid, with a 1- to several-layered velamen, smooth to warty, terete to dorsiventrally flattened; aerial roots adventitious. Stems usually leafy, but leaves often reduced in number and rarely reduced to bractlike scales, 1 or more internodes at base often swollen to form a pseudobulb. Leaves entire, alternate or occasionally opposite, often distichous, frequently fleshy or leathery, rarely terete or canaliculate, with a basal sheath, sometimes articulated at base. Inflorescences erect to pendulous, spicate, racemose, or paniculate, 1- to many flowered, basal, lateral, or terminal. Flowers small to large, often quite showy, usually pedicellate, mostly resupinate, glabrous to hairy; ovary inferior, 1-locular. Sepals usually free but sometimes variously adnate, dorsal often dissimilar to laterals, laterals sometimes adnate to column foot to form a saccate, conic or spurlike mentum. Petals free or rarely partly adnate to sepals, similar or not to sepals, often showy; lip entire, variously lobed, or 2- or 3-partite, ornamented or not with calli, ridges, hair cushions, or crests, with or without a basal spur or nectary, margins entire to lacinate. Column short to long, with or without a basal foot, occasionally winged or with lobes or arms at apex or ventrally; anther 1, ± terminal on column, caplike, attached to column apex by a short filament; pollen in tetrads, usually in discrete pollinia; pollinia mealy or waxy, 2, 4, 6, or 8, sessile on viscidium or attached by stipe or stipes to 1 or 2 sticky viscidia; stigma 3-lobed, concave, usually viscous; rostellum usually transverse, less commonly elongate and 1–3-lobed. Fruit a capsule, opening laterally by 3 or 6 slits. Seeds fusiform to discoid, numerous, dustlike, lacking endosperm, sometimes markedly winged; elaters often present.

About 600 genera and 18,000 species in 16 tribes: cosmopolitan in distribution but absent from the Antarctic; 138 genera (seven endemic) and 958 species (305 endemic) in China.

This subfamily is well represented in tropical and subtropical China.

### 57. CEPHALANTHERA Richard, De Orchid. Eur. 21, 29, 38. 1817.

头蕊兰属 tou rui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Callithronum* Ehrhart; *Dorycheile* Reichenbach; *Eburophyton* A. Heller; *Xiphophyllum* Ehrhart.

Herbs, terrestrial, autotrophic or holomycotrophic. Rhizome creeping, cylindric, slender; roots fasciculate, filiform, fleshy, usually numerous though few in holomycotrophic species. Stem erect, unbranched, leafy, with 1 to a few subcymbiform or cylindric basal sheaths. Leaves alternate, plicate, sessile, directly sheathing stem at base, reduced to membranous sheaths in holomycotrophic species. Inflorescence terminal, racemose, many or few flowered, rarely 1-flowered; proximal floral bracts foliaceous and usually longer than flowers, distal ones much shorter. Flowers resupinate, suberect, weakly spreading and campanulate, or rarely widely spreading, white, pink, or yellow; ovary slightly twisted, glabrous. Sepals free, similar to each other, subequal. Petals slightly shorter than sepals, ± connivent with sepals; lip adnate to base of column, 2-partite or rarely simple and not distinct from petals in peloric forms; hypochile with erect lateral lobes embracing column, saccate or with a short spur at base; epichile spreading, ovate-elliptic, apex obtuse or acute; disk with 3–7 longitudinal lamellae, or unornamented in peloric forms. Column erect, usually with 2 narrow lateral wings; anther erect, hinged, 2-locular; pollinia 2, each 2-partite, granular-farinaceous, lacking caudicles and viscidia; stigma concave, rounded; rostellum inconspicuous or absent. Capsule erect.

About 15 species: mainly in Europe, N Africa, and E Asia, but also in the Himalayas, SE Asia, and extending to the west coast of North America; nine species (four endemic) in China.

- 1a. Holomycotrophic herbs lacking green leaves.
  - 2a. Epichile of lip transversely oblong-elliptic, apex obtuse; lamellae extending from base to middle or slightly above middle of epichile; spur arising from base of hypochile ..... 1. *C. calcarata*
  - 2b. Epichile of lip broadly ovate, apex acute-acuminate; lamellae extending from base almost to apex of epichile; spur arising from slightly above base of hypochile ..... 2. *C. gracilis*
- 1b. Leafy autotrophic herbs.
  - 3a. Flowers yellow ..... 3. *C. falcata*
  - 3b. Flowers white.
    - 4a. Lip simple, similar to petals, not spurred or saccate at base ..... 4. *C. nanlingensis*
    - 4b. Lip 2-partite, distinct from petals, spurred or saccate at base.
      - 5a. Hypochile of lip spurred at base, spur protruding between bases of lateral sepals.

- 6a. Plants 2–4(or 5)-leaved; leaves 2–8 cm ..... 5. *C. erecta*  
 6b. Plants 6–8-leaved; leaves 6–14 cm ..... 6. *C. longibracteata*  
 5b. Hypochile of lip saccate or gibbous-saccate, enclosed within bases of lateral sepals.  
 7a. Floral bracts all more than 30 mm, foliaceous and exceeding ovary ..... 7. *C. damasonium*  
 7b. Floral bracts only basal 1 or 2 foliaceous and exceeding ovary, distal ones not more than 6 mm.  
 8a. Rachis 6–14 cm, laxly 3–14-flowered; lip 7–12 mm ..... 8. *C. alpicola*  
 8b. Rachis 1.5–6 cm, subdensely 2–20-flowered; lip 5–7 mm ..... 9. *C. longifolia*

**1. *Cephalanthera calcarata*** S. C. Chen & K. Y. Lang, Acta Bot. Yunnan. 8: 271. 1986.

硕距头蕊兰 shuo ju tou rui lan

Plants holomycotrophic, 8–21 cm tall. Rhizome ca. 5 cm, ca. 0.2 cm in diam., with tubular sheaths 2–7 mm; roots sparse, fleshy. Stem slender, lacking green leaves. Basal sheaths several, tubular, 7–25 mm, membranous. Inflorescence laxly 3–7-flowered; rachis 2.5–5 cm; floral bracts lanceolate to linear-lanceolate, basal ones to ca. 10 × 2 mm, scarious, apex acuminate. Flowers weakly spreading or not opening at all, suberect, white; pedicel and ovary 8–12 mm. Sepals equal, lanceolate-oblong, 13–14 × ca. 4 mm, 5-veined, apex acute. Petals similar to sepals, suboblong to narrowly elliptic, 10–12 × ca. 3 mm, apex acute; lip suberect, 8–9 × ca. 9 mm, spurred at base, 2-partite; hypochile lobes erect and clasping column, slightly falcate, narrowly triangular, ca. 3.5 mm, apex acute; epichile transversely oblong-elliptic, ca. 5 × 7 mm, densely papillose toward apex, apex obtuse, with 5–7 longitudinal lamellae extending from near base to middle or slightly above middle; spur located at base of hypochile, protruding between bases of lateral sepals, conic, 2–3 mm, apex obtuse. Column ca. 8 mm; stigma circular; anther oblong, ca. 3 mm. Capsule to 1 cm. Fl. May.

- Leaf litter in broad-leaved forests; ca. 2600 m. NW Yunnan.

**2. *Cephalanthera gracilis*** S. C. Chen & G. H. Zhu, Acta Bot. Yunnan. 24: 600. 2002.

纤细头蕊兰 xian xi tou rui lan

Plants holomycotrophic, 9–21 cm tall. Rhizome with several short scales toward apex. Stem slender, lacking green leaves. Basal sheaths 2 or 3, tubular, 8–15 mm, membranous. Inflorescence laxly 3- or 4-flowered; rachis 4–8 cm; floral bracts linear-lanceolate, basal ones 12–20 × 2–3 mm, apex acuminate. Flowers weakly spreading, suberect, ca. 1 cm; pedicel and ovary 10–18 mm. Sepals linear-lanceolate or oblong-lanceolate, ca. 10 × 2–3 mm, 1-veined, obtuse; lateral sepals slightly oblique. Petals lanceolate, ca. 8.5 × 2.5–3 mm, 1-veined, acuminate; lip suberect, ca. 9 × 7 mm, spurred at base, 2-partite; hypochile lobes erect and clasping column, obliquely triangular-lanceolate, ca. 2.5 mm, apex subacute; epichile broadly ovate, 5–6 × 5–7 mm, apex acute to acuminate, with 5 fleshy papillose lamellae extending from base almost to apex; spur located slightly above base of hypochile, protruding between bases of lateral sepals, conic, 1.5–3 mm, apex obtuse. Column ca. 6 mm. Fl. May.

- NW Yunnan.

**3. *Cephalanthera falcata*** (Thunberg) Blume, Coll. Orchid. 187. 1859.

金兰 jin lan

*Serapias falcata* Thunberg in Murray, Syst. Veg., ed. 14, 816. 1784; *Cephalanthera bijiangensis* S. C. Chen; *C. japonica* A. Gray; *C. platycheila* H. G. Reichenbach; *C. raymondiae* Schlechter; *Cymbidium falcatum* (Thunberg) Swartz; *Epipactis falcata* (Thunberg) Swartz; *Pelexia falcata* (Thunberg) Sprengel; *P. japonica* Sprengel.

Plants leafy, autotrophic, 20–50 cm tall. Stem slender to somewhat robust, 4–7-leaved. Basal sheaths 3–5, 1–5 cm. Leaves elliptic, elliptic-lanceolate, or ovate-lanceolate, 5–11 × 1.5–3.5 cm, apex acuminate to obtuse. Inflorescence subdensely 5–10-flowered; rachis 3–8 cm; floral bracts usually very small, 1–3 mm and all shorter than ovary, though occasionally lower one to 12 mm and exceeding ovary. Flowers suberect, weakly spreading, yellow; pedicel and ovary straight to slightly curved, 7–15 mm. Sepals rhombic-elliptic, 12–15 × 3.5–4.5 mm, 5-veined, apex obtuse to acute. Petals similar to sepals but shorter, 8–12 × 2.5–4.5 mm, apex obtuse to acute; lip suberect, 8–9 mm, spurred at base, 2-partite; hypochile lobes erect and loosely embracing column, triangular to ovate-lanceolate, 1.5–3.5 mm, apex subacute; epichile transversely elliptic, ca. 5 × 8–9 mm, densely papillose toward apex, with 5–7 brownish orange lamellae; central 3 lamellae 0.5–1 mm tall, outer lamellae shorter; spur protruding between bases of lateral sepals, conic, sometimes slightly incurved, ca. 3 mm, apex obtuse. Column 6–7 mm, apex dilated, with 2 ovate wings; anther elliptic, ca. 2 mm. Capsule narrowly elliptic, 2–2.5 × 0.5–0.6 cm. Fl. Apr–May, fr. Aug–Sep.  $2n = 34$ .

Forests, grasslands, valleys, along streams; 700–2000 m. Anhui, N Fujian, N Guangdong, N Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, W Yunnan (Bijiang), Zhejiang [Japan, Korea].

*Cephalanthera bijiangensis*, described as a species endemic to Yunnan (Acta Phytotax. Sin. 25: 472. 1987), was distinguished from *C. falcata* only by the length of the lowest floral bract, which exceeds the ovary. Though the floral bracts of *C. falcata* are frequently all short (to ca. 3 mm), several collections seen from Japan indicate that plants of this species do occasionally have a foliaceous lower floral bract that exceeds the ovary. As such, it seems unjustifiable to maintain *C. bijiangensis* as distinct, and it is here treated as a synonym of *C. falcata*, with which it agrees in other respects.

**4. *Cephalanthera nanlingensis*** A. Q. Hu & F. W. Xing, Novon 19: 56. 2009.

南岭头蕊兰 nan ling tou rui lan

Plants leafy, autotrophic, 13–24 cm tall. Stem slender, somewhat flexuous, with a few basal sheaths, 3–6-leaved. Leaves elliptic to lanceolate, 3–5 × 0.8–1.2 cm, apex acuminate. Inflorescence ± laxly 3–5-flowered; rachis 3.2–5 cm, ridged; floral bracts triangular, 2–3 mm. Flowers suberect, weakly spreading or not opening at all, white; pedicel and ovary 8–11 mm. Sepals suboblong, cymbiform, 7–8 × 2–2.5 mm, 3-

or 5-veined, apex obtuse. Petals obovate, 5–6.5 × 1.7–2 mm, 4- or 5-veined, apex obtuse; lip similar to petals, without a spur. Column ca. 5 mm, without wings; anther ovoid, ca. 1.5 mm; rostellum absent. Fl. Apr–May.

• Edge of evergreen broad-leaved forests; 700–1500 m. N Guangdong.

The actinomorphic perianth of *Cephalanthera nanlingensis* indicates that it is a peloric form. On account of habit, flower color, and leaf shape and size, and given its occurrence in Guangdong, it seems probable that it is derived from *C. erecta*.

**5. *Cephalanthera erecta*** (Thunberg) Blume, Coll. Orchid. 188. 1859.

银兰 yin lan

*Serapias erecta* Thunberg in Murray, Syst. Veg., ed. 14, 816. 1784; *Cephalanthera elegans* Schlechter; *C. erecta* var. *szechuanica* Schlechter; *C. szechuanica* (Schlechter) Schlechter; *Epipactis erecta* (Thunberg) Swartz; *Limodorum erectum* (Thunberg) Kuntze.

Plants leafy, autotrophic, 10–30 cm tall. Stem slender, with 2–4 basal sheaths, 2–4(or 5)-leaved. Leaves elliptic to ovate-lanceolate, 2–8 × 0.7–2.3 cm, apex acute or acuminate. Inflorescence ± laxly 3–10-flowered; rachis 2–8 cm, ridged; basal floral bract foliaceous, lanceolate and to 80 mm, distal ones narrowly triangular, 1–3 mm. Flowers erect, weakly spreading or not opening at all, white; pedicel and ovary 6–9 mm. Sepals oblong-elliptic, 8–10 × 2.5–3.5(–4.5) mm, 5-veined, apex acute to obtuse. Petals similar to sepals but slightly shorter; lip 5–6 mm, spurred at base, 2-partite; hypochile lobes erect and embracing column, ovate-triangular to lanceolate, 1.5–2.5 mm, apex acute; epichile subcordate to broadly ovate, ca. 3 × 4–5(–5.5) mm, apex acute, with 3 brownish longitudinal lamellae, papillate toward apex; spur protruding between bases of lateral sepals, conic, 2–3 mm, apex subacute. Column 3.5–4 mm, with 2 narrowly oblong wings; anther ovoid, ca. 1.5 mm. Capsule narrowly elliptic to broadly cylindrical, ca. 1.5 × 0.3–0.5 cm. Fl. Apr–Jun, fr. Aug–Sep.  $2n = 34$ .

Clearings in forests, thickets; 800–2300 m. Anhui, N Fujian, S Gansu, N Guangdong, N Guangxi, Guizhou, Hubei, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

The report of this species from Xizang (Zayü) (Fl. Xizang. 5: 747. 1987) was based on a fruiting specimen, which was obviously misidentified.

**6. *Cephalanthera longibracteata*** Blume, Coll. Orchid. 188. 1859.

长苞头蕊兰 chang bao tou rui lan

*Epipactis longibracteata* (Blume) Wettstein; *Limodorum longibracteatum* (Blume) Kuntze; *Serapias longibracteata* (Blume) A. A. Eaton.

Plants leafy, autotrophic, 30–50 cm tall. Stem slender to somewhat robust, with several basal sheaths, 6–8-leaved, slightly scabrous toward apex. Leaves broadly lanceolate to oblong-lanceolate, 6–14 × 1.5–3 cm, abaxially scabrous on veins, apex long acuminate. Inflorescence ± laxly 8–15-flowered; rachis 3–5.5 cm; floral bracts linear-lanceolate, basal 2 to

ca. 10 cm, becoming shorter and narrower above. Flowers erect, weakly spreading, white; pedicel and ovary 12–16 mm. Sepals narrowly ovate to lanceolate, 10–13 × 2–3 mm, apex acute to acuminate. Petals ovate, 8.5–9 × ca. 3 mm, apex acute to mucronate; lip shorter than petals, 5.5–7 mm, spurred at base, 2-partite; hypochile broadly ovate; hypochile lobes erect and embracing column, triangular, 2–2.5 mm, apex subacute-falcate; epichile ovate-cordate, ca. 3.5 × 4–4.5 mm, with 3 longitudinal lamellae, papillate at apex, margin slightly undulate, apex acute; spur protruding slightly between bases of lateral sepals, slightly incurved, conic, 1–1.5 mm, apex obtuse. Column 5.5–6.5 mm; anther ovoid, ca. 1.5 mm. Capsule erect, 2–2.5 cm. Fl. May–Jun, fr. Aug–Sep.  $2n = 30, 32, 33, 34, 36$ .

Forests, forest margins. S Jilin (Linjiang), Liaoning [Japan, Korea, Russia (Far East)].

**7. *Cephalanthera damasonium*** (Miller) Druce, Ann. Scott. Nat. Hist. 60: 225. 1906.

大花头蕊兰 da hua tou rui lan

*Serapias damasonium* Miller, Gard. Dict., ed. 8, Serapias no. 2. 1768; *Cephalanthera yunnanensis* Handel-Mazzetti.

Plants leafy, autotrophic, 14–36 cm tall. Stem slender, smooth or sometimes scabrous toward apex, with 2–5 basal sheaths, 4- or 5(–7)-leaved. Leaves elliptic to oblong, becoming smaller and linear-lanceolate above, 3–6 × (0.5–)1.2–2 cm, apex acute to acuminate. Inflorescence laxly (1 or)2- or 3(–5)-flowered; rachis 1–2.5 cm; floral bracts foliaceous, lanceolate to elliptic, 30–50 × 5–12 mm, all exceeding ovary. Flowers suberect, rarely opening fully, white, 1.5–2.5 cm; pedicel and ovary 10–12 mm. Sepals narrowly obovate-elliptic, 1.6–1.8 cm × 5.5–6.5 mm, 7-veined, apex obtuse to acute. Petals subobovate, 13–14 × ca. 6 mm, apex acute to acuminate; lip 8–9 mm, 2-partite; hypochile gibbous-saccate, enclosed within bases of lateral sepals, with an orange-yellow patch near base of disk; hypochile lobes erect and loosely embracing column, ovate-triangular, 2–2.5 mm; epichile transversely elliptic, ca. 4 × 8 mm, densely papillose toward apex, with 3 longitudinal, orange lamellae in basal half, obtuse-truncate. Column 9–11 mm, with 2 narrow, oblong wings; anther ovoid, ca. 2.5 mm. Fl. Jun.  $2n = 36, 54$ .

Open forests; 2100–2900 m. N and NW Yunnan (Lijiang, Luquan) [Bhutan, India, Myanmar; SW Asia, Europe].

The extensive extra-Chinese synonymy is not cited here.

**8. *Cephalanthera alpicola*** Fukuyama, Bot. Mag. (Tokyo) 52: 242. 1938.

高山头蕊兰 gao shan tou rui lan

*Cephalanthera taiwaniana* S. S. Ying.

Plants leafy, autotrophic, 15–45 cm tall. Stem slender, with several basal sheaths, 5–8-leaved. Leaves elliptic-lanceolate to sub lanceolate, 4–10 × 0.6–2.5 cm, base slightly contracted, apex acuminate. Inflorescence laxly 3–14-flowered; rachis 6–14 cm; basal floral bract linear-lanceolate and slightly exceeding ovary, distal ones subtriangular, 3–5 mm. Flowers suberect, weakly spreading or remaining closed, white; pedicel and ovary 10–17 mm. Sepals narrowly elliptic to suboblong, 10–15 × 3–5 mm, apex acute. Petals elliptic to sub lanceolate, 8–12 × 3–4.5

mm, apex acute; lip 7–12 mm, 2-partite; hypochile shallowly saccate, enclosed within bases of lateral sepals; hypochile lobes erect to spreading, obliquely triangular-ovate, apex obtuse; epichile broadly ovate to ovate-suborbicular, 3–6 × 5–6 mm, with 3–5 irregularly papillate, brownish lamellae. Column erect, 5–7 mm, with 2 small wings; anther ovoid, 2–3 mm. Capsule cylindrical, 2–3 cm. Fl. May–Aug.

• Dry open *Pinus* forests, alpine meadows; 2000–3000 m. C and N Taiwan.

**9. *Cephalanthera longifolia*** (Linnaeus) Fritsch, Oesterr. Bot. Z. 38: 81. 1888.

头蕊兰 *tou rui lan*

*Serapias helleborine* Linnaeus subsp. *longifolia* Linnaeus, Sp. Pl. 2: 950. 1753; *Cephalanthera acuminata* Lindley; *C. ensifolia* (Swartz) Richard var. *acuminata* (Lindley) Tang & F. T. Wang; *C. mairei* Schlechter; *C. thomsonii* H. G. Reichenbach.

Plants leafy, autotrophic, 20–50 cm tall. Stem slender to somewhat robust, with 3–5 loosely clasping basal sheaths, 4–7-leaved. Leaves elliptic, lanceolate, or oblong-lanceolate, 4–16 ×

0.5–3 cm, apex acuminate to long acuminate. Inflorescence subdensely 2–20-flowered; rachis 1.5–6 cm; floral bracts linear-lanceolate to narrowly triangular, basal 1 or 2 usually foliaceous and to ca. 70 mm, distal ones 2–6 mm. Flowers weakly spreading, white, 1–1.5 cm; pedicel and ovary 6–10 mm. Sepals narrowly rhombic-elliptic or narrowly elliptic-lanceolate, 11–16 × 3.5–4.5 mm, 5-veined, apex acuminate or subacute. Petals subobovate, 7–8 × ca. 4 mm, 5–7-veined, apex acute or mucronate; lip 5–7 × 6–9 mm, 2-partite; hypochile saccate, enclosed within bases of lateral sepals, with a small orange patch in middle of disk; hypochile lobes erect and embracing column, subovate-triangular, 3–4 mm, apex subacute; epichile triangular-cordate, 3–4 × 5–6 mm, with 3–5 orange lamellae, densely papillose toward apex, apex obtuse to acute. Column 4–6 mm, with 2 small oblong wings; anther 2–2.5 mm; stigma stalked. Capsule elliptic, 1.7–2 × 0.6–0.8 cm. Fl. May–Jun, fr. Sep–Oct.  $2n = 16, 32, 34, 34 + 2B, 42$ .

Forests, thickets, along streams, open grasslands; 1000–3600 m. S Gansu, W Henan, W Hubei, S Shaanxi, S Shanxi, W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan; N Africa, SW Asia, Europe].

The extensive extra-Chinese synonymy is not cited here.

## 58. TANGTSINIA S. C. Chen, Acta Phytotax. Sin. 10: 194. 1965.

金佛山兰属 *jin fo shan lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale

Terrestrial herbs, with a rather short rhizome and tufted roots. Roots fleshy, elongate. Stem erect, leafy, with several sheaths toward base. Leaves several, scattered, subsessile, plicate, papery. Raceme terminal, usually with several flowers; floral bracts very small, conspicuously shorter than pedicel and ovary, but lowest bract ± foliaceous. Flowers actinomorphic, erect, almost not twisted. Perianth composed of 3 similar sepals and 3 similar petals, lacking a modified lip. Column erect, relatively long, bearing at its apex a concave stigma with anther behind and 5 staminodes surrounding stigma; anther erect, 2-locular, with a short filament; among 5 staminodes, 3 opposite to petals, other 2 inconspicuous and resembling an extension of column ridges; pollinia 4, granular-farinaceous, lacking appendages; rostellum absent. Fruit a capsule.

• One species: China.

For a detailed discussion on this genus, *Diplandrorchis*, and *Holopogon*, see Chen and Tsi (Acta Phytotax. Sin. 25: 329–339. 1987). One of us (Gale) believes that *Tangtsinia nanchuanica* is a peloric form of *Cephalanthera falcata* and that *Tangtsinia* should be considered congeneric with *Cephalanthera*.

**1. *Tangtsinia nanchuanica*** S. C. Chen, Acta Phytotax. Sin. 10: 195. 1965.

金佛山兰 *jin fo shan lan*

Plants leafy, autotrophic, 15–35 cm tall. Rhizome 1–2 cm, 0.4–0.8 cm in diam.; roots 2.5–4 mm in diam. Stem slender, with several sheaths at base, 4–6-leaved. Leaves elliptic to lanceolate, 6–9 × 1.2–3 cm, 5–7-veined, apex acute to acuminate. Inflorescence 3–6-flowered or rarely only 1- or 2-flowered; rachis 3–6 cm; floral bracts deltoid-lanceolate, much reduced, 1–1.5 mm, though lowest one to 10 mm. Flowers erect, weakly spreading, yellow, base slightly tinged with white; pedicel and ovary 13–16 mm. Sepals narrowly elliptic to elliptic, 15–17 ×

3.5–4.5(–5.5) mm, 5-veined, apex obtuse. Petals obovate-elliptic, 11–13 × 4–4.5(–5.5) mm, apex obtuse; lip similar to petals, not distinct, lacking lamellae, spurless. Column yellowish green, subtrigonal-cylindrical, 6–8 mm, apex slightly dilated, with 3 large and 2 small wings; large wings white, spotted with silver, subligulate; smaller wings inconspicuous, similar in color to column; anther oblong-ovoid, ca. 1.5 mm; filament broad, subovate-lanceolate, 1–1.5 mm; pollinia white, narrowly falcate-ovate, ca. 1.6 mm. Capsule erect, subellipsoid, ca. 2 × 0.7 cm. Fl. Apr–Jun.

• Openings in forests, thicket margins, grassy slopes; 700–2100 m. Chongqing, N Guizhou.

## 59. APHYLLORCHIS Blume, Tab. Pl. Jav. Orchid. ad t. 77. 1825.

无叶兰属 *wu ye lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale

*Sinorchis* S. C. Chen.

Herbs, terrestrial, leafless, holomycotrophic. Rhizome short; roots fascicled, spreading, fleshy. Stem erect, fleshy, unbranched, usually pale brown, with loose cymbiform or cylindric sheaths enclosing proximal nodes and scalelike sterile bracts at distal nodes. Inflorescence terminal, racemose, few to many flowered; floral bracts membranous. Flowers resupinate, small to medium-sized, often with long pedicel and ovary. Sepals similar, free, often weakly concave-cymbiform. Petals similar to but shorter and narrower than sepals; lip adnate to base of column, 2-partite; hypochile often winged; epichile hinged at junction with hypochile and often deflexed, entire or lobed. Column arcuate, long, slender; anther borne at anterior margin of clinandrium, suberect, 2-locular; filament extremely short; staminodes 2 (1 on either side of column), apical, white, spotted with silver; pollinia 2, granular-farinaceous, caudicles absent; viscidium large; stigma concave, near apex of column; rostellum very small. Capsule usually pendulous.

About 30 species: mainly in tropical Asia and the Himalayas, extending as far north as Japan and south to Australia; five species (one endemic) in China.

- 1a. Lip not distinct, similar to lateral petals ..... 1. *A. simplex*  
 1b. Lip clearly distinct from petals.  
 2a. Floral bracts shorter than pedicel and ovary.  
 3a. Sepal 9–11 mm, apex obtuse to subacute ..... 2. *A. montana*  
 3b. Sepal 30–35 mm, apex long cuspidate ..... 3. *A. caudata*  
 2b. Floral bracts longer than pedicel and ovary.  
 4a. Rachis 19–22 cm; flowers yellowish green; floral bracts linear to linear-lanceolate, 3–4 mm wide; lip contracted at middle into hypochile and epichile ..... 4. *A. alpina*  
 4b. Rachis to 6 cm; flowers pale purplish brown; floral bracts ovate to elliptic-lanceolate, 6–8 mm wide; lip contracted near base into hypochile and epichile ..... 5. *A. gollanii*

**1. *Aphyllorchis simplex*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 67. 1951.

单唇无叶兰 dan chun wu ye lan

*Sinorchis simplex* (Tang & F. T. Wang) S. C. Chen.

Plants 48–53 cm tall. Rhizome 4–6 mm in diam., densely noded; roots long, 1.5–2 mm in diam. Stem glabrous; proximal internodes 7–12 mm, each node with 1 tubular sheath 4–18 mm; distal internodes much longer. Inflorescence with 10–13 well-spaced flowers; rachis 18–22 cm; floral bracts reflexed, linear-lanceolate, ca. 1 cm, 3-veined. Flowers white, suberect; pedicel 3–5 mm; ovary 1.2–1.7 cm, with sparse glandular hairs. Sepals sublanceolate-oblong, ca. 10 × 2–3 mm, apex subacute; lateral petals similar, suboblong, slightly shorter than sepals, thinly textured; lip unmodified, similar to lateral petals. Column ca. 8 mm, apex slightly dilated, with 2 silver staminodes and linear appendage on ventral surface near apex; appendage 0.7–1 mm; stigma subterminal; rostellum ovate, apex emarginate. Fl. Aug.

- Sandy soils in thickets, rocky slopes. E Guangdong.

One of us (Gale) regards this species as probably a peloric form of *Aphyllorchis montana*, with which it agrees in all characters except the lip. However, the other of us (Chen) does not agree, noting that *A. montana* is not found in E Guangdong and that the column of *A. simplex* is different from that of *A. montana*.

**2. *Aphyllorchis montana*** H. G. Reichenbach, Linnaea 41: 57. 1877.

无叶兰 wu ye lan

*Aphyllorchis benguetensis* Ames; *A. prainii* J. D. Hooker; *A. purpurea* Fukuyama; *A. tanegashimensis* Hayata; *A. unguiculata* Rolfe ex Downie.

Plants 43–70 cm tall. Rhizome short, creeping; roots spreading, stout. Stem with many membranous sheaths; proxi-

mal sheaths tubular, 0.5–2 cm; sterile bracts 1–1.3 cm. Inflorescence with few to 10 or more well-spaced flowers; rachis 10–20 cm; floral bracts reflexed, linear-lanceolate, 6–14 × 2–2.5 mm, shorter than pedicel and ovary. Flowers spreading ± horizontally, usually becoming pendulous, yellow or yellowish brown; ovary glabrous or sometimes slightly puberulent. Dorsal sepal cymbiform, oblong or obovate, 9–11 × 3–4 mm, 3-veined, apex obtuse; midrib of dorsal sepal scabrous near apex on abaxial surface; lateral sepals slightly shorter, not cymbiform. Petals suboblong, shorter and thinly textured; lip 7–9 mm, fleshy, contracted into epichile and hypochile toward base; hypochile slightly concave, ca. 2 mm, irregularly verrucose inside, with 2 triangular or triangular-lanceolate wings; epichile ovate, 5–7 mm, obscurely 3-lobed, margin slightly undulate. Column slightly arcuate, 7–10 mm, apex dilated. Fl. Jul–Sep.  $2n = 40$ .

Open forests; 700–1500 m. E Guangxi, Guizhou, S Hainan, Hong Kong, C and N Taiwan, S and W Yunnan [Cambodia, India, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam].

**3. *Aphyllorchis caudata*** Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 415. 1925.

尾萼无叶兰 wei e wu ye lan

Plants to 1 m tall. Stem erect, stout, with many membranous sheaths to 4 cm. Inflorescence with many well-spaced flowers; rachis to 50 cm; floral bracts reflexed, narrowly lanceolate, 4–4.8 × 0.5–0.6 cm, shorter than pedicel and ovary, apex acuminate. Flowers creamy white and purple-brown, ca. 4 cm in diam.; pedicel and ovary 4.5–5 cm, glabrous. Dorsal sepal linear-lanceolate or lanceolate, slightly concave, 30–35 × ca. 8 mm, abaxially sparsely puberulent, apex long cuspidate; lateral sepals similar to dorsal sepal, not concave, 6–7 mm wide. Petals lanceolate, ca. 20 × 6–7 mm, thinly textured, slightly hairy along abaxial midrib, apex acuminate; lip 14–17 mm, fleshy, contracted below middle into epichile and hypo-

chile; hypochile concave, small, 2–3 mm, with 2 ligulate wings ca. 4 mm; epichile ovate, ca. 1.2 cm × 5 mm, adaxially densely papillose, 3-lobed; lateral lobes incurved, suborbicular; mid-lobe with acuminate apex. Column slightly arcuate, 1.1–1.4 cm, winged toward apex. Fl. Jul–Aug.  $2n = 36$ .

Forests; ca. 1200 m. S Yunnan [Thailand, Vietnam].

**4. *Aphyllorchis alpina*** King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 261. 1898.

高山无叶兰 gao shan wu ye lan

Plants 75–100 cm tall. Rhizome elongate, covered in scales. Stem erect, with many membranous sheaths 1–4 cm. Inflorescence with 10–20 widely spaced flowers; rachis 19–22 cm; floral bracts reflexed, linear to linear-lanceolate, 25–30 × 3–4 mm, conspicuously longer than pedicel and ovary. Flowers spreading ± horizontally, yellowish green; pedicel and ovary puberulent, 2–3 cm, stout. Sepals ovate-lanceolate, slightly cymbiform, 18–23 × 6–7 mm, apex acuminate-caudate. Petals 14–17 × 5–7 mm; lip 14–17 mm, contracted at or above middle into epichile and hypochile; hypochile winged, basal margins forming a small sac; epichile ovate, margin often involute, apex

acute. Column slightly arcuate, 1–1.3 cm. Capsule elliptic, ca. 3 × 1 cm. Fl. Jul, fr. Sep.

Forests, riverbanks; 2100–2600 m. SE Xizang [India, Nepal].

**5. *Aphyllorchis gollanii*** Duthie, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 71: 42. 1902 [“*gollani*”].

大花无叶兰 da hua wu ye lan

Plants 40–50 cm tall. Rhizome subcylindric; roots sparse, stout, fleshy. Stem robust, erect, tinged with purple, with many sheaths; sheaths mostly tubular, 1.5–3.5 cm, membranous. Inflorescence stout, 10- or more flowered; rachis less than 6 cm; floral bracts suberect, ovate to elliptic-lanceolate, large, 15–25 × 6–8 mm, longer than pedicel and ovary. Flowers suberect, not opening fully, pale purplish brown; ovary puberulent, including pedicel to 1.7 cm. Sepals ovate-lanceolate, ca. 30 × 6–7 mm, apex acuminate. Petals slightly shorter than sepals; lip slightly shorter than petals, contracted near base forming epichile and hypochile; hypochile slightly concave, winged; epichile sub-ovate, lateral margins reflexed, erose. Column strongly arcuate, ca. 1 cm. Fl. Jun–Jul.

Evergreen broad-leaved forests; 2200–2400 m. S Xizang (Nyalam) [India].

## 60. *EPIPACTIS* Zinn, Cat. Pl. Hort. Gott. 85. 1757, nom. cons., not Séguier (1754).

火烧兰属 huo shao lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Phillip J. Cribb, Stephan W. Gale

*Amesia* A. Nelson & J. F. Macbride; *Arthrochilium* (Irmisch) Beck (1890), not *Arthrochilus* F. Mueller (1858); *Calliphyllo* Bani; *Epipactis* [unranked] *Arthrochilium* Irmisch; *Helleborine* Miller; *Limonia* Ehrhart; *Parapactis* W. Zimmermann.

Herbs, terrestrial, autotrophic or rarely holomycotrophic, medium-sized. Rhizome creeping, short or elongate, with many elongate, fleshy roots. Stem erect, leafy, with 2 or 3 scalelike sheaths toward base, glabrous or pubescent. Leaves 3 to many, cauline, spirally arranged, broadly elliptic to linear-lanceolate, plicate, scabrous or smooth. Inflorescence terminal, racemose, often secund, few to many flowered; floral bracts usually foliaceous. Flowers spreading or nodding, resupinate or very rarely not resupinate, medium-sized. Sepals free, spreading or connivent, glabrous, puberulent, or pubescent. Petals similar to sepals but shorter; lip fleshy, not spurred, constricted near middle to form a distinct epichile and hypochile, and sometimes with a mesochile in between; hypochile cymbiform or saccate, sometimes containing lamellae; mesochile (when present) short or elongate, narrow; epichile spreading, usually hinged at its base, thickened or not, variable in shape, sometimes 3-lobed, sometimes with wartlike calli or keels. Column short, without a column foot; anther sessile; pollinia 4, granular-farinaceous, without caudicles; viscidium absent in autogamous species; rostellum usually large, very rarely absent; stigma rounded to subquadrate. Capsule pendulous or ascending, obovoid to ellipsoid.

About 20 species: throughout Europe and through temperate and alpine parts of E, S, and SW Asia, also in tropical Africa and North America; ten species (two endemic) in China.

- 1a. Upper stem and rachis glabrous (though rachis of *E. alata* occasionally puberulent).
  - 2a. Flowers not resupinate, rose-purple; floral bracts all shorter than ovary ..... 10. *E. alata*
  - 2b. Flowers resupinate, green, yellow, yellow-green, or yellow-brown; lower floral bracts foliaceous and exceeding flowers.
    - 3a. Lip with a short mesochile 1–2 mm; lateral margins of mesochile parallel; epichile with a pair of low keels ..... 8. *E. thunbergii*
    - 3b. Lip with an elongate mesochile ca. 6 mm; lateral margins of mesochile slightly protruding and obtuse-rounded; epichile without keels ..... 9. *E. xanthophaea*
- 1b. Upper stem and rachis pubescent.
  - 4a. Hypochile of lip subglobose-saccate, without lateral lobes.
    - 5a. Leaves glabrous ..... 1. *E. helleborine*
    - 5b. Leaves adaxially white papillose-puberulent along veins and margins ..... 2. *E. papillosa*
  - 4b. Hypochile of lip cymbiform, with lateral lobes.

- 6a. Epichile of lip obovate to suborbicular, connected to hypochile by a short mesochile ca. 2 mm ..... 7. *E. palustris*  
 6b. Epichile of lip ovate, ovate-elliptic, or elliptic, connected directly to hypochile; lip without a mesochile.  
 7a. Plants 10–20 cm tall ..... 5. *E. humilior*  
 7b. Plants 30–100 cm tall.  
 8a. Leaves scabrous adaxially; rachis 10- to more than 20-flowered ..... 3. *E. mairei*  
 8b. Leaves glabrous; rachis 2–8-flowered.  
 9a. Leaves 6–9; lip purple or pink with purple or dark red venation ..... 4. *E. royleana*  
 9b. Leaves 3–5; lip white with brown and orange markings ..... 6. *E. veratrifolia*

**1. *Epipactis helleborine*** (Linnaeus) Crantz, Stirp. Austr. Fasc., ed. 2, 2: 467. 1769.

火烧兰 huo shao lan

Plants 20–70 cm tall. Rhizome short. Stem glabrous toward base, becoming pubescent above, with 2 or 3 scalelike sheaths near base. Leaves 4–7, ovate-orbicular, ovate, or elliptic-lanceolate, rarely lanceolate, upper ones narrower and lanceolate to linear-lanceolate, 3–13 × 1–6 cm, glabrous, apex acuminate to long acuminate. Rachis 10–30 cm, pubescent, laxly to subdensely 3–40-flowered; floral bracts foliaceous, linear-lanceolate, lower ones exceeding flowers, becoming shorter above. Flowers usually nodding, resupinate, green or pale purple, out-crossing; pedicel and ovary 10–15 mm, yellow-brown tomentose. Dorsal sepal ovate-lanceolate, rarely elliptic, cymbiform, 6–13 × 4–5 mm, apex acuminate; lateral sepals ovate-lanceolate, oblique, 9–13 × ca. 4 mm, apex acuminate. Petals elliptic, 5.5–8 × 3–4 mm, apex acute or obtuse; lip 6–8 mm, without a mesochile; hypochile subglobose-saccate, 3–4 mm; epichile subtriangular or suboblate, ca. 3 × 3–4 mm, veins sometimes thickened near apex, with a pair of either suborbicular, erose lamellae or thickened, fleshy wartlike calli toward base, apex acute. Column 2–5 mm (excluding anther). Capsule obovoid-ellipsoid, ca. 10 mm, puberulent. Fl. Jun–Jul, fr. Sep.  $2n = 38, 40$ .

Forests, grasslands, wooded slopes, streamsides; 200–3600 m. Anhui, Gansu, Guizhou, Hebei, Hubei, Liaoning, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, Kashmir, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; N Africa, SW Asia, Europe; naturalized in North America].

- 1a. Flowers usually 7–40; epichile of lip with a pair of suborbicular, erose lamellae toward base ..... 1a. var. *helleborine*  
 1b. Flowers usually 6–10; epichile of lip with a pair of thickened, fleshy wartlike calli toward base ..... 1b. var. *tangutica*

**1a. *Epipactis helleborine* var. *helleborine***

火烧兰(原变种) huo shao lan (yuan bian zhong)

*Serapias helleborine* Linnaeus, Sp. Pl. 2: 949. 1753; *Amesia discolor* (Kraenzlin) Hu; *A. longibracteata* C. Schweinfurth; *A. monticola* (Schlechter) Hu; *A. squamellosa* (Schlechter) Hu; *A. tenii* (Schlechter) Hu; *A. yunnanensis* (Schlechter) Hu; *Epipactis discolor* Kraenzlin; *E. helleborine* subsp. *ohwii* (Fukuyama) H. J. Su; *E. helleborine* var. *rubiginosa* Crantz; *E. helleborine* var. *viridans* Crantz; *E. latifolia* (Linnaeus) Allioni; *E. lingulata* Handel-Mazzetti; *E. longibracteata* (C. Schweinfurth) S. Y. Hu (1972), not Wettstein (1889); *E. macrostachys* Lindley; *E. monticola* Schlechter; *E. nephrocordia* Schlechter;

*E. ohwii* Fukuyama; *E. squamellosa* Schlechter; *E. tenii* Schlechter; *E. yunnanensis* Schlechter; *S. helleborine* var. *latifolia* Linnaeus.

Flowers usually 7–40. Dorsal sepal 8–13 mm. Petals 6.5–8 mm; lip with a pair of suborbicular, erose lamellae toward base of epichile. Column 3–5 mm.  $2n = 36, 38, 40, 44$ .

Forests, grasslands, wooded slopes, streamsides; 200–3600 m. Anhui, Gansu, Guizhou, Hebei, Hubei, Liaoning, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; N Africa, SW Asia, Europe; naturalized in North America].

This species has an extensive synonymy, only part of which is provided here.

**1b. *Epipactis helleborine* var. *tangutica*** (Schlechter) S. C. Chen & G. H. Zhu, Novon 13: 423. 2003.

青海火烧兰 qing hai huo shao lan

*Epipactis tangutica* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 57. 1919; *Amesia tangutica* (Schlechter) Hu; *Epipactis micrantha* E. Peter ex Handel-Mazzetti.

Flowers usually 6–10. Dorsal sepal 6–7 mm. Petals 5.5–6 mm; lip with a pair of thickened, fleshy wartlike calli toward base of epichile. Column ca. 2 mm.

- Near border between Qinghai and Gansu.

**2. *Epipactis papillosa*** Franchet & Savatier, Enum. Pl. Jap. 2: 519. 1878.

细毛火烧兰 xi mao huo shao lan

*Epipactis helleborine* (Linnaeus) Crantz var. *papillosa* (Franchet & Savatier) T. Hashimoto; *E. latifolia* (Linnaeus) Allioni var. *papillosa* (Franchet & Savatier) Maximowicz ex Komarov; *E. sayekiana* Makino.

Plants 30–70 cm tall. Rhizome short. Stem brown papillose-pubescent throughout, with several sheaths toward base. Leaves 5–7, elliptic-ovate to broadly elliptic, 7–12 × 2–4 cm, adaxially white papillose-puberulent along veins and margins, apex shortly acuminate. Rachis 10–20 cm, brown papillose-pubescent, laxly to subdensely 10- to more than 20-flowered; floral bracts lanceolate, lower ones exceeding flowers. Flowers spreading horizontally or nodding, resupinate, probably self-pollinating, green; lip pale green. Sepals narrowly ovate, 9–12 × 3–5 mm, apex acute. Petals ovate-orbicular, 8–10 × 2–4 mm, apex acute; lip 7–8 mm, without a mesochile; hypochile subglobose-saccate; epichile narrowly cordate or triangular, apex acute. Column ca. 3 mm. Capsule ellipsoid, ca. 10 mm. Fl. Aug.  $2n = 38, 40$ .

Forests. S Liaoning (Fengcheng) [Japan, Korea].

**3. *Epipactis mairei*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 55. 1919.

大叶火烧兰 da ye huo shao lan

*Amesia mairei* (Schlechter) Hu; *A. schensiana* (Schlechter) Hu; *A. setschuanica* (Ames & Schlechter) Hu; *A. wilsonii* (Schlechter) Hu; *Arthrochilium mairei* (Schlechter) Szlachetko; *A. schensianum* (Schlechter) Szlachetko; *A. setschuanicum* (Ames & Schlechter) Szlachetko; *A. wilsonii* (Schlechter) Szlachetko; *Epipactis schensiana* Schlechter; *E. setschuanica* Ames & Schlechter; *E. wilsonii* Schlechter; *Helleborine mairei* (Schlechter) Soó; *H. schensiana* (Schlechter) Soó; *H. setschuanica* (Ames & Schlechter) Soó; *H. wilsonii* (Schlechter) Soó.

Plants 30–100 cm tall. Rhizome short and inconspicuous. Stem glabrous toward base, becoming rusty pubescent above, with 2 or 3 scalelike sheaths toward base. Leaves 5–8, usually elliptic to ovate-elliptic, 7–16 × 3–8 cm, adaxially scabrous, especially so on veins, base sheathing and amplexicaul, apex shortly acuminate to acuminate. Rachis 10–20 cm, rusty pubescent, subdensely 10- to more than 20-flowered; floral bracts elliptic-lanceolate, lower ones exceeding flowers. Flowers usually nodding, resupinate; sepals and petals yellowish green tinged purple on outer surfaces, lip with a purplish brown hypochile and an orange or yellowish brown epichile; pedicel and ovary 12–15 mm, yellowish brown- or rusty pubescent. Dorsal sepal elliptic or obovate-elliptic, cymbiform, 13–17 × 4–7.5 mm, outer surfaces occasionally puberulent, apex acuminate; lateral sepals ovate-lanceolate or ovate, oblique, 15–20 × 5–9 mm, apex acuminate and mucronate. Petals narrowly elliptic or elliptic, 11–17 × 5–9 mm, apex acuminate; lip 12–16 mm, without a mesochile; hypochile cymbiform, 6–9 mm, with suberect lateral lobes 4–6 mm wide, with 2 or 3 central crestlike lamellae; hypochile lamellae separate and narrow at base, converging and becoming wider toward apex; epichile thickened, ovate-elliptic to elliptic, 5–9 × 3–6 mm, apex acute. Column 4–5 mm; anther 3–4 mm. Capsule ellipsoid, ca. 25 mm, glabrous. Fl. Jun–Jul, fr. Sep.  $2n = 40$ .

Thickets, grasslands, riverbeds; 1200–3200 m. Gansu, Guizhou, Hubei, Hunan, Shaanxi, W Sichuan, Xizang, NW Yunnan [Bhutan, Myanmar, Nepal].

**4. *Epipactis royleana*** Lindley, Gen. Sp. Orchid. Pl. 461. 1840.

卵叶火烧兰 luan ye huo shao lan

*Amesia royleana* (Lindley) Hu; *Arthrochilium royleanum* (Lindley) Szlachetko; *Cephalanthera royleana* (Lindley) Regel; *Helleborine royleana* (Lindley) Soó; *Limodorum royleanum* (Lindley) Kuntze.

Plants 30–80 cm tall. Rhizome elongate, 3–5 mm in diam. Stem glabrous toward base, usually puberulent or glabrescent above, with several sheaths toward base. Leaves 6–9, ovate-lanceolate to lanceolate, lowest one occasionally elliptic or ovate, 7–12 × 2.5–4 cm, glabrous, base amplexicaul, apex acuminate. Rachis 5–8(–10) cm, brown pubescent, laxly (2–)5–8-flowered; floral bracts 15–40(–70) × 5–10 mm, lower ones exceeding flowers. Flowers resupinate; sepals and petals pale

green, lip purple or pink with purple or dark red venation; pedicel and ovary 13–16 mm, brown pubescent. Sepals ovate to elliptic-ovate, 15–18 × 5–7 mm, outer surface carinate, apex shortly acuminate; lateral sepals oblique, slightly wider than dorsal sepal. Petals ovate-elliptic, 13–16 × 6–8 mm, apex obtuse; lip 14–18 mm, without a mesochile; hypochile cymbiform, 7–10 × 14–18 mm, with erect, elliptic lateral lobes 5–7 mm wide; epichile narrowly ovate-elliptic, 9–10 × 4–5 mm, with a pair of fleshy, suborbicular calli on lateral veins toward margins and occasionally with minute protuberances centrally. Column 4–7 mm. Fl. Jul–Aug.  $2n = 40$ , 60.

Moist soil along streams, wet prairies; 2900–3000 m. S and SE Xizang [Bhutan, N India, Kashmir, Kyrgyzstan, Nepal, Pakistan, Tajikistan, Uzbekistan].

**5. *Epipactis humilior*** (Tang & F. T. Wang) S. C. Chen & G. H. Zhu, Novon 13: 423. 2003.

短茎火烧兰 duan jing huo shao lan

*Epipactis mairei* Schlechter var. *humilior* Tang & F. T. Wang, Acta Phytotax. Sin. 1: 67. 1951.

Plants 10–20 cm tall. Rhizome elongate, usually more than 10 cm, 3–4 mm in diam., many noded. Stem glabrous toward base, rusty pubescent above, with 2 or 3 sheaths toward base. Leaves 4–6, ovate-lanceolate or lanceolate, 4–9 × 2–3 cm, adaxially slightly scabrous or glabrescent, base amplexicaul, apex acuminate. Rachis 5–8 cm, rusty pubescent, laxly 5–8-flowered; floral bracts 15–40 × 5–10 mm, lower ones exceeding flowers. Flowers resupinate, yellow-green tinged purple; pedicel and ovary 13–16 mm, yellowish brown pubescent. Dorsal sepal obovate-elliptic, cymbiform, 13–17 × 5–7 mm, apex acuminate; lateral sepals ovate-lanceolate, oblique, slightly wider than dorsal sepal. Petals ovate-elliptic, 13–16 × 5–7 mm, apex obtuse; lip without a mesochile; hypochile cymbiform, 7–9 × 12–16 mm, with erect lateral lobes; epichile thickened, subovate, 8–9 × 4–5 mm, with 3 central crisped lamellae. Column 6–7 mm. Fl. Jun–Jul.

• Forests, grassy slopes, swampy meadows; 2200–2700 m. W Sichuan, E Xizang, Yunnan.

**6. *Epipactis veratrifolia*** Boissier & Hohenacker in Boissier, Diagn. Pl. Orient., ser. 1, 13: 11. 1854.

疏花火烧兰 shu hua huo shao lan

*Arthrochilium veratrifolium* (Boissier & Hohenacker) Szlachetko; *A. wallichii* (Schlechter) Szlachetko; *Epipactis handelii* Schlechter; *E. somaliensis* Rolfe; *E. wallichii* Schlechter; *Helleborine veratrifolia* (Boissier & Hohenacker) Bormmüller.

Plants 30–40 cm tall. Rhizome usually elongate. Stem glabrous, with 2–4 sheaths toward base. Leaves 3–5, ovate-lanceolate, 6–11 × 2–3 cm, papery, glabrous, base amplexicaul, apex acuminate or long acuminate. Rachis 5–15 cm, yellowish brown puberulent, laxly (3 or)4–6-flowered; floral bracts foliaceous, spreading, ovate-lanceolate, lower ones exceeding flowers, upper ones nearly as long as flowers. Flowers secund, resupinate; sepals chestnut-brown, petals green with broad chestnut-brown margins, lip white with chestnut-brown markings on

hypochile and an orange-brown band across epichile; pedicel and ovary grayish white tomentose, ca. 10 mm. Sepals grayish white tomentose on outer surfaces, 5-veined, midvein conspicuous; dorsal sepal elliptic, ca. 10 × 5 mm, apex acute; lateral sepals ovate-lanceolate, oblique, ca. 11 × 7 mm, apex acute. Petals ovate-elliptic, ca. 9 × 6 mm, apex acute; lip ca. 9 mm, without a mesochile; hypochile cymbiform, 5–6 × 3–4 mm, with erect lateral lobes, margins incurved; epichile broadly ovate, 8–12 × 6–9 mm, fleshy, apex subacute or obtuse. Column ca. 8 mm including anther, with 2 short falcate lateral wings; anther cylindrical, ca. 4 mm. Fl. May.  $2n = 20, 40, 60$ .

Forests, forest margins; 2700–3400 m. W Sichuan, Xizang, C and W Yunnan [Afghanistan, India, Myanmar, Nepal, Pakistan; Africa (Ethiopia, Somalia), SW Asia, Caucasus].

This species was misidentified as *Epipactis consimilis* D. Don in FRPS (17: 91. 1999).

**7. *Epipactis palustris*** (Linnaeus) Crantz, Stirp. Austr. Fasc., ed. 2, 2: 462. 1769.

新疆火烧兰 xin jiang huo shao lan

*Serapias helleborine* Linnaeus var. *palustris* Linnaeus, Sp. Pl. 2: 950. 1753; *Arthrochilium palustre* (Linnaeus) Beck; *Helleborine palustris* (Linnaeus) Schrank; *Limodorum palustre* (Linnaeus) Kuntze; *S. longifolia* Linnaeus.

Plants 25–60 cm tall. Rhizome elongate. Stem glabrous toward base, papillose-pubescent above, with 3 or 4 sheaths toward base. Leaves 7 or 8, spreading, lowest one ovate or ovate-elliptic, 4–5 × 2–2.5 cm, others relatively narrow, ovate-lanceolate, narrowly lanceolate, or linear-lanceolate, 4–16 × 0.6–2.5 cm, glabrous, base amplexicaul, apex acute to acuminate. Rachis 10–20 cm, papillose-pubescent, laxly 6- or more flowered. Flowers spreading, resupinate, yellow-green; sepals flushed chestnut-brown and petals with chestnut-brown venation, lip with yellow marks at base and a white epichile; pedicel and ovary ca. 15 mm, papillose-pubescent. Dorsal sepal elliptic-lanceolate, slightly cymbiform, 8–9 × ca. 2.5 mm, apex acute; lateral sepals ovate-lanceolate, slightly oblique, 7–8 × ca. 4 mm, apex acute and apiculate. Petals elliptic, 7–8 × ca. 3 mm, apex acuminate; lip ca. 10 mm, with a mesochile connecting hypochile and epichile; hypochile cymbiform, ca. 4 × 4–6 mm, with suberect lateral lobes, irregularly papillate inside and slightly carinate; mesochile oblong to subsquare, ca. 2 × 1.5 mm, with a pair of suborbicular lamellae 1–1.5 mm tall that extend onto epichile; epichile oblate to suborbicular, 3–5 × 4–4.5 mm, margin irregularly and inconspicuously crenulate, apex rounded. Column erect, ca. 3 mm; anther elliptic, ca. 3 mm, papillate on dorsal surface. Fl. Jul.  $2n = 40, 44, 46, 48$ .

N Xinjiang [Russia; Europe].

**8. *Epipactis thunbergii*** A. Gray in Perry, Narr. Exped. China Japan 2. 319. 1857.

尖叶火烧兰 jian ye huo shao lan

*Amesia thunbergii* (A. Gray) A. Nelson & J. F. Macbride; *Arthrochilium thunbergii* (A. Gray) Szlachetko; *Epipactis gigantea* Douglas var. *manshurica* Maximowicz ex Komarov;

*E. gigantea* var. *thunbergii* (A. Gray) M. Hiroe; *E. thunbergii* var. *manshurica* (Maximowicz ex Komarov) Tang & F. T. Wang; *Helleborine chinensis* Soó; *H. thunbergii* (A. Gray) Druce; *Limodorum thunbergii* (A. Gray) Kuntze.

Plants 20–30 cm tall. Rhizome elongate. Stem glabrous, with 2–4 sheaths toward base. Leaves 6–8, spreading, ovate-lanceolate, 5–13 × 1.2–3 cm, glabrous, base amplexicaul, apex acuminate or cuspidate-acuminate. Rachis 3–5 cm, glabrous, laxly 3–10-flowered; floral bracts foliaceous, ovate-elliptic, lower ones exceeding flowers. Flowers spreading, resupinate, pale green or yellow-green; lip white with purple venation on side lobes and purple markings on disk; ovary and pedicel ca. 15 mm, glabrous. Dorsal sepal ovate-elliptic, ca. 11 × 4 mm, apex acute; lateral sepals ovate-elliptic, ca. 10 × 3 mm, apex acute. Petals broadly ovate, slightly oblique, 7–10 × ca. 5 mm, apex acute; lip ca. 10 mm, with a short mesochile connecting hypochile and epichile; hypochile cymbiform, ca. 3 × 3 mm, with erect lateral lobes ca. 4 × 2 mm; mesochile sometimes inconspicuous, oblong, 1–2 × ca. 2 mm; epichile ovate-orbicular, ca. 3 × 3 mm, margin slightly undulate, with a pair of low keels. Column ca. 3 mm excluding anther, relatively thick. Fl. Jun–Jul.  $2n = 40$ .

E Zhejiang [Japan, Korea].

**9. *Epipactis xanthophaea*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 341. 1922.

北火烧兰 bei huo shao lan

*Amesia xanthophaea* (Schlechter) Hu; *Arthrochilium xanthophaeum* (Schlechter) Szlachetko; *Helleborine xanthophaea* (Schlechter) Soó.

Plants 40–60 cm tall. Rhizome slender. Stem glabrous, with 3 or 4 sheaths toward base. Leaves 5–7, ovate-lanceolate to elliptic-lanceolate, 6–13 × 3–5 cm, glabrous, base amplexicaul, apex acuminate or long acuminate. Rachis 7–10 cm, glabrous, laxly 5–10-flowered; floral bracts foliaceous, ovate-lanceolate, apex long acuminate, lower ones exceeding flowers. Flowers resupinate, rather large, yellow, yellowish brown, or rarely pale red; ovary and pedicel ca. 15 cm. Dorsal sepal elliptic, ca. 15 × 6 mm, apex acuminate; lateral sepals ovate-lanceolate, oblique, 15–16 × ca. 6 mm, apex long acuminate. Petals broadly ovate, ca. 12 × 8 mm, base broadly cuneate, apex acuminate; lip ca. 15 mm, with a broad mesochile connecting hypochile and epichile; hypochile cymbiform, with erect ovate-suborbicular lateral lobes; mesochile ca. 6 × 5 mm, lateral margins slightly protruding and obtuse-rounded, with a pair of subtriangular lamellae ca. 3.5 × 3 mm; epichile ovate-orbicular. Column ca. 6 mm including anther; anther ovoid, ca. 3 mm. Capsule ellipsoid, ca. 20 mm. Fl. Jul, fr. Sep.

• Meadows, damp places in forests; ca. 300 m. Hebei, Heilongjiang, Jilin, Liaoning, Shandong.

**10. *Epipactis alata*** Averyanov & Efimov, Rheedea 16: 4. 2006 ["*alatus*"].

短苞火烧兰 duan bao huo shao lan

Plants 20–30 cm tall. Rhizome short, 3–5 mm in diam.

Stem flexuous, glabrous, with 3 or 4 sheaths toward base. Leaves 2 or 3, ovate-lanceolate to lanceolate, lowest one elliptic or ovate, 2–7 × 1–4 cm, finely papillose along margins, base amplexicaul, apex acute. Rachis ca. 4 cm, glabrous or puberulent, laxly 1–4-flowered; floral bracts narrowly ovate, 3–4 × 2–3 mm, shorter than ovary, apex acute. Flowers not resupinate, rose-pink, lip with a yellow callus on epichile and brown warts on hypochile; pedicel and ovary ca. 10 mm, puberulent. Sepals ovate, ca. 10 × 5–5.5 mm, apex acute; lateral sepals oblique, slightly wider than dorsal sepal. Petals ovate, ca. 8.5 × 5 mm,

apex shortly acuminate; lip ca. 12 mm, with a mesochile connecting hypochile and epichile; hypochile cymbiform, with broadly triangular, rounded side lobes ca. 4 mm, with numerous brown warts; mesochile oblong, ca. 3.5 × 2 mm, with a pair of fleshy low keels; epichile suborbicular, ca. 3.5 mm, with a small callus at base, margin undulate, apex obtuse. Column ca. 7 mm. Fl. Jul–Aug.  $2n = 40, 60$ .

Coniferous (*Tsuga chinensis*) forests, on limestone karst; 1100–1200 m. SE Yunnan [N Vietnam].

## 61. DIPLANDRORCHIS S. C. Chen, Acta Phytotax. Sin. 17(1): 2. 1979.

双蕊兰属 *shuang rui lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

Herbs, small, heteromycotrophic, with stout, short rhizomes and tufted fleshy roots, without green leaves. Inflorescence erect, terminal, racemose; peduncle with several sheaths; sheaths tubular in lower half of peduncle, becoming bractlike above; rachis densely many flowered; floral bracts membranous. Flowers erect, not resupinate, actinomorphic; pedicel rather long, slender, not twisted; ovary ellipsoid, not twisted. Perianth composed of 3 similar sepals and 3 similar petals, without a modified lip. Column erect, cylindrical, with 2 fertile stamens at apex; stamens similar, erect, borne opposite dorsal sepal and central petal (lip) respectively; anthers 2-locular, each with an extremely short filament; pollinia 2, granular-farinaceous, without caudicle; stigma terminal, oblate; rostellum absent.

- One species: China.

For a detailed discussion on this genus and the allied *Holopogon*, see Chen and Tsi (Acta Phytotax. Sin. 25: 329–339. 1987).

Two of us (Cribb and Gale) consider *Diplandrorchis* to be a peloric form of *Neottia*. Our understanding of the genetic control of organ development in orchids can be used to explain how zygomorphic flowers may become “regular” (i.e., actinomorphic) and how floral organs can take on different forms, as when the lip becomes petaloid or a staminode develops as an anther. For further discussion on the occurrence of actinomorphy in the Orchidaceae and other monocot groups with zygomorphic flowers, see Rudall and Bateman (New Phytol. 162: 25–44. 2004).

### 1. *Diplandrorchis sinica* S. C. Chen, Acta Phytotax. Sin. 17(1): 2. 1979.

双蕊兰 *shuang rui lan*

Plants 17–24 cm tall. Rhizome slightly curved, ca. 2.5 mm in diam. Inflorescence slender, ca. 2 mm in diam., with 5–7 membranous sheaths; lower sheaths tubular, 2–3 cm; upper sheaths ovate-lanceolate, 1–1.5 cm; rachis 6–8 cm, densely 13–17-flowered; floral bracts lanceolate, 7–8 mm, apex acuminate.

Flowers pale green or greenish white, not opening widely; pedicel 4–6 mm, papillose-pubescent; ovary ellipsoid, ca. 4 × 2.5 mm, papillose-pubescent. Sepals oblong-lanceolate, ca. 3.5 × 1.5 mm, outer surfaces papillose-pubescent; lateral sepals slightly oblique. Petals and lip similar, suboblong, slightly shorter and narrower than sepals. Column ca. 2.5 mm including anthers; anthers broadly ovoid-oblong, ca. 0.6 mm. Fl. Aug.

- Humus-rich soils in *Tilia* forests, shaded places; 700–800 m. E Liaoning.

## 62. HOLOPOGON Komarov & Nevski in Komarov, Fl. URSS 4: 750. 1935.

无喙兰属 *wu hui lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

*Archineottia* S. C. Chen.

Herbs, small, heteromycotrophic, with short rhizomes and tufted fleshy roots, without green leaves. Inflorescence erect, terminal, racemose, sparsely papillose-pubescent above; peduncle with several tubular sheaths; rachis several to many flowered, sparsely papillose-pubescent; floral bracts membranous. Flowers erect or spreading, resupinate or not, actinomorphic or less commonly zygomorphic; pedicel rather long. Sepals similar, outer surfaces usually sparsely hairy. Petals similar, or central one a modified lip 2-lobed at apex. Column rather long, slightly dilated at apex, with a thick ridge on dorsal surface; anther erect or suberect, attached by a filament to ridge on back of column; pollinia 2, granular-farinaceous, soft, without caudicles or viscidia; stigma terminal; rostellum absent.

- Six species: China, NW India, Japan, Russia (Far East); two species (both endemic) in China.

In the opinion of one of us (Chen), this genus is characterized by its very distinct column structure, in which there is a thick ridge on its dorsal surface linked at the upper end by a filament to the suberect anther, and a terminal stigma, but no rostellum. This is a reliable and stable character found in all the species, including those with a modified lip very similar to that in *Neottia*. For a detailed discussion, see Chen and Tsi (Acta Phytotax. Sin. 25: 329–339. 1987).

Two of us (Cribb and Gale) consider *Holopogon* to be congeneric with *Neottia*, and the taxa of the former with actinomorphic flowers to be peloric forms. Our understanding of the genetic control of organ development in orchids can be used to explain how zygomorphic flowers may become "regular" (i.e., actinomorphic) and how floral organs can take on different forms, as when the lip becomes petaloid or a staminode develops as an anther. For further discussion on the occurrence of actinomorphy in the Orchidaceae and other monocot groups with zygomorphic flowers, see Rudall and Bateman (New Phytol. 162: 25–44. 2004).

- 1a. Perianth actinomorphic, with 3 similar petals, without a modified lip ..... 1. *H. gaudissartii*  
 1b. Perianth zygomorphic; lip subobovate-cuneate or oblong-obovate, distinct from petals ..... 2. *H. smithianus*

**1. *Holopogon gaudissartii*** (Handel-Mazzetti) S. C. Chen, Acta Phytotax. Sin. 35: 179. 1997.

无喙兰 *wu hui lan*

*Neottia gaudissartii* Handel-Mazzetti, Oesterr. Bot. Z. 86: 302. 1937; *Archineottia gaudissartii* (Handel-Mazzetti) S. C. Chen.

Plants 19–24 cm tall. Rhizome short. Roots tufted, fleshy. Inflorescence reddish brown; peduncle with 3–5 sheaths; sheaths tubular, 1.8–3 cm, membranous, uppermost one bract-like; rachis 6.5–7.5 cm, 10–17-flowered, papillose-pubescent; floral bracts lanceolate, 4–8 mm, membranous, abaxially sparsely pubescent. Flowers erect, not resupinate, actinomorphic, purplish red; pedicel 8–10 mm, slender, papillose-pubescent; ovary ellipsoid, ca. 3.5 mm, papillose-pubescent. Sepals suberect, narrowly oblong, 2.5–3 × 0.7–0.9 mm, with a prominent midvein, outer surfaces slightly pubescent. Petals 3, without a modified lip, similar, narrowly oblong, 2.5–3 × 0.6–0.8 mm. Column erect, 2–2.5 mm including anther, with a conspicuous ridge on dorsal surface; filament relatively short; anther subovoid-oblong, 0.6–0.7 mm; pollinia subelliptic. Fl. Aug.

- Forests; 1300–1900 m. W Henan, Liaoning, C Shanxi.

**2. *Holopogon smithianus*** (Schlechter) S. C. Chen, Acta Phytotax. Sin. 35: 179. 1997.

叉唇无喙兰 *cha chun wu hui lan*

*Neottia smithiana* Schlechter, Repert. Spec. Nov. Regni Veg. 19: 375. 1924; *Archineottia smithiana* (Schlechter) S. C. Chen; *N. kungii* Tang & F. T. Wang.

Plants 10–29 cm tall, usually growing in clumps. Rhizome short; roots tufted, fleshy. Inflorescence reddish brown; peduncle with 3–5 sheaths; sheaths tubular, 1–4 cm, membranous; rachis 6–8 cm, 15–25-flowered, papillose-pubescent; floral bracts ovate or ovate-elliptic, 6–7 mm, abaxially sparsely papillose-pubescent. Flowers spreading, resupinate, zygomorphic, green; pedicel 3–5 mm, papillose-pubescent; ovary ellipsoid, 3–4 mm, papillose-pubescent. Sepals narrowly ovate-elliptic, 2.5–3 × 0.8–1.5 mm, with a prominent midvein, outer surfaces sometimes sparsely papillose-pubescent toward base; lateral sepals slightly oblique. Petals linear, 2.5–3 × ca. 0.5 mm, with a prominent midvein; lip distinct from petals, subobovate-cuneate or oblong-obovate, 6–8 × ca. 2.5 mm, base contracted, margin sparsely ciliate, apex 2-lobed; apical lobes subparallel, narrowly ovate, divided by a sinus ca. 1.5 × 1 mm; disk with a pair of inconspicuous longitudinal ridges near base. Column slightly curved forward, 2–3 mm; anther suberect; filament conspicuous, ca. as long as anther. Fl. Jul–Sep.

- Thickets, forests; 1500–3300 m. S Shaanxi, SW Sichuan.

### 63. NEOTTIA Guettard, Hist. Acad. Roy. Sci. Mém. Math. Phys. (Paris, 4°) 1750: 374. 1754, nom. cons.

鸟巢兰属 *niao chao lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

*Distomaea* Spenner; *Listera* R. Brown (1813, nom. cons.), not Adanson (1763); *Neottidium* Schlechtendal; *Nidus* Rivinus; *Polinirhiza* Dulac.

Herbs, small, terrestrial, autotrophic or holomycotrophic. Rhizome short, with many densely crowded, tufted, fibrous or fleshy, sometimes coralloid roots. Stem erect, with several sheathing bracts at base, green, buff, or reddish brown, with or without green leaves. Leaves (when present) 2 [very rarely 3 or 4 in *Neottia ovata* (Linnaeus) Bluff & Fingerhuth], opposite or subopposite, usually borne midway along stem, sessile or subsessile, green, sometimes with white venation, ovate, deltoid-ovate, ovate-cordate, or cordate, base shallowly cordate, truncate, or broadly cuneate. Inflorescence terminal, racemose and many flowered or rarely reduced to a solitary flower; peduncle glabrous or pubescent; floral bracts persistent, usually shorter than ovary, membranous. Flowers small, resupinate or very rarely not resupinate, membranous or fleshy, green, purple, yellowish brown, or reddish; pedicel slender; ovary ellipsoid. Sepals free, similar, spreading. Petals often narrower and shorter than sepals; lip usually much larger than sepals and petals, sometimes with a pair of auricles at base, without a spur but sometimes shallowly concave at base, apex deeply 2-lobed or emarginate, or rarely unlobed; disk sometimes with a glandular pubescent longitudinal strip or a shallow glossy depression. Column suberect, straight or slightly arcuate, long or short, without a foot; anther inserted at rear margin of clinandrium, erect or slightly nodding; filament extremely short and inconspicuous; pollinia 2, each ± longitudinally 2-parted, granular-farinaceous, without caudicles; stigma subterminal, concave or protruding; rostellum spreading horizontally or suberect, ligulate or ovate, large. Capsule small.

About 70 species: E and N Asia, Europe, and North America, with a few species extending into tropical Asia; 35 species (23 endemic) in China.

*Neottia temis* (Lindley) Szlachetko (Fragm. Florist. Geobot., Suppl. 3: 119. 1995; *Listera temis* Lindley, J. Proc. Linn. Soc., Bot. 1: 176. 1857) has been noted from Xizang (Press et al., Annot. Checkl. Fl. Pl. Nepal, 220. 2000). However, the present authors found no relevant specimens and therefore could not substantiate the occurrence of this species in China.

- 1a. Plants holomycotrophic, lacking green leaves.
- 2a. Lip entire; column (excluding anther and rostellum) less than 0.5 mm.
- 3a. Floral rachis glabrous; flowers resupinate ..... 7. *N. acuminata*
- 3b. Floral rachis villous; flowers not resupinate ..... 8. *N. taibaishanensis*
- 2b. Lip bilobed at apex; column (excluding anther and rostellum) 1.5–4 mm.
- 4a. Lip distinctly concave at base; apical lobes of lip diverging at an obtuse angle to one another.
- 5a. Apical lobes of lip 2.5–3 mm; sinus of lip without a short tooth between lobes ..... 5. *N. papilligera*
- 5b. Apical lobes of lip less than 1 mm; sinus of lip with a short tooth between lobes ..... 6. *N. brevilabris*
- 4b. Lip not concave at base; apical lobes of lip parallel or diverging at an acute angle to one another.
- 6a. Lip with a pair of triangular auricles at base ..... 4. *N. tenii*
- 6b. Lip without a pair of auricles at base.
- 7a. Lip obovate, 6–10 mm wide ..... 3. *N. megalochila*
- 7b. Lip narrowly obovate-oblong or cuneate, 1.5–4 mm wide.
- 8a. Lip narrowly obovate-oblong, 6–9 × 3–4 mm ..... 1. *N. listeroides*
- 8b. Lip cuneate, 10–12 × 1.5–2 mm ..... 2. *N. camtschatea*
- 1b. Plants autotrophic, with 2, rarely more, green leaves.
- 9a. Lip with a pair of auricles near base.
- 10a. Auricles strongly incurved, embracing column and overlapping one another above column ..... 35. *N. japonica*
- 10b. Auricles spreading outward, not embracing column.
- 11a. Lip with a pair of swollen suborbicular lamellae on disk ..... 34. *N. yunnanensis*
- 11b. Lip without lamellae.
- 12a. Lip apex 3-lobed ..... 27. *N. karoana*
- 12b. Lip apex 2-lobed.
- 13a. Apical lobes of lip diverging widely, ca. 5 mm ..... 28. *N. divaricata*
- 13b. Apical lobes of lip parallel, slightly incurved, strongly recurved, or diverging at an acute angle, 0.5–3 mm.
- 14a. Apical lobes of lip strongly recurved and meeting underneath lip ..... 29. *N. brevicaulis*
- 14b. Apical lobes of lip spreading forward or pendent, not recurved.
- 15a. Rachis 1.9–2.2 cm, 2- or 3-flowered ..... 30. *N. tianschanica*
- 15b. Rachis 3–13 cm, 6–19-flowered.
- 16a. Peduncle ca. 15 cm, ca. 3 × as long as rachis ..... 31. *N. fangii*
- 16b. Peduncle 6–10 cm, not more than 2 × as long as rachis.
- 17a. Leaves borne at ca. middle of plant; rachis 3–4 cm, 6–8-flowered; pedicel glabrous; basal auricles of lip ca. 1.7 mm ..... 32. *N. pseudonipponica*
- 17b. Leaves borne below middle of plant; rachis 8–13 cm, 10–19-flowered; pedicel pubescent; basal auricles of lip ca. 0.5 mm ..... 33. *N. nanchuanica*
- 9b. Lip without a pair of auricles at base.
- 18a. Plants 40–50 cm tall; leaves 5–7.5 cm ..... 12. *N. mucronata*
- 18b. Plants 4–33 cm tall; leaves 0.6–4 cm.
- 19a. Lip shallowly notched or emarginate at apex, sinus less than 1 mm deep.
- 20a. Rachis 11–13-flowered; lip 3.5–4.5 mm; column ca. 1.5 mm; leaves wider than long ..... 11. *N. taizanensis*
- 20b. Rachis 1–4-flowered; lip 8–10 mm; column 3–4 mm; leaves longer than wide.
- 21a. Leaves inserted above middle of plant, one distinctly larger than other; inflorescence 1- or 2-flowered; rachis sparsely pubescent or almost glabrous ..... 9. *N. biflora*
- 21b. Leaves inserted at ca. middle of plant, equal in size; inflorescence 2–5-flowered; rachis densely pubescent ..... 10. *N. morrisonicola*
- 19b. Lip distinctly 2-lobed at apex, sinus more than 1 mm deep.
- 22a. Lip with a distinct claw at base ..... 26. *N. oblata*
- 22b. Lip not clawed at base.
- 23a. Apical lobes of lip 5–7 mm.
- 24a. Apical lobes of lip linear, 0.5–0.6 mm wide, apices acuminate ..... 21. *N. kuanshanensis*
- 24b. Apical lobes of lip oblong-ovate, subovate, or lanceolate, 1–6 mm wide, apices obtuse-rounded or truncate.
- 25a. Lip with a nectary at base.
- 26a. Leaves 2.5–3.8 × 2.5–4 cm; apical lobes of lip minutely ciliate ..... 22. *N. chenii*
- 26b. Leaves 1–2 × 1.2–2.5 cm; apical lobes of lip not ciliate ..... 23. *N. formosana*
- 25b. Lip without a nectary at base.

- 27a. Lip 3–5(–7) mm wide, without lamellae ..... 24. *N. pinetorum*  
 27b. Lip 7–13 mm wide, with 2 longitudinal lamellae ..... 25. *N. wardii*
- 23b. Apical lobes of lip to 3 mm.  
 28a. Leaves less than 1 cm long and wide ..... 13. *N. microphylla*  
 28b. Leaves more than 1 cm long and wide.  
 29a. Pedicel and ovary distinctly pubescent.  
 30a. Lip ca. 1.7 mm wide; apical sinus without a tooth between lobes ..... 14. *N. puberula*  
 30b. Lip 2.5–3 mm wide; apical sinus with a tooth between lobes ..... 15. *N. smithii*  
 29b. Pedicel and ovary glabrous or occasionally sparsely pubescent.  
 31a. Column 4–5 mm ..... 16. *N. meifongensis*  
 31b. Column 1–3 mm.  
 32a. Stem longer than peduncle and rachis together, leaves borne above middle of plant; disk of lip glandular papillose-pubescent along lateral veins ..... 17. *N. longicaulis*  
 32b. Stem shorter or subequal in length to peduncle and rachis together, leaves borne at or below middle of plant; disk of lip not papillose-pubescent.  
 33a. Lip to 2 mm wide; apical lobes of lip divergent, narrowly linear, ca. 0.5 mm wide.  
 34a. Leaves ovate to deltoid, much longer than broad ..... 18. *N. suzukii*  
 34b. Leaves orbicular-ovate or reniform, ca. as long as broad ..... 19. *N. bambusetorum*  
 33b. Lip 3–7 mm wide; apical lobes of lip usually parallel, oblong-ovate or subovate, 1 mm or more wide.  
 35a. Lip purplish; disk without a longitudinal channel ..... 20. *N. nankomontana*  
 35b. Lip greenish yellow; disk with a longitudinal channel ..... 24. *N. pinetorum*

**1. *Neottia listeroides*** Lindley in Royle, Ill. Bot. Himal. Mts. 368. 1839.

高山鸟巢兰 gao shan niao chao lan

*Listera lindleyana* (Decaisne) King & Pantling; *Neottia dongrengoensis* Schlechter; *N. lindleyana* Decaisne; *Nidus listeroides* (Lindley) Kuntze.

Plants leafless, holomycotrophic, 15–35 cm tall. Rhizome with many fleshy roots. Peduncle green, 8–20 cm, slender to robust, pubescent, with 3–5 sheaths; sheaths tubular, 1.5–3 cm, membranous; rachis 6–15 cm, pubescent, subdensely 10- to more than 20-flowered; floral bracts suboblong-lanceolate, lower ones 12–15 mm, to ca. 4 mm above, abaxially pubescent, apex acuminate or acute. Flowers resupinate, pale green or green; pedicel 6–8 mm, slender, pubescent; ovary broadly ellipsoid-fusiform, 3–8 mm, densely pubescent; sepals and petals spreading. Sepals oblong-ovate, 4–5 × 1–1.8 mm, outer surfaces sparsely pubescent, with prominent midvein, apex obtuse; lateral sepals falcate. Petals sublinear to narrowly oblong, 3.8–4.5 × ca. 0.5 mm, glabrous, with prominent midvein; lip pendulous or spreading forward, narrowly obovate-oblong, 6–9 × 3–4 mm, narrowing to 1.5–2 mm wide at base, apex deeply 2-lobed; lobes subparallel to one another, subovate or ovate-lanceolate, 1.5–2.5 × 0.8–1.2 mm, margins minutely ciliate, apices acute or obtuse; sinus with a short tooth between lobes. Column slightly arcuate, 2.5–3 mm; anther inclined toward rostellum, ovoid-ligulate, ca. 0.7 mm; stigma concave, suborbicular; rostellum spreading horizontally, broadly ovate-ligulate, nearly as long as anther. Fl. Jul–Sep.  $2n = 40, 46$ .

Forests, grassy slopes; (1500–)2500–3900 m. C Gansu, N Shanxi, W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan].

**2. *Neottia camtschatea*** (Linnaeus) H. G. Reichenbach in Reichenbach, Icon. Fl. Germ. Helv. 13/14: 146. 1850–1851.

北方鸟巢兰 bei fang niao chao lan

*Ophrys camtschatea* Linnaeus, Sp. Pl. 2: 948. 1753; *Epipactis kamtschatica* (Georgi) Lindley; *O. kamtschatica* Georgi; *Neottia kamtschatica* (Georgi) Sprengel; *Serapias camtschatea* (Linnaeus) Steudel.

Plants leafless, holomycotrophic, 10–27 cm tall. Rhizome with many long, fleshy roots. Peduncle 7–15 cm, slender to robust, pubescent, with 2–4 sheaths; sheaths tubular, 1–3 cm, membranous; rachis 4–15 cm, pubescent, laxly to subdensely 12–25-flowered; floral bracts narrowly ovate-oblong, lowest ones 5–8 mm, to ca. 4 mm above, membranous, abaxially hairy, apex acute. Flowers resupinate, pale green to greenish white; pedicel 3.5–5.5 mm, slender, sparsely pubescent; ovary fusiform, 2–3 mm, pubescent; sepals and petals spreading. Sepals ligulate-oblong, 5–6 × ca. 1.5 mm, outer surfaces sparsely pubescent, with prominent midvein, apex obtuse; lateral sepals falcate. Petals linear, 3.5–4.5 × ca. 0.5 mm, glabrous, with prominent midvein; lip spreading forward to suberect, cuneate, 10–12 × 1.5–2 mm, base extremely narrow, apex deeply 2-lobed; lobes diverging at an acute angle to one another, narrowly lanceolate or lanceolate, 3.5–5 × ca. 1 mm, margins minutely ciliate, apices acute. Column arcuate, ca. 3 mm; anther inclined toward rostellum, ca. 0.7 mm; stigma concave, sub-

orbicular; rostellum spreading horizontally or slightly down-curved, ovate-oblong or broadly oblong, large, ca. 0.7 mm. Capsule elliptic, 8–9 × 5–6 mm. Fl. Jul–Aug.  $2n = 40$ .

Forests, forest margins, humid places; 2000–2400 m. Gansu, NW Hebei, C and W Nei Mongol, NE Qinghai, N Shaanxi, C and N Xinjiang [Kazakhstan, Russia (Far East, Siberia)].

**3. *Neottia megalochila*** S. C. Chen, Acta Phytotax. Sin. 17(2): 17. 1979.

大花鸟巢兰 da hua niao chao lan

*Neottia grandiflora* Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 104. 1912, not Hooker (1830), nor (A. Richard) Kuntze (1891); *N. schlechteriana* Szlachetko, nom. illeg. superfl.

Plants leafless, holomycotrophic, 20–35 cm tall. Rhizome with many fleshy roots. Peduncle robust, 10–15 cm, glabrous or very sparsely pubescent above, with 3–5 sheaths; sheaths tubular, 2–5 cm, membranous; rachis 6–18 cm, glabrous or sometimes sparsely pubescent, subdensely to densely more than 30-flowered; floral bracts oblong-obovate, 5–7 × ca. 4 mm, lowest (2–)3–10 mm, shorter above, outer surfaces slightly pubescent at base. Flowers relatively large, resupinate, yellowish green or pale green, lip flushed white at margins; pedicel ca. 5 mm, almost glabrous; ovary obovoid, ca. 5 mm, sparsely pubescent; sepals and petals spreading. Dorsal sepal subovate or narrowly elliptic, ca. 5 × 2–3 mm, 1-veined, outer surfaces almost glabrous; lateral sepals falcate, similar to dorsal sepal, but somewhat wider. Petals linear to linear-ligulate, slightly oblique, ca. 4.5 × 1 mm, dilated toward apex, glabrous, 1-veined; lip obovate, 8.5–15 × 6–10 mm, narrowing to ca. 4 mm wide at base, apex deeply 2-lobed; lobes diverging at an acute angle to one another, broadly oblong to subsquare, 2–2.5 × 2–3.5 mm, margins minutely ciliate, apices truncate-rounded and slightly undulate or crenulate; disk with minute papillae. Column slightly arcuate, ca. 4 mm; anther inclined toward rostellum, ca. 0.7 mm; stigma concave, suborbicular, with slightly exerted margins; rostellum subsquare or broadly oblong-ovate, large, ca. 0.7 mm. Fl. Jul–Aug.

● *Pinus* forests, shaded grassy slopes; 3000–3800 m. W Sichuan, NW Yunnan.

**4. *Neottia tenii*** Schlechter, Repert. Spec. Nov. Regni Veg. 19: 376. 1924.

耳唇鸟巢兰 er chun niao chao lan

Plants leafless, holomycotrophic, ca. 25 cm tall. Peduncle sparsely pubescent above, with several sheaths; rachis pubescent, subaxially ca. 20-flowered; floral bracts lanceolate, 5–6 mm, glabrous or nearly so, apex acuminate. Flowers resupinate; pedicel and ovary 7–8 mm, sparsely pubescent. Sepals lanceolate, 3–4 mm, 1-veined, apex subacute; lateral sepals oblique, slightly falcate. Petals linear-ligulate, slightly shorter than sepals, 1-veined, apex obtuse; lip spreading forward, narrowly oblong, 7–8 × ca. 3.5 mm, with a pair of auricles at base, apex 2-lobed; lobes subparallel to one another, lanceolate, oblique, 1–1.5 mm, margins minutely ciliate, apices acute and slightly incurved; auricles triangular, projecting backward, very small,

slightly thickened at base; disk with 3–5 slightly thickened veins. Column slightly arcuate, ca. 2.5 mm; anther inclined toward rostellum, elliptic, ca. 0.6 mm; stigma concave, suborbicular, with slightly exerted margins; rostellum broadly ovate, rather large, slightly shorter than anther. Fl. unknown.

● N Yunnan.

The present authors have seen no specimens of this species. According to the original description, this species is similar to *Neottia listeroides*, differing only in the presence of a pair of auricles at the base of the lip.

**5. *Neottia papilligera*** Schlechter, Repert. Spec. Nov. Regni Veg. 16: 356. 1920.

凹唇鸟巢兰 ao chun niao chao lan

*Neottia nidus-avis* (Linnaeus) Richard var. *manshurica* Komarov; *N. papilligera* f. *glaberrima* Kitagawa.

Plants leafless, holomycotrophic, 27–34 cm tall. Rhizome with many stout, fleshy roots. Peduncle to ca. 25 cm, pubescent, with several sheaths; sheaths tubular, to 4.5 cm, membranous; rachis 10–15 cm, glabrous or pubescent, densely many flowered, though usually with 1–3 more widely spaced flowers at base; floral bracts subulate, 5–6 mm. Flowers resupinate, beige to flesh-colored; pedicel ca. 5 mm, usually glabrous; ovary fusiform, 4–5 mm, glabrous or pubescent. Sepals obovate-spatulate, ca. 3.5 × 1.8 mm, 1-veined, apex obtuse or subtruncate. Petals suboblong, ca. 3.5 × 1.5 mm, 1-veined, apex obtuse; lip subobovate, 5–5.5 mm, distinctly concave at base, apex deeply 2-lobed; lobes diverging at an obtuse (120°–170°) angle to one another, narrowly oblong, usually twisted, 2.5–3 × ca. 1.2 mm, apex obtuse or truncate. Column erect, slightly arcuate, 2–2.5 mm; anther suboblong, ca. 1.2 mm; stigma ligulate, ca. 1 mm, apex shallowly 2-lobed; rostellum slightly downcurved, suboblong, large, ca. 1.2 mm. Capsule ovoid-ellipsoid, 7–8 × 4–5 mm. Fl. Jul–Aug.  $2n = 36, 38$ .

Forests. C Heilongjiang, S Jilin [Japan, Korea, Russia (Far East, Siberia)].

**6. *Neottia brevibris*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 65. 1951.

短唇鸟巢兰 duan chun niao chao lan

Plants leafless, holomycotrophic, ca. 38 cm tall. Peduncle somewhat robust, ca. 4 mm in diam., pubescent above, with 6 sheaths; sheaths tubular, to 4 cm, membranous; rachis ca. 4 cm, pubescent, densely more than 10-flowered; floral bracts linear-lanceolate, to 10 mm, glabrous, 1-veined, apex obtuse. Flowers 4–6 mm in diam., resupinate; pedicel and ovary ca. 7.5 mm, pubescent. Dorsal sepal subelliptic, ca. 3 × 1.8 mm, glabrous, 1-veined, apex obtuse; lateral sepals elliptic, slightly oblique, ca. 3 × 1.6 mm, glabrous, 1-veined, apex obtuse. Petals narrowly elliptic, oblique, ca. 2.8 × 1 mm, 1-veined, apex obtuse; lip suboblong-obovate, 4–4.5 × ca. 2.2 mm, shallowly concave at base, apex shallowly 2-lobed; lobes diverging widely, suborbicular or broadly ovate, oblique, ca. 0.8 mm, apices obtuse; sinus with a short tooth between lobes. Column erect, ca. 1.5 mm; anther erect, ovoid, 0.5–0.7 mm; stigma 2-lobed. Capsule oblong, 9–10 × 4–5 mm. Fl. Jun.

- About 1800 m. Chongqing.

**7. *Neottia acuminata*** Schlechter, Acta Horti Gothob. 1: 141. 1924.

尖唇鸟巢兰 jian chun niao chao lan

*Aphyllorchis parviflora* King & Pantling; *Neottia asiatica* Ohwi; *N. micrantha* Lindley (1840), not Llave & Lex (1825), nor G. Don (1839); *N. oblonga* Tang & F. T. Wang; *N. parviflora* (King & Pantling) Schlechter (1924), not Smith (1813); *N. subsessilis* Ohwi.

Plants leafless, holomycotrophic, 14–30 cm tall. Rhizome with many fleshy roots. Peduncle 10–25 cm, glabrous, with 3–5 sheaths; sheaths tubular, 1–5 cm, membranous; rachis 4–8 cm, glabrous, densely more than 20-flowered, flowers usually in clusters of 3 or 4; floral bracts oblong-ovate, 3–4 mm, glabrous, apex obtuse. Flowers small, resupinate, yellowish brown; pedicel 3–4 mm, glabrous; ovary elliptic, 2.5–3 mm, glabrous. Dorsal sepal narrowly lanceolate, 3–5 × ca. 0.8 mm, glabrous, 1-veined, apex long acuminate; lateral sepals similar to dorsal sepal, ca. 1 mm wide. Petals narrowly lanceolate, 2–3.5 × ca. 0.5 mm; lip variable in shape, usually ovate, ovate-lanceolate, or lanceolate, 2–3.5 × 1–2 mm, margin slightly incurved, 1- or 3-veined, apex acuminate or obtuse, unlobed. Column extremely short, usually less than 0.5 mm, shorter than rostellum and anther; anther erect, subelliptic, ca. 1 mm; stigma erect, transversely oblong, incurved on both sides, embracing rostellum; rostellum erect, ligulate, to ca. 1 mm. Capsule ellipsoid, ca. 6 × 3–4 mm. Fl. Jun–Aug.  $2n = 36$ .

Forests, shaded grassy slopes; 1500–4100 m. Gansu, Hebei, Hubei, S. Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, N. Yunnan (Dayao) [India (Sikkim), Japan, Korea, Nepal, Russia (Far East)].

**8. *Neottia taibaishanensis*** P. H. Yang & K. Y. Lang, Acta Phytotax. Sin. 44: 86. 2006.

太白山鸟巢兰 tai bai shan niao chao lan

Plants leafless, holomycotrophic, 12–40 cm tall. Rhizome with many fleshy roots. Peduncle glabrous, with 3 or 4 sheaths; sheaths tubular, membranous; rachis 4–12 cm, villous, densely 20–40-flowered, flowers usually in clusters of 3 or 4; floral bracts oblong, 2.5–3.5 mm, apex mucronate. Flowers small, not resupinate, gray-black, lip with a gray-white margin; pedicel 3–4 mm, glabrous; ovary obovate, ca. 3 mm, subglabrous. Dorsal sepal linear-lanceolate, ca. 5 × 0.5–0.6 mm, glabrous, 1-veined, apex acuminate; lateral sepals similar to but slightly wider than dorsal sepal, oblique. Petals narrowly lanceolate, ca. 3 × 0.5 mm, glabrous, apex acuminate; lip obovate to suborbicular, ca. 3 × 2–2.2 mm, 3-, 4-, or rarely 5-veined, apex mucronate, unlobed. Column very short, less than 0.5 mm, shorter than rostellum and anther; anther erect.

• Mixed *Abies fargesii* and *Betula utilis* forests; ca. 2900 m. Shaanxi.

**9. *Neottia biflora*** (Schlechter) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 117. 1995.

二花对叶兰 er hua dui ye lan

*Listera biflora* Schlechter, Acta Horti Gothob. 1: 143. 1924.

Plants autotrophic, 10–13 cm tall. Rhizome with a few elongate, filiform roots. Stem cylindric, slender, with 1 sheath toward base. Leaves 2, opposite, borne above middle of plant, subsessile, unequal in size (one distinctly larger than other), larger one broadly ovate, 1.2–1.8 × 0.8–1.4 cm, smaller one narrowly ovate, 1–1.5 × 5–7 mm, both with bases rounded and apices acute. Peduncle 2–2.5 cm, pubescent, lacking sterile bracts; rachis very short, sparsely pubescent or almost glabrous, 1- or 2-flowered; floral bracts ovate-lanceolate, 3–5 × ca. 0.8 mm, shorter than pedicel, apex acute. Flowers resupinate, green; pedicel 4–6 mm, nearly glabrous; ovary 4–5 mm, glabrous; sepals and petals not spreading widely. Dorsal sepal ovate-elliptic, 6–7 × 1.2–1.8 mm, outer surface carinate, apex obtuse; lateral sepals linear-lanceolate, ca. 7 × 1 mm, outer surface carinate, apex acute. Petals linear, ca. 6.5 × 1 mm, apex obtuse or acute; lip spreading forward, cuneate, 8–10 × 4–5.5 mm, apex truncate-rounded and shallowly notched, usually with a minute tooth in notch; disk with a groove at base, midvein slightly thickened. Column slightly arcuate, 3–4 mm; anther inclined toward rostellum; rostellum large, but shorter than anther. Fl. Jul.

• Forests; 3000–3900 m. NW Sichuan (Songpan).

**10. *Neottia morrisonicola*** (Hayata) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 118. 1995.

浅裂对叶兰 qian lie dui ye lan

*Listera morrisonicola* Hayata, Icon. Pl. Formosan. 2: 140. 1912; *L. taiwaniana* S. S. Ying; *Neottia taiwaniana* (S. S. Ying) Szlachetko; *Ophrys morrisonicola* (Hayata) Makino.

Plants autotrophic, 4–20 cm tall. Rhizome with a few elongate, filiform roots. Stem cylindric, slender. Leaves 2, opposite, borne at ca. middle of plant, sessile, ovate or ovate-orbicular, 1.5–2 × 1.2–1.8 cm, base rounded, apex acute. Peduncle 2–5 cm, pubescent; rachis 2–6 cm, pubescent, subdensely 2–5-flowered; floral bracts ovate-lanceolate, 6–7 × ca. 3 mm, with 3 inconspicuous veins, apex obtuse. Flowers resupinate, light green, with lip tinged yellowish green at margins, 15–20 mm in diam.; pedicel 4–5 mm; ovary ca. 3.5 mm. Sepals not spreading widely, similar, ovate-lanceolate, 7–8 × 2–2.5 mm, 1-veined, apex acute. Petals linear-lanceolate, 6–7 × 1–1.5 mm, 1-veined, apex acute; lip pendulous or spreading forward, broadly cuneate, 9.5–10 × 5–6.5 mm, with 3 inconspicuous veins, base concave and slightly channeled, margin recurved, apex truncate and shallowly notched or emarginate. Column ca. 3 mm; anther erect, narrow, ca. 1 mm. Capsule obovoid, ca. 8 × 4 mm, with 3 conspicuous ridges. Fl. Jun–Jul.

• Coniferous forests, shaded and damp meadows; 2500–3800 m. Taiwan.

**11. *Neottia taizanensis*** (Fukuyama) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 119. 1995.

小花对叶兰 xiao hua dui ye lan

*Listera taizanensis* Fukuyama, Bot. Mag. (Tokyo) 48: 431. 1934.

Plants autotrophic, 11–16 cm tall. Rhizome with a few filiform roots. Stem slender, usually with 1 sheath toward base. Leaves 2, opposite, borne at ca. middle of plant, subsessile, deltoid or ovate-suborbicular, ca.  $2 \times 2.5$  cm, base cuneate or triangular-cuneate, apex acute. Peduncle 2–4 cm, pubescent, with 1–4 sterile bracts; rachis 2.5–5 cm, subdensely 11–13-flowered; floral bracts ovate-lanceolate, ca.  $3 \times 1-1.5$  mm, 1-veined, apex acute. Flowers small, resupinate; pedicel and ovary erect, 6–9 mm, glabrous. Dorsal sepal narrowly ovate, ca.  $2 \times 0.7$  mm, glabrous, 1-veined, apex acute or subacute; lateral sepals oblong, falcate, ca.  $2.5 \times 1$  mm, glabrous, apex subacute. Petals linear or spatulate-linear, ca.  $2.3 \times 0.3$  mm, glabrous, 1-veined, apex subacute; lip erect, spatulate,  $3.5-4.5 \times$  ca. 1.3 mm, base cuneate and narrowing to ca. 0.5 mm wide, 3-veined, apex emarginate. Column ca. 1.5 mm. Fl. Jul.

• Forests; ca. 1800 m. N Taiwan.

**12. *Neottia mucronata*** (Panigrahi & J. J. Wood) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 118. 1995.

短柱对叶兰 duan zhu dui ye lan

*Listera mucronata* Panigrahi & J. J. Wood, *Kew Bull.* 29: 731. 1975.

Plants autotrophic, 40–50 cm tall. Rhizome with many elongate, filiform roots. Stem 15–22 cm, somewhat stout, with 1 or 2 sheaths toward base. Leaves 2, opposite, borne at ca. middle of plant, sessile, broadly ovate to subcordate, 5–7.5  $\times$  4.4–7.9 cm, base broadly cuneate or subcordate, apex acute. Peduncle 6–15 cm, pubescent, with 2 or 3 sterile bracts 3–5 mm; rachis 15–17.5 cm, laxly 12–17-flowered; floral bracts ovate-lanceolate, 3–5 mm, 1-veined, apex acuminate. Flowers resupinate, green; pedicel 4.5–7 mm, pubescent; ovary fusiform, 3.5–5 mm, pubescent; sepals and petals spreading widely. Dorsal sepal elliptic or ovate-elliptic, 4–5  $\times$  ca. 1.2 mm, 1-veined, apex obtuse; lateral sepals ovate, oblique, ca. 5  $\times$  1.5 mm, apex obtuse. Petals linear or spatulate-linear, ca. 5  $\times$  0.6 mm, apex obtuse-rounded; lip pendulous or spreading forward, subobovate-cuneate, 8–10  $\times$  6–7 mm, narrowing to ca. 2 mm wide at base, apex deeply 2-lobed; lobes divergent, suboblong, 3.5–4  $\times$  2–3 mm, margins minutely papillose-ciliate; sinus with small tooth between lobes; disk with a distinct thickened central ridge extending from base of lip and continuous with tooth in sinus. Column 1–1.5 mm; anther inclined toward rostellum; rostellum large. Fl. Jul–Aug.

Shaded places in forests; ca. 2400 m. SW Sichuan, Yunnan [Bhutan, India, Japan, Nepal].

**13. *Neottia microphylla*** (S. C. Chen & Y. B. Luo) S. C. Chen, S. W. Gale & P. J. Cribb, **comb. nov.**

小叶对叶兰 xiao ye dui ye lan

Basionym: *Listera microphylla* S. C. Chen & Y. B. Luo, *Novon* 12: 438. 2002.

Plants autotrophic, 5–11 cm tall. Rhizome with a very few elongate, filiform roots. Stem 0.6–2 cm, slender. Leaves 2, opposite, borne below middle of plant, sessile, orbicular-ovate, 0.6–0.8  $\times$  0.7–0.9 cm, minutely glandular hairy on both surfaces, base broadly truncate, apex obtuse-acute. Peduncle 2.6–6

cm, glabrous, sometimes with 1 sterile bract; rachis 1.6–3 cm, sparsely pubescent, laxly 3- or 4-flowered; floral bracts subovate or ovate-lanceolate, 3–4  $\times$  ca. 2 mm, apex acute. Flowers resupinate, greenish white; pedicel arcuate, 1.5–2 mm, slender, glabrous; ovary ca. as long as pedicel, glabrous; sepals and petals not spreading. Dorsal sepal oblong-ovate, ca.  $3.5 \times 1.5$  mm, 1-veined, apex obtuse; lateral sepals lanceolate-ovate, slightly oblique, similar in size to dorsal sepal, outer surface carinate. Petals oblong-ovate, slightly shorter and narrower than dorsal sepal; lip spreading forward, obovate-cuneate, 5–5.5  $\times$  ca. 3.5 mm, apex deeply 2-lobed; lobes broadly oblong, ca. 1.4  $\times$  1.6 mm, 3-veined, apices obtuse; sinus with small tooth between lobes; disk with an indistinct ridge extending from base of lip and continuous with tooth in sinus. Column suberect, 1.5–2 mm; anther ca. 1 mm. Capsule erect, ellipsoid, ca.  $3 \times 2$  mm. Fl. Oct.  $2n = 40 + 0-2B^*$ .

• Grassy slopes; ca. 2500 m. NW Yunnan.

**14. *Neottia puberula*** (Maximowicz) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 118. 1995.

对叶兰 dui ye lan

Plants autotrophic, 8–20 cm tall. Rhizome with very few elongate, filiform roots. Stem cylindrical, slender, usually with 1 or 2 membranous sheaths toward base. Leaves 2, opposite, borne at ca. middle of plant, subsessile, cordate, broadly ovate, or broadly ovate-triangular, 1.5–2.5  $\times$  1.5–2.2 cm, base broadly cuneate or subcordate, margin slightly crisped, apex acute or obtuse. Peduncle 2–7 cm, pubescent; rachis 2.5–7 cm, pubescent, laxly 4–7-flowered; floral bracts lanceolate, 1.5–3.5 mm, glabrous, apex acute. Flowers very small, resupinate, green; pedicel 3–4 mm, pubescent; ovary ca. 6 mm, pubescent; sepals and petals not spreading widely. Dorsal sepal ovate-lanceolate, 1.8–2.4  $\times$  0.8–1 mm, 1-veined, apex subacute; lateral sepals ovate-lanceolate, oblique, 1.5–2.2  $\times$  ca. 0.6 mm, apex acute. Petals linear, 1.2–2.2  $\times$  ca. 0.5 mm, 1-veined, apex acute; lip narrowly obovate-cuneate or oblong-cuneate, 6–8  $\times$  ca. 1.7 mm, margin slightly papillate-ciliate, apex deeply 2-lobed; lobes divergent or nearly parallel, oblong, 1.8–2.5  $\times$  0.8–1 mm; disk with a thickened midvein. Column slightly arcuate, 1.5–2.5 mm; anther inclined toward rostellum; rostellum broadly ovate, large, but shorter than anther. Capsule obovoid, ca. 6  $\times$  3.5 mm. Fl. Jul–Sep, fr. Sep–Oct.

Damp places in dense forests, deep shade of coniferous forests; 1400–2600 m. Chongqing, C and S Gansu, Guizhou, NW Hebei, Heilongjiang, S Jilin, Liaoning, Nei Mongol, Qinghai, N Shanxi, N and NW Sichuan [Japan, Korea, Russia (Far East)].

- 1a. Leaves uniformly green ..... 14a. var. *puberula*  
 1b. Leaves green with grayish white  
 venation ..... 14b. var. *maculata*

**14a. *Neottia puberula* var. *puberula***

对叶兰(原变种) dui ye lan (yuan bian zhong)

*Listera puberula* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg* 29: 204. 1884; *L. bungeana* Yabe; *L. major* Nakai; *L. savatieri* Maximowicz ex Komarov; *L. yatabei* Makino.

Leaves uniformly green. Apical lobes of lip straight.

Damp places in dense forests; 1400–2600 m. C Gansu, Guizhou, NW Hebei, Heilongjiang, S Jilin, Liaoning, Nei Mongol, Qinghai, N Shanxi, NW Sichuan [Japan, Korea, Russia (Far East)].

**14b. *Neottia puberula* var. *maculata*** (Tang & F. T. Wang) S. C. Chen, S. W. Gale & P. J. Cribb, **comb. nov.**

花叶对叶兰 *hua ye dui ye lan*

Basionym: *Listera savatieri* Maximowicz ex Komarov var. *maculata* Tang & F. T. Wang, Acta Phytotax. Sin. 1: 65. 1951; *L. maculata* (Tang & F. T. Wang) K. Y. Lang; *L. puberula* var. *maculata* (Tang & F. T. Wang) S. C. Chen & Y. B. Luo.

Leaves green, white, or grayish white along midvein and longitudinal lateral veins. Apical lobes of lip slightly incurved toward apex.

• Deep shade of coniferous forests; 2000–2200 m. Chongqing, S Gansu, N Sichuan.

**15. *Neottia smithii*** (Schlechter) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 118. 1995.

川西对叶兰 *chuan xi dui ye lan*

*Listera smithii* Schlechter, Acta Horti Gothob. 1: 144. 1924.

Plants autotrophic, 9–12 cm tall. Rhizome with several elongate, filiform roots. Stem slender, with 2 sheaths toward base. Leaves 2, opposite, borne above middle of plant, sessile, green, ovate or ovate-orbicular, 1.3–1.7 × 1.2–1.6 cm, base rounded or broadly cuneate, apex obtuse or subacute. Peduncle pubescent; rachis 1.5–4 cm, pubescent, laxly 2–5-flowered; floral bracts ovate-lanceolate, ca. 4 mm. Flowers small, resupinate, green with paler sepals and petals and a whitish margin to lip; pedicel ca. 3 mm, pubescent; ovary ca. 2 mm, sparsely pubescent. Dorsal sepal narrowly elliptic, ca. 3 × 1.2 mm, 1-veined, apex obtuse; lateral sepals ovate-lanceolate, falcate, ca. 3 × 1.5 mm. Petals linear-ligulate, oblique, ca. 2.8 × 0.4 mm, apex obtuse; lip spreading forward, obovate, ca. 8 × 2.5–3 mm, margin minutely papillose-ciliate, apex deeply 2-lobed; lobes almost parallel, linear-lanceolate, oblique, ca. 2.7 mm; sinus with a triangular tooth between lobes; anther inclined toward rostellum; rostellum broadly ovate, large. Fl. Jul.

• Forests; ca. 3900 m. NW Sichuan.

**16. *Neottia meifongensis*** (H. J. Su & C. Y. Hu) T. C. Hsu & S. W. Chung, Taiwaniana 54: 83. 2009.

梅峰对叶兰 *mei feng dui ye lan*

*Listera meifongensis* H. J. Su & C. Y. Hu, Taiwaniana 45: 240. 2000.

Plants autotrophic, 12–25 cm tall. Rhizome with a few clustered, filiform roots. Stem slender, ridged. Leaves 2, opposite, borne at or above middle of plant, sessile, broadly ovate to ovate-deltoid, 1.5–2.5 × 1.8–3.2 cm, base truncate-subcordate, apex acute. Peduncle 3–6 cm, pubescent, with 1–3 ovate-lanceolate sterile bracts 3–5 mm; rachis 3–6 cm, pubescent, laxly 2–7-flowered; floral bracts ovate-lanceolate, 3–4.5 × ca. 2 mm,

apex acute. Flowers resupinate, light green, lip tinged pale yellowish green along margin; pedicel and ovary arcuate, 6–8 mm, glabrous or sometimes sparsely pubescent at base; sepals and petals spreading. Dorsal sepal lanceolate, 3–4.5 × ca. 1.3 mm, apex acute; lateral sepals lanceolate, falcate, 3.5–5.5 × 1.5–2 mm, apex acute. Petals linear-lanceolate, 3–5 × 0.7–1 mm, apex acuminate; lip spreading forward, cuneate-rectangular or broadly oblong, 6–10 × 3–7.5 mm, apex obtuse-rounded and shallowly 2-lobed; lobes ovate-oblong, 1.5–2 × 1.5–2.5 mm; disk with a longitudinal groove at base that extends into a thickened keel running almost to apical sinus, margins ciliate. Column distinctly arcuate above middle, 4–5 mm; anther inclined toward rostellum, ca. 1 mm; rostellum large, ca. 0.8 mm. Fl. Jun–Jul.

• *Abies* and *Tsuga* forests; 2200–3300 m. C Taiwan.

**17. *Neottia longicaulis*** (King & Pantling) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 117. 1995.

毛脉对叶兰 *mao mai dui ye lan*

*Listera longicaulis* King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 126. 1896.

Plants autotrophic, 12–15 cm tall. Rhizome with a few filiform roots. Stem 8–10 cm, slender, with 1 sheath at base. Leaves 2, opposite, borne above middle of plant, subsessile, broadly ovate-cordate, ca. 2.5 × 3 cm, base shallowly cordate, apex acute or obtuse. Peduncle ca. 1.5 cm, pubescent, with 1 sterile bract 4–6 mm; rachis 3–4 cm, pubescent, laxly to subdensely 5- or 6-flowered; floral bracts ovate-lanceolate, ca. 3 mm, apex acuminate. Flowers resupinate, yellowish green; pedicel 4–5 mm, almost glabrous; ovary 2–3 mm, glabrous. Dorsal sepal oblong-ovate, ca. 4 × 1.7 mm, 1-veined, apex obtuse; lateral sepals lanceolate, falcate, ca. 4.5 × 1.5 mm, slightly thickened, apex obtuse. Petals linear-lanceolate, ca. 3.5 × 1 mm, 1-veined, apex obtuse; lip suboblong or obovate-oblong, ca. 12 × 7 mm, margin ciliate, apex deeply 2-lobed; lobes nearly parallel or slightly divergent, broadly ovate, ca. 3 mm, apices obtuse; disk glandular papillose-pubescent along lateral veins, midvein thickened. Column arcuate above middle, ca. 2.7 mm; anther inclined toward rostellum; rostellum large. Fl. Jul.  $2n = 46$ .

*Pinus wallichiana* forests; ca. 2800 m. S Xizang [Bhutan, NE India].

P. Ormerod (pers. comm.) notes that a comparison of type material of this species and *Listera yueana* (here treated as a synonym of *Neottia pinetorum*) led him to find them conspecific, and he believes what is called *N. longicaulis* here and *L. longicaulis* in FRPS is in fact a different species (see Ormerod, Taiwaniana 48: 91. 2003).

**18. *Neottia suzukii*** (Masamune) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 119. 1995.

无毛对叶兰 *wu mao dui ye lan*

*Listera suzukii* Masamune, Trop. Hort. 3: 42. 1933; *L. deltoidea* Fukuyama; *L. uraiensis* S. S. Ying; *Neottia deltoidea* (Fukuyama) Szlachetko; *N. uraiensis* (S. S. Ying) Szlachetko.

Plants autotrophic, 8–30 cm tall. Rhizome with very few elongate, filiform roots. Stem ridged, 3.5–12 cm, with a sheath

near base. Leaves 2, opposite, borne at or below middle of plant, sessile, ovate to deltoid, 2–4 × 1–3 cm, base truncate-rounded, apex acute. Peduncle green or purple, 2.5–10 cm, pubescent; rachis 2.5–9 cm, glabrous, laxly 10- to more than 20-flowered; floral bracts ovate-triangular, 1–2 × 1–1.5 mm, apex acute. Flowers resupinate, pale greenish brown; pedicel and ovary 5–6 mm, glabrous; sepals and petals not spreading. Dorsal sepal ovate, ca. 2.5 × 1.5 mm, 1-veined, apex acute; lateral sepals rhombic to broadly ovate, oblique, ca. 2.5 × 2 mm, apex acute. Petals oblong-ovate, falcate, ca. 2 × 0.8 mm, 1-veined, apex acute; lip narrowly cuneate or obovate-cuneate, 4–8 × 1.5–2 mm, apex deeply 2-lobed; lobes divergent, narrowly linear, 2.5–4 × ca. 0.5 mm, apices acuminate; sinus with a short tooth between lobes; disk with a thickened midvein. Column ca. 1 mm; rostellum spreading forward, ovate, very large. Fl. Jan–Apr.

- Forests; 800–2200 m. NE and S Taiwan.

**19. *Neottia bambusetorum*** (Handel-Mazzetti) Szlachetko, *Fragm. Florist. Geobot., Suppl.* 3: 117. 1995.

高山对叶兰 *gao shan dui ye lan*

*Listera bambusetorum* Handel-Mazzetti, *Symb. Sin.* 7: 1338. 1936.

Plants autotrophic, 10–18 cm tall. Rhizome with a few filiform roots. Stem 1.5–5 cm, with 1 or 2 sheaths toward base. Leaves 2, opposite, borne below middle of plant, orbicular-ovate or reniform, 1.8–2.6 × 1.8–2.8 cm, base obtuse-rounded, apex rounded or subacute. Peduncle pubescent; rachis 5–9 cm, pubescent, laxly 8–20-flowered; floral bracts ovate or broadly ovate, 3–4 mm, apex acute or obtuse. Flowers resupinate, green; pedicel ca. 3 mm, almost glabrous; ovary 1–1.5 mm, glabrous. Sepals elliptic or ovate, ca. 3 × 1 mm, 1-veined, apex obtuse; lateral sepals oblique. Petals linear, ca. 3 × 0.5 mm, apex obtuse; lip subcuneate, ca. 6 × 1.5–2 mm, base attenuate, apex deeply 2-lobed; lobes divergent, narrowly linear, 2–2.5 × ca. 0.5 mm, margins minutely papillose-ciliate, apices obtuse; sinus with a short tooth between lobes. Column slightly arcuate, ca. 2 mm. Fl. Jul.

- Bamboo forests; 3200–3400 m. W Yunnan.

**20. *Neottia nankomontana*** (Fukuyama) Szlachetko, *Fragm. Florist. Geobot., Suppl.* 3: 118. 1995.

台湾对叶兰 *tai wan dui ye lan*

*Listera nankomontana* Fukuyama, *Bot. Mag. (Tokyo)* 49: 291. 1935.

Plants autotrophic, 12–20 cm tall. Stem cylindrical, 4–7 cm, slender. Leaves 2, opposite, borne at ca. or below middle of plant, sessile, broadly ovate, 1.8–2 × 1.5–2.5 cm, base truncate, apex acute. Peduncle 3–6 cm, pubescent, with 3 sterile bracts; rachis 5–8 cm, pubescent, laxly 5–8-flowered; floral bracts lanceolate, ca. 3 mm, apex acute. Flowers resupinate, greenish, lip purplish; pedicel and ovary 7–9 mm, glabrous. Sepals spreading to slightly reflexed, membranous, 1-veined; dorsal sepal ligulate, 2.5–3.5 × 1–1.3 mm, apex obtuse; lateral sepals ligulate, falcate, 3–5 × 1.3–2 mm. Petals spreading, linear, 2.5–3.5 × ca. 0.6 mm, slightly dilated at base, 1-veined, apex obtuse; lip

spreading forward, narrowly cuneate, ca. 7 × 3.5 mm, slightly fleshy at center, apex deeply 2-lobed; lobes parallel, subovate, 2–3 × ca. 1 mm, apices obtuse. Column erect, arcuate above middle, 2.5–3 mm. Fl. Jul.

- Coniferous forests; 2600–3200 m. C and N Taiwan.

**21. *Neottia kuanshanensis*** (H. J. Su) T. C. Hsu & S. W. Chung, *Taiwania* 54: 83. 2009.

关山对叶兰 *guan shan dui ye lan*

*Listera kuanshanensis* H. J. Su, *J. Exp. Forest Natl. Taiwan Univ.* 13: 206. 1999.

Plants autotrophic, 12–14 cm tall. Rhizome with a few elongate, filiform roots. Stem 5–7 cm, slender. Leaves 2, opposite, borne at ca. middle of plant, subsessile, deltoid or ovate-suborbicular, ca. 1.5 × 1.8–2 cm, membranous, base broadly truncate, apex acute. Peduncle pubescent, with 2 sterile bracts; rachis 3–4 cm, pubescent, laxly 3–7-flowered; floral bracts ovate-lanceolate, ca. 3.5 mm, apex acute. Flowers resupinate, greenish; pedicel and ovary ca. 8 mm, glabrous; sepals and petals spreading widely. Dorsal sepal ovate-lanceolate, ca. 3.3 × 1 mm, base slightly contracted, apex acute; lateral sepals falcate, ca. 3.5 × 1.2 mm, base broadly cuneate, apex acute. Petals linear-lanceolate, ca. 3.3 × 0.5 mm, apex obtuse; lip lanceolate, ca. 14 × 2.5 mm, apex deeply 2-lobed; lobes divergent, linear, 6.5–7 × 0.5–0.6 mm, apices acuminate; disk with a longitudinal keel. Column arcuate toward apex, 2.5–3 mm; rostellum ca. 0.9 mm. Fl. Aug.

- Forests; 2600–2700 m. S Taiwan.

**22. *Neottia chenii*** S. W. Gale & P. J. Cribb, *nom. nov.*

巨唇对叶兰 *ju chun dui ye lan*

Replaced synonym: *Listera grandiflora* Rolfe var. *megalo-chila* S. C. Chen, *Acta Phytotax. Sin.* 25: 473. 1987, not *Neottia megalochila* S. C. Chen, *Acta Phytotax. Sin.* 17(2): 17. 1979 [see p. 187]; *L. megalochila* (S. C. Chen) S. C. Chen & G. H. Zhu.

Plants autotrophic, 13–23 cm tall. Stem slender, usually with 1 sheath toward base. Leaves 2, opposite, borne near or above middle of plant, broadly ovate or ovate-cordate, 2.5–3.8 × 2.5–4 cm, apex subacute. Peduncle pubescent, with 1 or 2 sterile bracts 8–10 mm; rachis 3.5–6.5 cm, pubescent, 3–6-flowered; floral bracts ovate-lanceolate, 6–7 mm. Flowers resupinate, greenish yellow; pedicel and ovary 11–12 mm, nearly glabrous; sepals and petals spreading widely to reflexed. Dorsal sepal subelliptic, ca. 6.5 × 2.2 mm, apex subacute; lateral sepals elliptic-lanceolate, oblique, ca. 6.5 × 2 mm, apex subacute. Petals linear, ca. 6.5 × 1 mm; lip spreading forward, subobovate-oblong, 15–16 × 7–10 mm, slightly narrowing to ca. 5 mm wide at base, apex deeply 2-lobed; lobes subovate-oblong, 5–6 mm, margins minutely ciliate, apices truncate; disk with a V-shaped nectary at base. Column slightly arcuate, 6–7 mm. Fl. Jun–Jul.

- Forests; 2200–2800 m. S Gansu, W Sichuan.

The specific epithet honors the first co-author of the present treatment of *Neottia*.

**23. *Neottia formosana*** S. C. Chen, S. W. Gale & P. J. Cribb, **nom. nov.**

长唇对叶兰 *chang chun dui ye lan*

Replaced synonym: *Listera macrantha* Fukuyama, Rep. (Annual) Taihoku Bot. Gard. 3: 86. 1933; *Neottia macrantha* (Fukuyama) Szlachetko, Fragm (1995), not *Neottia macrantha* Sweet, Hort. Brit., ed. 2, 485. 1830.

Plants autotrophic, 10–20 cm tall. Rhizome with a few elongate, filiform roots. Stem ridged, with 1 or 2 sheaths toward base, 7–14 cm to height of leaves. Leaves 2, opposite, sessile, broadly ovate or ovate-suborbicular, 1–2 × 1.2–2.5 cm, base subcordate, apex truncate-rounded and sometimes mucronate. Peduncle 3–5 cm, pubescent; rachis 2–5 cm, pubescent, laxly 2–6-flowered; floral bracts ovate-cuspidate, 2–5 × 2–4 mm, 1-veined, apex acuminate. Flowers resupinate, yellowish green; pedicel and ovary 8–9.5 mm; sepals and petals spreading. Dorsal sepal narrowly ovate-lanceolate, 4–5.5 × 1–2 mm, 1-veined, base slightly contracted, apex acute; lateral sepals ovate-lanceolate, falcate, 4–5.5 × 1.8–2.8 mm, 1-veined. Petals linear, 3–4.5 × 0.7–1 mm, 1-veined, apex acute; lip spreading forward, cuneate, 11–20 × 5.5–8.5 mm, apex truncate and deeply 2-lobed; lobes slightly divergent, ovate-oblong, ca. 6 × 2.5–4 mm, apices rounded; disk with a longitudinal groove and a nectary near base. Column green, distinctly arcuate above middle, 4–5 mm; anther erect, ovoid-lanceolate, ca. 0.9 mm. Fl. Jun–Aug.

- Forests; 2200–3300 m. Taiwan.

**24. *Neottia pinetorum*** (Lindley) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 118. 1995.

西藏对叶兰 *xi zang dui ye lan*

*Listera pinetorum* Lindley, J. Proc. Linn. Soc., Bot. 1: 175. 1857; *L. brachybotryosa* Tang & F. T. Wang; *L. yueana* Tang & F. T. Wang [“*yüana*”]; *Neottia yueana* (Tang & F. T. Wang) Szlachetko.

Plants autotrophic, 6–33 cm tall. Rhizome with a few elongate, filiform roots. Stem 4–15 cm, slender, with 1 sheath toward base. Leaves 2, opposite, borne at ca. middle of plant, sessile, broadly ovate to ovate-cordate, 1–3.5 × 1–4 cm, base shallowly cordate to nearly broadly truncate, apex acute. Peduncle pubescent; rachis 3–12 cm, pubescent, laxly 2–14-flowered; floral bracts ovate-lanceolate or ovate, 3–6 mm, apex acuminate. Flowers resupinate, greenish yellow; pedicel 4–6 mm, almost glabrous; ovary 3–4.5 mm, glabrous; sepals and petals not spreading widely. Dorsal sepal narrowly elliptic or nearly oblong, 3–4 × 1–1.5 mm, 1-veined, apex obtuse; lateral sepals narrowly elliptic, falcate, 3–4 × 1.2–1.5 mm, apex acute or obtuse. Petals linear, 3–4 × 0.5–1 mm, apex subacute; lip pendulous, variable in shape, obovate-cuneate, oblong-cuneate, sublinear-cuneate, or oblanceolate, 7–13 × 3–5(–7) mm, apex deeply 2-lobed; lobes parallel or occasionally divergent, oblong-ovate, 2–5 × 1–2 mm, margins slightly papillate, apices obtuse-rounded; sinus sometimes with a short tooth between lobes; disk with a longitudinal channel extending from base of lip almost to sinus. Column slightly arcuate above middle, 2–2.5 mm; anther inclined toward rostellum; rostellum large, ca. as long as anther. Fl. Jun–Jul.  $2n = 40$ .

Dense forests, *Picea* and *Abies* forests; 2200–3600 m. N Fujian, S and SE Xizang, W Yunnan [Bhutan, NE India, Nepal].

**25. *Neottia wardii*** (Rolfe) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 119. 1995.

大花对叶兰 *da hua dui ye lan*

*Listera wardii* Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 127. 1913; *L. grandiflora* Rolfe; *Neottia grandiflora* (Rolfe) Szlachetko (1995), not Hooker (1830), nor (A. Richard) Kuntze (1891), nor Schlechter (1912).

Plants autotrophic, 15–25 cm tall. Rhizome with a few elongate, filiform roots. Stem cylindrical, slender, with 1 membranous sheath toward base. Leaves 2, opposite, borne above middle of plant, subsessile, green, broadly ovate or ovate-cordate, 2.5–4 × 2.5–4.2 cm, base broadly cuneate or shallowly cordate, margin slightly crisped or sometimes irregularly denticulate, apex subacute or mucronate. Peduncle 3.5–5 cm, pubescent, with 1 or 2 sterile, ovate bracts to ca. 8 mm; rachis 3–7 cm, pubescent, laxly 2–7-flowered; floral bracts ovate-lanceolate, 5–7 mm, apex acute to acuminate. Flowers rather large, resupinate, green or greenish yellow, lip with a thin white margin; pedicel 5–6 mm, almost glabrous; ovary narrowly conic, ca. 6 mm, glabrous; sepals and petals spreading widely. Dorsal sepal rhombic-elliptic or elliptic, 6–7 × ca. 2.2 mm, 1-veined, apex subacute; lateral sepals elliptic-lanceolate, oblique, 6–7 × ca. 2 mm, apex acute. Petals linear, 6–7 × ca. 1 mm, apex acuminate; lip spreading forward, obovate-cuneate, 16–19 × 7–13 mm, much narrower at base, apex deeply 2-lobed; lobes divergent or sometimes almost parallel, subovate, 5–6 × 4–6 mm, margins minutely papillose-ciliate, apices obtuse-rounded; disk with 2 longitudinal lamellae connected to base of column, midvein slightly thickened. Column arcuate above middle, ca. 7 mm; anther inclined toward rostellum; rostellum large, nearly as long as anther. Fl. Jun–Jul.

- Damp places in scrub and coniferous forests; 2300–3500 m. W Hubei, N and W Sichuan, SE Xizang, NW Yunnan.

**26. *Neottia oblata*** (S. C. Chen) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 118. 1995.

圆唇对叶兰 *yuan chun dui ye lan*

*Listera oblata* S. C. Chen, Kew Bull. 35: 759. 1981.

Plants autotrophic, ca. 23 cm tall. Rhizome with several clustered roots. Stem with 1 sheath toward base. Leaves 2, opposite, borne at ca. middle of plant, subcordate, ca. 2.8 × 3–3.5 cm, base slightly cordate, apex subacute; bractlike leaflets ovate-lanceolate, 5–6 mm, turning into floral bracts farther up stem. Peduncle pubescent, with 3 sterile bracts 5–6 mm; rachis ca. 6.5 cm, pubescent, laxly 7-flowered; floral bracts ovate-lanceolate, ca. 5 mm. Flowers large, resupinate; pedicel ca. 4 mm, pubescent; ovary clavate, ca. 4 mm, almost glabrous; sepals and petals spreading widely. Dorsal sepal narrowly elliptic, ca. 5 × 2 mm, 1-veined, apex obtuse; lateral sepals elliptic-lanceolate, oblique, ca. 6.5 × 2.5 mm, apex subacuminate. Petals linear, nearly as long as lateral sepals, ca. 0.7 mm wide; lip suborbicular or oblate, ca. 13 × 12 mm, base abruptly contracted into a

claw ca.  $2 \times 1.5$  mm, margin minutely papillose-ciliate, apex deeply 2-lobed; lobes parallel but somewhat overlapping toward apex, broadly ovate, ca.  $4.5 \times 6$  mm, apices rounded; disk with midvein thickened and deep brown. Column slightly arcuate, ca. 5.5 mm; rostellum protruding, large. Fl. unknown.

• Chongqing.

**27. *Neottia karoana*** Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 117. 1995.

卡氏对叶兰 ka shi dui ye lan

*Listera micrantha* Lindley, *J. Proc. Linn. Soc., Bot.* 1: 176. 1857; *Diphryllum micranthum* (Lindley) Kuntze.

Plants autotrophic, 6–13 cm tall. Stem with 1 oblong sheath toward base. Leaves 2, opposite, borne below middle of plant, sessile, cuneate or ovate,  $0.5\text{--}1.1 \times 0.4\text{--}0.9$  cm, apex obtuse to subacute. Peduncle 5–10 cm, minutely pubescent; rachis 3–5 cm, pubescent, laxly 4–10-flowered; floral bracts narrowly ovate, concave, ca. 1 mm, apex acute. Flowers resupinate, pale green; pedicel and ovary 2–5 mm, glabrous. Sepals and petals subequal, elliptic,  $2\text{--}3.3 \times 1\text{--}1.5$  mm, apex subacute, 1-veined; lip deflexed, rectangular,  $2\text{--}2.5 \times 0.5\text{--}1.7$  mm, 3-veined, with a pair of suborbicular auricles near base, apex 3-lobed; lobes triangular, middle lobe exceeding lateral lobes. Column erect, 0.8–1 mm; anther inclined toward rostellum; rostellum short. Fl. Sep.

Forests; 2800–3100 m. W Yunnan [NE India (Sikkim)].

**28. *Neottia divaricata*** (Panigrahi & P. Taylor) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 117. 1995.

叉唇对叶兰 cha chun dui ye lan

*Listera divaricata* Panigrahi & P. Taylor, *Kew Bull.* 30: 559. 1975.

Plants autotrophic, 15–24 cm tall. Stem slender, with 2 or 3 tubular sheaths near base. Leaves 2, opposite, borne at ca. middle of plant, subsessile, broadly ovate-cordate,  $2\text{--}3 \times 1.7\text{--}3.1$  cm, base shallowly cordate to subtruncate, apex subacute. Peduncle 3–8 cm, pubescent, with 2–5 sterile bracts 4–5 mm; rachis 3–7 cm, pubescent, densely 8–14-flowered; floral bracts linear-lanceolate, 6–8 mm, 1-veined, apex acute. Flowers erect, resupinate, pale yellow or pale green; pedicel 2.5–4 mm, slender, glabrous; ovary fusiform, 1.8–3 mm, glabrous; sepals and petals spreading. Dorsal sepal oblong-lanceolate, ca.  $2.2 \times 0.9$  mm, 1-veined, apex obtuse; lateral sepals oblong-lanceolate, oblique, ca.  $3.5 \times 1.5$  mm, apex acute. Petals slightly incurved, linear-lanceolate, ca.  $2.8 \times 1$  mm, 1-veined, apex obtuse; lip erect or spreading forward, obovate-flabellate,  $3\text{--}4 \times$  ca. 8 mm, with a pair of triangular auricles near base, apex deeply 2-lobed; lobes diverging widely, oblong or oblong-lanceolate, ca.  $5 \times 2$  mm, 3- or 4-veined, apices obtuse; sinus with a tooth between lobes. Column suberect, 1.5–2 mm; anther inclined toward rostellum; rostellum ascending, ovate, slightly shorter than anther. Fl. Jul–Aug.

*Tsuga* forests; 3000–3500 m. SE Xizang [NE India].

**29. *Neottia brevicaulis*** (King & Pantling) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 117. 1995.

短茎对叶兰 duan jing dui ye lan

*Listera brevicaulis* King & Pantling, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 65: 126. 1896.

Plants autotrophic, 20–30 cm tall. Rhizome with filiform roots. Stem short, with 1 or 2 membranous sheaths. Leaves 2, opposite, borne below middle of plant and almost prostrate on ground, sessile, cordate to suborbicular,  $0.5\text{--}1.5 \times 0.5\text{--}1.5$  cm, apex acute. Peduncle 6–8 cm, pubescent, with 1 or 2 sterile bracts; rachis 1–7 cm, subdensely 3–8-flowered, pubescent; floral bracts rhombic. Flowers resupinate, secund, uniformly green; pedicel and ovary 4–8 mm. Dorsal sepal elliptic, ca.  $4 \times 1$  mm; lateral sepals ovate, oblique, ca.  $4 \times 1.2$  mm, apex acuminate. Petals narrowly elliptic, ca.  $3.5 \times 1$  mm; lip spreading forward, cuneate, ca.  $6 \times 4$  mm, with a pair of triangular auricles near base, apex deeply bilobed; lobes strongly recurved and meeting underneath lip, ca.  $2 \times 1.3$  mm. Column ca. 1.5 mm. Fl. Aug.

Dense bamboo forests, grasslands; ca. 3300 m. NW Yunnan [NE India (Sikkim)].

**30. *Neottia tianschanica*** (Grubov) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 119. 1995.

天山对叶兰 tian shan dui ye lan

*Listera tianschanica* Grubov, *Rast. Tsentral. Azii, Mater. Bot. Inst. Komarova* 7: 106. 1977.

Plants autotrophic, 3–4 cm tall. Rhizome with a few elongate roots. Stem slender, with 2 or 3 tubular sheaths at base. Leaves 2, opposite, borne at ca. middle of plant, broadly ovate to ovate,  $0.9\text{--}1.5 \times 0.8\text{--}1.4$  cm, base broadly cuneate to subtruncate, apex subrounded to obtuse-acute. Peduncle pubescent; rachis 1.9–2.2 cm, pubescent, 2- or 3-flowered; floral bracts lanceolate, 1.5–3 mm, almost glabrous, acuminate. Flowers resupinate, green, lip tinged whitish green along apical margins; pedicel and ovary 2–3 mm, puberulent on ribs. Dorsal sepal narrowly elliptic-ovate,  $2\text{--}2.5 \times 1\text{--}1.1$  mm, 1-veined, apex obtuse; lateral sepals narrowly ovate, oblique,  $2.5\text{--}3 \times 1\text{--}1.2$  mm, 1-veined. Petals suboblong,  $2.5\text{--}3 \times 0.5\text{--}0.6$  mm, apex obtuse; lip spatulate,  $3.5\text{--}4.5 \times 2\text{--}2.5$  mm, with a pair of small auricles at base, apex shallowly 2-lobed; lobes diverging at an acute angle, suborbicular or broadly ovate, ca. 0.5 mm; disk with a fleshy callus near base. Column less than 1 mm; rostellum small. Fl. Jun.

• Open wet places in *Picea* forests; 2100–2200 m. C Xinjiang (N Tian Shan, Ürümqi).

**31. *Neottia fangii*** (Tang & F. T. Wang ex S. C. Chen & G. H. Zhu) S. C. Chen, S. W. Gale & P. J. Cribb, **comb. nov.**

扇唇对叶兰 shan chun dui ye lan

Basionym: *Listera fangii* Tang & F. T. Wang ex S. C. Chen & G. H. Zhu, *Novon* 12: 438. 2002.

Plants autotrophic, to 29 cm tall. Rhizome with a few elongate, filiform roots. Stem ca. 10.5 cm, slender, with 1 tubular sheath more than 2 cm toward base. Leaves 2, opposite, borne below middle of plant, subsessile, ovate-orbicular,  $2.4\text{--}2.8 \times 2.8\text{--}3$  cm, adaxially minutely puberulent, base cuneate-subcordate, apex acute-rounded. Peduncle ca. 15 cm, pubes-

cent; rachis ca. 4.5 cm, pubescent, 11-flowered; floral bracts subovate-oblong, 1.5–2.5 × ca. 0.8 mm, sparsely pubescent on both surfaces. Flowers erect or spreading, resupinate; pedicel 3.5–4.5 mm, pubescent; ovary ca. 2 mm, sparsely pubescent or glabrescent; sepals and petals spreading. Sepals ovate-oblong, ca. 2 × 0.8 mm, 1-veined, apex obtuse; lateral sepals slightly oblique. Petals similar to dorsal sepal but slightly narrower; lip spreading forward to suberect, spatulate-obovate, ca. 5 × 3 mm, contracted below middle into a claw, dilated apical portion fan-shaped, ca. 2 × 3 mm, apex deeply 2-lobed; lobes diverging at an acute angle, subquadrate, ca. 2 mm, apices truncate; sinus with a small tooth between lobes; claw ca. 2.8 × 0.8 mm, with a pair of broadly ovate-deltoid auricles ca. 0.8 mm at base. Column ca. 2 mm. Fl. Jul.

- Forests; 800–1000 m. NW Sichuan.

**32. *Neottia pseudonipponica*** (Fukuyama) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 118. 1995.

耳唇对叶兰 *er chun dui ye lan*

*Listera pseudonipponica* Fukuyama, *Bot. Mag. (Tokyo)* 49: 665. 1935.

Plants autotrophic, ca. 20 cm tall. Stem slender, with tubular sheaths at base. Leaves 2, opposite, borne at ca. middle of plant, ovate-suborbicular or nearly reniform-suborbicular, 2–2.5 × 3–3.5 cm, base subcordate, apex rounded and with caudate tip. Peduncle ca. 6 cm, pubescent; rachis 3–4 cm, pubescent, laxly 6–8-flowered; floral bracts ovate-lanceolate, 1–3 mm, apex subacute. Flowers spreading, resupinate; pedicel and ovary 6–8 mm, glabrous. Dorsal sepal linear-oblongate, 3.2–3.5 × 0.7–1 mm, 1-veined, base narrowed, apex slightly obtuse; lateral sepals linear-oblong, 3.5–3.7 × ca. 0.7 mm, 1-veined, apex slightly obtuse. Petals linear-oblong, 3.5–3.7 × 0.8–1 mm, 1-veined, apex obtuse; lip subobovate or obtriangular, 5–6 mm, narrowly clawed at base, dilated apical portion obcordate, apex deeply 2-lobed; lobes diverging at an acute angle, oblong, oblique, ca. 2.5 × 4 mm, margins entire or minutely denticulate; sinus with a tooth between lobes; claw with a pair of oblongate auricles ca. 1.7 mm at base. Column erect, ca. 2.5 mm; anther ca. 0.7 mm; rostellum broadly ovate. Fl. unknown.

- Forests. C Taiwan.

**33. *Neottia nanchuanica*** (S. C. Chen) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 118. 1995.

南川对叶兰 *nan chuan dui ye lan*

*Listera nanchuanica* S. C. Chen, *Kew Bull.* 35: 761. 1981.

Plants autotrophic, 25–30 cm tall. Rhizome with a few elongate, filiform roots. Stem slender, with 1 or 2 sheaths near base. Leaves 2, opposite, borne below middle of plant, subsessile, broadly ovate or broadly ovate-cordate, 3.2–6 × 3–6 cm, base broadly cuneate or nearly shallowly cordate, apex obtuse or acute. Peduncle 6–10 cm, pubescent, with 3 sterile bracts 4–6 mm; rachis 8–13 cm, pubescent, laxly 10–19-flowered; floral bracts ovate-lanceolate, 3.5–4.5 mm, apex acuminate. Flowers spreading horizontally, resupinate, pale green; pedicel 5–9 mm, pubescent; ovary narrowly elliptic, 2.5–4 mm, glabrous; sepals and petals reflexed. Dorsal sepal oblong or narrowly elliptic,

2.8–3 × ca. 1 mm, 1-veined, apex obtuse; lateral sepals ovate-oblong, oblique, ca. 3 × 1.5 mm. Petals sublinear or narrowly oblong, ca. 2.6 × 0.8 mm, 1-veined; lip subobovate, 7–9 × 3.5–6.5 mm, narrowing at base into a claw, apex deeply 2-lobed; lobes parallel or slightly incurved and overlapping toward apex, subobovate-oblong, 2.5–3 × 1.5–2.2 mm, margins ciliate, apices obtuse; sinus with a short tooth between lobes; claw 0.7–1.3 mm wide, with a pair of subovate or subsquare auricles ca. 0.5 mm near base. Column suberect, ca. 2 mm; anther inclined toward rostellum; rostellum broadly ovate, large, nearly as long as anther but wider. Fl. Jul.

- Forests or forest margins; 2000–2100 m. Chongqing.

**34. *Neottia yunnanensis*** (S. C. Chen) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 119. 1995.

云南对叶兰 *yun nan dui ye lan*

*Listera yunnanensis* S. C. Chen, *Kew Bull.* 35: 759. 1981.

Plants autotrophic, 37–47.5 cm tall. Rhizome with a few roots. Stem with 1 tubular sheath at base. Leaves 2, opposite, borne below middle of plant, sessile, ovate, 5.5–6 × 4.4–5 cm, base slightly cordate, apex acute or mucronate. Peduncle pubescent, with 1 sterile bract 3–8 mm; rachis 14–16 cm, pubescent, laxly 24–35-flowered; floral bracts lanceolate, nearly as long as pedicel. Flowers resupinate, green; pedicel ca. 4 mm, sparsely pubescent; ovary fusiform, ca. 3 mm, glabrous; sepals and petals spreading. Dorsal sepal narrowly ovate-elliptic, 2.5–3 × ca. 1 mm, 1-veined, apex obtuse; lateral sepals ovate, oblique, 2.5–3 × ca. 1.3 mm, 1-veined. Petals suboblong, 2.5–2.8 × 0.5–0.6 mm, apex rounded; lip narrowly obovate-cuneate, 6–7 × 2.5–5 mm, with a pair of auricles near base, apex deeply 2-lobed; lobes diverging at an acute angle, narrowly lanceolate, 3–4 mm, margins minutely ciliate, apices acuminate; disk with a pair of somewhat fleshy calli at base and a pair of swollen, suborbicular lamellae midway along length of lip; auricles ovate-oblong, ca. 1.3 × 0.6 mm. Column ca. 1 mm; rostellum ovate, slightly shorter than anther. Fl. Aug.

- Mixed forests; ca. 2300 m. SE Yunnan.

**35. *Neottia japonica*** (Blume) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 117. 1995.

日本对叶兰 *ri ben dui ye lan*

*Listera japonica* Blume, *Coll. Orchid.* 115. 1859; *Diphryllum japonicum* (Blume) Kuntze; *L. shaoi* S. S. Ying; *L. shikokiana* Makino; *Neottia shaoi* (S. S. Ying) Szlachetko; *Ophrys japonica* (Blume) Makino; *O. shikokiana* (Makino) Makino.

Plants autotrophic, 10–18 cm tall. Rhizome with very few elongate, filiform roots. Stem 6–8 cm tall, slender, ridged, with 1 or 2 tubular sheaths at base, purple or pale green. Leaves 2, opposite, borne slightly below middle of plant, sessile, ovate-triangular, 1–1.8 × 1–1.6 cm, base cordate or truncate, apex acute. Peduncle 3–5 cm, pubescent; rachis 3–5 cm, pubescent, laxly 3–8-flowered; floral bracts broadly ovate, very small, 1–2 mm, acute. Flowers resupinate, purplish green, lip deep purple; pedicel elongate, 9–12 mm, slender, glabrous or slightly pubescent toward base; ovary 1–3 mm, glabrous; sepals and petals reflexed. Dorsal sepal obovate-elliptic, 1.8–2.5 × 0.8–1 mm,

apex acute or obtuse; lateral sepals ovate, oblique, 2–2.5 × 0.7–1.1 mm, apex obtuse. Petals lanceolate or lanceolate-linear, 1.8–2.5 × ca. 0.5 mm, apex obtuse; lip narrowly cuneate, ca. 6 mm, with a pair of auricles at base, apex deeply 2-lobed; lobes diverging at an acute angle, linear, ca. 4 mm, apex obtuse or acute; sinus with a triangular tooth between lobes; auricles

strongly incurved, embracing column and overlapping one another above column, slender. Column less than 1 mm. Fl. May–Jul.

Forests; 1400–3000 m. C and N Taiwan [S Japan (Ryukyu Islands)].

#### 64. *TROPIDIA* Lindley, Edwards's Bot. Reg. 19: ad t. 1618. 1833.

竹茎兰属 zhu jing lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Chloidia* Lindley; *Cnemidia* Lindley; *Govindooia* Wight; *Muluorchis* J. J. Wood; *Schoenomorphus* Thorel ex Gagnepain.

Herbs terrestrial, autotrophic [rarely mycotrophic outside Flora area]. Rhizome ascending, stout; roots wiry, fibrous. Stem erect, rigid, branched or unbranched, noded, with sheaths at nodes. Leaves 2 to many, plicate, ovate to narrowly lanceolate, base contracted into amplexicaul sheaths. Inflorescence a short raceme or panicle, terminal or arising from leaf axils near apex of stem, several or many flowered. Flowers resupinate or not. Dorsal sepal free; lateral sepals free or connate to form a synsepal and embracing base of lip. Petals free, similar to sepals or slightly smaller; lip cymbiform, slightly shorter than sepals, entire, with or without a short spur, sometimes constricted at middle, base loosely embracing column, distally expanded, apex acuminate and reflexed. Column short; anther dorsal, erect; rostellum prominent, erect, bifid after viscidium removed; pollinia 2, granular-farinaceous, sectile, with slender caudicle and peltate viscidium.

About 20 species: mainly in tropical and subtropical Asia, with a few species extending to Australia and the Pacific islands and one in Central and North America; seven species (three endemic) in China.

- 1a. Leaves many, distichous, usually more than 10; lateral sepals connate only at base ..... 1. *T. curculigoides*  
 1b. Leaves 1–5; lateral sepals connate for almost their entire length, forming a synsepal. .... 2. *T. angulosa*  
 2a. Lip spurred at base; spur to 4 mm ..... 2. *T. angulosa*  
 2b. Lip saccate, concave-saccate, or inconspicuously concave at base.  
 3a. Synsepal subtruncate at apex; column ca. 2 mm ..... 7. *T. emeishanica*  
 3b. Synsepal bilobed at apex; column 3–6 mm.  
 4a. Leaves 3–5; disk bearing a pair of rounded calli toward apex ..... 3. *T. nanhuae*  
 4b. Leaves 1 or 2; disk without calli.  
 5a. Leaves linear-lanceolate to narrowly ovate-lanceolate, 1.7–2.1 cm wide, apex acuminate ..... 4. *T. angustifolia*  
 5b. Leaves ovate, cordate, elliptic, or ovate-lanceolate, 4–8 cm wide, apex acute.  
 6a. Inflorescence racemose, laxly 10–20-flowered; sheaths on stem less than 2 cm ..... 5. *T. somae*  
 6b. Inflorescence subglobose, densely 5–10-flowered; sheaths on stem to 4 cm ..... 6. *T. nipponica*

**1. *Tropidia curculigoides*** Lindley, Gen. Sp. Orchid. Pl. 497. 1840.

短穗竹茎兰 duan sui zhu jing lan

*Tropidia assamica* Blume; *T. formosana* Rolfe; *T. graminea* Blume; *T. hongkongensis* Rolfe; *T. squamata* Blume.

Plants 30–70 cm or taller. Rhizome short, rigid; roots 2–3 mm in diam., fleshy. Stem erect, unbranched or occasionally with branches, proximally often naked, distally enclosed in leaf sheaths, internodes 2–4 cm. Leaves many, often more than 10, distichous and well spaced along stem, narrowly elliptic-lanceolate to narrowly lanceolate, (10–)15–25 × (1–)2–4 cm, papery, base contracted into amplexicaul sheath, apex long acuminate-caudate. Inflorescence racemose, terminal or axillary, with several to 10 crowded flowers, 1–2.5 cm; floral bracts imbricate, lanceolate, 4–7(–10) mm, conspicuously with longitudinal veins. Flowers not resupinate, greenish white; pedicel and ovary 5–6 mm. Sepals lanceolate or oblong-lanceolate, 7–10 × 1.5–1.7 mm, apex long acuminate; lateral sepals connate only at base, apex recurved. Petals oblong-lanceolate, 6–8 × ca. 1.3 mm; lip ovate-lanceolate or oblong-lanceolate, cymbiform, 6–8

mm, concave-saccate at base, with 2 inconspicuous lamellae on disk, apex acuminate. Column ca. 3 mm; anther ovoid, ca. 1.5 mm; rostellum erect, obovate, ca. 2 mm, apex 2-lobed-apiculate. Capsule suboblong, ca. 2 cm × 5 mm. Fl. Jun–Aug, fr. Oct. 2n = 40, 60.

Shaded places, along valleys in forests; 200–1000 m. SW Guangxi, Hainan, Hong Kong, Taiwan, SE Xizang, S and SE Yunnan [Cambodia, India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

**2. *Tropidia angulosa*** (Lindley) Blume, Coll. Orchid. 122. 1859.

阔叶竹茎兰 kuo ye zhu jing lan

*Cnemidia angulosa* Lindley, Edwards's Bot. Reg. 19: ad t. 1618. 1833; *C. semilibera* Lindley; *Decaisnea angulosa* (Lindley) Wallich; *Govindooia nervosa* Wight; *Tropidia barbeyana* Schlechter; *T. bellii* Blatter & McCann; *T. calcarata* Ames; *T. govindovii* Blume; *T. semilibera* (Lindley) Blume.

Plants 16–45 cm tall. Rhizome short, rigid; roots 1.5–2.5 mm in diam., fleshy. Stem solitary or 2 arising from same rhizome, erect, unbranched or 1-branched, internodes 3–6.5 cm;

proximal nodes naked or with tubular sheaths, distal nodes enclosed in sheaths 1.5–3(–6.5) cm. Leaves 2, apical, subopposite, elliptic or ovate-elliptic, (6–)10–17 × (3–)4.5–9.5 cm, papery, base contracted into amplexicaul sheaths, apex long acuminate. Inflorescence a terminal raceme with more than 10 flowers, 5–8 cm; floral bracts narrowly lanceolate, 6–8 mm, midvein conspicuous. Flowers not resupinate, greenish white; pedicel and ovary 6–9 mm. Dorsal sepal linear-lanceolate, 8–9 × ca. 1.5 mm, apex acuminate or acute; lateral sepals almost completely connate and forming a synsepal; synsepal suboblong, 8–10 × 2–2.5 mm, apex shallowly 2-lobed, embracing lip and connected to spur at its base. Petals linear-lanceolate, 8–9 × ca. 1.5 mm; lip suboblong, 6–7 × ca. 2 mm, with 2 slightly thickened longitudinal ridges from middle to base, base spurred; spur cylindrical, ca. 4 × 1–1.5 mm, apex obtuse. Column ca. 6 mm; anther erect, ovoid-lanceolate, ca. 3.5 mm; rostellum erect, lanceolate, ca. 5 mm. Capsule oblong-ellipsoid, 1–1.5 cm × 6–7 mm. Fl. Sep. fr. Dec–Jan.  $2n = 57$ .

Forests, forest margins; 100–1800 m. Guangxi, Taiwan, SE Xizang, S and SW Yunnan [Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Thailand, Vietnam].

**3. *Tropidia nanhuae*** W. M. Lin, Kuo Huang & T. P. Lin, *Taiwania* 51: 165. 2006.

南华竹茎兰 *nan hua zhu jing lan*

Plants 25–40 cm tall. Rhizome ascending; roots filiform. Stem erect, slender, branched or unbranched. Leaves 3–5, alternate, widely spaced, lanceolate-oblong, ca. 16 × 2.7 cm, base rounded, apex acuminate. Inflorescence terminal, 5–8 cm, up to 25-flowered; bracts lanceolate, glabrous. Flowers not resupinate, greenish white, glabrous, ca. 6.5 mm; pedicel and ovary ca. 4 mm. Dorsal sepal free, lanceolate, ca. 5 × 2.5 mm, apex acute; lateral sepals connate for ca. 3/5 of length and forming a synsepal, ca. 6 × 3 mm; synsepal bilobed at apex, saccate at base. Petals concave, lanceolate, ca. 5 × 2 mm, keeled abaxially, apex acute; lip oblong, ca. 5.5 × 2 mm, saccate at base, apex recurved; disk bearing a pair of rounded calli toward apex, and with 2 longitudinal ridges toward base. Column ca. 3 mm including rostellum; anther ovate, fleshy, 3–3.3 mm, apex rounded; pollinia clavate, stipe slender; viscidium linear-lanceolate; stigma broadly triangular. Fl. Oct–Nov.

• Bamboo forests; 100–200 m. Taiwan.

**4. *Tropidia angustifolia*** C. L. Yeh & C. S. Leou, *Taiwania* 54: 140. 2009.

狭叶竹茎兰 *xia ye zhu jing lan*

Plants 10–20 cm tall. Rhizome ascending; roots rigid, filiform. Stem erect, slender, unbranched. Leaf usually solitary, occasionally 2, linear-lanceolate to narrowly ovate-lanceolate, 8–10.5 × 1.7–2.1 cm, base cuneate, apex acuminate. Inflorescence terminal, 5–6 cm, 9–12-flowered; bracts lanceolate, glabrous. Flowers not resupinate, whitish, tinged pale green at apex of sepals and petals, tinged orange at apex of lip, glabrous; pedicel and ovary 5–7 mm. Dorsal sepal free, oblong, ca. 6.5 × 2.5 mm, apex subacute; lateral sepals almost completely connate and forming a synsepal; synsepal ca. 8 mm, bilobed at apex, slightly concave at base, apex reflexed. Petals slightly concave, oblong, slightly oblique, 6.5–7 × ca. 2.8 mm, keeled

abaxially, apex acute; lip oblong-ovate, ca. 5 × 3 mm, concave-saccate at base, apex recurved; disk with 2 longitudinal ridges toward base. Column ca. 3 mm including rostellum; anther ovate, ca. 1.8 mm, apex rounded; pollinia clavate, ca. 1.7 mm, stipe linear; viscidium ovoid; stigma transversely elliptic. Fl. Jul–Aug.

• Broad-leaved evergreen forests; 600–800 m. S Taiwan.

**5. *Tropidia somae*** Hayata, *Icon. Pl. Formosan.* 6: 85. 1916 [“*somai*”].

台湾竹茎兰 *tai wan zhu jing lan*

Plants usually less than 20 cm tall. Rhizome ascending; roots fibrous. Stem unbranched or 1- or 2-branched, with many sheaths; sheaths less than 2 cm. Leaves 1 or 2, apical, ovate to cordate, ca. 11 × 6.5 cm, 7–13-veined, base rounded, apex acute. Inflorescence a terminal raceme with 10–20 flowers, 4–8 cm; floral bracts lanceolate, 5–6 mm. Flowers not resupinate, white; pedicel and ovary ca. 5 mm. Dorsal sepal free, narrowly lanceolate, 9–10 × ca. 3 mm; lateral sepals almost completely connate and forming a synsepal; synsepal 10–11 mm, bilobed at apex. Petals narrowly ovate, 8–9 × 3–3.5 mm, keeled abaxially; lip narrowly oblong, ca. 9 × 2 mm, saccate at base, with 2 lamellae on adaxial surface of basal half. Column straight, 5–6 mm; anther lanceolate, 3–3.3 mm, apex acuminate; pollinia clavate; caudicle slender; rostellum lanceolate. Fl. Sep.

Forests; low elevations. Taiwan [S Japan (Ryukyu Islands)].

**6. *Tropidia nipponica*** Masamune, *Bot. Mag. (Tokyo)* 43: 249. 1929.

竹茎兰 *zhu jing lan*

*Tropidia angulosa* (Lindley) Blume var. *nipponica* (Masamune) S. S. Ying.

Plants to 60 cm tall. Rhizome ascending; roots filiform, often with small tuberlike nodules. Stem erect, slender, 20–50 cm, 3–4 mm in diam., often branched, proximal nodes enclosed in sheaths; sheaths to 4 cm. Leaves 1 or 2, alternate, elliptic or ovate-lanceolate, 10–16 × 4–8 cm, papery, apex acute. Inflorescence terminal, subglobose, ca. 6 cm, sparsely pubescent, 5–10-flowered; floral bracts lanceolate, 5–6 mm. Flowers not resupinate, off-white. Dorsal sepal ovate-lanceolate, ca. 7 × 3 mm, apex obtuse; lateral sepals almost completely connate and forming a synsepal; synsepal oblanceolate, 7–8 mm, apex 2-lobed. Petals elliptic, ca. 6 × 3 mm, apex acute; lip ovate-lanceolate, ca. 6 mm, base saccate, apex reflexed; disk pale yellow, thickened apically. Column suberect, ca. 3 mm, 3-lobed; anther ovoid, ca. 2.5 mm; caudicle slender; rostellum triangular, apex bifid. Fl. Jul.

Forests; low to mid elevations. Taiwan [S Japan (Ryukyu Islands)].

**7. *Tropidia emeishanica*** K. Y. Lang, *Acta Phytotax. Sin.* 20: 184. 1982.

峨眉竹茎兰 *e mei zhu jing lan*

Plants to 22 cm tall. Rhizome somewhat thickened; roots often with small tuberlike nodules. Stem erect, unbranched, nodes with tubular sheaths; internodes 2–3 cm. Leaves 2, alter-

nate, well spaced along stem, petiolate, ovate or elliptic, 7–10 × 3–4 cm, papery, base subrounded, apex acuminate. Inflorescence terminal, 13-flowered, ca. 5 cm; floral bracts ovate-lanceolate, ca. 3 mm. Flowers not resupinate, green, small; pedicel and ovary ca. 1.2 cm. Dorsal sepal oblong, concave, ca. 5.5 × 1.8 mm, 3-veined, apex obtuse; lateral sepals almost completely connate and forming a synsepal; synsepal obovate-lanceolate,

ca. 6 × 2.3 mm, apex subtruncate. Petals elliptic, concave, ca. 5 × 1.6 mm, apex obtuse; lip obovate, ca. 3 × 2 mm, adaxially with 1 thick longitudinal ridge, base spurless. Column ca. 2 mm; anther erect, cordate; caudicle inconspicuous; rostellum erect, apex 2-lobed. Fl. Jul.

• Forests; 1100–1200 m. SW Sichuan.

## 65. CORYMBORKIS Thouars, Nouv. Bull. Sci. Soc. Philom. Paris 1: 318. 1809.

管花兰属 guan hua lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Corymbis* Thouars; *Hysteria* Reinwardt; *Rynchanthera* Blume; *Tomotris* Rafinesque.

Herbs, terrestrial. Rhizome short; roots slender, wiry. Stem 1 or several arising from same rhizome, unbranched, slender, reed-like. Leaves many, distichous, often large, ovate to elliptic, papery, plicate, base contracted into amplexicaul sheaths. Inflorescence an axillary raceme or panicle, conspicuously shorter than leaves, few to many flowered; peduncle often enclosed in leaf sheaths. Flowers scented, distichously arranged, resupinate or not, usually greenish white to yellow; pedicel short. Sepals and petals subequal, rather long and narrow, spreading, connivent or connate at base. Petals slightly wider than sepals; lip ca. as long as petals or slightly shorter, embracing column, with 2 longitudinal ridges. Column erect, slightly shorter than lip, slender, apex dilated and with 2 auricles; anther inserted on dorsal side of column, erect, suboblong or ovate-oblong; pollinia 2, granular-farinaceous, sectile; caudicle slender; viscidium subpetalate; stigma with 2 outwardly curved lobes; rostellum prominent, taller than anther, bifid. Capsule strongly 6-ridged, apex with persistent column.

Seven species: pantropical; one species in China.

**1. *Corymborkis veratrifolia*** (Reinwardt) Blume, Coll. Orchid. 125. 1859.

管花兰 guan hua lan

*Hysteria veratrifolia* Reinwardt, Syll. Pl. Nov. 2: 5. 1826; *Corymbis veratrifolia* (Reinwardt) H. G. Reichenbach; *Corymborkis assamica* Blume; *C. sakisimensis* Fukuyama.

Plants 80–100 cm tall. Stem erect, subterete, 8–12 mm in diam., with many leaves. Leaves narrowly elliptic or narrowly elliptic-lanceolate, 25–38 × 5.5–10 cm, abaxially often brown scurfy, basal sheaths 5–9 cm, apex long acuminate. Inflorescence a panicle, 5–9 cm, 2–6-branched, 10–30- or more flowered; bracts at branch base lanceolate, 1–1.5 cm; floral bracts ovate, 2–4 mm. Flowers fragrant, not widely spreading, white,

tubular or campanulate, 3.2–3.8 cm; pedicel and ovary 4–6 mm. Sepals similar, oblanceolate-linear or narrowly spatulate, 3.2–3.8 cm, ca. 2 mm wide at narrow base, apically 5–6 mm wide. Petals similar to sepals; lip ca. as long as sepals, long clawed, apically dilated; apical lobe orbicular or broadly ovate-elliptic, ca. 1 × 1 cm, with 2 longitudinal ridges, margin undulate, apex acute and recurved. Column subcylindric, shorter than lip; rostellum bifid, ca. 3 mm. Fl. Jul.

In shade in dense forests; 700–1000 m. SW Guangxi, Taiwan, S Yunnan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam; N Australia, SW Pacific islands].

The extensive extra-Chinese synonymy is not cited here.

## 66. NERVILIA Commerson ex Gaudichaud, Voy. Uranie, Bot. 421. 1829, nom. cons.

芋兰属 yu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale

*Aplostellis* Thouars; *Bolborchis* Zollinger & Moritzi; *Cordyla* Blume (1825), not Loureiro (1790); *Roptrostemon* Blume; *Stellorkis* Thouars.

Herbs, terrestrial. Tubers globose or ovoid, cormlike, fleshy, few to several noded, with a few short roots at nodes or rootless. Stem arising from apex of tuber and giving rise to an inflorescence and a leaf in succession, bearing 1 to several lateral, subterranean runners during leafing period. Runners producing new tubers at apex. Leaf solitary, usually emerging after anthesis, usually horizontal, cordate, orbicular, reniform, or elliptic, palmately veined, often plicate, membranous or fleshy, glabrous or pubescent, base cordate, apex acute, obtuse, or rounded, borne on an elongate, erect or prostrate petiole-like stalk. Inflorescence erect, terminal, slender or slightly stout, usually slightly fleshy, glabrous; peduncle with 1 to several tubular sheaths, elongating in fruit in 1-flowered species; rachis 1-, 2-, or several flowered; floral bracts usually small, lanceolate. Flowers erect or nodding, resupinate or not, medium-sized, opening widely or not; pedicel becoming erect and elongating in fruit in 1-flowered species. Sepals and petals similar, narrowly ovate or elliptic; lip 3-lobed or occasionally simple, base spurless or spurred, apex entire or fimbriate. Column elongate, clavate, slender, not winged; anther terminal, incumbent, usually ovoid, 2-locular; pollinia 2, cleft, granular-farinaceous, sectile; caudicle absent; viscidium reduced or prominent; rostellum broad, entire, sometimes absent; stigmatic surface shield-shaped to orbicular, lying below rostellum.

About 65 species: tropical and subtropical Africa, Madagascar, and parts of the Arabian Peninsula, across India, Nepal, and Bhutan to Japan, SE Asia, New Guinea, N Australia, and the SW Pacific islands; nine species (three endemic) in China; one additional species (endemic) is incompletely known.

This is a taxonomically problematic genus that remains poorly understood, primarily because the solitary inflorescence and solitary leaf usually emerge and are present aboveground at different times in the growing season, frequently leading to incomplete herbarium collections and species circumscriptions. Some of the widespread taxa may represent species complexes and are in need of critical re-examination.

- 1a. Flowers erect, not resupinate; lip apex lacerate or fimbriate; adaxial surface of leaf sparsely setulose throughout.
- 2a. Inflorescence 1-flowered; leaf with 7 main veins; adaxial surface of leaf green with fine white reticulate venation ..... 5. *N. crocififormis*
- 2b. Inflorescence 2- or 3-flowered; leaf with 10 or more main veins; adaxial surface of leaf uniformly light green ..... 6. *N. cumberleigei*
- 1b. Flowers nodding, resupinate; lip apex not divided; leaf glabrous or pubescent primarily on main veins.
- 3a. Inflorescence 2–15-flowered; lip brownish tinged yellow or purple, or pale green, white, pinkish white, or pale green with purplish venation; leaf orbicular-cordate or cordate-ovate.
- 4a. Inflorescence 2-flowered; lip obscurely 3-lobed, longitudinally folded at apex, brownish tinged yellow or purple; leaf pubescent on main veins ..... 7. *N. plicata*
- 4b. Inflorescence 3–15-flowered; lip distinctly 3-lobed, not folded at apex, pale green, white, pinkish white, or pale green with purplish venation; leaf glabrous.
- 5a. Inflorescence 3–5-flowered; lip densely villous, especially toward apex; leaf ca. 5 × 6 cm ..... 8. *N. fordii*
- 5b. Inflorescence 4–15-flowered; lip villous primarily on veins; leaf 9–15 × 10–18 cm ..... 9. *N. aragoana*
- 3b. Inflorescence 1-flowered; lip white, with purple, purplish magenta, or pinkish purple flecks, spots, or blotches; leaf usually 5–7-sided.
- 6a. Sepals white; dorsal sepal ca. 28 mm; lip ca. 25 mm; lateral lobes of lip not prominent, apices rounded ..... 4. *N. muratana*
- 6b. Sepals brown, greenish brown, or greenish beige; dorsal sepal 14–22 mm; lip 12–20 mm; lateral lobes of lip triangular, apices acute.
- 7a. Mid-lobe of lip ca. 2.5 mm wide; disk with 3 thickened central veins; leaf margin cornutely toothed at tips of main veins ..... 3. *N. mackinnonii*
- 7b. Mid-lobe of lip 4–6 mm wide; disk with a single longitudinal ridge; leaf margin not usually cornutely toothed.
- 8a. Mid-lobe of lip 6–8 mm, apex rounded or obtuse; leaf membranous, margin crisped, adaxially uniformly green ..... 1. *N. lanyuensis*
- 8b. Mid-lobe of lip 8–10 mm, apex acute; leaf slightly fleshy, margin not crisped, adaxially green with irregular silvery-white mottling ..... 2. *N. taiwaniana*

**1. *Nervilia lanyuensis*** S. S. Ying, Mem. Coll. Agric. Natl. Taiwan Univ. 29: 55. 1989 [*“lanyuense”*].

兰屿芋兰 lan yu yu lan

Tuber whitish, subglobose or ovoid, 7–12 mm in diam. Leaf abaxially pale green, adaxially green, 5- or 6-sided to cordate, 3–6 × 4–5.5 cm, membranous, glabrous, with 5 or 7 main veins, base deeply cordate, margin crisped, apex acute; petiole-like stalk erect, 4–6 cm, with 1 or 2 short tubular sheaths at base. Inflorescence 8–15 cm, 1-flowered; peduncle brownish beige, with 1 or 2 tubular sheaths, elongating in fruit; sheaths brownish beige with purple flecks, 2–3.5 cm, apex acuminate or acute; floral bract lanceolate or linear-lanceolate, 4–8 × 1–3 mm, apex acute. Flower nodding, resupinate, opening widely, 15–20 mm in diam.; pedicel and ovary 6–8 mm, glabrous. Sepals pale greenish brown with purple flecks on outer surfaces, lanceolate, 16–20 × 3–4 mm, apex acute or acuminate. Petals pale greenish brown, lanceolate, 15–18 × 2–3 mm, apex acute; lip white with small purple flecks, narrowly oblong, 12–15 × 5–7 mm, spurless, 3-lobed near middle; lateral lobes erect and loosely embracing column, triangular, 4.5–5.5 × 2–3 mm, apices acute; mid-lobe obovate or orbicular, 6–8 × 4–5 mm, apex rounded or obtuse; disk with a longitudinal ridge extending from base of lip almost to apex of mid-lobe. Column

white with purple spots, 4.5–6 mm, apex dilated; stigma shield-shaped. Fl. Mar–Apr.

• Evergreen forests. S Taiwan (Lan Yu).

**2. *Nervilia taiwaniana*** S. S. Ying, Quart. J. Chin. Forest. 11: 104. 1978.

台湾芋兰 tai wan yu lan

Tuber whitish, subglobose, 5–15 mm in diam., 3- or 4-noded. Leaf abaxially green with purple venation, adaxially green with irregular silvery-white mottling, 5- or 7-sided to cordate, 3–4.5 × 3.5–4.5 cm, with 5 or 7 main veins, slightly fleshy, glabrous, base deeply cordate, apex acute or obtuse; petiole-like stalk erect, 2–5 cm, with 1 or 2 short tubular sheaths near base. Inflorescence 7–15 cm, 1-flowered; peduncle brown to greenish brown with purple flecks, with 2 or 3 tubular sheaths, elongating in fruit; sheaths brown to greenish brown with purple flecks, 1–2 cm, apex acute or acuminate; floral bract ovate-lanceolate, 4–7 × 1–2 mm, apex acute. Flower nodding, resupinate, opening widely or not, 16–25 mm in diam.; pedicel and ovary brown or greenish brown with purple flecks, 6–10 mm. Sepals brown to greenish brown with purple flecks, lanceolate, 18–22 × 2.2–3 mm, apex acute or acuminate. Petals brown to greenish brown with purple flecks, lanceolate,

16–20 × 1.5–2 mm, apex acuminate; lip white with purplish magenta spots and blotches, oblong or oblanceolate, 14–20 × 4.5–8 mm, spurless, 3-lobed near middle; lateral lobes erect and loosely embracing column, triangular, ca. 4 × 1–2 mm, apices acute; mid-lobe narrowly obovate to elliptic, 8–10 × 4–6 mm, apex acute; disk papillose, densely pubescent-lanate between lateral lobes, with a central longitudinal ridge extending from near base of lip almost to apex of mid-lobe. Column white, 4–6.5 mm, with a cluster of hairs below stigma, apex dilated; pollinia enclosed within clinandrium; stigma shield-shaped; rostellum large. Fl. Mar.

- Evergreen forests; 500–2000 m. Taiwan.

This species has been considered conspecific with the Japanese *Nervilia nipponica* Makino by some authors (e.g., see T. P. Lin, Native Orchids Taiwan 3: 174. 1987; H. J. Su, Fl. Taiwan, ed. 2, 5: 978–979. 2000). However, *N. nipponica* has a uniformly green (non-mottled), membranous leaf, smaller floral parts, a semipeloric perianth in which the petals bear patches of papillae (as on the lip), and a column that lacks a rostellum. Accordingly, *N. taiwaniana* and *N. nipponica* should be treated as separate species. A recent collection from Yunnan that was referred to *N. nipponica* (G. W. Hu et al., Acta Bot. Yunnan. 30: 146. 2008) does not match authentic material of that species from Japan and is distinct also from *N. taiwaniana*. Further investigation may reveal the Yunnan entity to represent a new species.

**3. *Nervilia mackinnonii*** (Duthie) Schlechter, Bot. Jahrb. Syst. 45: 402. 1911.

七角叶芋兰 qi jiao ye yu lan

*Pogonia mackinnonii* Duthie, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 71: 43. 1902.

Tuber whitish, subglobose, 7–12 mm in diam., 3–5-noded. Leaf green on both surfaces, 7-sided to cordate, 2.5–4.5 × 3.7–5 cm, membranous, glabrous, with 7 main veins, base deeply cordate, margin cornutely toothed at tips of main veins, apex acute; petiole-like stalk erect, 4–7 cm, with 1 or 2 short tubular sheaths near base. Inflorescence 6–10 cm, 1-flowered; peduncle brown, with 2 or 3 tubular sheaths, elongating in fruit; floral bract lanceolate, 2.5–5 × ca. 1 mm, apex acute. Flower nodding, resupinate, opening widely or not; pedicel and ovary 4–7 mm. Sepals light greenish beige with purplish flecks on outer surfaces, linear-lanceolate, 14–17 × ca. 2 mm, apex acuminate. Petals light greenish beige with purplish flecks on outer surfaces, linear-lanceolate, 13–16 × ca. 1.5 mm, apex acute; lip white tinged pale green at base and with purple blotches on mid-lobe, oblong, ca. 14 × 5 mm, spurless, 3-lobed near middle; lateral lobes erect and loosely embracing column, triangular, ca. 3 × 0.8 mm, apices acute; mid-lobe narrowly oblong, 6–7.5 × ca. 2.5 mm, apex obtuse; disk with 3 thickened central veins. Column 6–7 mm; stigma shield-shaped. Fl. May.  $2n = 36$ .

Forests; 900–1400 m. S Guizhou, C and NW Yunnan [NE India, Myanmar].

**4. *Nervilia muratana*** S. W. Gale & S. K. Wu, Makinoa, n.s., 7: 81. 2008.

滇南芋兰 dian nan yu lan

Tuber whitish to pale brown, subglobose, 4–9 mm in diam.,

3–5-noded. Leaf deep green on both surfaces, 6-sided, ca. 4.5 × 4 cm, papery, glabrous, with 5 main veins, base deeply cordate, apex acute; petiole-like stalk erect, 5–6 cm, green with purple flecks, with 1 or 2 short tubular sheaths near base. Inflorescence 6.5–10 cm, 1-flowered; peduncle pale brown with purple flecks, with 2 tubular sheaths; floral bract narrowly lanceolate, ca. 7 × 1 mm, apex acuminate. Flower nodding, resupinate, opening widely, ca. 50 mm in diam.; pedicel and ovary pale beige-white with sparse maroon flecks, ca. 5.5 mm; sepals and petals similar, white on both surfaces, tinged greenish brown toward base, and with sparse maroon flecks on outer surfaces. Dorsal sepal narrowly ovate-lanceolate, ca. 28 × 2.8 mm, apex acuminate and slightly reflexed; lateral sepals linear-lanceolate, ca. 26 × 1.8 mm, margin slightly asymmetric and involute, apex acuminate and slightly reflexed. Petals slightly falcate, linear-lanceolate, ca. 24 × 1.5 mm, apex acuminate; lip white with irregular pinkish purple blotches on mid-lobe, narrowly obovate, ca. 25 × 9 mm, spurless, 3-lobed near middle; lateral lobes erect and tightly embracing column, not prominent, apices rounded; mid-lobe ovate-triangular, ca. 12 × 9 mm, apex acute and slightly reflexed; disk with a thickened midvein, lanate between lateral lobes, shortly scabrid-pubescent on veins of mid-lobe. Column white, ca. 12.5 mm, with a narrow strip of short hairs from near base to midway along its length on ventral surface, apex dilated; pollinia enclosed within clinandrium, ca. 3 mm, attached to a triangular viscidium; stigma shield-shaped; rostellum transversely elliptic, large. Fl. Mar.

- Evergreen forests; 200–500 m. S Yunnan.

**5. *Nervilia crociformis*** (Zollinger & Moritz) Seidenfaden, Dansk Bot. Ark. 32(2): 151. 1978.

白脉芋兰 bai mai yu lan

*Bolborchis crociformis* Zollinger & Moritz, Syst. Verz. 89. 1846; *Nervilia crispata* (Blume) Schlechter ex K. Schumann & Lauterbach; *N. monantha* Blatter & McCann; *N. prainiana* (King & Pantling) Seidenfaden; *Pogonia crispata* Blume; *P. prainiana* King & Pantling.

Tuber whitish, subglobose to ovoid, ca. 12 mm in diam. Leaf abaxially pale green, adaxially green with fine white reticulate venation, cordate or polygonal, 2.5–4 × 2.5–5 cm, slightly fleshy, adaxially sparsely setulose throughout, with 7 main veins, base cordate, margin undulate, apex acute; petiole-like stalk erect, 2–5 cm. Inflorescence 3–6 cm, 1-flowered; peduncle green, with 3 or 4 tubular sheaths; floral bract ovate-lanceolate, small, apex acute. Flower erect, not resupinate, opening widely, 18–25 mm in diam. Sepals green, lanceolate, 13–14 × ca. 2 mm, apex acute or acuminate. Petals green, narrowly lanceolate, ca. 11 × 1.5 mm, apex acute to acuminate; lip strongly reflexed above middle, white tinged pale green at base and sometimes with a yellowish patch at center, rhombic, ca. 13 × 8 mm, spurless, simple or 3-lobed, lateral margins erect and loosely enclosing column, apical margin irregularly lacerate or fimbriate; lateral lobes (when present) suborbicular, small; disk papillose, with 3 longitudinal ridges extending from near base almost to apex. Column ca. 6.5 mm, apex dilated; stigma suborbicular. Fl. May–Jun.

Grasslands; 200–300 m. S Taiwan [India, Indonesia, Malaysia, Nepal, New Guinea, Philippines, Thailand, Vietnam; Africa, Australia].

Broadly circumscribed here following Pettersson (Orchid Monogr. 5: 44–47. 1991), *Nervilia crocififormis* is a widespread species with a variable lip shape.

**6. *Nervilia cumberlegei*** Seidenfaden & Smitinand, Orchids Thailand 4(2): 729. 1965.

流苏芋兰 liu su yu lan

Tuber whitish, ovoid to globose, 6–12 mm in diam. Leaf light green on both surfaces, reniform to broadly cordate, 2–4.5 × 3–5.5 cm, adaxially sparsely setulose throughout, with 10 or more main veins, base cordate, margin undulate, apex rounded; petiole-like stalk erect but very short, 0.8–1 cm; leaf blade borne flush with substratum. Inflorescence 7–9 cm, 2- or 3-flowered; peduncle green, with 2 or 3 tubular sheaths; floral bracts small. Flowers erect, not resupinate, opening widely; pedicel and ovary 7–9 mm. Sepals green, linear-oblong, ca. 14 × 2–2.5 mm, apex acute. Petals green, linear-elliptic, ca. 12 × 2 mm, apex acute; lip white tinged pale yellowish green at base, oblong, ca. 13 × 5 mm, spurless, simple or obscurely 3-lobed above middle; lateral lobes suborbicular, small, apices rounded; mid-lobe subquadrate, apical margin fimbriate; disk papillose; papillae longer and denser toward apex of lip. Column 7–8 mm; stigma suborbicular. Fl. May.

Grasslands; ca. 800 m. C Taiwan [NC Thailand].

**7. *Nervilia plicata*** (Andrews) Schlechter, Bot. Jahrb. Syst. 45: 403. 1911.

毛叶芋兰 mao ye yu lan

*Arethusa plicata* Andrews, Bot. Repos. 5: 321. 1803; *Aplostellis velutina* (E. C. Parish & H. G. Reichenbach) Ridley; *Cordyla discolor* Blume; *Nervilia biflora* (Wight) Schlechter; *N. dallachyana* (F. Mueller ex Benth) Schlechter; *N. discolor* (Blume) Schlechter; *N. discolor* var. *purpurea* (Hayata) S. S. Ying; *N. plicata* var. *purpurea* (Hayata) S. S. Ying; *N. purpurea* (Hayata) Schlechter; *N. velutina* (E. C. Parish & H. G. Reichenbach) Schlechter; *Pogonia biflora* Wight; *P. discolor* (Blume) Blume; *P. dallachyana* F. Mueller ex Benth; *P. plicata* (Andrews) Lindley; *P. pudica* Ames; *P. pulchella* J. D. Hooker; *P. purpurea* Hayata; *P. velutina* E. C. Parish & H. G. Reichenbach; *Roptrostemon discolor* (Blume) Blume.

Tuber whitish, globose to ellipsoid, 5–20 mm in diam. Leaf abaxially green or dark purple, adaxially pale to dark green and sometimes with purple or yellowish blotches, orbicular-cordate, 7.5–11 × 10–13 cm, plicate, pubescent primarily on veins, many veined, base cordate, apex acute; petiole-like stalk erect, purple or dark green, 1.5–3 cm. Inflorescence 12–20 cm, 2-flowered; peduncle dark green or purple, with 2 or 3 tubular sheaths; floral bracts lanceolate, 5–7 × 1–2 mm, apex acuminate. Flowers nodding, resupinate, usually opening widely; pedicel and ovary 10–14 mm, ridged. Sepals brownish yellow or purple with purplish red venation, spatulate, 15–25 × 2.5–4 mm, apex acute. Petals brownish yellow or purple with purplish red venation, linear-oblong, 14–22 × 2.5–3 mm, apex acute; lip brownish tinged yellow at center and with purplish brown venation, or pale purple tinged dark purple at center and with purplish red venation, rhombic to ovate, 13–20 × 10–13 mm, spurless, obscurely 3-lobed above middle; lateral

lobes erect and loosely enclosing column, small, rounded; mid-lobe subsquare or ovate, longitudinally folded at apex, apex truncate-obtuse when flattened or sometimes slightly emarginate; disk glabrous, with a ridge running from near base almost to apex of mid-lobe. Column white, 7–10 mm, apex dilated; stigma suborbicular. Fl. May–Jun.  $2n = 20, 72, 108$ .

Forests, shaded and damp places along valleys; 200–1000 m. Fujian, S Gansu, Guangdong, Guangxi, Sichuan, S Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; N Australia].

This is a variable species in terms of lip shape, ornamentation, and color, as well as leaf size and color, and several forms have been recognized as distinct species by some authors. Further examination of this complex is required.

**8. *Nervilia fordii*** (Hance) Schlechter, Bot. Jahrb. Syst. 45: 403. 1911.

毛唇芋兰 mao chun yu lan

*Pogonia fordii* Hance, J. Bot. 23: 247. 1885.

Tuber whitish, globose, 10–15 mm in diam. Leaf pale green on both surfaces, cordate-ovate, ca. 5 × 6 cm, plicate, membranous, glabrous, with ca. 20 main veins, base cordate, margin undulate, apex acute; petiole-like stalk erect, ca. 7 cm. Inflorescence 13–30 cm, 3–5-flowered; peduncle with 3–6 tubular sheaths; floral bracts reflexed, linear, 6–11 × ca. 1.5 mm, slightly exceeding ovary, apex acuminate. Flowers nodding, resupinate, opening widely or not; pedicel and ovary 5–10 mm, narrowly ridged. Sepals and petals pale green with purplish venation, linear-oblong, 9–17 × 2–2.5 mm, apex obtuse or acute; lip white with purplish venation, obovate, 7–13 × 5.5–7 mm, base cuneate, spurless, 3-lobed above middle; lateral lobes erect and loosely embracing column, triangular, ca. 2 × 1.5 mm, apices acute; mid-lobe transversely elliptic, ca. 2 × 3.5 mm, apex obtuse-rounded; disk densely villous especially toward apex. Column 6–8 mm. Fl. May.

Shaded damp places in forests; 200–1000 m. Guangdong, Guangxi, C and W Sichuan, Yunnan [N Thailand, N Vietnam].

**9. *Nervilia aragoana*** Gaudichaud, Voy. Uranie, Bot. 422. 1829.

广布芋兰 guang bu yu lan

*Aplostellis flabelliformis* (Lindley) Ridley; *Epipactis carinata* Roxburgh; *Nervilia carinata* (Roxburgh) Schlechter; *N. flabelliformis* (Lindley) Tang & F. T. Wang; *N. scottii* (H. G. Reichenbach) Schlechter; *N. tibetensis* Rolfe; *N. yaeyamensis* Hayata; *Pogonia carinata* (Roxburgh) Lindley; *P. flabelliformis* Lindley; *P. gracilis* Blume; *P. nervilia* Blume; *P. scottii* H. G. Reichenbach.

Tuber whitish, subglobose to ovoid, 10–17 mm in diam., 3–5-noded. Leaf green on both surfaces, broadly cordate-ovate, 9–15 × 10–18 cm, glabrous, many veined, base deeply cordate, margin undulate, apex acute or rounded; petiole erect, 2.5–11 cm, green, with 1 or 2 short tubular sheaths near base or embrace. Inflorescence 15–45 cm, 4–15-flowered; peduncle green or purple, with 3–5 tubular sheaths; floral bracts reflexed, linear-lanceolate, 10–16 × 1–1.5 mm, exceeding ovary. Flowers nodding, resupinate, usually opening widely, emitting an

unpleasant odor; pedicel and ovary 7–13 mm, ridged. Sepals yellowish green, linear-oblong, 15–22 × 2.5–3 mm, apex acuminate or acute. Petals yellowish green, linear-lanceolate, 12–20 × 2–2.5 mm, apex acute; lip pale green, white, pinkish white, or pale green with purplish brown venation, variable in shape, ovate-oblong, obovate, or rhombic, 12–17 × 5–8 mm, base cuneate, spurless, 3-lobed above middle; lateral lobes erect and loosely embracing column, triangular, 2–4 × 2–4 mm, apices acute; mid-lobe ovate-elliptic, ovate-triangular, or sub-

obovate-square, 3–5 × 3–5 mm, apical margin undulate, apex obtuse or acute; disk villous primarily on veins. Column white, 6–10 mm, apex dilated; stigma suborbicular. Fl. May–Jun.  $2n = 72$ .

Forests, shaded and damp places along valleys; 400–2300 m. Hubei, Sichuan, C and S Taiwan, S and SE Xizang, S and W Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; Australia, Pacific islands].

#### Incompletely known species

**Nervilia taitoensis** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. 10: 6. 1911.

台东芋兰 tai dong yu lan

*Pogonia taitoensis* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 346. 1911.

Tuber subglobose, 6–8 mm in diam. Leaf not known. Inflorescence ca. 11 cm, 2-flowered; peduncle with 2 tubular sheaths; floral bracts linear, ca. 10 × 1 mm. Flowers resupinate;

pedicel and ovary ca. 5 mm. Sepals narrowly linear-elliptic, 15–20 × 1–2 mm, apex acuminate. Petals narrowly linear-elliptic, 15–19 × 1.2–1.5 mm, apex acuminate; lip purple, obovate, ca. 18 × 6–10 mm, base cuneate, spurless, 3-lobed above middle, apex acute; lateral lobes small, apices truncate; mid-lobe ovate, margin slightly undulate; disk hirsute. Column ca. 7 mm.

• S Taiwan.

*Nervilia taitoensis* is known only from the type collection, which consists of a single inflorescence.

### 67. GASTRODIA R. Brown, Prodr. 330. 1810.

天麻属 tian ma shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Epiphanes* Blume.

Herbs terrestrial, leafless, holomycotrophic. Rhizomes horizontal, tuberous, cylindrical, sometimes slightly coralloid, slightly fleshy, usually densely noded. Inflorescence erect, terminal, noded below middle, nodes with tubular or scalelike sheaths, glabrous, yellowish brown or dull brown, usually few to many flowered, rarely 1-flowered, sometimes elongating in fruit. Flowers spreading or nodding, campanulate, urceolate, or cylindrical, resupinate or not, cream-brown, yellowish brown, or dull brown, occasionally greenish brown, lip often lighter brown and sometimes with orange markings; pedicel usually elongating in fruit. Sepals and petals united and forming a perianth tube, only apical portions free; perianth tube sometimes dilated and saccate at base, sometimes with a deep sinus between lateral sepals, outer surface often verrucose; petals much smaller than sepals; lip enclosed within perianth tube, adnate to apex of column foot, usually small, usually clawed at base, simple or 3-lobed; disk with a pair of globose calli at base. Column elongate, with a short but distinct column foot at base, winged toward apex, sometimes with a pair of toothlike projections at apex; anther borne on a filament, large, subterminal, incumbent; pollinia 2, granular-farinaceous, usually composed of friable massulae, without caudicles; stigma raised, shield-shaped. Capsule erect.

About 20 species: from NE India through the E Himalayas, across S China to Japan and E Siberia, throughout SE Asia to E Australia and the SW Pacific islands, also in tropical Africa, Madagascar, and the Mascarene Islands; 15 species (nine endemic) in China.

- 1a. Plants 2–15 cm tall in flower; perianth tube campanulate.
  - 2a. Outer surface of perianth tube smooth ..... 11. *G. pubilabata*
  - 2b. Outer surface of perianth tube verrucose.
    - 3a. Disk of lip with 6–8 parallel ridges ..... 12. *G. fontinalis*
    - 3b. Disk of lip unadorned or with a single forked, fleshy keel.
      - 4a. Lip 3-lobed, lateral lobes papillose; disk with a forked, fleshy keel ..... 15. *G. shimizuana*
      - 4b. Lip simple, glabrous; disk unadorned.
        - 5a. Column with an elongate, forked appendage on ventral surface ..... 13. *G. appendiculata*
        - 5b. Column lacking an appendage ..... 14. *G. confusa*
  - 1b. Plants 10–100 cm tall in flower; perianth tube cylindrical or urceolate.
    - 6a. Perianth tube cylindrical, lacking a deep sinus between lateral sepals.
      - 7a. Perianth tube 16–18 mm; lobes of perianth tube not crisped ..... 10. *G. longitudinalis*
      - 7b. Perianth tube 5–12 mm; lobes of perianth tube crisped.
        - 8a. Lip shallowly 3-lobed; disk with a fleshy longitudinal ridge ..... 7. *G. menghaiensis*
        - 8b. Lip simple, unadorned.
          - 9a. Lip connate with perianth tube for most of its length ..... 8. *G. peichatieniana*
          - 9b. Lip free of perianth tube ..... 9. *G. wuyishanensis*

- 6b. Perianth tube urceolate, inflated at base, with a deep sinus between lateral sepals.
- 10a. Disk of lip rugose and thickened, but without ridges, lamellae, or calli ..... 1. *G. javanica*
- 10b. Disk of lip with longitudinal ridges, lamellae, or calli.
- 11a. Disk of lip with a pair of fleshy reniform calli.
- 12a. Rachis subdensely to densely 20–50-flowered; lip obscurely 3-lobed, apical margin irregularly fimbriate; claw with a pair of gibbous foldings ..... 5. *G. elata*
- 12b. Rachis 7–20-flowered; lip simple, apical margin entire; claw with a pair of ellipsoid calli ..... 6. *G. flavilabella*
- 11b. Disk of lip with longitudinal ridges or lamellae.
- 13a. Lip obscurely 3-lobed; disk with 4 longitudinal ridges ..... 2. *G. tuberculata*
- 13b. Lip simple; disk with 2 longitudinal lamellae or ridges.
- 14a. Lip ovate-triangular, 5–6 mm, slightly papillose ..... 3. *G. gracilis*
- 14b. Lip oblong-rhombic, ca. 15 mm, glabrous ..... 4. *G. angusta*

**1. *Gastrodia javanica*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 384. 1840.

南天麻 nan tian ma

*Epiphanes javanica* Blume, Bijdr. 421. 1825; *Gastrodia lutea* Fukuyama; *G. stapfi* Hayata.

Plants 20–80 cm tall. Rhizome cylindrical, subterete, 3–15 cm, ca. 1 cm in diam., fleshy, densely noded. Peduncle dull brown, to 60 cm, with scattered scales toward base; rachis 5–20 cm, laxly 4–18-flowered; floral bracts triangular, 3–4 mm. Flowers spreading, not resupinate, pale yellowish beige to yellowish green, lip yellowish green at base and flushed yellow at apex; pedicel and ovary 5–6 mm; pedicel not elongating in fruit. Perianth tube urceolate, ca. 10 × 13 mm, with sinus between lateral sepals extending almost to base, base inflated, outer surface smooth; free portion of sepals broadly ovate-orbicular, 2.5–3 mm, apex obtuse; free portion of petals ovate, slightly smaller than sepal lobes, apex obtuse; lip exposed by deep sinus in perianth tube, simple, rhombic-ovate, 5–7 × 5–6 mm, glabrous, base clawed, margin involute, apex acute; claw 3–4 mm, with a pair of calli; disk rugose and thickened. Column 6–8 mm, with a pair of narrow wings, yellowish white; column foot prominent, ca. 3 mm; anther ovoid. Capsule cylindrical, ca. 20 mm. Fl. Jun–Jul.

Forests. N Fujian, S Taiwan [Indonesia, Japan (Ryukyu Islands), Malaysia, Philippines, Thailand].

**2. *Gastrodia tuberculata*** F. Y. Liu & S. C. Chen, Acta Bot. Yunnan. 5: 76. 1983.

疣天麻 you tian ma

Plants 24–35 cm tall. Rhizome ovoid or obconic, 3–6 cm, stout, 1.5–2.8 cm in diam., fleshy, sparsely papillose, densely noded, with small scales at nodes. Peduncle 18–25 cm, with white longitudinal stripes, fleshy, with several sheaths at base; sheaths 7–12 mm; rachis 4–7 cm, laxly 2–10-flowered; floral bracts lanceolate, 5–8 mm. Flowers suberect, resupinate, whitish with greenish gray stripes; pedicel and ovary 6–7 mm, sparsely papillose. Perianth tube urceolate, 11–13 × 5–6 mm, with a deep sinus between lateral sepals, base inflated; free portion of sepals subovate to broadly ovate-triangular, 2–2.5 mm, outer surface smooth but minutely papillose, apex obtuse; free portion of petals broadly ovate, 1–1.5 mm, apex acute; lip obscurely 3-lobed, triangular-ovate, 6–8 × ca. 4 mm, glabrous, base shortly clawed, margin irregularly erose at apex, apex

acute; claw 1.5–2 mm, with a pair of calli; disk with 4 fleshy, tuberculate, longitudinal ridges extending from base to apex. Column 7–8 mm, with a pair of toothlike projections at apex; column foot short. Capsule obovoid-ellipsoid, 11–13 × 6–7 mm. Fl. and fr. Mar–Apr.

• Bamboo forests, forest margins; 1900–2300 m. C Yunnan.

**3. *Gastrodia gracilis*** Blume, Mus. Bot. 2: 174. 1856.

细天麻 xi tian ma

*Gastrodia dioscoreirrhiza* Hayata; *G. taiwaniana* Fukuyama.

Plants 10–60 cm tall. Rhizome brown, cylindrical or conic, 3–10 cm, 0.3–2 cm in diam., fleshy, pilose. Peduncle pale yellow, to 50 cm, with several scattered scales at base; rachis 3–10 cm, densely 3–20-flowered; floral bracts ovate or elliptic, 2–4 mm. Flowers nodding, resupinate, yellowish brown, lip flushed orange-red toward apex; pedicel and ovary 8–15 mm; pedicel elongating to 15 cm in fruit. Perianth tube urceolate, base inflated, outer surface smooth; free portion of sepals ovate, ca. 2 mm, apex rounded and usually 3-lobed; free portion of petals ovate, much shorter than sepal lobes; lip simple, ovate-triangular, 5–6 mm, base clawed, margin undulate, apex obtuse; claw with a pair of ellipsoid or subglobose calli; disk with 2 longitudinal lamellae, slightly papillose. Column 5–6 mm, with a pair of semilunar wings toward apex; column foot prominent; anther orbicular, ca. 1 mm. Capsule obovoid or ellipsoid, 20–23 × 7–8 mm. Fl. May–Jun.

Forests; 600–1500 m. C and N Taiwan [Japan].

**4. *Gastrodia angusta*** S. Chow & S. C. Chen, Acta Bot. Yunnan. 5: 363. 1983.

原天麻 yuan tian ma

Plants 40–60(–80) cm tall. Rhizome grayish white, ellipsoid-fusiform, 5–10(–15) cm, stout, 3–5 cm in diam., densely noded, fleshy, with scales at nodes. Peduncle 25–35 cm, with a few scattered scales at base; rachis 15–25 cm, 20–30-flowered; floral bracts elliptic, 7–8 mm, much shorter than ovary, apex acuminate. Flowers suberect, resupinate, cream-white; pedicel and ovary 10–12 mm. Perianth tube urceolate, 10–12 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of dorsal sepal ovate to suborbicular, ca. 3 mm, margin involute, apex obtuse; free portion of lateral sepals

obliquely triangular, 6–7 mm, margin involute, apex obtuse to acute; free portion of petals concave, ovate, ca. 2.5 mm, apex obtuse to acute; lip simple, oblong-rhombic, ca. 15 × 5–6 mm, glabrous, base shortly clawed, margin erose toward apex; claw with a pair of lunar calli at base; disk with 2 yellowish, slightly raised longitudinal ridges. Column 7–8 mm; column foot short; stigma linear, narrow. Capsule obovoid, ca. 20 × 7–8 mm. Fl. and fr. Mar–Apr.  $2n = 36^*$ .

- 1600–1800 m. NW and SE Yunnan.

**5. *Gastrodia elata*** Blume, Mus. Bot. 2: 174. 1856.

天麻 tian ma

*Gastrodia elata* f. *alba* S. Chow; *G. elata* f. *flavida* S. Chow; *G. elata* f. *glauca* S. Chow; *G. elata* var. *gracilis* Pampanini; *G. elata* f. *pilifera* Tuyama; *G. elata* f. *viridis* (Makino) Makino; *G. elata* var. *viridis* (Makino) Makino; *G. mairei* Schlechter; *G. viridis* Makino.

Plants 30–100 cm, rarely to 200 cm tall. Rhizomes usually ellipsoid, 8–12 cm, stout, 3–5(–7) cm in diam., sometimes larger, fleshy, densely noded, with triangular or broadly ovate scales at nodes. Peduncle orange, yellow, grayish brown, or greenish, 25–80(–150) cm, with several membranous sheaths toward base; rachis 5–30(–50) cm, subdensely to densely 20–50-flowered; floral bracts oblong-lanceolate, 10–16 mm, often exceeding ovary, membranous, apex acuminate. Flowers suberect, resupinate, opening weakly, orange, pale yellow, bluish green, or yellowish white; pedicel and ovary 7–12 mm. Perianth tube urceolate, 8–10 × 5–7 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of sepals ovate-triangular, 3–5 mm, apex obtuse; free portion of petals suboblong, smaller than sepal lobes, apex acute; lip obscurely 3-lobed, oblong-ovoid, 6–7 × 3–4 mm, glabrous, base clawed, apical margin irregularly fimbriate; claw with a pair of gibbous foldings; disk papillose, with a pair of fleshy reniform calli. Column 5–7 mm; column foot short. Capsule obovoid-ellipsoid, 14–18 × 8–9 mm. Fl. and fr. May–Jul.  $2n = 24, 30, 36$ .

Sparse forests, open places in forests, forest margins, thicket margins; 400–3200 m. Anhui, N Fujian, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, NE India, Japan, Korea, Nepal, Russia (Far East)].

This species is widely cultivated for its tubers (*tianma*) that are used in traditional Chinese medicine for the treatment of convulsive disorders such as epilepsy.

**6. *Gastrodia flavilabella*** S. S. Ying, Quart. J. Chin. Forest. 17: 83. 1984.

夏天麻 xia tian ma

Plants 40–100 cm tall. Rhizome 4–10 cm, stout, 0.6–1.6 cm in diam., with many coral-like roots. Peduncle lower part yellowish brown, dull purplish brown above, to ca. 70 cm, with several scalelike sheaths; rachis 7–25 cm, laxly 7–20-flowered; floral bracts caducous, ovate-lanceolate, apex acute. Flowers spreading or nodding, resupinate, yellowish green, lip yellowish; pedicel and ovary ca. 6 mm; pedicel not elongating in

fruit. Perianth tube urceolate, 10–11 mm, with a deep sinus between lateral sepals, base inflated, outer surface smooth; free portion of sepals ovate, 2.5–4 mm, apex rounded; free portion of petals ovate to suborbicular, much smaller than sepal lobes; lip simple, obovate or obovate-oblong, 6–7 × 5–6 mm, glabrous, base shortly clawed, apical margin entire; claw with a pair of ellipsoid calli; disk with a pair of large, fleshy reniform calli near apex. Column pale green, ca. 7 mm, winged; column foot prominent; stigma rounded. Capsule dark brown, ellipsoid, ca. 15 mm. Fl. Jul.

- Open humid places in forests; 1100–1300 m. C Taiwan.

**7. *Gastrodia menghaiensis*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 32: 559. 1994.

勐海天麻 meng hai tian ma

Plants 13–30 cm tall. Rhizome subellipsoid, 1–2.5 cm, rather stout, 0.5–1 cm in diam., with a few roots. Peduncle brown to gray, 10–25 cm, with 5–7 cylindrical, membranous sheaths below middle; rachis 2–5 cm, laxly 3–10-flowered; floral bracts brownish, ovate, 3–4 mm, apex acute. Flowers suberect, not opening widely, white; pedicel and ovary 4–5 mm; pedicel elongating to ca. 2.2 cm in fruit. Perianth tube cylindrical, 8–12 mm, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals deltoid, 1.5–2 mm, margin crisped, apex obtuse-rounded; free portion of petals orbicular, much smaller than sepal lobes, margin crisped, apex rounded; lip shallowly 3-lobed, broadly ovate, 2–2.8 × 1.8–2.2 mm, glabrous, base long clawed, margin denticulate, apex obtuse; claw ca. 4.5 × 1 mm, connate to inner surface of perianth tube for its entire length, with a pair of calli at base; disk with a fleshy longitudinal ridge. Column 4–5 mm, winged, papillate at base; column foot short or inconspicuous. Capsule ellipsoid, 15–18 × 5–8 mm. Fl. and fr. Sep–Oct.

- Forests; ca. 1200 m. S Yunnan (Menghai).

**8. *Gastrodia peichatieniana*** S. S. Ying, Coloured Ill. Fl. Taiwan 2: 690. 1987 [*“peichatieniana”* and *“peichiatieniana”*].

北插天天麻 bei cha tian tian ma

*Gastrodia autumnalis* T. P. Lin.

Plants 10–40 cm tall. Rhizome 1.8–2.6 cm, 0.5–0.8 cm in diam., fleshy, villous. Peduncle pale whitish brown, 20–32 cm, 3- or 4-noded, with several sheaths at base; sheaths not persistent; rachis 1–6 cm, subdensely 2–8-flowered; floral bracts pale brown, narrowly oblong-ovate, 2.5–4 mm, apex acute. Flowers erect, not resupinate, not opening widely, white, sometimes tinged brown; pedicel and ovary white, tinged pale brown, 7–9 mm; pedicel elongating in fruit. Perianth tube cylindrical, 5–8 mm, slender, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals deltoid, 0.8–1.5 mm, margin crisped; free portion of petals elliptic or suborbicular, smaller than sepal lobes, margin crisped; lip connate with perianth tube for most of its length, only apical portion free; free portion of lip exerted at sinus between lateral sepals, simple, ovate, slightly concave, small, glabrous, sometimes absent. Column 4–6 mm, with glandular spots on ventral surface toward base; column wings 1–1.5 mm wide; column foot short. Capsule ellipsoid, to 20 mm. Fl. Oct.

- Forests; 900–1500 m. C and N Taiwan.

This species has a petaloid lip. It may well represent a peloric form of a species such as *Gastrodia menghaiensis*.

**9. *Gastrodia wuyishanensis*** Da M. Li & C. D. Liu, *Novon* 17: 354. 2007.

武夷山天麻 wu yi shan tian ma

Plants 13–28 cm tall. Rhizome brown, cylindrical-ellipsoid, 1.5–2 cm, 0.6–0.8 cm in diam., 3- or 4-noded, with several fleshy roots, papillose. Peduncle grayish brown or grayish green, 10–20 cm, 3- or 4-noded below middle, with sheaths at nodes; sheaths cylindrical, 4–13 mm; rachis 2.5–7 cm, laxly 5–8-flowered; floral bracts caducous, brown, broadly ovate, 2–3 mm, apex acute. Flowers spreading or nodding, not resupinate, not opening widely, grayish white; pedicel and ovary greenish white, 3–7 mm. Perianth tube cylindrical, 7–11 × 4–5 mm, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals triangular to suborbicular, 1.5–2 mm, margin crisped, apex obtuse; free portion of petals suborbicular, 0.7–0.9 mm, margin crisped, apex rounded; lip simple, rhombic-ovate, 2–3 × 1.5–2 mm, glabrous. Column 4–5 mm; column wings narrow, dilated toward apex; column foot short. Capsule ca. 5 mm. Fl. Aug–Sep.

- Dense forests; 1200–1400 m. W Fujian (Wuyi Shan).

**10. *Gastrodia longitubularis*** Q. W. Meng, X. Q. Song & Y. B. Luo, *Nordic J. Bot.* 25: 23. 2008.

海南天麻 hai nan tian ma

Plants 12–30 cm tall. Rhizome cylindrical or digitate, 4–7 cm, 0.3–0.6 cm in diam., with several roots. Peduncle 10–24 cm, several noded; rachis 1–3.5 cm, 2–6-flowered; floral bracts brown, lanceolate-ovate, ca. 6 mm, apex acuminate. Flowers spreading or nodding, not resupinate, not opening widely, gray-brownish, lip tinged red or orange-red; pedicel and ovary 8–10 mm; pedicel not elongating in fruit. Perianth tube cylindrical, 16–18 × 6–8 mm, lacking a deep sinus between lateral sepals, outer surface smooth; free portion of sepals ovate to suborbicular, 2–3 mm, apex acute; free portion of petals elliptic, ovate, or suborbicular, much smaller than sepal lobes, apex acute; lip simple, ovate or cordate, ca. 6 × 4–5 mm, glabrous, base clawed, margin entire or undulate, apex cuspidate; claw with a pair of subglobose calli; disk with 3–5 longitudinal grooves, with 2 longitudinal lamellae toward apex. Column 6–7 mm, with a pair of toothlike projections at apex; column wings narrow; column foot prominent. Capsule 12–15 mm. Fl. Apr–Jun, fr. May–Jul.

- Dense tropical forests; 800–1000 m. Hainan.

**11. *Gastrodia pubilabiata*** Sawa, *Res. Rep. Kochi Univ.* 29: 60. 1980.

冬天麻 dong tian ma

*Gastrodia hiemalis* T. P. Lin; *G. nipponica* (Honda) Tuyama var. *hiemalis* (T. P. Lin) S. S. Ying.

Plants 2–5 cm tall. Rhizome subcylindric to fusiform, 3–5(–10) cm. Peduncle dark brown, densely many noded; rachis very short, 1–3-flowered; floral bracts broadly ovate, 3–4 mm.

Flowers suberect, resupinate, opening widely, brown; pedicel and ovary dark brown, 10–12 mm, papillate; pedicel elongating to 50 cm in fruit. Perianth tube campanulate, ca. 15 mm, outer surface smooth; free portion of sepals spreading, ca. 5 mm, apex obtuse-rounded; free portion of petals ovate to suborbicular, much smaller than sepal lobes; lip simple to obscurely 3-lobed, broadly ovate-rhombic, ca. 5 × 6.5 mm, base shortly clawed, apex cuspidate; claw ca. 1.5 × 3.3 mm, with a pair of stalked, globose calli; disk with white hairs, with 2 small lamellae near apex of lip. Column ca. 6 mm, narrowly winged; column foot prominent, with a pair of subglobose calli. Capsule 20–35 mm. Fl. Dec.

Bamboo forests, bamboo plantations; 200–300 m. C and N Taiwan [Japan].

**12. *Gastrodia fontinalis*** T. P. Lin, *Native Orchids Taiwan* 3: 129. 1987.

春天麻 chun tian ma

Plants 7–12 cm tall. Rhizome flexuous, cylindrical, slender. Peduncle pale brown, to ca. 10 cm, with 3 or 4 amplexicaul sheaths below middle; sheaths 6–7 mm; rachis ca. 2 cm, 1–3-flowered; floral bracts ca. 3.5 × 3 mm, apex acute. Flowers spreading or nodding, resupinate, opening widely, dark brown, fleshy; pedicel and ovary dark brown, ca. 15 mm; pedicel elongating to ca. 17 cm in fruit. Perianth tube campanulate, ca. 17 × 18 mm, outer surface verrucose; free portion of sepals broadly ovate-triangular, ca. 6 × 7–9 mm, dorsal one concave at apex, lateral ones obtuse at apex and wider than dorsal one; free portion of petals ovate, ca. 4 × 3.5 mm, apex acute; lip simple, ovate or rhombic, 6.5–7.5 × 5–6 mm, fleshy, glabrous, base shortly clawed, lateral margins erect, apex cuspidate; claw with a pair of small, oblong, verrucose calli; disk with 6–8 parallel ridges, central 2 terminating in raised, fleshy red calli at apex of lip. Column ca. 8 mm, narrowly winged, with a pair of toothlike projections at apex, white, tinged reddish brown toward base; column foot short. Capsule cylindrical, ca. 30 mm, papillate. Fl. and fr. Feb.

- Bamboo forests. N Taiwan.

**13. *Gastrodia appendiculata*** C. S. Leou & N. J. Chung, *Quart. J. Exp. Forest. Natl. Taiwan Univ.* 5(4): 138. 1991.

无喙天麻 wu hui tian ma

Plants 3–6 cm tall. Rhizome yellowish brown, fusiform, 2–4 cm, 0.5–1.2 cm in diam., with scales at nodes, pilose. Peduncle brown, to ca. 4 cm, fleshy, densely noded; rachis less than 1 cm, densely 2–10-flowered; floral bracts lanceolate, shorter than pedicel, apex acute. Flowers suberect or spreading, opening weakly, pale greenish brown, often turning dark brown; pedicel and ovary 11–16 mm; pedicel elongating to 25–50 cm in fruit. Perianth tube campanulate, 8–11 mm, outer surface verrucose, with a deep sinus between lateral sepals; free portion of sepals broadly ovate, apex obtuse; free portion of petals ovate to suborbicular, much smaller than sepal lobes, apex rounded; lip simple, ovate, ca. 7 × 5 mm, glabrous, base shortly clawed, margin usually slightly erose, apex acute; claw with a pair of globose or ellipsoid calli. Column clavate, 4–5 mm, with an elongate, forked appendage on ventral surface;

column wings subquadrate; column foot short; stigma subterminal. Capsule cylindrical, 30–40 mm. Fl. Sep–Oct.

- Forests, bamboo plantations; 800–1200 m. C Taiwan.

**14. *Gastrodia confusa*** Honda & Tuyama, J. Jap. Bot. 15: 659. 1939.

八代天麻 ba dai tian ma

Plants 6–15 cm tall. Rhizome brown, obconic or fusiform, 2–4.5 cm, 5–8-noded, with 8–10 scales at each node, pilose. Peduncle pale brown, to ca. 13 cm, with several sheaths; rachis short, densely 3–10-flowered; floral bracts ovate, 6–8 mm, apex acute. Flowers suberect or nodding, resupinate, pale brown or blackish; pedicel and ovary 15–20 mm; pedicel elongating to ca. 30 cm in fruit. Perianth tube campanulate, 11–12 mm, outer surface verrucose; free portion of sepals curved inward, ovate, 3–5.5 mm, apex obtuse; free portion of petals subelliptic, much smaller than sepal lobes, thickened at base; lip yellow, simple, ovate, 7–8 × ca. 4 mm, glabrous, base clawed, margin irregularly denticulate; claw broad, with a pair of crestlike calli at base. Column clavate, ca. 4.5 mm; column wings triangular or subsquare; column foot prominent. Capsule fusiform, 32–35 mm. Fl. Sep–Nov.  $2n = 22$ .

Bamboo forests; ca. 1200 m. C Taiwan [Japan (Ryukyu Islands), Korea].

**15. *Gastrodia shimizuana*** Tuyama, Acta Phytotax. Geobot. 33: 380. 1982.

叉脊天麻 cha ji tian ma

Plants 2–5 cm tall. Rhizome cylindrical, 5–9 cm, 0.5–0.8 cm in diam., with deltoid sheaths at nodes, sparsely pubescent. Peduncle dark brown, to ca. 4 cm, with several short tubular sheaths toward base; rachis 1–1.5 cm, densely 1–4-flowered; floral bracts broadly oblong-ovate, 5–7 mm, shorter than ovary, apex acuminate. Flowers suberect or spreading, resupinate, yellowish brown, 15–18 mm in diam.; pedicel and ovary 8–10 mm, shortly papillate; pedicel elongating in fruit. Perianth tube campanulate, outer surface verrucose; free portion of sepals spreading, broadly ovate, 4.5–6 × 5–6.3 mm, margin entire or crisped, apex obtuse; free portion of petals spreading, orbicular to broadly ovate, 3–3.5 × 3–3.5 mm, margin entire or crisped, apex obtuse; lip 3-lobed, orange-brown at base, tinged pale cream-brown toward apex, deltoid-ovate, 5–6 × 5.5–6.5 mm, base clawed; lateral lobes suborbicular to deltoid, 3.2–3.5 × 4.8–5 mm, apex obtuse to acute; mid-lobe oblong, 2–2.1 × ca. 1 mm, apex obtuse-truncate; claw quadrate or broadly obovate, 2.5–2.8 mm, with a pair of globose, papillose calli; disk papillose on lateral lobes, with a central fleshy keel that forks below mid-lobe into 2 shallow lamellae. Column 4–5 mm; column wings truncate, incurved; anther ovoid, 1.3–1.5 mm; column foot prominent, with a pair of rounded calli where it meets base of lip. Capsule cylindrical. Fl. Mar.

Evergreen forests; 300–400 m. N Taiwan [Japan (Ryukyu Islands)].

## 68. DIDYMOPLEXIS Griffith, Calcutta J. Nat. Hist. 4: 383. 1843.

双唇兰属 shuang chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Leucorchis* Blume (1849), not E. Meyer (1839).

Herbs, terrestrial, small, holomycotrophic. Rhizome fusiform, tuberous, fleshy, neck sometimes with a few filiform roots. Stem erect, slender, with a few scalelike sheaths near base, leafless, glabrous. Inflorescence erect, terminal, racemose, with 1 to several flowers; floral bracts small. Flowers spreading, resupinate, often ephemeral, white or pale yellowish brown; pedicel elongating in fruit. Sepals and petals connate at base and forming a short tube; dorsal sepal and petals connate for ca. 1/2 their length and forming a perfect hood; lateral sepals usually connate for more than 1/2 of their length, deflexed distally; lip adnate with column foot at base, free from sepals and petals, not spurred, entire or weakly 3-lobed; disk with 1 or more basal glands and often papillate. Column elongate, dilated and with 2 wings at apex, wings forming short, toothlike stelidia, with distinct column foot at base; anther subterminal, borne on a short filament; pollinia 4, in 2 pairs, granular-farinaceous, ecaudiculate, each pair directly attached to a sticky viscidium; rostellum erect, transverse; stigma broad, placed directly below rostellum. Capsule erect, fusiform.

About 18 species: India, S China, and Indochina to S Japan (Ryukyu Islands) and the Philippines, throughout the Malay Archipelago to Papua New Guinea, tropical Australia, and the SW Pacific islands, also in SW Africa and Madagascar; two species in China.

- 1a. Column foot conspicuous, 2–3 mm; lip 6–7 mm wide, broader than long ..... 1. *D. pallens*  
 1b. Column foot inconspicuous, less than 1 mm; lip 4–5 mm wide, slightly longer than or as long as broad ..... 2. *D. micradenia*

**1. *Didymoplexis pallens*** Griffith, Calcutta J. Nat. Hist. 4: 383. 1843.

双唇兰 shuang chun lan

*Apetalon minutum* Wight; *Arethusa ecristata* Griffith; *Cheirostylis kanarensis* Blatter & McCann; *Didymoplexis brevipes* Ohwi; *D. subcampanulata* Hayata; *D. sylvatica* (Blume) Garay; *Gastrodia pallens* (Griffith) F. Mueller; *Leucorchis sylvatica* Blume.

Plants 6–25 cm tall. Rhizome pale brown, fusiform or moniliform, 8–25 × 5–8 mm; roots few to many, wiry, often with small globose thickenings. Stem 5–20 cm, with 3–5 scalelike sheaths, pale brown to reddish brown. Rachis 0.4–3 cm, elongating in fruit, laxly to subdensely 4–20-flowered; floral bracts ovate, ca. 2 mm, apex acute. Flowers opening in succession, white, campanulate; pedicel and ovary erect, brown, 0.7–1.2 cm; pedicel extending to 15 cm in fruit. Dorsal sepal and petals 4–7 mm, usually united for more than 1/2 of their length,

free portion ovate-triangular, shallowly 3-lobed, each lobe ovate-deltoid and with an obtuse apex; lateral sepals 3–4.5 mm, connate with each other for up to 1/2 of their length, and with petals for 1/3 of their length, free portion 2-lobed, each lobe ovate and with an obtuse apex, reflexed; lip broadly obovate, 4.5–5 × 6–7 mm, erose-crenate, lateral margins erect or incurved, apex subtruncate; disk with a dense row of warty papillae along midvein. Column slightly curved, clavate, ca. 4 mm, apex dilated and with 2 oblong wings; column foot slightly curved, 2–3 mm; anther orbicular. Capsule cylindrical-fusiform, 2–2.8 cm. Fl. and fr. Apr–May.

Thickets in coastal areas. N Fujian, C and S Taiwan [Afghanistan, Bangladesh, NE India, Indonesia, Japan (Ryukyu Islands), Malaysia, New Guinea, Philippines, Thailand, Vietnam; Australia, SW Pacific islands].

**2. *Didymoplexis micradenia*** (H. G. Reichenbach) Hemsley, J. Linn. Soc., Bot. 20: 311. 1883.

小双唇兰 xiao shuang chun lan

*Epiphanes micradenia* H. G. Reichenbach in Seemann, Fl. Vit. 295. 1868; *Didymoplexis minor* J. J. Smith.

Plants 6–30 cm tall. Rhizome pale brown, fusiform or moniliform, 10–50 × 4–7 mm; roots few. Stem pale brown to whitish, with 3–5 scalelike sheaths. Rachis 2–5 cm, with 8–15 flowers; floral bracts ovate, ca. 1.5 mm. Flowers not opening widely, whitish, tinged with pale red; pedicel and ovary 4–6 mm. Dorsal sepal and petals 5–8 mm, united for 1/2–2/3 of their length, free portion 3-lobed, lobes subsquare; lateral sepals 5–7 mm, connate with each other for 2/3–4/5 of their length, and with petals for 1/2 of their length, free portion 2-lobed, lobes suborbicular; lip obovate, 4–6 × 4–5 mm, margin erose apically, incurved on both sides; disk with a row of warty papillae along midvein. Column clavate, ca. 5 mm, apex dilated and with 2 wings; column foot inconspicuous, less than 1 mm; anther oval or orbicular. Capsule cylindrical, 1.8–2.2 cm; pedicel lengthening 10–25 cm in fruit, fleshy. Fl. and fr. Mar–May.

Wet rain forests, bamboo plantations, seasonal drought forests; 100–300 m. C and S Taiwan [Indonesia; SW Pacific islands].

## 69. *DIDYMOPLEXIELLA* Garay, Arch. Jard. Bot. Rio de Janeiro 13: 33. 1954 [“*Didimoplexiella*”].

锚柱兰属 mao zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Leucolena* Ridley, J. Linn. Soc., Bot. 28: 340. 1891, not *Leucolaena* (Candolle) Bentham (1837).

Herbs, terrestrial, small, holomycotrophic. Rhizome narrowly fusiform, tuberous, fleshy, neck sometimes with a few filiform roots. Stem erect, slender, with a few scalelike sheaths, leafless, glabrous. Inflorescence erect, terminal, racemose, with 1 to several flowers; rachis congested, sometimes thickened; floral bracts very small. Flowers erect or spreading, resupinate, often ephemeral, white or pale yellowish brown, small; pedicel elongating in fruit. Sepals and petals connate at base and forming a short tube; dorsal sepal and petals connate for ca. 1/2 their length and forming a porrect hood; lateral sepals usually connate for more than 1/2 of their length, deflexed or weakly spreading; lip adnate with column at base, free from sepals and petals, not spurred, apex entire or weakly 3-lobed; disk with a 2-lobed gland at base and sometimes papillate usually with callus. Column elongate, dilated and with 2 wings at apex, wings attenuate into decurved, filiform steldia on either side of stigma, lacking a column foot; anther terminal, borne on a long filament; pollinia 4, in 2 pairs, granular-farinaceous, ecaudiculate, each pair directly attached to a sticky viscidium; rostellum erect, transverse, small; stigma broad, placed directly below rostellum. Capsule erect, fusiform.

About eight species: Thailand, SE China, and S Japan (Ryukyu Islands) to the Malay Archipelago; one species in China.

*Didymoplexiella* is closely related to *Didymoplexis* but is distinguished from it by the presence of elongate, filiform steldia that extend from the column wings and by the absence of a column foot.

**1. *Didymoplexiella siamensis*** (Rolfe ex Downie) Seidenfaden, Bot. Tidsskr. 67: 99. 1972.

锚柱兰 mao zhu lan

*Leucolena siamensis* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 416. 1925.

Plants slender, 8–30 cm tall. Rhizome brown, fusiform, 8–24 mm, 3–5 mm in diam.; roots few, wiry, often with small globose thickenings. Stem 7–28 cm, with 2 or 3 scalelike sheaths, brown. Rachis 0.2–3 cm, elongating in fruit, slightly dilated, laxly to subdensely 3–20-flowered; floral bracts ovate, ca. 2 mm, apex acute. Flowers white, sometimes tinged pink, campanulate; pedicel and ovary erect or spreading, brown, 0.4–1.4 cm; pedicel extending to ca. 2 cm in fruit. Dorsal sepal and

petals 5–7 mm, united for 1/2 of their length, free portion ovate, shallowly 3-lobed, each lobe ovate-deltoid and with an acute apex; lateral sepals 5–8 mm, connate with each other for ca. 2/3 of their length, and with petals only at their base, free portion 2-lobed, each lobe ovate, oblique and with an acute apex, reflexed; lip cuneate-spatulate, 5–6 × 2–3 mm, apex truncate and emarginate, midvein raised on disk and with irregular calli at apex, with small glands at base. Column elongate, ca. 4 mm, dilated toward apex, column wings triangular and extending into decurved steldia; each steldium ca. 2 mm; anther orbicular and borne on distinct filament; rostellum thickened. Capsule cylindrical, ca. 2.2 cm. Fl. Apr–Jul.  $2n = 36, 150$ .

Shaded places in broad-leaved forests. S Hainan, S Taiwan [Japan (Ryukyu Islands), Thailand, Vietnam].

**70. DIDYMOPLEXIOPSIS** Seidenfaden, Contr. Orchid Fl. Thailand 13: 13. 1997.

拟锚柱兰属 ni mao zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, small, holomycotrophic. Rhizome moniliform, tuberous, fleshy, neck sometimes with a few filiform roots; roots white. Stem erect, slender, with a few scalelike sheaths, leafless, glabrous. Inflorescence erect, terminal, racemose, 2- to several flowered; floral bracts triangular, very small. Flowers spreading, resupinate, opening in succession, white or pale yellowish brown, small. Sepals and petals similar, elliptic-ovate; dorsal sepal and petals united at very base; lateral sepals united for up to 1/3 of their length and with base of column foot; lip broadly cuneate, fleshy, adnate with column foot and articulate at joint, lateral corners obtuse and incurved, not spurred, apex truncate and weakly emarginate; disk with irregular papillose calli at base and at apex. Column stout, with a distinct column foot, dilated at apex and with 2 wings, wings attenuate into decurved stelidia on either side of stigma; column foot elongate, with rows of tiny red blotches; anther terminal; rostellum erect, transverse, small; stigma broad, placed directly below rostellum.

One species: China, Thailand, Vietnam.

**1. *Didymoplexiopsis khiriwongensis*** Seidenfaden, Contr. Orchid Fl. Thailand 13: 13. 1997.

拟锚柱兰 ni mao zhu lan

*Didymoplexiella hainanensis* X. H. Jin & S. C. Chen.

Plants slender, 5–16 cm tall. Rhizome fusiform or moniliform, 50–60 mm, 3–10 mm in diam. Stem 5–15 cm, with 2 or 3 scalelike sheaths, brown; sheaths 1.5–2.5 mm. Rachis 0.7–0.9 cm, densely 2–4-flowered; floral bracts triangular-lanceolate, 1.5–2 mm, apex acute. Flowers spreading, pale yellowish white; pedicel and ovary 0.5–1.5 cm, brown. Dorsal sepal and petals

ovate-elliptic, 7–13 × 3–5 mm, united only at very base, apex obtuse; lateral sepals ovate-elliptic, 10–13 × ca. 4 mm, connate with each other for up to 1/3 of their length, and with petals only at their very base, apex obtuse; lip cuneate, 5–6 × 11–12 mm, articulate at joint with column foot, margin undulate; disk with irregular papillose calli at base and at apex. Column ca. 2 mm, dilated at apex, column wings narrow and extending into decurved stelidia; each stelidium 2.5–3 mm; column foot deflexed, elongate, 4–5 mm, adnate with lip, with red blotches. Fl. Mar.

Humid evergreen forests; 700–800 m. Hainan [Thailand, Vietnam].

**71. STEREOSANDRA** Blume, Mus. Bot. 2: 176. 1856.

肉药兰属 rou yao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, holomycotrophic. Rhizome tuberous, fusiform to oblong, fleshy, noded, lacking roots. Stem erect, with scalelike or tubular sheaths at nodes, white with violet streaks, leafless, glabrous. Inflorescence terminal, racemose, with a few to many well-spaced flowers; floral bracts lanceolate. Flowers usually pendulous, resupinate, not opening widely, white with violet markings; pedicel and ovary short, conic. Sepals and petals free, connivent, similar, lanceolate; lip similar to petals but wider, entire, concave, margin undulate and incurved, ecallose, with 2 glands at base, not spurred. Column stout, fleshy, lacking a column foot; anther suberect, borne on a broad filament arising from back of column; pollinia 2, clavate, granular-farinaceous, with a long common caudicle and attached to a small common viscidium; stigma exerted, continuous with rostellum. Capsule maturing rapidly.

One species: widespread in SE Asia, extending north to S China and S Japan (Ryukyu Islands) and southeast to New Guinea and the Solomon Islands.

**1. *Stereosandra javanica*** Blume, Mus. Bot. 2: 176. 1856.

肉药兰 rou yao lan

*Stereosandra javanica* var. *papuana* J. J. Smith; *S. koidzumiana* Ohwi; *S. liukuensis* Tuyama; *S. pendula* Kraenzlin.

Plants to 30 cm tall. Rhizome 1.5–4 × 1–2.5 cm. Stem whitish with violet streaks, with many scalelike sheaths; sheaths brownish, clustered near base of stem, becoming more widely spaced above, to ca. 1.8 cm. Rachis laxly 5- to more than 10-flowered; floral bracts erect, 6–7 mm, mostly shorter than

ovary. Flowers pendulous, off-white, tinged with deep violet at apex; pedicel and ovary to ca. 1 cm. Sepals and petals similar, lanceolate, 7–9 × ca. 2.5 mm, apex acute; lip ovate-lanceolate, ca. 8 × 3.5 mm, concave, containing 2 low, wartlike calli at base. Column short, ca. 2 mm excluding anther; anther borne on a broad filament, cucullate, ca. 2.5 mm; stigma terminal. Capsule elliptic, to ca. 1 cm. Fl. Jun–Jul.

Evergreen forests; below 1200 m. S Taiwan, S Yunnan [Indonesia, Japan (Ryukyu Islands), Malaysia, New Guinea, Philippines, Thailand, Vietnam; Pacific islands (Solomon Islands)].

**72. EPIPOGIUM** J. G. Gmelin ex Borkhausen, Tent. Disp. Pl. German. 139. 1792.

虎舌兰属 hu she lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Ceratopsis* Lindley; *Galera* Blume; *Podanthera* Wight.

Herbs, terrestrial, holomycotrophic. Rhizome tuberous or coralloid, fleshy. Stem erect, fleshy, with short, scalelike sheathing bracts at nodes, white or pale yellowish white, leafless, glabrous. Inflorescence terminal, racemose, several to many flowered, ephemeral; floral bracts ovate-lanceolate, membranous. Flowers usually pendulous, resupinate or not, yellowish white with violet or reddish brown markings; pedicel slender, often elongate; ovary dilated. Sepals and petals similar, connivent or spreading, free, lanceolate; lip broadly ovate when flattened, fleshy, concave, spurred at base, entire or 3-lobed; disk papillate and with longitudinal ridges or lamellae; spur broad, shortly saccate to elongate, straight or slightly curved, apex obtuse. Column short, fleshy, lacking a column foot; anther incumbent or suberect; pollinia 2, each deeply cleft, clavate, loosely granular-farinaceous, each with a slender caudicle and attached to a viscidium; stigma placed at base of column; rostellum broad, sometimes reduced and obscure, usually distant from stigma. Capsule ellipsoid or ovoid, usually maturing rapidly.

Three species: tropical Africa, temperate and tropical Asia, NE Australia, Europe, SW Pacific islands; three species in China.

The genus name is based on the pre-Linnaean name "*Epipogum*" (J. G. Gmelin, Fl. Sibir. 1: 11. 1747).

- 1a. Rhizome coralloid; flowers not resupinate; lip distinctly 3-lobed near base ..... 3. *E. aphyllum*  
 1b. Rhizome tuberous; flowers resupinate; lip entire or obscurely 3-lobed.  
 2a. Peduncle and flowers white with faint purple spots on lip; sepals and petals linear-lanceolate, 2–3 mm wide;  
 spur projecting backward, nearly parallel to ovary ..... 1. *E. roseum*  
 2b. Peduncle and flowers brown with pink to maroon spots and striations on sepals, petals, and lip; sepals and  
 petals ovate-lanceolate, 3–6 mm wide; spur pendulous, curving forward away from ovary ..... 2. *E. japonicum*

**1. *Epipogium roseum*** (D. Don) Lindley, J. Proc. Linn. Soc., Bot. 1: 177. 1857.

虎舌兰 hu she lan

*Limodorum roseum* D. Don, Prodr. Fl. Nepal. 30. 1825; *Ceratopsis rosea* (D. Don) Lindley; *Epipogium africanum* Schlechter; *E. dentilabellum* Ohtani & S. Suzuki; *E. guilfoylei* F. Mueller; *E. indicum* H. J. Chowdhery, G. D. Pal & G. S. Giri; *E. kassnerianum* Kraenzlin; *E. kusukusense* (Hayata) Schlechter; *E. makinoanum* Schlechter; *E. nutans* (Blume) H. G. Reichenbach; *E. poneranthum* Fukuyama; *E. rolfei* (Hayata) Schlechter; *E. sessanum* S. N. Hegde & A. N. Rao; *E. sinicum* C. L. Tso; *E. tuberosum* Duthie; *Galera kusukusensis* Hayata; *G. nutans* Blume; *G. rolfei* Hayata; *G. rosea* (D. Don) Blume; *Gastrodia schinziana* Kraenzlin; *Podanthera pallida* Wight; *Stereosandra schinziana* (Kraenzlin) Garay.

Plants 10–45 cm tall. Rhizome tuberous, narrowly fusiform to ovoid, 1–5 cm, 0.5–2 cm in diam., many noded. Stem with 1–8 scattered sheaths, white, sometimes tinged pale pink; sheaths amplexicaul, white, 7–13 mm, membranous. Rachis laxly to subdensely 2–16-flowered, sometimes pendulous toward apex; floral bracts ovate-lanceolate, 7–12 × 4–7 mm. Flowers resupinate, pendulous, opening widely or not, white with faint purple spots on lip; pedicel 3–7 mm; ovary 5–7 mm. Sepals weakly spreading, linear-lanceolate, 8–11 × 2–3 mm, 3-veined, margin undulate, apex subacute. Petals similar to sepals, weakly spreading, often slightly shorter and wider than sepals, slightly oblique, 7–10 × 2–3 mm, apex acute to acuminate; lip elliptic-ovate when flattened, concave, 8–12 × 6–7 mm, spurred at base, entire, margins erose-denticulate; disk with 2 longitudinal densely papillose ridges, and occasionally with a shorter central ridge, or ridges sometimes reduced and inconspicuous; spur projecting backward, nearly parallel to ovary, cylindrical, 3–5 × 1.5–2.5 mm, shorter than ovary, apex obtuse. Column 2.5–4.5 mm; anther subglobose. Capsule broadly ovoid-ellipsoid, 5–7 × ca. 5 mm. Fl. and fr. Apr–Sep.  $2n = 68$ .

Moist broad-leaved forests, shady places along valleys; 500–1600 m. Guangdong, Hainan, C and S Taiwan, SE Xizang, S Yunnan [India, Indonesia, Japan, Kashmir, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Pacific islands].

**2. *Epipogium japonicum*** Makino, Bot. Mag. (Tokyo) 18: 131. 1904.

日本虎舌兰 ri ben hu she lan

*Galera japonica* (Makino) Makino.

Plants 10–30 cm tall. Rhizome tuberous, narrowly ovoid, 1–3 cm, 0.4–1.5 cm in diam., many noded. Stem with 1–6 scattered sheaths, pale yellowish brown with purple spots and streaks; sheaths amplexicaul, pale yellowish brown, ca. 10 mm, membranous. Rachis laxly 3–10-flowered, sometimes slightly curved toward apex; floral bracts ovate-lanceolate, ca. 10 × 4 mm, apex acute to acuminate. Flowers resupinate, porrect to pendulous, usually opening widely, brown with pink to maroon spots and striations on sepals, petals, and lip; pedicel and ovary ca. 12 mm. Sepals weakly or widely spreading, ovate-lanceolate, 8–11 × 3–5 mm, 3-veined, margin undulate, apex acute to acuminate. Petals similar to sepals, weakly spreading, slightly oblique, 8–10 × 5–6 mm, apex acute to acuminate; lip cordate-ovate when flattened, concave, 8–12 × 9–10 mm, spurred at base, entire, lateral margins incurved; disk densely papillose; spur pendulous and curving forward away from ovary, elongate cylindrical, 6–9 × 2–4 mm, longer than ovary, apex shallowly 2-lobed. Column ca. 8 mm, arcuate; anther ovoid. Fl. Sep.

*Picea* forests, moist broad-leaved forests; 2200–3000 m. SW Sichuan, C Taiwan [Japan].

**3. *Epipogium aphyllum*** Swartz, Summa Veg. Scand. 32. 1814.

裂唇虎舌兰 lie chun hu she lan

*Orchis aphylla* F. W. Schmidt in J. Mayer, Samml. Phys. Aufsätze Böhm. Naturgesch. 1: 240. 1791, not Forsskål (1775); *Epipactis epipogium* (Linnaeus) Allioni; *Epipogium aphyllum* f. *albiflorum* Y. N. Lee & K. S. Lee; *E. aphyllum* var. *stenochilum* Handel-Mazzetti; *E. gmelinii* Richard; *Limodorum epipogium* (Linnaeus) Swartz; *Satyrium epipogium* Linnaeus; *Serapias epipogium* (Linnaeus) Steudel.

Plants 10–30 cm tall. Rhizome coralloid, 1.5–2.5 × 1–1.8 cm, branching. Stem pale brown, with a few membranous sheaths; sheaths amplexicaul, pale brown, 5–9 mm, membranous. Rachis laxly 2–6-flowered; floral bracts narrowly

ovate, 6–9 × 2.8–4 mm. Flowers not resupinate, usually pendulous, weakly spreading to widely spreading, yellow, tinged with pink or pale purple; pedicel 3–5 mm; ovary 3–5 mm. Sepals spreading, lanceolate to oblong-lanceolate, 12–18 × 2–3 mm, apex obtuse or acute. Petals similar to sepals, spreading, often slightly wider than sepals, apex acute; lip cordate-ovate when flattened, concave, 6–10 × 6–12 mm, 3-lobed near base; lateral lobes erect, ovate-triangular, 3–3.5 × ca. 3 mm; mid-lobe reflexed, ovate-elliptic, concave, 8–10 × 6–7 mm, lateral mar-

gins nearly slightly erose and involute, apex acute; disk with 4–6 longitudinal, purplish red, papillose ridges; spur large and thick, 5–8 × 4–5 mm, apex obtuse. Column 6–7 mm. Fl. Aug–Sep.  $2n = 68$ .

Forests, crevices, mossy places; 1200–3600 m. S Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shanxi, NW Sichuan, Taiwan, Xinjiang, SE Xizang, NW Yunnan [Bhutan, India, Japan, Kashmir, Korea, Nepal, Russia; Europe].

### 73. *BLETILLA* H. G. Reichenbach, Fl. Serres Jard. Eur. 8: 246. 1853, nom. cons.

白及属 *bai ji shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

*Jimensia* Rafinesque.

Herbs, terrestrial. Rhizome tuberous, irregularly shaped, with many long, fibrous roots. Stem erect, enclosed by tubular sheaths, leafy. Leaves 2–6, erect or suberect, plicate, narrowly oblong-lanceolate to linear-lanceolate. Inflorescence erect, terminal, racemose, few flowered, glabrous; peduncle terete, usually with 1 or more short sterile bracts; rachis short, somewhat flexuous, simple or occasionally branched; floral bracts lanceolate, caducous. Flowers resupinate, showy, white, pink, purple, or yellow; pedicel and ovary cylindrical, slender. Sepals and petals similar, free, spreading; lip 3-lobed above middle, porrect, not spurred; lateral lobes erect and embracing column; disk with 3 or 5 lamellate ridges. Column arcuate, slender, winged, lacking a column foot; anther subterminal, incumbent, 2-locular; pollinia 8, in 2 groups of 4, oblong and laterally compressed, equal in size or one group slightly smaller, granular-farinaceous, with inconspicuous caudicles and viscidia; stigma suborbicular to transversely elliptic, lying directly below rostellum; rostellum truncate, projecting forward over stigma. Capsule erect, oblong-fusiform.

About six species: from N Myanmar and Indochina through China to Japan; four species in China.

- 1a. Lip obscurely 3-lobed near apex to almost entire; disk with 3 longitudinal fimbriate lamellae ..... 1. *B. sinensis*  
 1b. Lip conspicuously 3-lobed above middle; disk with 5 longitudinal undulate lamellae.  
 2a. Sepals and petals pale yellowish green, rarely whitish; lateral lobes of lip with obtuse apices ..... 4. *B. ochracea*  
 2b. Sepals and petals pale purple, purplish red, or pink, rarely whitish; lateral lobes of lip with acute or subacute apices.  
 3a. Lip with 5 longitudinal lamellae undulate throughout their length ..... 2. *B. formosana*  
 3b. Lip with 5 longitudinal lamellae only undulate on mid-lobe ..... 3. *B. striata*

**1. *Bletilla sinensis*** (Rolfe) Schlechter, Repert. Spec. Nov. Regni Veg. 10: 256. 1911.

华白及 *hua bai ji*

*Arethusa sinensis* Rolfe, J. Linn. Soc., Bot. 36: 46. 1903; *Bletilla chinensis* Schlechter; *Jimensia sinensis* (Rolfe) Garay & R. E. Schultes.

Plants 15–20 cm tall. Rhizome subglobose, 1–1.5 cm in diam. Stem short, to ca. 3 cm, stout, enclosed by leaf bases and tubular sheaths, 2- or 3-leaved. Leaves basal, elliptic-lanceolate, 5–12 × 0.8–3 cm, base contracted into amplexicaul sheath, apex acute or acuminate. Peduncle 7–15 cm, slender, with 1 short sheathing bract; rachis flexuous, 1–2 cm, simple, 1–3-flowered; floral bracts often deciduous at anthesis, oblong-lanceolate, 5–8 mm, usually much shorter than ovary, apex acute. Flowers suberect or nodding, pale purple; pedicel and ovary twisted, 7–9 mm. Sepals white, tinged with purple, linear-lanceolate, 11–13 × ca. 3 mm, apex subacute. Petals white, tinged with purple, lanceolate, 11–13 × 3–3.5 mm, apex acute; lip white, with small purplish spots and purple apex, narrowly rhombic-obovate, obscurely 3-lobed near apex to almost entire, concave, 11–13 × 5–6 mm, apical margin irregularly fimbriate-serrulate; disk with 3 longitudinal fimbriate lamellae. Column cylindrical, 8–9 mm, slender, dilated toward apex; rostellum large. Fl. May–Jun.

Forests. S Yunnan [Myanmar, Thailand].

**2. *Bletilla formosana*** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. 10: 256. 1911.

小白及 *xiao bai ji*

*Bletia formosana* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 323. 1911; *B. kotoensis* Hayata; *B. morrisonicola* Hayata; *Bletilla formosana* f. *kotoensis* (Hayata) T. P. Lin; *B. formosana* f. *rubrolabella* S. S. Ying; *B. kotoensis* (Hayata) Schlechter; *B. morrisonicola* (Hayata) Schlechter; *B. striata* (Thunberg) H. G. Reichenbach var. *kotoensis* (Hayata) Masamune; *B. szetschuanica* Schlechter; *B. yunnanensis* Schlechter; *B. yunnanensis* var. *limprichtii* Schlechter; *Jimensia formosana* (Hayata) Garay & R. E. Schultes; *J. kotoensis* (Hayata) Garay & R. E. Schultes; *J. morrisonicola* (Hayata) Garay & R. E. Schultes; *J. szetschuanica* (Schlechter) Garay & R. E. Schultes; *J. yunnanensis* (Schlechter) Garay & R. E. Schultes.

Plants 15–80 cm tall. Rhizome usually dorsiventrally compressed, subglobose to ovoid, 1–2 cm in diam. Stem 5–15 cm, enclosed by several tubular sheaths, 2–8-leaved. Leaves widely spaced along stem, linear-lanceolate to narrowly oblong, 6–40 × 0.5–1.5(–4.5) cm, base contracted into amplexicaul sheath, apex acuminate. Peduncle 20–60 cm, slender, usually with 1

short sheathing bract; rachis to 10 cm, flexuous, simple or occasionally branched, (1 or)2–6-flowered; floral bracts deciduous at anthesis, oblong-lanceolate, 10–13 mm, apex acuminate. Flowers erect or spreading, pale purple or pink, rarely white; pedicel and ovary twisted, 8–12 mm. Sepals pale purple or pink, rarely white, lanceolate to narrowly oblong, 15–21 × 4–6.5 mm, lateral ones slightly oblique, apex subacute. Petals similar to sepals but slightly narrower, oblique, pale purple or pink, rarely white; lip whitish to pale yellow with small dark purple spots and broken lines, broadly elliptic, 15–18 × 8–9 mm, 3-lobed above middle; lateral lobes erect and embracing column, obliquely suborbicular, apex acute; mid-lobe suborbicular to square, 4–5 × 4–5 mm, margin slightly crisped, apex obtuse-truncate or rarely slightly emarginate; disk with 5 undulate lamellae extending from base of lip almost to apex of mid-lobe. Column subterete, 12–13 mm, slender, dilated toward apex, with narrow wings; rostellum broadly suborbicular. Capsule to ca. 2.5 cm. Fl. Apr–Jun.  $2n = 16, 32, 36$ .

Evergreen broad-leaved forests, *Quercus* forests, coniferous forests, grasslands, grassy slopes, crevices; 600–3100 m. SE Gansu, Guangxi, Guizhou, Jiangxi, S Shaanxi, Sichuan, Taiwan, SE Xizang, Yunnan [Japan (Ryukyu Islands)].

This species is thought to hybridize with *Bletilla ochracea* in the wild, and critical re-examination of *B. szetschuanica* and *B. yunnanensis*, treated as synonyms here, may reveal them to be natural hybrids.

**3. *Bletilla striata*** (Thunberg) H. G. Reichenbach, Bot. Zeitung (Berlin) 36: 75. 1878.

白及 bai ji

*Limodorum striatum* Thunberg in Murray, Syst. Veg., ed. 14, 816. 1784; *Bletia gebina* Lindley; *B. hyacinthina* (Smith) Aiton; *B. hyacinthina* var. *gebina* (Lindley) Blume; *B. striata* (Thunberg) Druce; *Bletilla elegantula* (Kraenzlin) Garay & Romero; *B. gebina* (Lindley) H. G. Reichenbach; *B. hyacinthina* (Smith) H. G. Reichenbach; *B. striata* var. *albomarginata* Makino; *B. striata* f. *gebina* (Lindley) Ohwi; *B. striata* var. *gebina* (Lindley) H. G. Reichenbach; *Calanthe gebina* (Lindley) Lindley; *Coelogyne elegantula* Kraenzlin; *Cymbidium hyacinthinum* Smith; *C. striatum* (Thunberg) Swartz; *Epidendrum striatum* (Thunberg) Thunberg; *Jimensia nervosa* Rafinesque, nom. illeg. superfl.; *J. striata* (Thunberg) Garay & R. E. Schultes; *Limodorum hyacinthinum* (Smith) Donn.

Plants 18–60 cm tall. Rhizome dorsiventrally compressed, subglobose or irregularly shaped, 1–3 cm in diam. Stem 3–25 cm, stout, enclosing several long tubular sheaths, 4–6-leaved. Leaves widely spaced or clustered toward apex of stem, narrowly oblong to lanceolate-elliptic, 8–29 × 1.5–4 cm, base contracted into amplexicaul sheath, apex acuminate. Peduncle

14–34 cm, slender, usually with 1 sheathing bract; rachis flexuous, sometimes pendulous, 2–7 cm, simple or sometimes branched, 3–10-flowered; floral bracts usually deciduous at anthesis, oblong-lanceolate, 6–20 mm. Flowers erect or spreading, purplish red or pink, large; pedicel and ovary twisted, 10–24 mm. Sepals purplish red or pink, narrowly oblong, 14–30 × 4–8 mm, lateral ones slightly oblique, apex acute. Petals similar to but slightly larger than sepals, purplish red or pink, 14–32 × 4–11 mm, apex acute; lip white, tinged with purplish red, with purplish veins, obovate-elliptic, 14–28 × 10–18 mm, 3-lobed above middle; lateral lobes erect and embracing column, triangular to suborbicular, apex acute; mid-lobe square, 3–8 × 2–6 mm, margin slightly crisped, apex truncate; disk with 5 longitudinal lamellae extending from base of lip almost to apex of mid-lobe; lamellae undulate only on mid-lobe. Column subterete, 14–20 mm, slender, dilated toward apex, with narrow wings; rostellum large. Capsule to 3.4 cm. Fl. Apr–May.  $2n = 32, 38, 76$ .

Evergreen broad-leaved forests, *Quercus* forests, coniferous forests, grassy places, crevices; 100–3200 m. Anhui, Fujian, SE Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Zhejiang [Japan, Korea, Myanmar].

**4. *Bletilla ochracea*** Schlechter, Repert. Spec. Nov. Regni Veg. 12: 105. 1913.

黄花白及 huang hua bai ji

*Jimensia ochracea* (Schlechter) Garay & R. E. Schultes.

Plants 25–55 cm tall. Rhizome somewhat dorsiventrally compressed, obliquely ovoid, ca. 2 cm in diam. Stem to ca. 8 cm, stout, 4-leaved. Leaves oblong-lanceolate, 8–35 × 1.5–2.8 cm, base contracted into amplexicaul sheath, apex acuminate or acute. Peduncle to ca. 40 cm, ebracteate; rachis flexuous, 3–8-flowered, simple or very rarely branched; floral bracts deciduous at anthesis, oblong-lanceolate, 18–20 mm, apex acute. Flowers erect or spreading, yellow; pedicel and ovary twisted, ca. 18 mm. Sepals and petals subequal in length, usually pale yellowish green, very rarely whitish, outer surface often with small purple spots, oblong, 18–23 × 5–7 mm, apex obtuse or subacute; lip ovate-elliptic, 15–20 × 8–12 mm, 3-lobed above middle; lateral lobes erect and embracing column, oblong, apex obtuse; mid-lobe subsquare, margin slightly undulate, apex emarginate; disk with 5 longitudinal lamellae extending from base of lip almost to apex of mid-lobe; lamellae undulate only on mid-lobe. Column 15–18 mm, with narrow wings. Fl. Jun–Aug.

Evergreen broad-leaved forests, coniferous forests, thickets, grasslands or shaded places along gullies; 300–2400 m. SE Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, S Shaanxi, Sichuan, Yunnan [Vietnam].

## 74. YOANIA Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 18: 68. 1872.

宽距兰属 kuan ju lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, holomycotrophic. Rhizome cylindrical or coralloid, stout, fleshy, branched, with many scalelike sheaths. Stem erect, stout, fleshy, with many scalelike or cucullate sheaths, leafless, pale brown to pinkish white. Inflorescence terminal, racemose, laxly or subdensely few to several flowered; floral bracts often prominent. Flowers purplish rose to yellowish, fleshy; pedicel and

ovary elongate. Sepals and petals free, spreading to connivent, ovate. Petals often wider and shorter than sepals; lip oblong, concave, adnate to short column foot at base, spurred at base; disk with a prominent central papillate-pubescent callus; spur broad, protruding forward, parallel to lip, apex obtuse. Column erect, broad, with a fingerlike process projecting on either side of anther at apex, with short column foot at base; anther terminal, incumbent, 2-locular, apex acuminate; pollinia 4, in 2 pairs, granular-farinateous, sectile, lacking conspicuous caudicles, attached directly to a common viscidium; stigma concave, broad and large; rostellum inconspicuous.

Four species: China, NE India, Japan, Vietnam; one species in China.

**1. *Yuania japonica*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 18: 68. 1872.

宽距兰 kuan ju lan

*Yuania amagiensis* Nakai & F. Maekawa var. *squamipes* (Fukuyama) C. L. Yeh & C. S. Leou; *Y. japonica* var. *squamipes* Fukuyama; *Y. squamipes* (Fukuyama) Masamune.

Plants 10–30 cm tall. Rhizome branching, to ca. 15 × 1.5 cm. Stem pinkish white, covered with scattered scalelike sheaths. Rachis terminal, subdensely 3–5-flowered; floral bracts ovate to broadly ovate, 5–7 mm, clasping pedicel. Flowers erect,

spreading, pinkish purple; pedicel and ovary cylindric, 2.5–7 cm, slender. Sepals oblong-ovate, 18–26 × 10–18 mm, apex obtuse. Petals broadly ovate, 15–24 × 14–18 mm, apex obtuse; lip spreading horizontally, ovate, concave, 15–20 × ca. 10 mm, saccate and spurred at base; disk with several longitudinal rows of papillae; spur spreading forward, parallel to lip, broad, 7–8 × 3.5–4 mm, apex obtuse. Column flattened, 8–13 mm, apex with 2 fingerlike processes; processes each ca. 2 mm; column foot ca. 1.5 mm. Fl. Jun–Jul.  $2n = 24$ .

Coniferous forests, damp grassy slopes; 1800–2000 m. N Fujian, Jiangxi, E Taiwan [NE India, Japan].

## 75. *LIPARIS* Richard, De Orchid. Eur. 21, 30, 38. 1817, nom. cons.

羊耳蒜属 yang er suan shu

Chen Xinqi (陈心启 Chen Sing-chi); Paul Ormerod, Jeffrey J. Wood

*Alipsa* Hoffmannsegg; *Anistylis* Rafinesque; *Diteilis* Rafinesque; *Dituilis* Rafinesque; *Empusa* Lindley; *Empusaria* Reichenbach; *Iebine* Rafinesque; *Leptorkis* Thouars; *Malaxis* sect. *Platystylis* Blume; *Mesoptera* Rafinesque; *Paliris* Dumortier; *Platystylis* (Blume) Lindley (1830), not Sweet (1828); *Pseudorchis* Gray (1821), not Séguier (1754); *Sturmia* Reichenbach (1826), not Hoppe (1799).

Herbs, terrestrial, lithophytic, or epiphytic, rhizomatous, rarely mycotrophic and leaves reduced to scales. Stems pseudobulbous, sometimes appearing as a many-noded, fleshy stem, clustered or not, when young covered by sterile bracts. Leaves 1 to several, linear to ovate or elliptic, plicate or not, thinly textured to leathery, basal or cauline (terrestrial species), or arising from apex or subterminal nodes of pseudobulbs (epiphytic species), articulate or not at base. Inflorescences erect to pendulous, racemose, laxly or densely many flowered; floral bracts persistent, small. Flowers small or medium-sized, yellow, green, orange, or purple, often translucent, usually resupinate. Sepals spreading, dorsal sepal free, lateral sepals sometimes fused for part or all of their length. Petals free, often reflexed, often linear and unlike sepals; lip often reflexed, ovate, oblong, or flabellate, entire or lobed, usually with a basal callus, lacking a spur. Column incurved-arcuate, clavate, long, winged at apex and sometimes at base; anther cap attached by a slender filament, 2-locular; pollinia 4 in 2 pairs, waxy, ovoid, bilaterally flattened, each pair with a small viscidium; rostellum thinly textured, blunt. Capsule subglobose to ellipsoid, often ± with 3 obtuse ridges.

About 320 species: well represented in tropical Asia, New Guinea, Australia, SW Pacific islands, and the subtropical and tropical Americas, with a single species in Europe and two in North America; 63 species (20 endemic) in China.

*Liparis gibbosa* Finet (Bull. Soc. Bot. France 55: 342. 1908) was recorded from Yunnan by Y. M. Shui and W. H. Chen (Seed Pl. Karst Region China, 241. 2006). This species is easily recognizable by its distichous floral bracts and gibbous lip. It has a wide distribution (Indonesia, Laos, Malaysia, Myanmar, New Guinea, Thailand, Vietnam; Pacific islands) and so could well be present in S China. However, the present authors could not substantiate the Chinese record because they found no relevant specimens.

1a. Leaves herbaceous or membranous, not articulate at base; plants usually terrestrial.

2a. Leaf solitary.

3a. Floral bracts lanceolate, 5–9 mm.

4a. Leaf cordate; lip with 2 small basal calli; column strongly arcuate, base with 2 low oblong mounds ..... 28. *L. petiolata*

4b. Leaf oblong to oblong-elliptic; lip without calli; column weakly arcuate, base with 2 subglobose mounds ..... 4. *L. glossula*

3b. Floral bracts triangular, 0.5–1 mm.

5a. Leaves (3–)6–17 cm, cordate at base; raceme many flowered; lip broadly obovate, with 2 small calli ..... 1. *L. cordifolia*

5b. Leaves 1–2 cm, base not cordate; raceme 1- or 2-flowered; lip ovate-orbicular with 2 low ridges ..... 3. *L. amabilis*

2b. Leaves 2 to many.

6a. Plants with an elongate rhizome, pseudobulbs 2–5 cm or more apart.

7a. Floral bracts 1.5–2.5 mm; lip apex usually broadly rounded, sometimes apiculate ..... 7. *L. auriculata*

- 7b. Floral bracts 5–6 mm; lip apex broadly triangular, acute ..... 28. *L. petiolata*
- 6b. Plants with an abbreviated rhizome, pseudobulbs sequentially close together.
- 8a. Lip rectangular-cuneate, apex deeply erose to pectinate ..... 27. *L. barbata*
- 8b. Lip not as above, at most shallowly dentate.
- 9a. Ovary with 6 prominent wavy wings ..... 24. *L. regneri*
- 9b. Ovary wingless or with narrow straight wings.
- 10a. Plants with stemlike pseudobulbs (2–)5–30 cm.
- 11a. Flowers greenish yellow; lip with a deep median channel flanked by lamellate callus ridges ..... 23. *L. sootenzanensis*
- 11b. Flowers greenish or greenish purple to black-purple; lip base with 2 calli lacking lamellate extensions.
- 12a. Column with triangular wings, basal margins of wings forming an acute to right angle with axis of column ..... 20. *L. formosana*
- 12b. Column almost wingless or with narrow rounded wings.
- 13a. Flowers dark purple throughout; dorsal sepal 18–20 mm ..... 21. *L. gigantea*
- 13b. Flowers greenish, tinged with purple, never dark purple throughout; dorsal sepal shorter than 16 mm.
- 14a. Dorsal sepal 10–15 mm; lip 9–15 mm; column 5–6 mm ..... 22. *L. henryi*
- 14b. Dorsal sepal 8–9 mm; lip 3.5–6.5 mm; column 3.5–4 mm ..... 19. *L. nervosa*
- 10b. Plants with ovoid, globose, or fusiform pseudobulbs shorter than 3.5 cm.
- 15a. Leaves 3–6, linear to linear-lanceolate.
- 16a. Petals 3-veined; lip papillose adaxially ..... 26. *L. hensoaensis*
- 16b. Petals 1-veined; lip not papillose adaxially.
- 17a. Leaf blade 3–5 × as long as wide ..... 16. *L. odorata*
- 17b. Leaf blade 8–10 × as long as wide ..... 25. *L. ferruginea*
- 15b. Leaves 2 or 3, ligulate to cordate.
- 18a. Lip without a basal callus.
- 19a. Column with 2 short teeth projecting from sides at base; lip elliptic-obovate to broadly obovate-obcordate ..... 13. *L. rostrata*
- 19b. Column without projecting basal teeth; lip cuneate to narrowly obovate.
- 20a. Sepals 10–12 × 2.5–3.5 mm; lip 10–12 mm; column 5–6 mm ..... 5. *L. elongata*
- 20b. Sepals 5–9 × to 2 mm; lip 6–7 mm; column 2.5–3.5 mm ..... 6. *L. campylostalis*
- 18b. Lip with a basal callus or lamellae.
- 21a. Floral bracts 4–15 mm.
- 22a. Lip elliptic, rounded; callus extending 2/3 medially along lip as a glossy dark green thickening ..... 14. *L. tschangii*
- 22b. Lip broadly obovate or with an emarginate, transversely elliptic blade; callus without a thickened extension.
- 23a. Inflorescence with a dense pyramidal raceme; lip with a transversely elliptic, emarginate blade ..... 15. *L. siamensis*
- 23b. Inflorescence with a narrow, laxer raceme; lip blade broadly obovate to subquadrate.
- 24a. Leaves 2, opposite, blades lying on ground, base subcordate, sessile; petals 1-veined; lip callus shallowly bilobed, lobules obtuse ..... 2. *L. oppositifolia*
- 24b. Leaves 2 or 3, suberect to erect, base cuneate, with elongate sheathing base; petals 3-veined; lip callus deeply bilobed, lobules acute ..... 16. *L. odorata*
- 21b. Floral bracts 0.3–3 mm.
- 25a. Lip with an ovate, acuminate blade.
- 26a. Lip apparently with a lamellate basal callus, margin of blade entire or sparsely minutely ciliate ..... 12. *L. krameri*
- 26b. Lip with a large, convex, frontally excavate basal callus, margin of blade conspicuously white ciliate ..... 11. *L. sasakii*
- 25b. Lip with blade suborbicular or elliptic to obovate, apex apiculate to emarginate.
- 27a. Inflorescence many flowered; lip broadly obovate to suborbicular.

- 28a. Flowers blackish purple; callus restricted to base of lip, not forming a hollow ..... 10. *L. dunnii*
- 28b. Flowers green, base of column and most of lip purple; callus obscure, forming a basal hollow and from there a shallow groove extending onto blade flanked by low keels ..... 8. *L. cathcartii*
- 27b. Inflorescence 1–6-flowered; lip subquadrate, obovate-elliptic, or oblong-subpandurate.
- 29a. Leaves 2.7–9 cm, with exposed or evident petioles; lip obovate-elliptic ..... 9. *L. pauliana*
- 29b. Leaves shorter than 2 cm, without exposed or evident petioles.
- 30a. Lip subquadrate, ca. 8.5 × 7 mm; column ca. 4 mm ..... 18. *L. brunnea*
- 30b. Lip oblong-subpandurate, 5–7 × ca. 3 mm; column 2–2.5 mm ..... 17. *L. pygmaea*
- 1b. Leaves papery to thickly papery, articulate at base; plants usually epiphytic or lithophytic.
- 31a. Pseudobulbs 1-leaved.
- 32a. Lip strongly 3-lobed ..... 44. *L. mannii*
- 32b. Lip entire or apex bilobed.
- 33a. Lip apex deeply bilobed, lobules minutely lobulate with ciliate-pubescent margins ..... 43. *L. latifolia*
- 33b. Lip apex acute to shallowly emarginate, without ciliate-pubescent margins.
- 34a. Pseudobulbs prostrate or distinctly wider than long.
- 35a. Lip obovate, base with a fleshy bilobed callus ..... 40. *L. chapaensis*
- 35b. Lip cuneate-subpandurate, base with 2 separate low ridges.
- 36a. Leaves subsessile; dorsal sepal connate to margins of lateral sepals for ca. 2/3 of length ..... 63. *L. seidenfadeniana*
- 36b. Leaves petiolate, petiole 3–12 mm; dorsal sepal free from lateral sepals ..... 42. *L. fargesii*
- 34b. Pseudobulbs erect or ascending, ca. as wide as long to elongate.
- 37a. Flowers very small, sepals 1.5–2.5 mm.
- 38a. Sepals 1.5–1.8 mm; lip with an indistinct basal callus; column 0.8–1.2 mm .... 36. *L. cespitosa*
- 38b. Sepals ca. 2.5 mm; lip with separated calli on each side above base; column ca. 2 mm ..... 41. *L. pumila*
- 37b. Flowers larger, sepals 3.5–11.5 mm.
- 39a. Column apex unwinged or narrowly winged.
- 40a. Floral bracts ca. 3 mm; sepals 3.5–5.3 mm; lip apex bilobed to truncate-emarginate ..... 30. *L. averyanoviana*
- 40b. Floral bracts 5–10 mm; sepals 5–10 mm; lip apex truncate to shovel-shaped.
- 41a. Sepals 8–10 mm; lip subpandurate, apex shovel-shaped, 4.7–6 mm wide ..... 35. *L. esquirolii*
- 41b. Sepals 5–6 mm; lip rectangular, apex truncate, 2.5–3 mm wide ..... 57. *L. sparsiflora*
- 39b. Column apex with triangular to hook-shaped wings.
- 42a. Lateral sepals connate to middle; lip without a callus; column with an additional pair of apical triangular wings ..... 38. *L. inaperta*
- 42b. Lateral sepals free; lip with a basal callus or a low medial thickening; column without additional apical wings.
- 43a. Pseudobulbs 1.5–5 cm apart.
- 44a. Leaves 9–11 × 1.6–1.8 cm; lip ca. 7.5 × 10 mm; calli confluent basally; column curved, ca. 4 mm ..... 32. *L. bautingensis*
- 44b. Leaves 8.3–11.5 × 3–4 cm; lip 10–11 × ca. 10 mm; calli separate, not confluent; column straight, 4.8–5 mm ..... 33. *L. superposita*
- 43b. Pseudobulbs close together.
- 45a. Leaves 3.4–4 cm wide; lip callus divided into a pair of narrowly conic, acute lobes ..... 34. *L. rockii*
- 45b. Leaves 0.5–3.3 cm wide; lip callus not as above, sometimes with digitate extensions but these obtuse.
- 46a. Lip ca. 2 mm wide.

- 47a. Lip apex with irregular margins, basal half with a low medial thickening ..... 37. *L. laurissilvatica*
- 47b. Lip apex with entire margins, basal half with a quadrate, rarely indistinct callus ..... 39. *L. kwangtungensis*
- 46b. Lip 3–13 mm wide.
- 48a. Sepals 5–8 mm; lip 5–7 × 4–5 mm, cuneate to cuneate-obovate; anther cap ca. 1 mm ..... 29. *L. bootanensis*
- 48b. Sepals 9–13 mm; lip 8–12 × 9–13 mm, suborbicular to broadly obovate; anther cap ca. 2 mm ..... 31. *L. balansae*
- 31b. Pseudobulbs 2–5-leaved.
- 49a. Pseudobulbs (2 or)3–5-leaved.
- 50a. Leaves linear, 1–2 mm wide ..... 58. *L. perpusilla*
- 50b. Leaves ligulate to oblong-lanceolate, 4–11 mm wide.
- 51a. Column with a single pair of broad wings, each with a retrorse thread; lip apex shortly calceolate ..... 62. *L. resupinata*
- 51b. Column with 2 pairs of wings; lip apex not calceolate.
- 52a. Lip with a complicate callus, appearing to be in 2 bilobed parts ..... 60. *L. platyrachis*
- 52b. Lip callus simpler, U-shaped or frontally excavate.
- 53a. Sepals 2.5–3.5 mm; lip blade transversely elliptic-suborbicular ..... 59. *L. delicatula*
- 53b. Sepals 4.5–5.8 mm; lip blade cuneate-obovate ..... 61. *L. assamica*
- 49b. Pseudobulbs 2-leaved.
- 54a. Lip blade broadly obovate ..... 48. *L. distans*
- 54b. Lip not as above.
- 55a. Pseudobulbs cylindric to narrowly conic-cylindric, longer than 5 cm.
- 56a. Pseudobulbs well spaced on a slender rhizome, 2–4 cm apart; lip margins minutely pubescent-ciliate ..... 46. *L. condylobulbon*
- 56b. Pseudobulbs clustered, on a short rhizome; lip margins glabrous.
- 57a. Sepals 2–3.5 mm; lip without a callus ..... 45. *L. viridiflora*
- 57b. Sepals 5–6 mm; lip with a bifurcate basal callus ..... 47. *L. bistricta*
- 55b. Pseudobulbs globose to ovoid, shorter than 5 cm.
- 58a. Lip apex deeply bilobed.
- 59a. Leaf apex obtuse; scape without peduncular bracts below middle; lip with 2 divergent ridges in basal 1/4 ..... 54. *L. grossa*
- 59b. Leaf apex acute; scape with several peduncular bracts below middle; lip with 2 longitudinal lamellae from base to middle ..... 55. *L. fissilabris*
- 58b. Lip apex not as above.
- 60a. Pseudobulbs compressed globose; lip ovate-elliptic, apex subacuminate, lacking a basal callus ..... 52. *L. elliptica*
- 60b. Pseudobulbs globose to ovoid; lip not as above, usually with some form of callus or thickening.
- 61a. Lip with a medial longitudinal ridge with a bilobed or sulcate basal callus.
- 62a. Lip transversely elliptic-suborbicular, 8–10 mm wide, basal callus bilobed and disjunct from medial ridge ..... 51. *L. latilabris*
- 62b. Lip cuneate, ca. 3 mm wide, basal callus sulcate and continuous with a short ridge ..... 56. *L. luteola*
- 61b. Lip without a longitudinal ridge but either a bilobed callus or an obscure quadrate thickening.
- 63a. Sepals (5.5–)7–12 mm; lip cuneate to subpandurate ..... 49. *L. nakaharae*
- 63b. Sepals 1.5–6 mm; lip not as above.
- 64a. Leaves 1.2–4.5 cm; lip transversely elliptic-suborbicular; column with 2 pairs of wings ..... 59. *L. delicatula*
- 64b. Leaves 4–46 cm; lip ovate-oblong, rectangular to broadly obdeltate; column with 1 pair of wings.
- 65a. Inflorescence 4–8-flowered; lip rectangular ..... 57. *L. sparsiflora*
- 65b. Inflorescence many flowered; lip not as above.
- 66a. Lip broadly obdeltate ..... 50. *L. stricklandiana*
- 66b. Lip ovate-oblong ..... 53. *L. somae*

**1. *Liparis cordifolia*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1811. 1889.

心叶羊耳蒜 *xin ye yang er suan*

*Leptorkis cordifolia* (J. D. Hooker) Kuntze; *Liparis argentopunctata* Averyanov; *L. keitaensis* Hayata.

Herbs, terrestrial or lithophytic. Pseudobulbs clustered, ovoid, somewhat flattened, 2–3 cm × 5–12 mm, ± enclosed by white membranous sheaths. Leaf 1; petiole 2–3 cm, sheathlike, amplexicaul, not articulate; blade green or occasionally white spotted, ovate to cordate, (3–)6–10(–17) × (2–)3.5–8(–14.5) cm, membranous or herbaceous, base cordate and decurrent to petiole, apex acuminate. Inflorescence 6–12(–25) cm; peduncle slightly compressed, with narrow wings on both sides; rachis often more than 10-flowered; floral bracts deltoid-lanceolate, usually 0.5–1 mm. Flowers green or pale green, often densely arranged; pedicel and ovary 6–10 mm. Sepals linear-lanceolate or sublinear, 6–7 × ca. 1.8 mm, 3-veined, midvein rather conspicuous, margin revolute, apex obtuse or acute. Petals filiform or narrowly linear, 6–7 × ca. 0.5 mm, 1-veined; lip obovate-triangular, 6–7 × ca. 6 mm, narrowed toward base, with a hollow near base and above hollow a pair of inconspicuous calli, midvein thickened and ± raised, margin ± undulate and apically erose-denticulate, apex truncate and mucronate. Column curved, 4–5 mm, upper part with broad wings, base dilated and thick; wings subquadrate, one side ca. 1 mm wide. Fl. Oct–Dec.  $2n = 20$ .

Humus-rich soil in forests, soil-covered crevices or forks of trees; 1000–2000 m. Guangxi, Taiwan, SE Xizang, SE Yunnan [Bhutan, N India, Nepal, Vietnam].

**2. *Liparis oppositifolia*** Szlachetko, Fragm. Florist. Geobot. 38(2): 458. 1993.

对叶羊耳蒜 *dui ye yang er suan*

Herbs, terrestrial. Pseudobulbs clustered, ovoid to conic, 1.6–2.4 × 1–1.3 cm, probably partly or wholly subterranean. Leaves 2, broadly ovate-elliptic, 5.5–12.5 × 4.5–11 cm, base subcordate, apex acute to subacute, inner leaf much larger than outer leaf, lying on ground, sessile. Inflorescence to 32 cm; peduncle ca. 15 cm; peduncular bracts 7, deflexed, lanceolate, to 8 mm, acute; rachis to 18 cm, successively many flowered; floral bracts lanceolate, 4–11 mm, apex acute. Flowers green; pedicel and ovary 5–6 mm. Dorsal sepal oblong, ca. 6.5 × 1.8 mm, 5-veined, obtuse; lateral sepals obliquely ovate-lanceolate, ca. 6 × 2.6 mm, 5-veined, apex subacute. Petals linear-oblancheolate, ca. 6.5 × 0.6 mm, 1-veined, obtuse; lip suborbicular-subquadrate from a narrower subquadrate base, ca. 6.5 × 6.5 mm, margin entire to shallowly erose, apex truncate to shallowly emarginate, shortly apiculate, base with a fleshy bilobed callus. Column partly deflexed near apex, to 3.5 mm, with narrow subquadrate wings. Fl. Aug.

Dense woods; ca. 1100 m. Yunnan [Cambodia, Laos, ?Vietnam].

**3. *Liparis amabilis*** Fukuyama, Bot. Mag. (Tokyo) 52: 245. 1938.

白花羊耳蒜 *bai hua yang er suan*

Herbs, terrestrial, small. Pseudobulbs clustered, globose,

somewhat flattened, ca. 1 cm in diam., ± enclosed by white membranous sheaths. Leaf 1; petiole short, not articulate; blade ovate or ovate-elliptic, 1–2 cm, membranous or herbaceous, base decurrent into petiole, apex acute or obtuse. Inflorescence 3–4 cm, 1- or 2-flowered; floral bracts triangular, very small. Flowers large, white, lip with purplish red veins; pedicel and ovary 6–10 mm. Sepals linear, ca. 1.2 × 3 mm, 3-veined. Petals filiform or narrowly linear, nearly as long as sepals, ca. 0.5 mm wide, 1-veined; lip orbicular or ovate-orbicular, ca. 1.2 cm, base slightly contracted, margin minutely ciliate, apex rounded or mucronate, with 2 rather thick longitudinal lamellae from base extending to above middle. Column arcuate, ca. 5 mm, base dilated. Fl. Apr.

• Forests; ca. 900 m. N Taiwan (Taipei).

**4. *Liparis glossula*** H. G. Reichenbach, Linnaea 41: 44. 1877.

方唇羊耳蒜 *fang chun yang er suan*

*Leptorkis glossula* (H. G. Reichenbach) Kuntze.

Herbs, terrestrial. Pseudobulbs clustered, ovoid, ca. 10 × 6–8 mm, ± enclosed by white membranous sheaths. Leaf 1; petiole sheathlike, 4.5–12 cm, amplexicaul, not articulate; blade oblong or elliptic-oblong, 8–15 × 2–5 cm, membranous or herbaceous, base subcuneate and decurrent into petiole, apex obtuse or subacute. Inflorescence 12–22 cm; peduncle somewhat compressed, narrowly winged on either side; rachis 3–12 cm, several to 20-flowered, winged, wings along rachis nearly as wide as rachis itself when dried; floral bracts lanceolate, 6–9 mm. Flowers purplish red, slightly spaced; pedicel and ovary 1–1.6 cm. Sepals linear-lanceolate, 10–13 × ca. 3 mm, 3-veined, midvein rather conspicuous, margin revolute, apex subacute. Petals filiform or narrowly linear, 10–12 × ca. 0.7 mm, 1-veined; lip subquadrate or broadly oblong, ca. 10 × 8–9 mm, base slightly contracted, with a deeply colored central longitudinal band, without a callus, margin minutely ciliate, apex subtruncate and mucronate. Column slightly curved, 4–5 mm, upper part winged, base with 2 callus-shaped projections; anther cap beaked. Fl. Jul.  $2n = 20$ .

Forests, forest margins, thickets; 2200–3200 m. S Xizang, SE Yunnan [NE India, Nepal].

**5. *Liparis elongata*** Fukuyama, Rep. (Annual) Taihoku Bot. Gard. 3: 82. 1933.

宝岛羊耳蒜 *bao dao yang er suan*

*Liparis derchiensis* S. S. Ying.

Herbs, terrestrial. Pseudobulbs clustered, ovoid, 1.8–3 × 1.5–2.5 cm, enclosed by 2 or 3 membranous sheaths. Leaves 2; petiole 5–9 cm, base sheathing, not articulate; blade ovate to oblong, 6–13 × 4–6 cm, base contracted into petiole, apex obtuse. Inflorescence 23–40 cm; peduncle 5–20 cm, 3-ridged; rachis 18–20 cm, laxly 10–20-flowered; floral bracts triangular, 2–3 mm, apex acute. Flowers widely opening, pale green, center of lip often tinged purple; pedicel and ovary ca. 15 mm. Dorsal sepal reflexed, linear, 10–12 × 2.5–3 mm, keeled dorsally, 3-veined, margin revolute, apex obtuse; lateral sepals obliquely ligulate-lanceolate, 10–12 × 3–3.5 mm, parallel below lip, keeled dorsally, 3-veined, margin revolute, apex acute.

Petals linear, 10–12 × ca. 1 mm, margins revolute, deflexed lower than lateral sepals but upcurved from middle; lip recurved abruptly at middle, cuneate-obovate, 10–12 × 7–10 mm, base contracted and without a callus, margin entire to indistinctly serrulate, apex truncate-rounded, minutely apiculate. Column curved, 5–6 mm, base dilated into 2 rounded mounds, apex with obtuse wings. Fl. Jun–Jul.

- Forests; 1800–2000 m. E and N Taiwan.

This species may be conspecific with *Liparis makinoana* Schlechter, from Japan, given that the descriptions of the two coincide. In Japan, the name *L. makinoana* has been misapplied to different taxa (e.g., by Tsutsumi & Yukawa, Bull. Natl. Mus. Nat. Sci., Tokyo, B, 34: 89–94. 2008).

**6. *Liparis campylostalis*** H. G. Reichenbach, Linnaea 41: 45. 1877.

羊耳蒜 yang er suan

*Leptorkis campylostalis* (H. G. Reichenbach) Kuntze; *Liparis giraldiana* Kraenzlin; *L. pauciflora* Rolfe; *L. yuana* Ormerod.

Herbs, terrestrial, rarely epiphytic. Pseudobulbs clustered, ovoid to globose, 5–12 × 3–8 mm, enclosed by 2 or 3 membranous sheaths. Leaves 2; petiole 1.5–8 cm, base sheathing, not articulate; blade ovate or ovate-oblong to subelliptic, (2–)5–10(–16) × (1–)2–4(–7) cm, base contracted into petiole, margin entire, occasionally wavy, apex acute to obtuse. Inflorescence 10–25 cm; peduncle 3.5–15 cm, winged; rachis 2–17 cm, laxly to subdensely few to many flowered; floral bracts lanceolate, 1–5.5 mm, apex acute. Flowers greenish, often tinted pink to purple or light purple; pedicel and ovary 5–10 mm. Dorsal sepal ligulate-lanceolate, 5–9 × 1.8–2 mm, 3-veined, apex subacute; lateral sepals parallel below lip, obliquely oblong-lanceolate, 4.5–8.5 × 1.5–2 mm, 3-veined, apex subacute. Petals deflexed, parallel to and below lateral sepals, linear, 5–7 × ca. 0.5 mm; lip cuneate to oblong-obovate, 5–6 × 3–3.5 mm, base contracted, without a callus, margin entire to irregularly suberose, apex broadly apiculate, truncate to emarginate. Column weakly curved, 2.5–3.5 mm, base dilated, apex with small subquadrate wings. Fl. Aug–Oct.

Forests, thickets, grasslands; 1100–2800(–3400) m. Gansu, Guizhou, Hebei, Heilongjiang, Henan, W Hubei, Jilin, Liaoning, Nei Mongol, Shandong, S Shanxi, Sichuan, Taiwan, Xizang, Yunnan [Japan, Korea, Russia (Far East)].

Tsutsumi and Yukawa (Bull. Natl. Mus. Nat. Sci., Tokyo, B, 34: 89–94. 2008) argue that the name *Liparis japonica* (Miquel) Maximowicz is actually a synonym of *Malaxis monophyllos*. The next available name for the "*L. japonica*" of authors is *L. campylostalis*. We have not followed Lang and Tsi (in Wu, Fl. Xizang. 5: 842–844. 1987) in separating "*L. japonica*" (larger plants, entire lip) from *L. campylostalis* (small plants, entire lip) given that intermediates exist.

**7. *Liparis auriculata*** Blume ex Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 203. 1866.

玉簪羊耳蒜 yu zan yang er suan

*Leptorkis auriculata* (Blume ex Miquel) Kuntze; *Liparis yakusimensis* Masamune.

Herbs, terrestrial, often forming large clusters. Pseudo-

bulbs borne 3–5 cm apart, ovoid, slightly compressed, 1–2 × ca. 1.5 cm. Leaves 2; petiole sheathlike, 4–6 cm, not articulate; blade ovate, broadly ovate, or cordate, 4–10 × 3–8 cm, base rounded to cordate and decurrent into petiole, apex acute. Inflorescence 20–30 cm; rachis several to more than 10-flowered; floral bracts lanceolate, 1.5–2.5 mm. Flowers ca. 1 cm in diam., greenish, purplish, or deep purplish red; pedicel and ovary 5–6 mm. Dorsal sepal linear, 6–7 × 1.5–2 mm, apex acute; lateral sepals similar to dorsal sepal, slightly shorter and broader. Petals subfiliform, ca. 6 × 0.5 mm; lip orbicular or ovate-orbicular, 5.5–6 × ca. 5 mm, with 2 subtriangular small calli near base, apex rounded or sometimes apiculate. Column recurved at apex, 3–5 mm, slender, narrowly winged, base dilated. Fl. May–Jul.

Dense forests, damp places; 1000–2500 m. C and N Taiwan [Japan (Ryukyu Islands)].

**8. *Liparis cathcartii*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1808. 1889.

二褶羊耳蒜 er zhe yang er suan

*Leptorkis cathcartii* (J. D. Hooker) Kuntze.

Herbs, terrestrial. Pseudobulbs ovoid, 5–6 × 4–5 mm, ± enclosed by white membranous sheaths. Leaves 2; petiole sheathlike, 2–5.5 cm, amplexicaul, not articulate; blade elliptic, ovate, or ovate-oblong, 3.5–8 × 1.7–4 cm, base contracted and decurrent into petiole, margin slightly crisped or nearly entire, apex acute or obtuse. Inflorescence 7–25 cm; peduncle slightly compressed cylindrical, narrowly winged on either side; rachis several to more than 10-flowered; floral bracts ca. 1 mm. Flowers pink, occasionally green or purple; pedicel and ovary 7–8 mm. Sepals narrowly oblong, 7–9 × ca. 2.5 mm, inconspicuously 3-veined, apex obtuse; lateral sepals slightly oblique. Petals nearly filiform, 7–9 × ca. 0.4 mm, 1-veined; lip obovate to elliptic-obovate, 8–9 × 7–8 mm, base contracted, usually with 2 short longitudinal lamellae, very rarely lamellae inconspicuous, margin irregularly toothed, apex subtruncate and mucronate. Column arcuate, 3–3.5 mm, base dilated and thick, apex winged. Capsule obovoid-oblong, 1.1–1.3 cm × ca. 5 mm; fruiting pedicel 6–9 mm. Fl. Jun–Jul, fr. Oct.

Humid or grassy places along valleys; 1900–2500 m. Sichuan, C and NW Yunnan [Bhutan, NE India, Nepal].

**9. *Liparis pauliana*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 58: 65. 1921.

长唇羊耳蒜 chang chun yang er suan

*Liparis cucullata* S. S. Chien.

Herbs, terrestrial. Pseudobulbs ovoid or ovoid-oblong, 1–2.5 cm × 8–15 mm, ± enclosed by many white membranous sheaths. Leaves 2, very rarely 1; petiole sheathlike, 0.5–4 cm, amplexicaul, not articulate; blade ovate to elliptic, 2.7–9 × 1.5–5 cm, membranous or herbaceous, base contracted into petiole, margin crisped and irregularly serrate, apex acute or shortly acuminate. Inflorescence 7–28 cm; peduncle flattened cylindrical, narrowly winged on either side; rachis laxly several flowered, very rarely many flowered or 1- or 2-flowered; floral bracts ovate or ovate-lanceolate, 1.5–3 mm. Flowers pale purple, sepals often pale yellowish green; pedicel and ovary 1–1.8

cm. Sepals linear-lanceolate, 11.5–18 × 2–2.5 mm, 3-veined, apex acuminate; lateral sepals slightly oblique. Petals nearly filiform, 11.5–18 × ca. 0.3 mm, 1-veined; lip obovate-elliptic, 1.3–2 × 0.8–1.2 cm, often with 2 short longitudinal lamellae near base, sometimes lamellae inconspicuous, apex obtuse or sometimes mucronate. Column arcuate, 3.5–4.5 mm, base dilated and thick, apex winged. Capsule obovoid, ca. 1.7 cm × 7–8 mm, upper part with 6 wings ca. 1.5 mm wide, wings becoming narrower downward; fruiting pedicel 1–1.2 cm. Fl. May, fr. Oct–Nov.

• Damp places or crevices in forests; 600–2300 m. N Guangdong, N Guangxi, E Guizhou, Hubei, Hunan, Jiangxi, C Yunnan, Zhejiang.

**10. *Liparis dunnii*** Rolfe, J. Linn. Soc., Bot. 38: 368. 1908.

福建羊耳蒜 fu jian yang er suan

Herbs, terrestrial or lithophytic, with somewhat dilated base ± enclosed by white membranous sheaths. Leaves 2, ovate-oblong, ca. 13 × 6 cm, membranous or herbaceous, obtuse. Inflorescence 15–18 cm; rachis many flowered; floral bracts ovate, ca. 2 mm, apex acute. Pedicel and ovary ca. 1 cm. Dorsal sepal oblong-lanceolate, 9–10 × 2–2.5 mm, 3-veined, apex acute; lateral sepals obliquely oblong-lanceolate, to 9.5 × 2.5 mm, 3-veined, apex subacute. Petals linear, ca. 8.5 × 0.5–1 mm, 1-veined; lip suborbicular-obovate, 9.5–10 × ca. 8.5 mm, basal callus erect and bilobed, margin shallowly dentate, apex broadly apiculate. Column arcuate, clavate, 3.5–4 mm. Fl. Oct.  $2n = 20^*$ .

• Humid rocks; ca. 900 m. N and W Fujian.

**11. *Liparis sasakii*** Hayata, Icon. Pl. Formosan. 4: 32. 1914.

阿里山羊耳蒜 a li shan yang er suan

*Liparis krameri* Franchet & Savatier var. *sasakii* (Hayata) T. Hashimoto.

Herbs, terrestrial or lithophytic. Pseudobulbs flattened ovoid, 1.5–2.5 × 1–1.5 cm, ± enclosed by white membranous sheaths. Leaves 2, subsessile, not articulate, obovate, ca. 5 × 2.5 cm, membranous or herbaceous, base cuneate, apex acute or obtuse. Inflorescence ca. 8 cm; rachis ca. 2 cm, 5-flowered; floral bracts ovate-triangular, 2–3 mm. Flowers dark purple; pedicel and ovary ca. 8 mm. Sepals linear-lanceolate, 12–13 × 2–3 mm, 3-veined, margin revolute, apex acuminate; lateral sepals slightly oblique. Petals linear, 10–12 × ca. 1 mm; lip elliptic-ovate, 8–10 × 5–6 mm, indistinctly 3-lobed; lateral lobes erect; mid-lobe ovate, ca. 6 mm, margin minutely ciliate, apex with a short tail ca. 1.5 mm; disk with a basal callus. Column slightly arcuate, 3–4 mm, with narrow wings on both sides. Fl. May.  $2n = 30^*$ .

• Forests; 1500–2000 m. C Taiwan.

**12. *Liparis krameri*** Franchet & Savatier, Enum. Pl. Jap. 2: 509. 1878.

尾唇羊耳蒜 wei chun yang er suan

*Leptorkis krameri* (Franchet & Savatier) Kuntze; *Liparis krameri* var. *viridis* Makino.

Herbs, terrestrial. Pseudobulbs small, ± enclosed by white membranous sheaths. Leaves 2; petiole sheathlike, 0.5–3 cm,

not articulate; blade broadly ovate or ovate, 2–3(–8) × 2–4 cm, membranous or herbaceous, base rounded and decurrent into petiole, margin conspicuously with irregular teeth, apex obtuse or subacute. Inflorescence 6–7 cm or longer, conspicuously longer than leaves; peduncle cylindric, slightly compressed, narrowly winged; rachis several flowered; floral bracts ovate, ca. 1 mm. Flowers green or purplish red; pedicel and ovary 7–8 mm. Sepals linear or linear-lanceolate, 9–12 × 1.5–2 mm, 3-veined, apex subacute; lateral sepals slightly oblique. Petals filiform, 8–10 × ca. 0.5 mm; lip ± reflexed at lower 1/3, nearly ovate-oblong, 6–7 mm, with a large lamellate basal callus, apex shortly cuspidate, with a tail ca. 1 mm. Column slightly arcuate, ca. 2 mm, nearly wingless. Fl. Jun–Jul.  $2n = 30, 36$ .

Forests; ca. 1400 m. SW Hubei [Japan, Korea, Russia (Far East)].

**13. *Liparis rostrata*** H. G. Reichenbach, Linnaea 41: 44. 1877.

齿突羊耳蒜 chi tu yang er suan

*Liparis diodon* H. G. Reichenbach.

Herbs, terrestrial. Pseudobulbs ovoid, very small, ± enclosed by white membranous sheaths. Leaves 2; petiole sheathlike, 1–2 cm or longer, amplexicaul, not articulate; blade ovate, 3–3.5(–7.5) × 1.5–2.5 cm, membranous or herbaceous, base contracted and decurrent into petiole, margin entire, apex acute or obtuse. Inflorescence ca. 5 cm; peduncle cylindric, slightly compressed, narrowly winged on either side; rachis several flowered; floral bracts ovate, ca. 1.5 mm. Flowers green or yellowish green; pedicel and ovary 5–10 mm. Sepals narrowly oblong-lanceolate or narrowly oblong, (5–)10–12 × ca. 2 mm, 3-veined, apex obtuse; lateral sepals somewhat oblique. Petals filiform or narrowly linear, 5–7 × ca. 0.3 mm, 1-veined; lip broadly obovate-obcordate (elliptic-obovate in material from Yunnan), 5–7 × 4–5 mm, base contracted, without a callus, margin irregularly toothed, apex mucronate. Column slightly arcuate, 3–3.5 mm, with 2 thick dentate projections on ventral side, base dilated, apex winged. Fl. Jul.  $2n = 28, 30$ .

Soil-covered rocks in *Tsuga* forests along valleys; 2600–2700 m. S Xizang, Yunnan [N India, Nepal].

**14. *Liparis tchangii*** Schlechter, Repert. Spec. Nov. Regni Veg. 19: 380. 1924.

折苞羊耳蒜 zhe bao yang er suan

*Liparis sutepensis* Rolfe ex Downie.

Herbs, terrestrial. Pseudobulbs ovoid, 1–2 cm × 7–13 mm, noded, ± enclosed by white, membranous sheaths. Leaves 2; petiole sheathlike, 2–5.5 cm, amplexicaul, not articulate; blade spreading horizontally, ovate-elliptic to ovate, 5–13 × 2.5–7.3 cm, membranous or herbaceous, base contracted into petiole, margin entire, apex acuminate. Inflorescence 11–29 cm, conspicuously exceeding leaves; rachis 10–20-flowered; floral bracts reflexed, lanceolate, 4–6 mm. Flowers green; pedicel and ovary 8–9 mm. Dorsal sepal lanceolate-linear, 7–8 × ca. 1.5 mm, inconspicuously 3-veined, apex subobtusely; lateral sepals slightly shorter and broader. Petals narrowly linear or nearly filiform, 7–8 × ca. 0.5 mm, 1-veined; lip obovate to nearly broadly elliptic, 7–8 × 5–7 mm, base contracted, with a thick longitudinal band of dark color extending from base to above

middle, band with 2 small basal calli ± united at base, margin irregularly denticulate in apical half, apex obtuse or subtruncate. Column slightly arcuate, 2.5–4 mm, upper part winged. Fl. Jul–Aug.

Forests; 1100–1700 m. SW Sichuan, NW to S Yunnan [Laos, Thailand, Vietnam].

**15. *Liparis siamensis*** Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 371. 1925.

滇南羊耳蒜 dian nan yang er suan

Herbs, terrestrial. Pseudobulbs ovoid, 1–2 cm × 8–15 mm, noded, ± enclosed by white membranous sheaths. Leaves 2; petiole sheathlike, 2–6 cm, amplexicaul, not articulate; blade ovate-elliptic or elliptic, 6.5–15.5 × 3–6.5 cm, membranous or herbaceous, base contracted into petiole, margin entire, apex acute or shortly acuminate. Inflorescence 10–20 cm; rachis several to more than 10-flowered; floral bracts ± reflexed, lanceolate, 4–7 mm. Flowers green; pedicel and ovary 1.1–1.5 cm. Dorsal sepal narrowly oblong, 7.5–8.5 × ca. 1.8 mm, 3-veined, apex obtuse; lateral sepals oblong-ovate, 6–7 × ca. 3 mm, slightly oblique, 5-veined, apex obtuse. Petals narrowly linear, 7–8 × ca. 0.7 mm, widened toward apex, 1-veined; lip broadly obovate to transversely oblong, 5–5.5 × ca. 7 mm, margin irregularly denticulate, apex emarginate, base narrowed into a short claw, with a basal callus; callus ca. 1 mm high, apex 2-lobed. Column arcuate, 3–3.5 mm, with narrow wings on both sides. Fl. Aug.  $2n = 42$ .

Forests; ca. 700 m. S Yunnan [Laos, Myanmar, Thailand].

**16. *Liparis odorata*** (Willdenow) Lindley, Gen. Sp. Orchid. Pl. 26. 1830.

香花羊耳蒜 xiang hua yang er suan

*Malaxis odorata* Willdenow, Sp. Pl. 4: 91. 1805; *Empusa paradoxa* Lindley; *Leptorkis odorata* (Willdenow) Kuntze; *Liparis longiscapa* (Rolfe ex Downie) Gagnepain & Guillaumin; *L. odorata* var. *longiscapa* Rolfe ex Downie; *L. paradoxa* (Lindley) H. G. Reichenbach; *L. paradoxa* var. *parishii* J. D. Hooker; *L. parishii* (J. D. Hooker) J. D. Hooker; *L. simeonis* Schlechter; *L. teniana* Kraenzlin; *L. tenii* Schlechter; *L. tonkinensis* Gagnepain.

Herbs, terrestrial. Pseudobulbs subovoid, 1.3–2.2 × 1–1.5 cm, noded, ± enclosed by white membranous sheaths. Leaves 2 or 3; petiole sheathlike, 2.5–10 cm, not articulate; blade narrowly elliptic, ovate-oblong, oblong-lanceolate, or linear-lanceolate, 6–17 × 2.5–6 cm, membranous or herbaceous, base contracted into petiole, margin entire, apex acuminate. Inflorescence 14–40 cm, conspicuously exceeding leaves; rachis laxly several to 10-flowered; floral bracts often spreading horizontally, lanceolate, 4–6 mm. Flowers greenish yellow or greenish brownish; pedicel and ovary 6–8 mm. Dorsal sepal linear, 7–8 × ca. 1.5 mm, inconspicuously 3-veined, margin revolute, apex obtuse; lateral sepals ovate-oblong, slightly oblique, 6–7 × ca. 2.5 mm, 3(or 4)-veined. Petals narrowly linear, 6–7 × ca. 0.8 mm, widened toward apex, 1-veined, margin revolute; lip obovate-oblong, ca. 5.5 × 3.5–4.5 mm, with 2 triangular calli near base, apical margin denticulate, apex subtruncate and emarginate; calli ± united at base, ca. 0.8 mm

tall. Column slightly arcuate, ca. 4.5 mm, with narrow wings on both sides, wings gradually widened toward column apex. Capsule obovoid-oblong or ellipsoid, 1–1.5 cm. Fl. Apr–Jul, fr. Oct.  $2n = 36, 42$ .

Forests, sparse forests, grassy slopes; 600–3100 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, SW Sichuan, Taiwan, S Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam; Pacific islands (Guam)].

**17. *Liparis pygmaea*** King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 34. 1898.

华西洋耳蒜 hua xi yang er suan

Herbs, terrestrial or lithophytic. Pseudobulbs clustered, narrowly ovoid, 5–10 × 2–5 mm, enclosed by 2 or 3 membranous sheaths. Leaves 2; petiole ca. 7 mm, broad, base sheathing, not articulate; blade ovate to elliptic, 8–15 × 3–5 mm, base contracted into petiole, apex acute. Inflorescence to 5 cm; peduncle 20–35 mm; rachis 0–15 mm, 1–3-flowered; floral bracts lanceolate, 2.7–3 mm, apex acute. Flowers yellow or pink; pedicel and ovary 3–6 mm. Dorsal sepal linear, 8–11 × ca. 2 mm, apex obtuse; lateral sepals parallel below lip, linear, 8–11 × 2–2.2 mm. Petals linear, 5–7 mm; lip 5–7 × ca. 3 mm, lower half cuneate, upper half oblong-elliptic, base with a fleshy bilobed callus, apex entire to obscurely dentate, apiculate. Column 2–2.5 mm, slender, base dilated, apex with small wings. Fl. Jul.

About 3100 m. “W China” [NE India, Nepal].

This new record for China is based on *E. H. Wilson 4579* (K), collected in W China in July 1904. We do not accept the view of Pearce and Cribb (Orchids Bhutan, 203. 2002) that *Liparis nana* Rolfe from Vietnam is conspecific because it differs in having an erose, subquadrate lip with a U-shaped callus.

**18. *Liparis brunnea*** Ormerod, Taiwania 52: 309. 2007.

褐花羊耳蒜 he hua yang er suan

Herbs, ?terrestrial. Pseudobulbs clustered, elliptic to subquadrate, laterally compressed, 5–7 × 3–5 mm, apex truncate, enclosed by 3 sheaths. Leaves 1 or 2, ovate-elliptic to suborbicular, 10–17.5 × 7–11 mm, base contracted into a sheath, not articulate, apex subacute. Inflorescence 15–65 mm; peduncle 15–39 mm; rachis 0–26 mm, laxly 1–5-flowered; floral bracts ovate-lanceolate, to 0.8 mm, apex acute. Flowers brown; pedicel and ovary 7.5–11 mm. Dorsal sepal reflexed, linear, ca. 8.3 × 0.7–0.8 mm, apex subacute; lateral sepals linear, ca. 7 × 1 mm, 1-veined, apex obtuse. Petals reflexed, linear-filiform, ca. 7 × 0.5 mm, subacute; lip subquadrate, ca. 8.5 × 7 mm, base contracted, with a deeply bilobed callus, apex emarginate. Column arcuate, ca. 4 mm, slender, base dilated, apex narrowly winged. Fl. Mar.

• Swampy thickets. Guangdong.

**19. *Liparis nervosa*** (Thunberg) Lindley, Gen. Sp. Orchid. Pl. 26. 1830.

见血青 jian xue qing

*Ophrys nervosa* Thunberg in Murray, Syst. Veg., ed. 14, 814. 1784; *Bletia bicallosa* D. Don; *Epidendrum nervosum* (Thunberg) Thunberg; *Liparis bambusifolia* Makino;

*L. bicallosa* (D. Don) Schlechter; *Malaxis nervosa* (Thunberg) Swartz; *Sturmia nervosa* (Thunberg) H. G. Reichenbach.

Herbs, terrestrial. Stem cylindrical, 2–8(–10) cm, 5–7(–10) mm in diam., thick, fleshy, with many nodes, usually ± enclosed by sheaths, upper part sometimes naked. Leaves 3–6; petiole sheathlike, 2–3(–5) cm, amplexicaul, long, not articulate; blade ovate to ovate-elliptic, 5–11(–16) × 3–5(–8) cm, membranous or herbaceous, base contracted and decurrent into petiole, margin entire, apex subacuminate. Inflorescence subterminal, 10–20(–25) cm; rachis several to 10-flowered, sometimes with very narrow wing; floral bracts deltoid, 1(–2) mm. Flowers purple; pedicel and ovary 8–16 mm. Dorsal sepal linear or broadly linear, 8–10 × 1.5–2 mm, inconspicuously 3-veined, margin revolute, apex obtuse; lateral sepals narrowly ovate-oblong, slightly oblique, 6–7 × 3–3.5 mm, 3-veined, apex obtuse. Petals reflexed, filiform, 7–8 × ca. 0.5 mm, 1-veined; lip oblong-obovate, 6–6.5 × 4.5–5 mm, base narrowed and with 2 suboblong calli, apex truncate and emarginate. Column 4–5 mm, rather stout, upper part distinctly or indistinctly with narrow wings. Capsule obovate-oblong or narrowly elliptic, ca. 1.5 cm × 6 mm; fruiting pedicel 4–7 mm. Fl. Feb–Jul, fr. Oct. *2n* = 36, 40, 42.

Forests, shaded places in grasslands or soil-covered rocks along streamsides; 1000–2100 m. N Fujian, Guangdong, Guangxi, Guizhou, Hubei, S Hunan, Jiangxi, S Sichuan, Taiwan, SE Xizang, Yunnan, S Zhejiang [widespread in Old and New World tropics].

*Liparis nervosa* is represented in China by the typical variety; *L. nervosa* var. *khasiana* (J. D. Hooker) P. K. Sarkar is restricted to NE India and is distinguished by having only two or three leaves and petals that are neither reflexed nor twisted.

**20. *Liparis formosana*** H. G. Reichenbach, Gard. Chron., n.s., 13: 394. 1880.

低地羊耳蒜 di di yang er suan

*Liparis bituberculata* (Hooker) Lindley var. *formosana* (H. G. Reichenbach) Ridley.

Herbs, terrestrial. Pseudobulbs clustered, cylindrical, 5–15 × 1–1.5 cm. Leaves 2–4, obliquely elliptic to ovate, 7–12 × 4–6 cm, acute. Inflorescence ca. 30 cm; peduncle ca. 15 cm, winged; rachis ca. 15 cm, 15–30-flowered; floral bracts triangular, 2–3 mm, apex acute. Flowers green, tinged with purple or purplish; pedicel and ovary 11–14 mm, with 6 sharp ridges. Dorsal sepal lanceolate, 10–12 × 2–2.5 mm, 3-veined, apex obtuse; lateral sepals obliquely oblong-lanceolate, 7–9 × 3–4 mm, 3-veined, apex acute. Petals linear, 9–10 × ca. 1 mm, 1-veined; lip obovate-elliptic, ca. 7 × 5 mm, above base with a bilobed erect callus, apex acute. Column curved, 4–5 mm, apex with 2 triangular, basally truncate wings. Fl. Feb–May.

Broad-leaved forests; 300–500 m. Hong Kong, Taiwan [Japan].

**21. *Liparis gigantea*** C. L. Tso, Sunyatsenia 1: 136. 1933.

紫花羊耳蒜 zi hua yang er suan

*Liparis macrantha* Rolfe (1895), not J. D. Hooker (1889).

Herbs, terrestrial or lithophytic. Stem green, cylindrical, 8–20 cm, ca. 1 cm in diam., thick, fleshy, with many nodes, lower part covered with several membranous sheaths. Leaves 3–6; petiole sheathlike, 2–5 cm, amplexicaul, not articulate; blade

elliptic, ovate-elliptic, or ovate-oblong, often slightly oblique, 9–17 × 3.5–9 cm, membranous or herbaceous, base oblique and contracted into petiole, apex acuminate, shortly caudate, or subacute. Inflorescence subterminal, 18–45 cm; rachis 6–16 cm, several to 20-flowered, very narrowly winged; floral bracts ovate, 1–2 mm. Flowers deep purplish red; pedicel and ovary 1.6–1.8 cm. Dorsal sepal linear-lanceolate, 16–20 × 2.5–3 mm, 3-veined, apex obtuse; lateral sepals ovate-lanceolate, 15–17 × 4–5 mm, 5-veined, apex obtuse. Petals linear or narrowly linear, 16–18 × ca. 0.8 mm, 1-veined; lip obovate-elliptic or broadly obovate-oblong, 9–15 × 12–18 mm, base abruptly contracted and with a pair of backward spreading auricles, margin conspicuously denticulate, apex truncate and sometimes mucronulate; disk with 2 calli near base; calli triangular, 0.8–1 mm tall. Column 6–8 mm, with narrow wings on both sides; anther cap ca. 2 mm. Capsule obovoid-oblong, ca. 2.8 × 1 cm; fruiting pedicel 6–9 mm. Fl. Feb–May, fr. Nov.

• Broad-leaved evergreen forests, shaded and damp places, soil-covered rocks; 500–1700 m. E and N Guangdong, Guangxi, SW Guizhou, Hainan, Taiwan, SE Xizang, C and SE Yunnan.

Chinese records of *Liparis nigra* Seidenfaden (e.g., in FRPS 18: 73. 1999) should be referred to *L. gigantea*, whereas true *L. nigra* is distributed in Thailand. X. H. Jin (Taxon 54: 191. 2005) regarded the two taxa as conspecific and proposed the name *L. nigra* (1970) for conservation against the senior *L. gigantea*, but the Nomenclature Committee for Vascular Plants did not recommend conservation (Brummitt, Taxon 56: 590. 2007). It is not certain that *L. nigra* is the same as the Chinese taxon, and this group of large-flowered *Liparis* requires critical revision.

**22. *Liparis henryi*** Rolfe, Bull. Misc. Inform. Kew 1896: 193. 1896.

具棱羊耳蒜 ju leng yang er suan

*Liparis shaoshunia* S. S. Ying.

Herbs, terrestrial. Pseudobulbs cylindrical, 10–20 × 0.6–1.5 cm, fleshy. Leaves 3–5, ovate-elliptic to ovate-lanceolate, 5–15 × 3–6 cm, acute. Inflorescence 15–30 cm; peduncle 7–15 cm; rachis 8–15 cm; floral bracts triangular, 2–4 mm, apex acute. Flowers purplish red; pedicel and ovary 12–17 mm, with 6 sharp ridges. Dorsal sepal linear-oblong, 10–15 × 2–2.5 mm, 3-veined, apex obtuse; lateral sepals falcate-oblong, 8–12 × 2.5–3 mm, apex acute to obtuse. Petals linear, 10–13 × ca. 1 mm; lip obovate, 9–15 × 7–10 mm, base with 2 hornlike calli, margin denticulate, apex rounded. Column 5–6 mm, apex narrowly winged. Fl. unknown.

• Forests; low elevations. Taiwan.

**23. *Liparis sootenzanensis*** Fukuyama, Rep. (Annual) Taihoku Bot. Gard. 3: 84. 1933.

插天山羊耳蒜 cha tian shan yang er suan

*Diteilis sootenzanensis* (Fukuyama) M. A. Clements & D. L. Jones; *Liparis macrantha* Rolfe var. *sootenzanensis* (Fukuyama) S. S. Ying; *L. nigra* Seidenfaden var. *sootenzanensis* (Fukuyama) T. S. Liu & H. J. Su; *L. piriformis* Szlachetko; *L. tixieri* Guillaumin.

Herbs, terrestrial. Stem cylindrical, 15–25 cm, 2.5–3 cm in diam., stout, thick, fleshy, with many nodes, ± enclosed by sheaths. Leaves several; petiole sheathlike, amplexicaul, not articulate; blade 15–25 × 6–12 cm, base contracted into petiole,

apex acuminate. Inflorescence 20–30 cm, stout, distinctly ridged; rachis 5–15-flowered; floral bracts green, ovate, 4–5 × ca. 2.3 mm. Flowers greenish yellow; pedicel and ovary ca. 1.4 cm. Sepals linear-oblong or narrowly elliptic, 13–16 × 3–4 mm, margin revolute, apex acute; lateral sepals slightly oblique. Petals filiform, ca. 1.4 cm; lip reflexed near middle, obovate, ca. 1.4 × 1.1 cm, base contracted, apical margin denticulate; disk with 2 carinae. Column arcuate, ca. 8 mm. Capsule pale green, ca. 2.7 cm × 9 mm; fruiting pedicel ca. 1.1 cm. Fl. Apr–May.

Broad-leaved forests; 500–1500 m. Taiwan [Vietnam].

**24. *Liparis regnieri*** Finet, Bull. Soc. Bot. France 55: 338. 1908.

翼蕊羊耳蒜 *yi rui yang er suan*

*Liparis amplifolia* Schlechter; *L. craibiana* Kerr; *L. dalatensis* Guillaumin.

Herbs, terrestrial. Leaves 3 or 4; petiole sheathlike, short, not articulate; blade elliptic to ovate, 15–20 × 7–10 cm, base decurrent into petiole, apex acuminate. Inflorescence 25–37 cm, usually conspicuously exceeding leaves; rachis densely many flowered; floral bracts lanceolate, very small. Flowers yellowish green; pedicel and ovary 8–10 mm. Sepals lanceolate, ca. 7 mm, 3-veined, apex obtuse; lateral sepals slightly oblique. Petals sublinear, ca. 6.5 mm, 1-veined; lip oblong, ca. 7 × 3 mm, toward base slightly narrowed, recurved, with 2 basal calli, apex subtruncate and mucronate. Column slightly arcuate, ca. 4 mm; ovary with 6 undulate wings. Fl. unknown.

C and SW Yunnan [Myanmar, Thailand, Vietnam].

**25. *Liparis ferruginea*** Lindley, Gard. Chron. 1848: 55. 1848.

锈色羊耳蒜 *xiu se yang er suan*

*Empusa ferruginea* (Lindley) M. A. Clements & D. L. Jones; *Leptorkis ferruginea* (Lindley) Kuntze.

Herbs, terrestrial. Pseudobulbs narrowly ovoid, very small. Leaves 3–6, linear to lanceolate, (13–)20–33 × 0.8–1.2 cm, membranous or herbaceous, base slightly contracted and decurrent into amplexicaul sheath, not articulate, apex acute or shortly acuminate. Inflorescence 35–55 cm, stout; rachis 8–20 cm, several to 10-flowered; floral bracts lanceolate, (2–)4–6 mm. Flowers yellow, lip pale yellowish brown slightly tinged with pale purple; pedicel and ovary 1–1.2 cm. Dorsal sepal linear, 6–7 × ca. 1.5 mm, 3-veined, margin revolute, apex obtuse; lateral sepals reflexed, obliquely ovate-oblong, ca. 6 × 2.5 mm, 5-veined. Petals nearly linear or narrowly oblanceolate-linear, ca. 6 × 1 mm, 1-veined, margin revolute; lip ± recurved, obovate-oblong, 4–5 × ca. 3 mm, with a pair of basal auricles backward spreading and 2 calli near base, apex broadly truncate, often emarginate and sinus apiculate. Column 3–4 mm, upper part with narrow wings on both sides. Capsule oblong or obovoid-oblong, ca. 1.5 cm × 6 mm; fruiting pedicel 8–10 mm. Fl. Jul.  $2n = 42$ .

Shallow water along streamsides, paddy fields, swamps. SE Fujian, S and W Hainan, Hong Kong [Cambodia, Indonesia, Malaysia, Thailand, Vietnam].

**26. *Liparis hensoaensis*** Kudô, J. Soc. Trop. Agric. 2: 237. 1930.

日月潭羊耳蒜 *ri yue tan yang er suan*

*Cestichis hensoaensis* (Kudô) F. Maekawa; *Liparis nigra* Seidenfaden var. *hensoaensis* (Kudô) S. S. Ying.

Herbs, terrestrial. Pseudobulbs ovoid, ca. 1 cm × 8 mm. Leaves 3 or 4, linear-lanceolate, 10–30 × 1–1.5 cm, membranous or herbaceous, base not articulate, apex acute. Inflorescence 40–60 cm; rachis 10–20 cm, 10-flowered; floral bracts triangular, 4–6 mm. Flowers green; pedicel and ovary ca. 1 cm. Dorsal sepal oblong-lanceolate, ca. 9 × 2 mm, 6-veined; lateral sepals oblong-ovate, ca. 8 × 3 mm, 5-veined. Petals linear-oblong-elliptic, ca. 9 × 1.3 mm, 3–5-veined; lip ovate or oblong-elliptic, adaxially with papillate projections, base cuneate, apex emarginate and mucronate. Column ca. 5 mm. Fl. Sep.

• C Taiwan.

**27. *Liparis barbata*** Lindley, Gen. Sp. Orchid. Pl. 27. 1830.

须唇羊耳蒜 *xu chun yang er suan*

*Diteilis wrayi* (J. D. Hooker) M. A. Clements & D. L. Jones; *Leptorkis wrayi* (J. D. Hooker) Kuntze; *Liparis fimbriata* Kerr; *L. wrayi* J. D. Hooker.

Herbs, terrestrial. Stem subterete, 2–3(–10) cm, thick, fleshy, with many nodes, ± enclosed by white membranous sheaths, not articulate. Leaves often 2; petiole sheathlike, ca. 3 cm, not articulate; blade subelliptic, ca. 6.5 × 2.8 cm, membranous or herbaceous, base contracted into petiole, apex acute or obtuse. Inflorescence ca. 10 cm, usually not exceeding leaves; rachis laxly several flowered; floral bracts broadly ovate-triangular, ca. 1 mm. Flowers greenish white, often with 2 red stripes on lip; pedicel and ovary 6–7 mm. Dorsal sepal broadly linear, ca. 7 × 1.3 mm, inconspicuously 3-veined, apex obtuse; lateral sepals suboblong, ca. 6.5 × 1.8 mm, inconspicuously 3-veined, apex acuminate. Petals narrowly linear, ca. 7 × 0.5 mm; lip oblong, ca. 5 × 3.5 mm, shortly fimbriate, with 2 calli near base, slightly widened toward apex, subtruncate and emarginate. Column slightly arcuate, ca. 3.5 mm. Fl. Jul.  $2n = 42$ .

Soil-covered rocks in forests. S Hainan, C Taiwan [India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand; Pacific islands (Samoa, Vanuatu)].

**28. *Liparis petiolata*** (D. Don) P. F. Hunt & Summerhayes, Kew Bull. 20: 52. 1966.

柄叶羊耳蒜 *bing ye yang er suan*

*Acianthus petiolatus* D. Don, Prodr. Fl. Nepal. 29. 1825; *Liparis angkai* Kerr; *L. nepalensis* Lindley; *L. pulchella* J. D. Hooker; *L. taronensis* S. C. Chen.

Herbs, terrestrial, with slender rhizomes. Pseudobulbs 2–4 cm apart on rhizome, ovoid, 1.5–3 × 1–1.5 cm, ± enclosed by white membranous sheaths. Leaves 2; petiole sheathlike, 5–11 cm, amplexicaul, not articulate; blade broadly ovate, 5–11 × 3.5–8 cm, membranous or herbaceous, base subtruncate or shallowly cordate, margin ± irregularly obtuse-crenate or nearly entire, apex subacuminate or shortly cuspidate. Inflorescence 10–24 cm, lower part ridged, upper part narrowly winged; rachis several to more than 10-flowered; floral bracts lanceolate, 5–6 mm. Flowers greenish white, lip tinged with purplish green;

pedicel and ovary 6–8 mm. Sepals linear-lanceolate, ca. 8 × 1.8 mm, inconspicuously 3-veined, apex obtuse; lateral sepals somewhat oblique. Petals narrowly linear, 7–8 × ca. 0.4 mm, 1-veined; lip elliptic to orbicular, ca. 10 × 8–9 mm, with 2 calli near base, margin often slightly irregularly incised, apex mucronate. Column arcuate, ca. 4 mm, base thickened, apex slightly enlarged and narrowly winged. Capsule subobovoid-oblong, ca. 1.5 cm × 6–7 mm; fruiting pedicel 4–5 mm. Fl. May–Jun, fr. Sep–Oct.  $2n = 30, 36$ .

Forests, streamsides, humid places; 1000–2900 m. N Guangxi, Hunan, W Jiangxi, SE Xizang, S Yunnan [Bhutan, NE India, Nepal, Thailand, Vietnam].

**29. *Liparis bootanensis*** Griffith, Not. Pl. Asiat. 3: 278. 1851.

镰翅羊耳蒜 lian chi yang er suan

*Cestichis plicata* (Franchet & Savatier) F. Maekawa; *Leptorkis bootanensis* (Griffith) Kuntze; *L. lancifolia* (J. D. Hooker) Kuntze; *L. plicata* (Franchet & Savatier) Kuntze; *Liparis bootanensis* var. *uchiyamae* (Schlechter) S. S. Ying; *L. lancifolia* J. D. Hooker; *L. plicata* Franchet & Savatier; *L. pterostyloides* Szlachetko; *L. ruybarrettoi* S. Y. Hu & Barretto; *L. subplicata* Tang & F. T. Wang; *L. uchiyamae* Schlechter.

Herbs, epiphytic. Pseudobulbs densely arranged, ovoid, ovoid-oblong, or narrowly ovoid-cylindric, 0.8–1.8(–3) cm × 4–8 mm. Leaf 1; petiole 1–7(–10) cm, articulate; blade narrowly oblong-ob lanceolate, lanceolate, or narrowly elliptic-oblong, (5–)8–22 cm × (5–)11–33 mm, papery, base contracted into petiole, apex acuminate. Inflorescence 7–24 cm; peduncle somewhat compressed, both sides with very narrow wings; rachis arching or pendulous, 5–12 cm, several to 20-flowered; floral bracts narrowly lanceolate, 3–8(–13) mm. Flowers often yellowish green, sometimes slightly tinged with brown, rarely nearly white; pedicel and ovary 4–15 mm. Dorsal sepal ovate-lanceolate to oblong-lanceolate, 5.2–8 × 1.3–2.3 mm, apex subacute to obtuse; lateral sepals obliquely oblong-lanceolate to elliptic, 5–7 × 1.5–2 mm, apex obtuse. Petals narrowly linear, 5.2–8 × 0.4–1 mm; lip broadly oblong-obovate, 5–6.5 × 4–5.5 mm, apical margin entire to slightly irregular, apex emarginate to subtruncate-rounded, broadly apiculate, at base with 2 variously shaped calli, in profile appearing low, rounded, triangular to digitate. Column arcuate, 2.6–3.4 mm, apex with 2 falcate, triangular wings; anther cap ca. 1 mm. Capsule obovoid-ellipsoid, 8–10 × 5–6 mm; fruiting pedicel 8–10 mm. Fl. Aug–Oct, fr. Mar–May.  $2n = 38, 42$ .

Forest margins, forests or shaded trees, rocks or cliffs along valleys; 400–2300(–3100) m. N Fujian, S Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, SW Sichuan, Taiwan, SE Xizang, Yunnan [Bhutan, NE India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**30. *Liparis averyanoviana*** Szlachetko, Fragm. Florist. Geobot. 38(2): 451. 1993.

狭翅羊耳蒜 xia chi yang er suan

*Liparis bootanensis* Griffith var. *angustissima* S. C. Chen & K. Y. Lang.

Herbs, epiphytic. Pseudobulbs borne close together, ovoid-

conic, to 3 × 1.2 cm, binodal. Leaf 1, erect, oblanceolate to oblong, to 19 × 2.3 cm, stout, conduplicate toward base, apex acute. Inflorescence subaxillary ca. 35-flowered; peduncle arcuate, to 10 cm, distinctly winged; rachis to 13 cm; floral bracts subulate, ca. 3 mm, apex acuminate. Flowers yellow-white, not resupinate, arcuately bent downward with lip outwardly directed; pedicel and ovary 8–9 mm. Dorsal sepal oblong to lanceolate, 3.5–5.3 × ca. 1.2 mm, 1-veined, apex obtuse; lateral sepals ovate-lanceolate, 3.5–5.2 × ca. 1.4 mm, 3-veined, apex acute. Petals linear, 3–5.1 × ca. 0.4 mm, 1-veined, apex obtuse; lip rectangular, 4.8–5.2 × 2.6–4 mm, slightly constricted near middle, usually ± notched at apex, basal auricles very small, fleshy in basal portion with a small thickening perpendicular to veins, apical margin almost entire. Column ca. 3 mm, with narrow wings. Fl. Nov.

Guangxi, Guizhou [Laos, Vietnam].

The type is from Guizhou (“Kouy-Tcheou: Houang-tre-a”).

**31. *Liparis balansae*** Gagnepain, Bull. Soc. Bot. France 79: 165. 1932.

圆唇羊耳蒜 yuan chun yang er suan

*Liparis hainanensis* Tang & F. T. Wang.

Herbs, epiphytic. Pseudobulbs densely arranged, nearly narrowly ovoid or ovoid, 1–1.5 cm × 4–7 mm. Leaf 1; petiole 2–4 cm; blade oblanceolate or narrowly elliptic-ob lanceolate, 10–17 × 1–2.8 cm, papery, base contracted into petiole, apex acuminate. Inflorescence 11–25 cm; peduncle compressed cylindric, narrowly winged; rachis laxly 3–5-flowered; floral bracts narrowly lanceolate, 3–15(–20) mm. Flowers green; pedicel and ovary 1.5–1.8 cm. Dorsal sepal oblong-lanceolate, 10–11 × 2–2.9 mm, apex obtuse; lateral sepals obliquely ligulate-lanceolate to oblong-ligulate, 10–11 × 2.5–3 mm, apex subacute to obtuse. Petals linear-lanceolate, 10–13 × 0.7–1.2 mm, 1-veined, apex subacute; lip flabellate-oblate or broadly obovate-orbicular, 8–12 × 10–13 mm, base contracted, with 2 calli, margin irregularly denticulate, apex rounded or subtruncate, mucronate. Column gently arcuate, 4.3–5 mm, apex with 2 straight to falcate, acute wings; anther cap ca. 2 mm. Capsule obovoid, 1–1.2 cm × 6–7 mm; fruiting pedicel 9–15 mm. Fl. Sep–Oct, fr. next spring.

On trees or rocks in forests or along valleys; 500–2200 m. Guangxi, Hainan, SW Sichuan, SE Xizang, SE Yunnan [Thailand, Vietnam].

**32. *Liparis bautingensis*** Tang & F. T. Wang, Acta Phytotax. Sin. 12: 39. 1974.

保亭羊耳蒜 bao ting yang er suan

Herbs, epiphytic. Rhizomes elongate, 2–2.5 mm in diam., with many nodes, internodes 2–8 mm, often with remaining membranous sheaths. Pseudobulbs borne 1.5–4 cm apart from each other, subcylindric or narrowly ovoid-cylindric, ca. 1.2 cm × 3–7 mm. Leaf 1; petiole 1.5–4 cm, articulate; blade elliptic, narrowly elliptic, or oblong, 6–15 × 1.6–1.8 cm, papery, base contracted into petiole, apex acuminate. Inflorescence 7–14 cm; peduncle compressed cylindric, narrowly winged; rachis ca. 5 mm, 3- or 4-flowered; floral bracts green, lanceolate or narrowly lanceolate, 5–15 mm. Flowers green or greenish white;

pedicel and ovary 1.5–2.2 cm. Dorsal sepal broadly linear or broadly linear-lanceolate, 9–10 × 1.5–2 mm, margin revolute, apex obtuse; lateral sepals sublanceolate, slightly oblique, 9–10 × ca. 2 mm. Petals filiform, 9–10 × ca. 0.5 mm; lip subflabellate-oblate or broadly obovate-orbicular, 8–9 × ca. 10 mm, base with 2 very small calli united basally, apex subtruncate and usually irregularly denticulate and centrally apiculate. Column slightly arcuate, ca. 4 mm, apical half winged on both sides; wings ca. 1 mm wide, decurved and hooked. Capsule obovoid, ca. 1.4 cm × 7–9 mm; fruiting pedicel 1.2–1.8 cm. Fl. Nov–Feb, fr. Jan–Apr.  $2n = 38^*$ .

- Rocks in forests; below 1600 m. S Hainan.

**33. *Liparis superposita*** Ormerod, *Taiwania* 52: 311. 2007.

云南羊耳蒜 *yun nan yang er suan*

Herbs, epiphytic. Pseudobulbs borne 3–5 cm apart, arising from base of previous pseudobulb or arising from apex of pseudobulb next to inflorescence, 1-leaved, 2–2.3 cm × 5–6 mm. Leaf 1; petiole 1.7–2.7 cm; blade narrowly elliptic, 8.3–11.5 × 3–4.5 cm, apex acute to subacuminate. Inflorescence terminal, 14.1–17.2 cm, narrowly winged; peduncle 4.1–11.5 cm; rachis ca. 10 cm, laxly 4–6-flowered; floral bracts lanceolate, 5–10.5 mm, apex acute. Flowers green; pedicel and ovary ca. 21 mm, narrowly winged. Dorsal sepal oblong-ligulate, ca. 10 × 3 mm, apex subacute; lateral sepals subfalcate, obliquely oblong-ligulate, ca. 10.5 × 2.5 mm, apex subacute. Petals linear, ca. 11.5 × 1 mm, apex acute; lip suborbicular-rhombic, 10–11 × ca. 10 mm, margin of upper half minutely irregularly erose, callus consisting of a pair of separate, parallel calli obliquely elliptic in side view. Column straight, 4.8–5 mm, upper half with 2 broad-based wings each with a short triangular, subfalcate lobe basally. Fl. Nov.

- Mixed forests; 1400–1800 m. Yunnan.

This species appears to be the plant that is illustrated as *Liparis bautingensis* in FRPS (18: 79. 1999). It differs from *L. bautingensis* in having longer (2–2.3 cm as opposed to ca. 1.2 cm) pseudobulbs, much broader (3–4.5 cm as opposed to 1.6–1.8 cm) leaves, a longer (ca. 10 cm as opposed to ca. 5 cm) rachis, and a longer (4.8–5 mm as opposed to ca. 4 mm), straight (not arcuate) column.

**34. *Liparis rockii*** Ormerod, *Taiwania* 52: 310. 2007.

若氏羊耳蒜 *ruo shi yang er suan*

Herbs, lithophytic. Pseudobulbs approximate, 2.5–4 cm, ca. 1 cm in diam. at base, ca. 0.4 cm in diam. at apex, 1-leaved, ovoid-subcylindric, covered by several subacuminate sheaths, largest 3 sheaths 2.5–7 cm. Leaf petiole 1.8–3.2 cm; blade oblong-ligulate to ligulate-oblong-lanceolate, 17.7–24.6 × 3.4–4.4 cm, thin, apex acute. Inflorescence terminal, 18–20.8 cm, narrowly winged; peduncle 8–8.8 cm; rachis 10–12 cm, laxly ca. 20-flowered; floral bracts lanceolate, ca. 8 mm, apex acute. Flowers orange; pedicel and ovary to 13 mm. Dorsal sepal oblong-lanceolate, ca. 9 × 2.4 mm, apex obtuse; lateral sepals oblong-lanceolate, ca. 8.7 × 2.3 mm, apex subacute. Petals linear-lanceolate, ca. 9 × 1 mm, apex acute; lip broadly obovate (flattened), 7.5–8 × 7.5–8 mm, in natural state with a subtubular basal third expanded into a transversely elliptic blade, basal margins entire becoming irregularly suberose toward apex,

basally with a single callus divided into 2 narrowly conic lobes. Column arcuate, subterete, ca. 3 mm, subapically with triangular, subfalcate, subacute wings. Fl. Oct–Nov.

- Rocks. Yunnan.

**35. *Liparis esquirolii*** Schlechter, *Repert. Spec. Nov. Regni Veg.* 12: 108. 1913.

贵州羊耳蒜 *gui zhou yang er suan*

Herbs, epiphytic. Pseudobulbs densely arranged, cylindric, 1–3.5 cm × 3–5 mm. Leaf 1, oblong to ligulate, 8–12 × 1.2–1.9 cm, papery, narrowed toward base into a short petiole, articulate, apex acuminate. Inflorescence compressed cylindric, ca. 19 cm, conspicuously exceeding leaf, narrowly winged; rachis laxly 10-flowered; floral bracts narrowly lanceolate, 6–10 mm. Flowers orange-yellow; pedicel and ovary 1–1.5 cm. Dorsal sepal ligulate, ca. 1.1 cm, apex acuminate; lateral sepals oblique. Petals narrowly linear, ca. 11 × 0.5 mm, apex subacute; lip obovate, ca. 11 × 6 mm, base cuneate, with a longitudinal ridge from base to middle. Column slightly arcuate, ca. 5 mm, upper part with narrow wings on both sides. Fl. May–Jul.

- Shaded rocks; ca. 900 m. S Guizhou.

**36. *Liparis cespitosa*** (Lamarck) Lindley, *Bot. Reg.* 11: ad t. 882. 1825.

丛生羊耳蒜 *cong sheng yang er suan*

*Epidendrum cespitosum* Lamarck, *Encycl.* 1: 187. 1783; *Cestichis cespitosa* (Lamarck) Ames; *Leptorkis cespitosa* (Lamarck) Kuntze; *L. pusilla* (Ridley) Kuntze; *Liparis angustifolia* (Blume) Lindley; *L. pusilla* Ridley; *Malaxis angustifolia* Blume; *M. cespitosa* (Lamarck) Thouars.

Herbs, epiphytic, small. Pseudobulbs densely arranged, ovoid or narrowly ovoid to subcylindric, 8–20(–30) × 2–6 mm. Leaf 1, oblanceolate or linear-oblanceolate, 5–17 × 0.5–0.8(–1.5) cm, papery, base attenuate into a petiole, articulate, apex acuminate. Inflorescence 5–16 cm; peduncle slightly compressed cylindric, very narrowly winged; rachis (7–)10–40-flowered; floral bracts subulate, 3–5(–8) mm. Flowers green or greenish white, very small; pedicel and ovary 3–4 mm. Dorsal sepal suboblong, 1.5–1.8 × ca. 0.7 mm, 1-veined, apex obtuse; lateral sepals ovate-oblong, slightly oblique, 1.3–1.5 × 0.9–1 mm, 1-veined. Petals narrowly linear, 1.5–1.8 × ca. 0.3 mm, apex obtuse; lip nearly broadly oblong, ca. 1.8 × 1.2 mm, base with a pair of backward spreading auricles, without a conspicuous callus, margin sometimes slightly undulate, apex subtruncate and mucronate. Column slightly arcuate, 0.8–1.2 mm, apex dilated. Capsule subellipsoid, 3–4 × ca. 3 mm; fruiting pedicel 4–5 mm. Fl. Jun–Oct, fr. Oct–Nov.  $2n = 40$ .

On trees, rocks in forests, shaded places on cliffs; 500–2400 m. C and S Hainan, SE Xizang, S Yunnan [widely distributed in tropics of Africa and Asia, extending to Pacific islands].

**37. *Liparis laurisilvatica*** Fukuyama, *Rep. (Annual) Taihoku Bot. Gard.* 3: 83. 1933.

月桂羊耳蒜 *yue gui yang er suan*

*Cestichis laurisilvatica* (Fukuyama) Maekawa.

Herbs, epiphytic, 10–15 cm high. Pseudobulbs approximate, globose, somewhat obliquely complanate, 1–1.5 cm, with 1 or 2 broadly ovate, acuminate basal sheaths. Leaf 1, erect, oblanceolate-linear, ca. 10 × 1 cm, slightly leathery, base long decurrent, apex acute. Inflorescence ca. 10 cm; peduncle angular; rachis ca. 5 cm, rather laxly 10–15-flowered; floral bracts linear, ca. 1 cm, apex acute to acuminate. Flowers yellowish, ca. 8 mm in diam.; pedicel and ovary slightly recurved, ca. 5 mm. Dorsal sepal oblong, ca. 4.5 × 1.5 mm, 1-veined, margin slightly revolute, apex acute; lateral sepals spreading, slightly obliquely oblong, ca. 4.5 × 1.5 mm, 1-veined, apex acute and reflexed. Petals reflexed, narrowly linear to filiform, ca. 5 mm; lip curved at middle, oblong, ca. 4 × 2 mm, fleshy at base, distally slightly denticulate, rounded. Column ca. 2.5 mm, fleshy at base, apical wings triangular. Fl. Oct.

- Laurel forests (“silvis laurilignosis”); 900–1500 m. Taiwan.

**38. *Liparis inaperta*** Finet, Bull. Soc. Bot. France 55: 341. 1908.

长苞羊耳蒜 chang bao yang er suan

Herbs, epiphytic, small. Pseudobulbs somewhat densely arranged, ovoid, 4–7 × 3–5 mm. Leaf 1; petiole 7–15 cm, articulate; blade oblanceolate-oblong to suboblong, 2–7 × 0.6–1.3 cm, papery, apex acuminate. Inflorescence 4–8 cm; peduncle slightly compressed, very narrowly winged; rachis several flowered; floral bracts narrowly lanceolate, 3–5(–7) mm. Flowers pale green, often tubular in early stage due to dorsal sepal and lateral sepals connivent with each other; pedicel and ovary 4–7 mm. Dorsal sepal suboblong, ca. 4.5 × 1.2 mm, apex obtuse; lateral sepals subovate-oblong, oblique, ca. 4 × 1.4 mm. Petals ± falcate, narrowly linear, 3.5–4 × ca. 0.6 mm, apex obtuse; lip suboblong, 3.5–4 × 1.5–2 mm, slightly contracted toward base, without a callus or lamella, apex subtruncate and irregularly denticulate, with a short point. Column slightly arcuate, 2.5–3 mm, upper part winged; wings subtriangular, ca. 0.8 mm wide, ± decurrent and slightly hooked. Capsule obovoid, 5–6 × 4–5 mm; fruiting pedicel 4–5 mm. Fl. Sep–Oct, fr. next May–Jun.

- Forests or rocks along valleys; 500–1100 m. N Fujian, C and N Guangxi, C and E Guizhou, Jiangxi, SW Sichuan, Zhejiang.

**39. *Liparis kwangtungensis*** Schlechter, Repert. Spec. Nov. Regni Veg. 19: 379. 1924.

广东羊耳蒜 guang dong yang er suan

Herbs, epiphytic, small. Pseudobulbs subovoid or ovoid, 5–7 × 3–5 mm. Leaf 1, subelliptic or oblong, 2–5 × 0.7–1.1 cm, papery, base contracted into a conspicuous petiole, articulate, apex acuminate. Inflorescence 3–5.5 cm; peduncle somewhat compressed, very narrowly winged; rachis 1.5–2.5 cm, several flowered; floral bracts narrowly lanceolate, 3–4 mm. Flowers greenish yellow, very small; pedicel and ovary 3–4 mm. Dorsal sepal broadly linear, 4–4.5 × 1–1.2 mm, apex obtuse; lateral sepals ca. 4 × 1 mm. Petals narrowly linear, 3.5–4 × ca. 0.5 mm; lip obovate-oblong, 4–4.5 × ca. 2 mm, base with a distinct or rarely inconspicuous callus, apex subtruncate and irregularly denticulate, centrally mucronulate. Column slightly arcuate, 2.5–3 mm, upper part winged; wings sublanceolate-triangular,

ca. 0.7 mm wide, ± decurrent and slightly hooked. Capsule obovoid, 4–5 × 3–4 mm; fruiting pedicel 3–4 mm. Fl. Oct.

- Forests or rocks along valleys. W Fujian, E and S Guangdong.

**40. *Liparis chapaensis*** Gagnepain, Bull. Soc. Bot. France 79: 166. 1932.

平卧羊耳蒜 ping wo yang er suan

Herbs, epiphytic, small. Pseudobulbs densely arranged, ± prostrate, subovoid-oblong, 4–6(–15) × 5–10 mm. Leaf 1, narrowly elliptic to oblong, 3–5(–10) × 0.8–1.1 cm, papery or thinly leathery, base contracted into a conspicuous petiole, articulate, apex acuminate. Inflorescence 4–7 cm; peduncle compressed cylindrical, narrowly winged; rachis 2–4 cm, laxly several flowered; floral bracts narrowly lanceolate, 4–8 mm. Flowers pale yellowish green or turning orange, column white; pedicel and ovary 8–10 mm. Dorsal sepal nearly narrowly oblong-lanceolate, 4–6(–9) × 1.5–2 mm, 3-veined, margin revolute, apex acuminate; lateral sepals narrowly oblong-lanceolate, slightly oblique, 4–6 × 1.8–2.2 mm. Petals narrowly linear, ca. 4 × 0.5 mm; lip subobovate-oblong, ca. 4 × 3 mm, with a bilobed callus near base, apex subtruncate and mucronulate. Column slightly arcuate, ca. 3 mm, upper part narrowly winged. Fl. Oct.

On trees or rocks in broad-leaved evergreen forests on limestone slopes; 800–2500 m. W Guangxi, SW Guizhou, NW Yunnan [Myanmar, N Vietnam].

**41. *Liparis pumila*** Averyanov, Updated Checkl. Orchids Vietnam, 85. 2003.

中越羊耳蒜 zhong yue yang er suan

Herbs, epiphytic. Pseudobulbs clustered, ovoid to subglobose, 5–7 × 4–5 mm, enclosed by 3 or 4 green herbaceous sheaths. Leaf 1, ligulate to ligulate-oblanceolate, 5–6 × 0.6–0.8 cm, base contracted, articulate, apex acute. Inflorescence 3–7 cm; peduncle 1.5–3.5 cm; rachis 1.5–3.5 cm, sublaxly 7–20-flowered; floral bracts lanceolate, 3.5–4 mm, apex acute. Flowers pale green; pedicel and ovary 2–2.5 mm. Dorsal sepal oblong, ca. 2.5 × 1 mm, 1-veined, apex obtuse; lateral sepals obliquely oblong, ca. 2.5 × 1 mm, 1-veined, apex subacute. Petals linear, ca. 2.5 × 0.25 mm, apex obtuse; lip lower half broadly obovate, upper half transversely suborbicular, ca. 3 × 2 mm, base with 2 widely separated calli, apex irregularly dentate, apiculate. Column ca. 2 mm, not winged, slightly curved apically. Fl. Jun.

- Forests. Yunnan [Laos, Vietnam].

**42. *Liparis fargesii*** Finet, Bull. Soc. Bot. France 55: 340. 1908.

小羊耳蒜 xiao yang er suan

Herbs, epiphytic or lithophytic, often forming clusters. Pseudobulbs prostrate, subcylindric, 7–14 × ca. 3 mm, new pseudobulbs arising from near apex of old pseudobulb. Leaf 1; petiole 3–6 mm, articulate; blade elliptic or oblong, 1–2(–3) × 0.5–0.8 cm, papery, apex rounded or obtuse. Inflorescence 2–4 cm; peduncle compressed cylindrical, narrowly winged; rachis 1–2 cm, usually 2- or 3-flowered; floral bracts narrowly lanceolate, 1–1.8 mm. Flowers pale green; pedicel and ovary 8–9 mm. Sepals linear-lanceolate, 5–6 × 1.2–1.4 mm, 1-veined, margin often revolute, apex obtuse. Petals narrowly linear, 5–6 × ca.

0.3 mm; lip suboblong-pandurate, 4–5 × 2.5–3 mm, base slightly thickened, apex subtruncate and emarginate, sometimes apiculate in sinus. Column slightly arcuate, 3–3.5 mm, upper part with narrow wings. Capsule obovoid, 6–7 × 3–4 mm; fruiting pedicel 6–7 mm. Fl. Sep–Oct, fr. next May–Jun.

• On trees or rocks in forests or shaded places; 300–1700 m. S Gansu, Guizhou, W Hubei, Hunan, S Shaanxi, N and W Sichuan, C Yunnan.

**43. *Liparis latifolia*** Lindley, Gen. Sp. Orchid. Pl. 30. 1830.

宽叶羊耳蒜 kuan ye yang er suan

*Malaxis latifolia* Blume, Bijdr. 393. 1825, not Smith (1812); *Cestichis latifolia* (Lindley) Pfitzer; *Leptorkis latifolia* (Lindley) Kuntze; *Stichorkis latifolia* (Lindley) Pfitzer.

Herbs, epiphytic. Pseudobulbs somewhat densely arranged, subterete, narrowed toward apex, to 8 × 1.5–3 cm, base with reddish brown sheaths. Leaf 1, subelliptic or elliptic-oblong, ca. 20 × 5 cm, base contracted into a petiole, articulate, apex subacuminate. Inflorescence nearly as long as leaf; rachis many flowered; floral bracts small. Flowers pale yellow, lip orange-brown; pedicel and ovary ca. 1.5 cm. Sepals suboblong, ca. 8 × 3 mm, apex acute or obtuse. Petals narrowly linear, ca. 8 × 1 mm; lip subobovate-oblong, ca. 10 × 3 mm, deeply bilobed, with a bilobed basal callus; apical lobes divergent, suboblong, 4–5 × 2.5–3 mm, apex irregularly toothed. Column 3–3.5 mm, upper part with narrow wings. Fl. unknown.  $2n = 42$ .

S Hainan [Indonesia, Malaysia, Thailand].

**44. *Liparis mannii*** H. G. Reichenbach, Flora 55: 275. 1872.

三裂羊耳蒜 san lie yang er suan

*Leptorkis mannii* (H. G. Reichenbach) Kuntze.

Herbs, epiphytic. Pseudobulbs narrowly ovoid, ovoid, or suboblong, 1–2 cm × 4–7 mm. Leaf 1, narrowly oblong to narrowly oblong-ob lanceolate, 7–15 × 6–12 cm, papery, base contracted into a short petiole, articulate, apex acuminate. Inflorescence 9–13 cm; peduncle somewhat compressed, very narrowly winged; rachis 3.5–7.5 cm, 10- to many flowered; floral bracts narrowly lanceolate, 1.5–2.5 mm; pedicel and ovary 1.5–2 mm. Sepals nearly narrowly ovate-elliptic, 1.5–1.8 × ca. 0.7 mm. Petals narrowly linear, 1.3–1.6 × ca. 0.2 mm; lip subovate, ca. 1.8 × 1.5 mm, 3-lobed; lateral lobes subovate, obtuse; mid-lobe suboblate or broadly rhombic-oblate, 0.6–0.8 × ca. 1 mm, base ecallose, apical margins irregularly denticulate, apex subacute. Column slightly arcuate, ca. 1.2 mm, base dilated and thick. Capsule ellipsoid or broadly obovoid-ellipsoid, 2.5–3 × 1.8–2 mm; fruiting pedicel 1.5–2 mm. Fl. Oct–Nov, fr. next Mar.  $2n = 38$ .

On trees in forests; 700–1200 m. S Yunnan [NE India, Vietnam].

**45. *Liparis viridiflora*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 31. 1830.

长茎羊耳蒜 chang jing yang er suan

*Malaxis viridiflora* Blume, Bijdr. 392. 1825; *Cestichis longipes* (Lindley) Ames; *Leptorkis longipes* (Lindley) Kuntze; *L. viridiflora* (Blume) Kuntze; *Liparis longipes* Lindley; *L.*

*pendula* Lindley; *L. pleistantha* Schlechter; *L. simondii* Gagnepain; *L. spatulata* Lindley; *Sturmia longipes* (Lindley) H. G. Reichenbach.

Herbs, epiphytic, rather tall and large. Pseudobulbs somewhat densely arranged, base often ± prostrate, attenuate from base to apex, upper part erect, usually cylindrical, rarely suboblong, (3–)7–18 cm × 3–8(–12) mm. Leaves 2; petiole 1–4 cm, articulate; blade linear-ob lanceolate or linear-spatulate, 8–25 × 1.2–3 cm, papery, apex acuminate and apiculate. Inflorescence recurved, 14–30 cm; peduncle somewhat compressed, very narrowly winged, upper part with 1 or 2 sterile bracts; rachis 9–20 cm, many flowered; floral bracts narrowly lanceolate, 3–7 mm, membranous. Flowers greenish white or pale greenish yellow; pedicel and ovary 4–7 mm. Dorsal sepal subelliptic-oblong, 2–3 × 0.8–1 mm, margin revolute, apex obtuse; lateral sepals ovate-elliptic, slightly wider than dorsal sepal. Petals narrowly linear, 2–3 × ca. 0.3 mm, apex rounded; lip recurved from middle, nearly ovate-oblong, 2–3 × ca. 1.7 mm, base ecallose, margin slightly undulate, apex subacute or mucronate. Column slightly arcuate, 1.5–2 mm, base slightly enlarged, apex winged. Capsule obovoid-ellipsoid, 4–6 × 3–4 mm; fruiting pedicel 3–6 mm. Fl. Mar.  $2n = 22 + 6B, 30, 38$ .

On trees or rocks in forests or shaded places along valleys; 200–2300 m. Fujian, Guangdong, Guangxi, Hainan, SW Sichuan, Taiwan, SE Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; ?Pacific islands].

**46. *Liparis condylobulbon*** H. G. Reichenbach, Hamburger Garten-Blumenzeitung 18: 34. 1862.

细茎羊耳蒜 xi jing yang er suan

*Cestichis condylobulbon* (H. G. Reichenbach) M. A. Clements & D. L. Jones; *Leptorkis condylobulbon* (H. G. Reichenbach) Kuntze; *Liparis confusa* J. J. Smith; *L. dolichopoda* Hayata.

Herbs, epiphytic or lithophytic. Rhizomes long, ca. 2.5 mm in diam. Pseudobulbs borne 2–4 cm apart on rhizome, green, glossy, cylindrical, 6–12 cm × 5–8 mm, attenuate toward apex. Leaves 2, lanceolate or oblanceolate-linear, 10–15 × 1–1.5 cm, base contracted into a short petiole, articulate, apex obtuse or acute. Inflorescence 10–20 cm; rachis densely many flowered; floral bracts lanceolate, ca. 3 mm. Flowers pale green or nearly white; pedicel and ovary ca. 5 mm. Sepals oblong, ca. 3.5 × 1–1.5 mm, apex obtuse. Petals linear, ca. 3.5 × 0.5 mm, apex obtuse; lip obovate, ca. 3 × 2 mm, inconspicuously bilobed. Column ca. 2 mm. Fl. Sep–Nov.  $2n = 30, 42$ .

On dry and open rocks or tree trunks; 100–500(–1800) m. Taiwan [Indonesia, Malaysia, New Guinea, Philippines, Thailand; Pacific islands].

**47. *Liparis bistrata*** E. C. Parish & H. G. Reichenbach, Trans. Linn. Soc. London 30: 155. 1874.

折唇羊耳蒜 zhe chun yang er suan

*Leptorkis bistrata* (E. C. Parish & H. G. Reichenbach) Kuntze; *Liparis saltucola* Kerr.

Herbs, epiphytic or lithophytic. Pseudobulbs densely

arranged, cylindrical, 9–12 cm × 5–7 mm. Leaves 2, subelliptic or elliptic-lanceolate, 6.5–9 × 2.6–3.4 cm, somewhat leathery, base contracted into a short petiole, articulate, apex acuminate. Inflorescence 18–24 cm; peduncle subterete, nearly wingless; rachis more than 20-flowered; floral bracts lanceolate, 3–4 mm. Flowers pale green; pedicel and ovary ca. 1 cm. Sepals narrowly oblong, 5–5.5 × ca. 1.5 mm, 3-veined, margin revolute, apex obtuse. Petals linear, 4.5–5 × ca. 0.5 mm, 1-veined, apex obtuse; lip deflexed above middle, suboblong, 4.5–5 × ca. 2.5 mm, with a ± bilobed basal callus, apex subtruncate or ± erose, emarginate. Column slightly arcuate, ca. 3.5 mm, base dilated and thick, upper part with narrow wings. Capsule obovoid-ellipsoid, 8–10 × 5–6 mm; fruiting pedicel 8–10 mm. Fl. Jun–Jul, fr. Aug–Sep.  $2n = 32$ .

On trees or rocks in forests or along roadsides; 800–1800 m. SE Xizang, S and SW Yunnan [NE India, Myanmar, N Thailand].

**48. *Liparis distans*** C. B. Clarke, J. Linn. Soc., Bot. 25: 71. 1889.

大花羊耳蒜 da hua yang er suan

*Leptorkis distans* (C. B. Clarke) Kuntze; *Liparis macrantha* J. D. Hooker; *L. oxyphylla* Schlechter; *L. yunnanensis* Rolfe.

Herbs, epiphytic, rather tall and large. Pseudobulbs densely arranged, subcylindric or narrowly ovoid-cylindric, (2–)3–9.5 cm × 3–10 mm. Leaves 2; petiole 2–6 cm, articulate; blade oblanceolate or linear-oblanceolate, 15–35 × 1–2.8 cm, papery, apex acuminate. Inflorescence 14–39 cm; peduncle somewhat compressed, with narrow wings 1–2 mm wide on both sides, with 2 or 3 subulate sterile bracts; rachis 8–20 cm, several to 10-flowered; floral bracts nearly subulate, 6–12 mm. Flowers yellowish green or orange; pedicel and ovary 1.4–2.2 cm. Sepals linear, (0.8–)1–1.6 × ca. 0.2 cm, margin often revolute, apex obtuse; lateral sepals often slightly shorter than dorsal sepal. Petals nearly filiform, 12–16 × 0.3–0.5 mm, apex obtuse; lip obovate to semicircular, 1–1.4 × 1–1.1 cm, base narrowed into very short claw and with a frontally grooved callus, margin somewhat irregularly denticulate, apex rounded or obtuse. Column slightly arcuate, 5–6 mm, base slightly dilated, upper part narrowly winged. Capsule narrowly obovoid-oblong, 1.5–1.8 cm × 6–7 mm; fruiting pedicel 1–1.5 cm. Fl. Oct–Feb, fr. Jun–Jul.  $2n = 38$ .

On trees or rocks in shaded places along valleys; 1000–2400 m. Guangxi, SW Guizhou, Hainan, S Sichuan, SE Xizang, Yunnan [India (Assam), Laos, Thailand, Vietnam].

**49. *Liparis nakaharae*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 310. 1911 [“*nakaharai*”].

凹唇羊耳蒜 ao chun yang er suan

*Cestichis kawakamii* (Hayata) Maekawa; *C. nakaharae* (Hayata) Kudô; *C. nokoensis* (Fukuyama) Maekawa; *C. taiwaniana* (Hayata) Nakai; *Liparis kawakamii* Hayata; *L. plicata* Franchet & Savatier var. *kawakamii* (Hayata) S. S. Ying; *L. nokoensis* Fukuyama; *L. taiwaniana* Hayata.

Herbs, epiphytic. Leaves 2; petiole ca. 10 cm, articulate; blade oblanceolate, 18–35 (including petiole) × 1.7–2 cm, apex

acuminate. Peduncle ca. 18 cm; rachis 8–15 cm, laxly flowered; floral bracts lanceolate, 7–10 mm. Flowers 1–2 cm in diam. Sepals spreading, reflexed-recurved, oblong-linear to linear, 9–10 × 1–1.8 mm, apex obtuse. Petals reflexed, linear, 9–12 × ca. 0.5 mm, margin convolute; lip cuneate-obovate to lyrate, ca. 8 mm, 5.5–7 mm wide above, ca. 2.5 mm wide at base, with a dorsally grooved basal callus, apical margin sometimes unequally denticulate. Column 5–6 mm. Fl. Jan.

• Taiwan.

**50. *Liparis stricklandiana*** H. G. Reichenbach, Gard. Chron., n.s., 13: 232. 1880.

扇唇羊耳蒜 shan chun yang er suan

*Leptorkis dolabella* (J. D. Hooker) Kuntze; *L. stricklandiana* (H. G. Reichenbach) Kuntze; *Liparis chloroxantha* Hance; *L. dolabella* J. D. Hooker; *L. malleiformis* W. W. Smith; *L. stricklandiana* var. *longibracteata* S. C. Chen.

Herbs, epiphytic, rather tall and large. Pseudobulbs densely arranged, suboblong, 2–3.5 cm × 6–15 mm. Leaves 2; petiole 4–17 cm, articulate; blade oblanceolate or linear-oblanceolate, 16–46 × 1.7–3.5 cm, papery, apex acuminate. Inflorescence 16–45 cm; peduncle compressed cylindrical, both sides with wings 1–2 mm wide, upper portion with 1 or 2 subulate sterile bracts; rachis 8–22 cm, more than 10-flowered; floral bracts subulate, 5–10(–12) mm. Flowers greenish yellow; pedicel and ovary 7–11 mm. Sepals narrowly obovate or oblong to oblong-obovate, 4–4.5 × 1.5–1.8 mm, margin revolute, apex obtuse; lateral sepals often slightly wider than dorsal sepal. Petals nearly filiform, 4–4.5 × ca. 0.5 mm, slightly widened toward apex; lip flabellate, 4–4.5 × 5–6 mm, with an oblate basal callus, apical margin irregularly serrulate, apex subtruncate and mucronate; callus running forward becoming a broad, short and stout midvein. Column suberect or slightly arcuate, 3–3.5 mm, slender, base slightly dilated, apex with narrow wings. Capsule obovoid-ellipsoid, 7–8 × ca. 5 mm; fruiting pedicel 3–5 mm. Fl. Oct–Jan, fr. Apr–May.  $2n = 76$ .

On trees in forests, shaded cliffs along valleys; 1000–2400 m. S Guangdong, Guangxi, Guizhou, Hainan, SE Xizang, NW to SE Yunnan [Bhutan, NE India, N Vietnam].

**51. *Liparis latilabris*** Rolfe, J. Linn. Soc., Bot. 36: 6. 1903.

阔唇羊耳蒜 kuo chun yang er suan

Herbs, epiphytic or lithophytic, rather tall and large. Pseudobulbs densely arranged, narrowly ovoid or narrowly ovoid-cylindric, 2–2.5 cm × 7–10 mm. Leaves 2; petiole (2.5–)4–11 cm, articulate; blade oblanceolate or linear-oblanceolate, 13–29 × 1.3–3 cm, papery, apex acuminate. Inflorescence 20–35 cm; peduncle often ± narrowly winged, with a sterile bract; rachis 10- to many flowered; floral bracts narrowly lanceolate, 5–8 mm. Flowers yellowish green or yellow tinged with brown; pedicel and ovary 6–8 mm. Sepals oblong, ca. 7 × 2 mm, veins inconspicuous, apex obtuse. Petals narrowly linear or subfiliform, ca. 7 × 0.5 mm, apex obtuse; lip oblate or subreniform, 6–7 × 8–10 mm, adaxially with glandular hairs, with 2 small calli near base, middle part with a thick longitudinal lamella ca. 2 mm, margin irregularly toothed, apex rounded. Column sub-

erect or slightly arcuate, 2–2.5 mm, nearly wingless. Capsule obovoid-ellipsoid, 6–7 × 4–5 mm; fruiting pedicel 3–5(–8) mm. Fl. Nov–Feb, fr. Sep–Oct.

On trees in forests, rocks along valleys; 1200–1800 m. C and SE Yunnan [N Vietnam].

**52. *Liparis elliptica*** Wight, Icon. Pl. Ind. Orient. 5: 17, t. 1735. 1852.

扁球羊耳蒜 bian qiu yang er suan

*Cestichis platybolba* (Hayata) Kudô; *Leptorkis elliptica* (Wight) Kuntze; *Liparis hookeri* Ridley; *L. platybolba* Hayata; *L. wightii* H. G. Reichenbach.

Herbs, epiphytic. Pseudobulbs densely arranged, oblong or ellipsoid, compressed, 1–3 cm × 6–15 mm. Leaves 2, narrowly elliptic or narrowly oblong, 4–12 × 1.2–2.8 cm, papery, base contracted into a short petiole, articulate, apex acute to shortly acuminate. Inflorescence arching or pendulous, 7–17 cm; peduncle somewhat compressed, sometimes with a few sterile bracts; rachis 4–8 cm, several to many flowered; floral bracts lanceolate, 1.5–3 mm, membranous. Flowers pale yellowish green; pedicel and ovary ca. 4.5 mm. Sepals oblong-lanceolate, 4–5 × 1.5–1.8 mm, apex obtuse. Petals narrowly linear or nearly filiform, 3.5–4.5 × ca. 0.5 mm; lip orbicular or nearly ovate-orbicular, 4–5 mm, ecallose, margin ± crisped especially toward apex, appearing 3-lobed due to auriculate-folded margins at or above middle, apex long acuminate or shortly caudate. Column 1.5–2 mm, wingless. Capsule narrowly obovoid, 5–6 × 2–2.5 mm; fruiting pedicel ca. 2 mm. Fl. Nov–Feb, fr. May.

On trees in forests; 200–1600 m. S Sichuan, Taiwan, SE Xizang, S and W Yunnan [India, Indonesia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands].

**53. *Liparis somae*** Hayata, Icon. Pl. Formosan. 4: 33. 1914 [“*somai*”].

台湾羊耳蒜 tai wan yang er suan

*Liparis sikkimensis* Lucksom & S. Kumar.

Herbs, epiphytic. Pseudobulbs ovoid or clavate, ± compressed, 2.5–5.5 × 1–2 cm, longitudinally ridged. Leaves 2; petiole 2–3 cm, articulate; blade oblanceolate, ca. 13 × 2 cm, apex acute. Inflorescence erect, 10–20 cm; peduncle slightly compressed, narrowly winged; rachis densely 30- or more flowered; floral bracts lanceolate, 5–10 mm. Flowers yellowish or whitish, column white; pedicel and ovary 7–9 mm. Dorsal sepal lanceolate, ca. 3 × 1 mm, apex obtuse or acute; lateral sepals obliquely ovate, ca. 3 × 1.5 mm. Petals linear, ca. 2.5 × 0.5 mm; lip ovate, ca. 3 × 2 mm, obscurely 3-lobed; lateral lobes erect; mid-lobe slightly thickened near base, apical margin slightly crisped-denticulate, apex acute. Column ca. 1.5 mm. Fl. Jan.

On tree trunks in broad-leaved evergreen forests; 500–1000 m. E and S Taiwan [India (Sikkim)].

**54. *Liparis grossa*** H. G. Reichenbach, Gard. Chron., n.s., 19: 110. 1883.

恒春羊耳蒜 heng chun yang er suan

*Leptorkis grossa* (H. G. Reichenbach) Kuntze; *Liparis rizalensis* Ames; *L. tateishii* Kudô.

Herbs, epiphytic. Pseudobulbs densely arranged, globose-ovoid, slightly compressed, 2.5–4.5 × 2–3 cm, glabrous. Leaves 2, elliptic-oblong, 6–12 × 2–3 cm, leathery, slightly fleshy, base slightly contracted, without distinct petiole, articulate, apex obtuse or rounded. Inflorescence 10–20 cm; peduncle subterete, without distinct wings; rachis more than 10-flowered; floral bracts sublinear-lanceolate, to 9 mm. Flowers orange or pale orange-red; pedicel and ovary ca. 1 cm. Sepals elliptic-oblong, 4.5–5.5 × ca. 2.5 mm, obtuse. Petals narrowly linear or nearly filiform, 4.5–5.5 × ca. 0.7 mm, 1-veined; lip reflexed, suboblong, 6–7 × 3–5 mm, slightly contracted toward base, with 2 inconspicuous calli near base, apex deeply 2-lobed; lobes suboblong, 1.5–2 × ca. 1.5 mm, apical margin often irregularly incised. Column green, slightly arcuate, ca. 4 mm. Fl. Oct–Nov.

On tree trunks or large branches at margins of broad-leaved forests; below 500 m. E and S Taiwan [Myanmar, Philippines].

**55. *Liparis fissilabris*** Tang & F. T. Wang, Acta Phytotax. Sin. 12: 37. 1974.

裂唇羊耳蒜 lie chun yang er suan

Herbs, epiphytic or lithophytic. Pseudobulbs densely arranged, ovoid to ovoid-oblong, 1.5–3.5 × 1–1.8 cm. Leaves 2, oblanceolate-oblong, ligulate-oblong, or narrowly elliptic-oblong, 6–19 × 1.8–3.2 cm, papery, base attenuate into a petiole, articulate, apex acuminate or acute. Inflorescence 12–18 cm; peduncle nearly wingless, with several white sterile bracts; rachis laxly 10–30-flowered; floral bracts white, linear-lanceolate, 3–5 mm, membranous. Flowers green, lip red; pedicel and ovary 5–10 mm. Sepals suboblong, 3.5–4 × ca. 1.3 mm, 3-veined, apex obtuse. Petals filiform, 3.5–4 mm, 1-veined; lip nearly spatulate-oblong, 4–5 × ca. 1.7 mm, with a folded gap on either side of margins below middle, ± ciliate, with 2 longitudinal lamellae from base to middle, 2-lobed, sinus mucronulate; lobes ovate or oblong, ca. 1.2 × 1 mm, outer margin ± ciliate, apex irregularly incised. Column suberect or apex slightly arching, 2–2.5 mm, dilated at base, with narrow wings toward apex. Capsule obovoid-ellipsoid, 7–8 × 4–5 mm; fruiting pedicel 7–8 mm. Fl. Nov, fr. Jan–Feb.

• Forests, trees or rocks along valleys; ca. 500 m. SE Hainan.

**56. *Liparis luteola*** Lindley, Gen. Sp. Orchid. Pl. 32. 1830.

黄花羊耳蒜 huang hua yang er suan

*Leptorkis luteola* (Lindley) Kuntze.

Herbs, epiphytic or lithophytic. Pseudobulbs somewhat densely arranged, subovoid, 6–7 × 4–5 mm. Leaves 2; petiole 1–1.5 cm, articulate; blade linear or linear-oblanceolate, (4–)6–14 × 0.4–0.9 cm, papery, apex acuminate. Inflorescence 6–16 cm; peduncle somewhat compressed, narrowly winged, sometimes with 1 sterile bract; rachis 3–6 cm, several to 10-flowered; floral bracts lanceolate, 3–4(–6) mm. Flowers whitish green or yellowish green; pedicel and ovary 9–14 mm. Sepals lanceolate-linear or linear, ca. 4 × 1 mm, midvein slightly raised abaxially, apex obtuse; lateral sepals to 1.5 mm wide. Petals filiform, ca. 4 × 0.3 mm; lip oblong-obovate, ca. 3.5 × 2.8 mm, with a thick longitudinal ridge near base, with a bilobed callus in front of ridge, apex emarginate and sinus apiculate. Column

slightly arcuate, ca. 2.5 mm, slender, upper part winged. Capsule obovoid, 7–9 × 3–4 mm; fruiting pedicel 6–9 mm. Fl. and fr. Dec–Feb.  $2n = 38$ .

On trees or rocks in forests. N, E, and W Hainan [India, Myanmar, N Thailand, Vietnam].

**57. *Liparis sparsiflora*** Averyanov, Updated Checkl. Orchids Vietnam, 87. 2003.

疏花羊耳蒜 shu hua yang er suan

Herbs, epiphytic. Pseudobulbs ovoid to subglobose, 8–12 × 8–12 mm, partially enclosed by 2 or 3 whitish papery sheaths. Leaves 1 or 2, ligulate-oblong, 4–9 × 0.9–1.6 cm, base contracted, apex acute. Inflorescence 8–12 cm; peduncle 4–6 cm, winged; rachis flexuous, 2–6 cm, laxly 4–8-flowered; floral bracts broadly ovate, to 7 mm, apex acuminate. Flowers white with green tint to pale greenish, lip with deep green median stripe; pedicel and ovary 6–8 mm. Dorsal sepal oblong, 5–5.5 × ca. 1.5 mm, apex obtuse; lateral sepals oblong, 5–5.5 × ca. 2 mm, apex obtuse. Petals linear, 5–6 × 0.5–0.7 mm, apex obtuse; lip strongly recurved at middle, oblong-rectangular, 6–7 × 2.5–3 mm, deeply channeled lengthwise, base with 2 conic paired calli, apex truncate with slightly irregular margin. Column arcuate, 4.5–5 mm, not or very narrowly winged at apex. Fl. Oct.

Montane forests; ca. 1200 m. Hainan [Vietnam].

**58. *Liparis perpusilla*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1856b. 1889.

狭叶羊耳蒜 xia ye yang er suan

*Leptorkis perpusilla* (J. D. Hooker) Kuntze; *Liparis togashii* Tuyama & H. Hara; *Platystyliparis perpusilla* (J. D. Hooker) Margońska.

Herbs, epiphytic. Pseudobulbs tufted, ovoid or oblong, 2–3 cm × 1–2 mm. Leaves 4 or 5, linear, 10–15 × 1–2 mm, apex acute. Inflorescence erect, 2–4 cm; rachis 5–10-flowered; floral bracts ovate-lanceolate, 2–3 mm. Flowers yellow; pedicel and ovary 3–4 mm. Dorsal sepal suboblong, 1.1–1.3 × 0.4–0.5 mm, 1-veined, apex obtuse; lateral sepals elliptic-oblong, 1–1.2 × 0.6–0.7 mm, 1-veined, apex obtuse. Petals linear or narrowly lanceolate, 1–1.1 × 0.1–0.2 mm, apex obtuse; lip ± reflexed, suborbicular, ca. 1.1 × 0.9 mm, basal margins crisped, apex obtuse-rounded, sometimes slightly mucronate; disk with a U-shaped callus near base and 2 divergent calli at base of U-shaped callus. Column ca. 1 mm, with 2 wings on ventral sides. Fl. Jul.  $2n = 30$ .

On tree trunks in forests; ca. 2800 m. SW Yunnan (Weixi) [Bhutan, India (Sikkim), Nepal].

**59. *Liparis delicatula*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1889. 1889.

小巧羊耳蒜 xiao qiao yang er suan

*Leptorkis delicatula* (J. D. Hooker) Kuntze; *Platystyliparis delicatula* (J. D. Hooker) Margońska.

Herbs, epiphytic, very small, nearly in clusters. Pseudobulbs densely arranged, oblong or cylindrical-fusiform, 5–9 × 3–5 mm. Leaves 2(or 3), spatulate-oblong to oblong-lanceolate, 1.2–3.5(–4.5) × 0.5–1.1 cm, papery, base contracted into a short

petiole, articulate, apex acute and apiculate. Inflorescence 4–10 cm, upper part sometimes narrowly winged, with a few sterile bracts; rachis 2–5 cm, several to 10-flowered; floral bracts ovate-lanceolate, 2–3 mm. Flowers white; pedicel and ovary 3–4 mm. Dorsal sepal ovate-oblong, 2.5–3 × 1.5–1.8 mm, abaxially carinate, apex obtuse; lateral sepals ovate or ovate-elliptic, slightly oblique, ca. 2 mm wide. Petals narrowly linear-lanceolate, 2.5–3 × ca. 0.5 mm; lip broadly elliptic or orbicular, ca. 2.5 mm, conspicuously folded and twisted on both sides below middle, apical half strongly reflexed, base with an orbicular, auriculate, callus-shaped fold on either side, with a concave callus in center near base, apex subtruncate or rounded, shortly caudate. Column erect, ca. 2.2 mm, with 2 wings on upper ventral surface, and 2 wings on both lower sides. Capsule trigonous-obovoid, ca. 4 × 2.5 mm; fruiting pedicel ca. 2 mm. Fl. and fr. Dec–Feb.

On trees in forests or along valleys; 500–2900 m. S Hainan, SE Xizang, S and W Yunnan [NE India, N Laos, Vietnam].

**60. *Liparis platyrachis*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1890. 1889.

小花羊耳蒜 xiao hua yang er suan

*Leptorkis platyrachis* (J. D. Hooker) Kuntze; *Platystyliparis platyrachis* (J. D. Hooker) Margońska.

Herbs, epiphytic. Pseudobulbs densely arranged, subterete, attenuate toward apex, somewhat compressed, ca. 1 cm, near apex with 3–5 spaced leaves. Leaf blade linear-lanceolate, 1.5–3 × 0.4–0.6 cm, base contracted into a short petiole, articulate, apex acuminate or acute. Scape ± arching, to 8 cm, ± narrowly winged; raceme 10–20-flowered; floral bracts subulate, conspicuously shorter than pedicel and ovary. Flowers white. Sepals elliptic, ovate-elliptic, or oblong, 2–3 mm, apex acute; lateral sepals somewhat oblique. Petals linear, nearly as long as sepals; lip subsquare, conspicuously shorter than sepals, below middle conspicuously folded and twisted, appearing like 2 lateral auricles, near base with 4 calli, distal 2 larger, apex rounded and emarginate, or sometimes apiculate. Column erect, upper part with a pair of small triangular wings and lower part with a pair of lateral wings. Fl. Sep.

1000–1500 m. W Yunnan [India (Sikkim), Nepal].

**61. *Liparis assamica*** King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 36. 1898.

扁茎羊耳蒜 bian jing yang er suan

Herbs, epiphytic. Pseudobulbs densely arranged, ovoid-fusiform, slightly compressed, 1.5–2.5 cm × 6–10 mm, upper part with 3 or 4 spaced leaves. Leaf blade narrowly oblong-oblong-lanceolate, 3.5–6 × 0.5–1 cm, base contracted into a short petiole, articulate, apical half slightly crisped-margined, apex acuminate. Scape 10–13 cm, nearly wingless, with many sterile bracts 4–6 mm; raceme 5–7 cm, more than 10-flowered; floral bracts lanceolate, 2–3 mm. Flowers orange; pedicel and ovary 3–4 mm. Dorsal sepal narrowly ovate-oblong, 4.8–5.8 × ca. 1.6 mm, 1-veined, abaxially carinate, apex obtuse; lateral sepals oblong-ovate, 4.5–5.5 × 2–2.3 mm, abaxially somewhat carinate. Petals narrowly linear, 5–5.5 × ca. 0.7 mm, apex ± emarginate.

nate and sinus apiculate; lip broadly obovate-oblong, ca.  $4 \times 2.7$  mm, near base abruptly contracted and with 2 callus-shaped and thickened folds, base inconspicuously with 2 suborbicular lobes on both sides, centrally with 1 thickened, concave callus, apex truncate and emarginate. Column erect, ca. 2 mm, ventrally with a pair of broad wings, lower part with a second pair of arcuate wings on both sides. Fl. Nov.

On tree branches in forests; 800–2100 m. S and W Yunnan [India].

**62. *Liparis resupinata*** Ridley, J. Linn. Soc., Bot. 22: 290. 1886.

蕊丝羊耳蒜 rui si yang er suan

*Leptorkis resupinata* (Ridley) Kuntze; *Platystyliparis resupinata* (Ridley) Margońska.

Herbs, epiphytic. Pseudobulbs densely arranged, subcylindrical or  $\pm$  spindle-shaped, 1.8–5 cm  $\times$  3–6 mm, above middle usually with 3 or 4 remote leaves. Leaf blade narrowly oblong or nearly linear-lanceolate, 3–8  $\times$  0.5–1.2 cm, papery, base slightly contracted, articulate, subsessile, margin slightly serrate, apex acuminate. Scape arching or pendant, 7–18 cm, nearly wingless, with several sterile bracts 5–9 mm; raceme 5–14 cm, 10–50-flowered; floral bracts lanceolate, 3–5 mm. Flowers pale green or greenish yellow; pedicel and ovary 5–7 mm. Dorsal sepal oblong or elliptic-oblong, ca.  $4 \times 1.8$  mm, 1-veined, abaxially carinate, apex obtuse or acute; lateral sepals not carinate. Petals narrowly linear, ca.  $3.5 \times 0.3$  mm, apex obtuse; lip broadly elliptic-oblong or broadly ovate-oblong, 2.5–3 mm,

both sides strongly contracted and with 2 lateral splits below middle, forming epichile and hypochile, apex obtuse; epichile auriculate and sagittate at base; hypochile with suborbicular lobes on both sides, centrally with 1 bilobed callus. Column erect, ca. 2.8 mm, with 2 suborbicular wings on both sides, each with 1 pendulous filiform appendage. Capsule obovoid-oblong, ca.  $5 \times 2$ –3 mm; fruiting pedicel ca. 4 mm. Fl. and fr. Oct–Dec.  $2n = 28, 56$ .

On trees in dense forests or in broad-leaved forests along valleys; 1300–2500 m. SE Xizang, W to SE Yunnan [Bhutan, India, Nepal].

**63. *Liparis seidenfadeniana*** Szlachetko, Novon 3: 303. 1993.

管花羊耳蒜 guan hua yang er suan

Herbs, epiphytic. Pseudobulbs cylindrical, ca.  $10 \times 2$  mm, with 1 leaf at apex. Leaf blade obovate, 7–10(–25)  $\times$  5–8 mm, apex obtuse. Scape ca. 1.5 cm; raceme 1- or 2(or 3)-flowered; floral bracts ovate-triangular, ca. 3 mm, membranous; pedicel and ovary 3–4 mm. Flowers small, tubular. Dorsal sepal oblong-ovate, ca.  $4.5 \times 1.5$  mm, margin ca.  $2/3$  connate to lateral sepals; lateral sepals oblong-lanceolate, ca.  $4.5 \times 1.3$  mm, separate from each other. Petals linear, ca. as long as sepals, ca. 0.5 mm wide; lip suboblong, ca.  $4.5 \times 2.5$ –2.8 mm, fleshy, base  $\pm$  with small auricles, margin and midvein thickened, apex emarginate. Column slightly arcuate, wingless. Fl. unknown.

• Guizhou, Sichuan.

This species needs to be critically compared with *Liparis fargesii*, as both have a very similar lip.

## 76. *YPSILORCHIS* Z. J. Liu, S. C. Chen & L. J. Chen, J. Syst. Evol. 46: 623. 2008.

丫瓣兰属 ya ban lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Paul Ormerod, Jeffrey J. Wood

Herbs epiphytic or lithophytic. Pseudobulbs densely arranged, small, subfusiform or ovoid, with several terminal and lateral leaves. Leaves small, oblanceolate to narrowly obovate, thinly textured, strongly crisped margined, aristate apically, base shortly petiolate and articulated. Inflorescence terminal, suberect, racemose, laxly many flowered; floral bracts small, persistent. Flowers small, often yellow, resupinate. Dorsal sepal free; lateral sepals fused for part of their length to form a synsepal. Petals free, longer than sepals, deeply divergent-bilobed apically, Y-shaped; lip composed of a basal claw and an apical portion (epichile); epichile with 2 auricles on both basal sides; claw with a center callus. Column erect, with 2 hornlike appendages on both upper sides, footless; pollinia 2, granular-waxy, each with a somewhat elastic caudicle, without a true viscidium.

• One species: China.

**1. *Ypsilorchis fissipetala*** (Finet) Z. J. Liu, S. C. Chen & L. J. Chen, J. Syst. Evol. 46: 623. 2008.

丫瓣兰 ya ban lan

*Liparis fissipetala* Finet, Bull. Soc. Bot. France 55: 340. 1908; *Platystyliparis fissipetala* (Finet) Margońska.

Pseudobulbs 8–10  $\times$  4–5 mm, upper part with 3 or 4 leaves (1 or 2 terminal). Leaf blade narrowly obovate or oblanceolate-oblong, 0.8–1.6  $\times$  ca. 0.3 cm, base contracted into a petiole 3–5 cm, articulate, margin crisped, apex rounded and mucronate, rarely shortly cuspidate. Scape 5–7 cm, nearly wingless, with 1–3 sterile bracts; raceme sparsely several to 10-flowered; floral bracts green, ovate-lanceolate, 2–2.5 mm; pedicel and ovary 4–5 mm. Flowers yellow. Dorsal sepal oblong-lanceolate, 2.5–

3.5 mm, 1-veined; lateral sepals suboblong or ovate-oblong, fused from base to near or above middle forming a synsepal; synsepal suborbicular, 2.5–3 mm, bifid at apex. Petals narrowly linear, 3–4 mm, apex furcate-bilobed; lobes 0.7–1 mm; lip 1.5–2 mm, composed of limb and claw; limb oblong, base with auricles on both sides, apex emarginate; claw broadly linear, 0.4–0.5 mm, with a somewhat crescent-shaped callus along its apical margin bordering base of limb. Column erect, ca. 1.5 mm, upper part with obtuse-triangular wings on both sides. Capsule globose or broadly ellipsoid, 3–4 mm; fruiting pedicel 3–4 mm. Fl. Sep–Nov.

• On slightly sunny limestone rocks in evergreen broad-leaved forests, on trees in forests; 1200–1600 m. Chongqing (Chengkou), SE Yunnan (Malipo).

77. **MALAXIS** Solander ex Swartz, Prodr. 8, 119. 1788.

原沼兰属 yuan zhao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Achroanthes* Rafinesque; *Cheiropterocephalus* Barbosa Rodrigues; *Malaxis* [unranked] *Microstylis* Nuttall; *Microstylis* (Nuttall) Eaton; *Tamayorkis* Szlachetko.

Herbs, terrestrial or rarely epiphytic, occasionally holomycotrophic. Roots hairy. Stem cylindrical to pseudobulbous, fleshy, often creeping and rooting in basal part. Leaves, if present, thinly textured to fleshy, usually plicate, petiole sheathing at base. Inflorescences erect, racemose, unbranched; floral bracts persistent, lanceolate or setose. Flowers not resupinate or resupinate, green, brown, yellow, pink, or purple. Dorsal sepal spreading, free; lateral sepals free or fused, spreading. Petals often narrower than sepals, free, spreading; lip erect, flat but sometimes concave at base, entire to lobed, auriculate at base or lacking auricles, apical margin entire or toothed, lacking a spur, callus absent or present and cushionlike or obscurely transversely ridged. Column lacking a foot; anther cap dorsal, attached by a slender filament, locules opening ventrally; pollinia 4, waxy, lacking appendages or rarely with 1 or 2 tiny viscidia; stigma semicircular or ovate; rostellum often obtuse or emarginate at apex.

About 300 species: cosmopolitan, mainly in tropics and subtropics of Old and New World, with a few species in temperate regions of Europe, Asia, and the Americas; one species in China.

Recently, Szlachetko (Fragm. Florist. Geobot., Suppl. 3: 1–152. 1995) and Szlachetko and Margońska (Acta Bot. Fenn. 173: 1–275. 2002) recognized a number of new genera in subtribe Malaxideae: e.g., *Crepidium* (most Chinese taxa formerly referred to *Malaxis*), *Dienia*, *Oberonioides*, etc. Most of these were included in *Malaxis* by previous authors. Data from DNA sequence analysis shows that *Malaxis* s.l. is polyphyletic (Cameron, Amer. J. Bot. 92: 1025–1032. 2005) but not along the lines defined by Szlachetko and his co-workers. However, some of the segregate genera have been accepted by Pridgeon et al. (Gen. Orchid. 4(1): 453–486. 2005), based on morphological and preliminary molecular data:

*Malaxis* s.s.: a large clade of predominantly American species, including *M. spicata* Swartz, the type species. It includes two species with a small, ovoid pseudobulb, one or two leaves, and a racemose or subumbellate inflorescence.

*Malaxis monophyllos*: the temperate Eurasian and North American *M. monophyllos* is sister to a larger clade that includes *Malaxis* s.s., *Crossoglossa* (New World only), and some other species of *Malaxis*.

Asiatic *Crepidium* and *Dienia*: sister clades readily recognized by their elongate, several-noded pseudobulbs, plicate leaves, and flowers with a broad, often lobed lip. They form part of a larger clade including tropical and subtropical Asiatic *Liparis* species with a similar habit. Both are recognized in this treatment but might be united in the future.

**1. *Malaxis monophyllos*** (Linnaeus) Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 234. 1800.

原沼兰 yuan zhao lan

*Ophrys monophyllos* Linnaeus, Sp. Pl. 2: 947. 1753; *Achroanthes monophylla* (Linnaeus) Greene; *Epipactis monophylla* (Linnaeus) F. W. Schmidt; *Malaxis arisanensis* (Hayata) S. Y. Hu; *M. muscifera* (Lindley) Kuntze var. *stelostachya* Tang & F. T. Wang; *M. taiwaniana* S. S. Ying; *M. yunnanensis* (Schlechter) Tang & F. T. Wang; *M. yunnanensis* var. *nemato-phylla* Tang & F. T. Wang; *Microstylis arisanensis* Hayata; *M. monophyllos* (Linnaeus) Lindley; *M. yunnanensis* Schlechter.

Plants terrestrial. Pseudobulbs ovoid, relatively small, usually 6–8 × 4–5 mm, ± enclosed in white membranous sheaths. Leaf 1 or rarely 2, ovate, oblong, or subelliptic, 2.5–7.5(–12) × 1–3(–6.5) cm, base contracted into ± amplexicaul petiole 3–6.5(–8) cm, apex obtuse or subacute. Inflorescence erect,

(9–)15–40 cm, many flowered; rachis 4–12(–20) cm, narrowly winged; floral bracts 2–2.5 mm, lanceolate. Flowers pale yellowish green to pale green, small; pedicel and ovary 2.5–4(–6) mm. Dorsal sepal lanceolate or narrowly ovate-lanceolate, 2–4 × 0.8–1.4 mm, 1-veined, apex long acuminate; lateral sepals linear-lanceolate, 2–4 × 0.7–1.2 mm, 1-veined. Petals filiform or narrowly lanceolate, 1.5–3.5 × ca. 0.3 mm; lip ovate-triangular, 3–4 mm, caudate; disk broadly ovate or oblate, slightly concave, margin thickened and verrucose, base with a pair of short auricles on each side. Column ca. 0.5 mm, stout. Capsule obovoid or obovoid-ellipsoid, 6–7 × ca. 4 mm; fruiting pedicel 2.5–3 mm. Fl. and fr. Jul–Aug. 2n = 28, 30, 60.

Forests, thickets, grassy slopes; 800–2400 m (2500–4100 m in NW Yunnan and Xizang). Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, W Yunnan [Japan, Korea, Russia; Europe, North America].

78. **CREPIDIUM** Blume, Bijdr. 387. 1825.

沼兰属 zhao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Fingardia* Szlachetko; *Glossochilopsis* Szlachetko; *Pseudoliparis* Finet; *Pterochilus* Hooker & Arnott; *Saurolophorkis* Margońska & Szlachetko; *Seidenfia* Szlachetko; *Seidenforchis* Margońska.

Herbs, terrestrial, rarely epiphytic or lithophytic. Roots hairy. Stem cylindrical to pseudobulbous, fleshy, often creeping and

rooting in basal part. Leaves 2 to several, thinly textured to fleshy, plicate, petiolate, petiole sheathing at base. Inflorescence apical, erect, unbranched; floral bracts persistent, often recurved or reflexed, lanceolate or setose. Flower usually not resupinate, green, brown, yellow, pink, or purple. Dorsal sepal spreading, free; lateral sepals free or fused, spreading. Petals often narrower than sepals, free, spreading; lip erect, flat, usually concave at base, entire to lobed, auriculate at base or lacking auricles, apical margin entire or toothed, lacking a spur, callus absent. Column lacking a foot, with 2 apical arms on either side of clinandrium, rarely with a dorsal wing or protuberance; anther cap movable, dorsal, dorsiventrally flattened, attached by a slender filament, locules opening ventrally; pollinia 4, almost equal in size, in pairs, clavate, waxy, with 1 delicate viscidium or lacking a viscidium; stigma elliptic to transversely elliptic; rostellum often obtuse or rounded at apex.

About 280 species: throughout the Asian tropics and subtropics, Australasia, and Indian Ocean islands, with a few species in temperate Asia; 17 species (five endemic) in China.

- 1a. Lip without basal auricles, narrow, ligulate, entire ..... 1. *C. finetii*  
 1b. Lip auriculate, mid-lobe entire, toothed, or bilobed.  
 2a. Lip auricles short, never stretching backward and embracing column ..... 2. *C. ramosii*  
 2b. Lip auricles long, stretching backward and embracing column.  
 3a. Lip toothed or fimbriate-toothed at apex.  
 4a. Flowers dark purple or blackish purple; lip with 15–20 fimbriate teeth at apex ..... 3. *C. orbiculare*  
 4b. Flowers dark red, orange, or yellow; lip with several teeth at apex.  
 5a. Leaves 2–4; dorsal sepal distinctly longer than lateral sepals ..... 4. *C. ovalisepalum*  
 5b. Leaves 5–8; dorsal sepal and lateral sepals nearly equal in length ..... 5. *C. bancanoides*  
 3b. Lip 2-lobed, entire, or emarginate, never toothed or fimbriate-toothed, at apex.  
 6a. Lip entire or emarginate at apex.  
 7a. Lip not emarginate at apex; auricles 2–3 mm ..... 6. *C. biauratum*  
 7b. Lip emarginate at apex; auricles 0.4–0.6 mm ..... 7. *C. concavum*  
 6b. Lip conspicuously 2-lobed at apex.  
 8a. Leaves 2, subopposite, appressed to substrate ..... 8. *C. mackinnonii*  
 8b. Leaves often 3–7, if 2, not as above.  
 9a. Leaves with colorful markings adaxially, especially stained with white near margins ..... 9. *C. calophyllum*  
 9b. Leaves plain, without colorful markings.  
 10a. Pseudobulbs subglobose; center of lip glabrous or glandular-pilose.  
 11a. Center of lip glabrous ..... 10. *C. bahanense*  
 11b. Center of lip shortly glandular-pilose ..... 11. *C. sichuanicum*  
 10b. Pseudobulbs cylindric, cauliform; center of lip not as above.  
 12a. Dorsal sepal distinctly broader than lateral sepals; basal auricles of lip resembling bat wings ..... 12. *C. insulare*  
 12b. Dorsal sepal narrower than lateral sepals; basal auricles of lip not as above.  
 13a. Lip 10–11 mm; petals 8–9 mm ..... 13. *C. acuminatum*  
 13b. Lip 5–8 mm; petals 2.5–4.5 mm.  
 14a. Lip with an indentation on either side below or near middle formed by involute margins ..... 14. *C. khasianum*  
 14b. Lip lacking involute margins on both sides below or near middle; indentations, if present, formed by a contraction of margins.  
 15a. Pedicel and ovary 6–12 mm, ca. 2 × as long as floral bracts; flowers usually red, ca. 10 mm in diam. .... 15. *C. purpureum*  
 15b. Pedicel and ovary 5–6 mm, slightly longer than floral bracts; flowers yellow-green, yellowish, or green, rarely purplish green, 6–7 mm in diam.  
 16a. Ovary 6-ridged; adaxial surface of leaves purplish ..... 16. *C. matsudae*  
 16b. Ovary not ridged; adaxial surface of leaves greenish .... 17. *C. hainanense*

**1. *Crepidium finetii* (Gagnepain) S. C. Chen & J. J. Wood, comb. nov.**

二脊沼兰 er ji zhao lan

Basionym: *Microstylis finetii* Gagnepain, Bull. Soc. Bot. France 79: 127. 1932; *Glossochilopsis finetii* (Gagnepain) Szlachetko; *Malaxis finetii* (Gagnepain) Tang & F. T. Wang.

Plants terrestrial. Stem 2.5–4 cm, cylindric, fleshy, with several nodes, ± enclosed in sheaths. Leaves usually 4, grouped together; petiole sheathlike, toward base ± amplexicaul; blade ovate, ovate-oblong, or ovate-lanceolate, 6–11 × 2–4.2 cm, apex acuminate or subacute. Inflorescence erect; peduncle 15–23 cm, wingless, grooved when dried; rachis 5–14 cm, 20- or more flowered; floral bracts reflexed, 2–4(–6) mm, narrowly lanceolate. Flowers greenish yellow, 3–4 mm in diam.; pedicel and

ovary 2–3 mm. Dorsal sepal oblong or narrowly ovate-oblong, 2.8–3.2 × 0.8–1 mm, apex obtuse; lateral sepals narrowly ovate-oblong, 2–3.5 × 1–1.2 mm, apex obtuse. Petals narrowly linear or filiform, 2–3.5 × ca. 0.3 mm; lip superior, subovate-triangular, 1.8–2 × ca. 1 mm, unlobed, apex obtuse; disk with 5 thick longitudinal ridges, with a somewhat Y-shaped projection above. Column erect, ca. 1.5 mm. Capsule ellipsoid, ca. 8 × 3.5–4 mm; fruiting pedicel ca. 2 mm. Fl. and fr. Jul–Sep.

Forests. S and W Hainan [Vietnam].

**2. *Crepidium ramosii*** (Ames) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 131. 1995.

心唇沼兰 xin chun zhao lan

*Malaxis ramosii* Ames, *Philipp. J. Sci.*, C, 6: 45. 1911; *Pseudoliparis ramosii* (Ames) Margońska & Szlachetko.

Plants terrestrial. Pseudobulbs inconspicuous. Leaves usually 2, subopposite, pale green, obliquely elliptic-ovate, 5–8 × 3.5–4.5 cm, base with a sheathlike petiole, margin slightly crisped. Inflorescence erect; peduncle green, 10–12 cm, slender; rachis 10- or more flowered; floral bracts reflexed, very small. Flowers orange; pedicel and ovary ca. 3.8 mm. Dorsal sepal ovate, ca. 5 × 4 mm; lateral sepals obliquely obovate, ca. 4 × 2.8 mm. Petals oblanceolate or obovate, slightly smaller than lateral sepals; lip superior, cordate, ca. 3 × 3 mm, base subcordate and with 2 small auricles on either side, unlobed, apex obtuse; disk with a pair of short dark ridges. Column ca. 1.7 mm, basal half connate to lip, apical part with short broad wings. Fl. Aug–Nov.

Forests; 300–400 m. S Taiwan [Philippines].

**3. *Crepidium orbiculare*** (W. W. Smith & Jeffrey) Seidenfaden, *Contr. Orchid Fl. Thailand* 13: 18. 1997 [*“orbicularum”*].

齿唇沼兰 chi chun zhao lan

*Microstylis orbicularis* W. W. Smith & Jeffrey, *Notes Roy. Bot. Gard. Edinburgh* 9: 111. 1916; *Malaxis orbicularis* (W. W. Smith & Jeffrey) Tang & F. T. Wang; *Microstylis tenebrosa* Rolfe ex Downie.

Plants terrestrial. Pseudobulbs ovoid, ca. 1 cm × 7–8 mm, ± enclosed in white membranous sheaths. Leaves often 3, ovate-lanceolate, oblong-lanceolate, or ovate, 4.5–13 × 1.8–4.8 cm, base contracted into a sheathlike, amplexicaul petiole 2.5–6 cm, apex acuminate or long acuminate. Inflorescence erect; peduncle 14–40 cm, wingless; rachis 5–9 cm, usually more than 10-flowered; floral bracts reflexed, linear-lanceolate, 5–7(–10) mm. Flowers dark purple or blackish purple, 6–7 mm in diam.; pedicel and ovary 5–6 mm. Dorsal sepal oblong or broadly linear, 5–6 × 1.2–1.5 mm, margin often revolute, apex obtuse; lateral sepals nearly broadly oblong, ca. 3.5 × 2 mm, base slightly oblique, apex obtuse. Petals narrowly linear, ca. 5 × 0.6 mm; lip superior, suborbicular or broadly obovate-elliptic in outline, 7–8 × ca. 5 mm, apical margin with 15–20 fimbriate teeth 0.5–1 mm, with a central depression; auricles ovate-triangular to narrowly ovate, 3.5–4 mm, surrounding column. Column ca. 1 mm, stout. Fl. Jun.  $2n = 40^*$ .

• Forests; 800–2100 m. S and SW Yunnan.

**4. *Crepidium ovalisepalum*** (J. J. Smith) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 130. 1995.

卵萼沼兰 luan e zhao lan

*Microstylis ovalisepala* J. J. Smith, *Bull. Jard. Bot. Buitenzorg*, sér. 3, 10: 42. 1928; *Malaxis ovalisepala* (J. J. Smith) Seidenfaden; *M. szemaoensis* Tang & F. T. Wang.

Plants terrestrial. Stem cylindrical, 1–2 cm, fleshy. Leaves 2–4; petiole ca. 2 cm, sheathlike; blade obliquely ovate or elliptic, 2–6.5 × 1.2–3.5 cm, base cuneate, apex acute. Inflorescence erect; peduncle 8–12 cm, ± longitudinally ridged; rachis 2.5–6 cm, laxly 7- or 8-flowered; floral bracts reflexed, lanceolate, 3–4 mm. Flowers pale green to yellow, 4–5 mm in diam.; pedicel and ovary 3–4 mm. Dorsal sepal narrowly oblong to oblong, 3–3.5 × ca. 1 mm, margin often revolute, apex obtuse; lateral sepals ovate-elliptic, 2.5–3 × ca. 1.5 mm, slightly oblique, margin revolute, apex obtuse. Petals narrowly linear, 3–3.5 × ca. 0.4 mm, apex obtuse; lip superior, nearly broadly obovate or broadly oblong in outline, ca. 5 × 3.5 mm, with a central depression, apex 3-lobed or unlobed; if lip 3-lobed, mid-lobe with 1 or 2 teeth on either side, apex 2-lobed, lobules ovate-lanceolate to lunate; if lip unlobed, margin with several irregular teeth; auricles ovate-triangular to triangular-lanceolate, ca. 2.5 mm, surrounding column. Column ca. 1 mm, stout. Fl. Jun.

Shaded slopes; 600–1500 m. S Yunnan [W Indonesia (Sumatra), Thailand].

**5. *Crepidium bancanoides*** (Ames) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 124. 1995.

兰屿沼兰 lan yu zhao lan

*Malaxis bancanoides* Ames, *Orchidaceae* 2: 129. 1908; *M. miyakei* (Schlechter) Tang & F. T. Wang; *M. roohutuensis* (Fukuyama) K. Nakajima; *Microstylis iriomotensis* Masamune; *M. miyakei* Schlechter; *M. roohutuensis* Fukuyama.

Plants terrestrial. Stem erect, prostrate at base, green, cylindrical, 5–15 cm, 4–6 mm in diam., fleshy, with many nodes. Leaves 5–8, loosely arranged; petiole 3–4 cm; blade elliptic or ovate-elliptic, 4.5–7.5 × 2–3.5 cm, margin crisped, apex acute. Peduncle 14–15 cm; rachis densely many flowered; floral bracts reflexed, linear-lanceolate, ca. 5 mm. Flowers orange-yellow, 2.5–3 mm in diam.; pedicel and ovary ca. 5 mm. Sepals oblong-lanceolate or narrowly elliptic, 2.5–3 × 1–1.5 mm, apex obtuse; lateral sepals somewhat oblique. Petals narrowly linear, ca. 2.5 × 0.8 mm, apex obtuse; lip superior, suborbicular or slightly square in outline, 3–4 × 2.5–3.5 mm, 3-lobed; lateral lobes triangular; mid-lobe ovate-triangular, apex emarginate, with 1 or 2 teeth on each side; auricles ovate-triangular, ca. 2 mm, surrounding column. Column ca. 1 mm, stout, with 2 broad apical wings. Fl. Sep–Nov.  $2n = 44$ .

Dense forests, along streamsides; 300–400 m. E and S Taiwan [Japan (Ryukyu Islands), Philippines].

Chinese records of *Crepidium copelandii* (Ames) Szlachetko (e.g., in FRPS 18: 113. 1999, as *Malaxis copelandii* Ames) are referable to *C. bancanoides*. True *C. copelandii* is endemic to the Philippines.

**6. *Crepidium bauritum*** (Lindley) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 124. 1995.

二耳沼兰 er er zhao lan

*Microstylis baurita* Lindley, *Gen. Sp. Orchid. Pl.* 20. 1830; *Malaxis baurita* (Lindley) Kuntze; *M. brevicaulis* (Schlechter) S. Y. Hu; *M. sutepensis* (Rolfe ex Downie) Seidenfaden & Smitinand; *Microstylis brevicaulis* Schlechter; *M. sutepensis* Rolfe ex Downie.

Plants terrestrial. Stem cylindrical, 2–2.5 cm, fleshy, with several nodes, ± enclosed in membranous sheaths. Leaves usually 3, ovate, oblong-ovate, or subelliptic, 5–10 × 1.8–5 mm, base contracted into a sheathlike, amplexicaul petiole 1.5–3.5 cm, apex acuminate. Inflorescence erect; peduncle 15–21 cm, wingless; rachis 7–9 cm, 20–30-flowered; floral bracts reflexed, narrowly lanceolate, 4.5–6 mm. Flowers purplish red to green, ca. 7 mm in diam.; pedicel and ovary 4–5 mm. Dorsal sepal suboblong or oblong-lanceolate, 6–6.5 × 1.5–2 mm, margin revolute, apex obtuse; lateral sepals narrowly oblong-ovate, ca. 5 × 1.5–2 mm, base oblique, apex obtuse. Petals narrowly linear, ca. 5.5 × 0.3 mm; lip superior, rhombic-elliptic in outline, 4–5.5 × ca. 3 mm, base with a pair of auricles decurrent backward embracing column apex, unlobed, central part with 2 short lamellae, and between lamellae a longitudinal groove; auricles ovate or narrowly ovate, 2–3 mm. Fl. Jun.

Forests; 1300–2500 m. S and W Yunnan [NE India, Laos, Myanmar, Thailand].

**7. *Crepidium concavum*** (Seidenfaden) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 125. 1995.

凹唇沼兰 ao chun zhao lan

*Malaxis concava* Seidenfaden, *Bot. Tidsskr.* 65: 325. 1970.

Plants terrestrial. Pseudobulbs small, enclosed in sheaths. Leaves 2, elliptic-oblong or narrowly elliptic, 7–11 × 1.5–2 cm, base contracted into a sheathlike petiole 1–1.5 cm, apex acuminate. Inflorescence erect; rachis ca. 2 cm, ca. 10-flowered; floral bracts narrowly lanceolate, very small. Flowers 3–4 mm in diam.; pedicel and ovary 3–4 mm. Dorsal sepal oblong, 2–3 × ca. 0.8 mm; lateral sepals rather broad and short, obtuse. Petals narrowly linear, 2–3 × ca. 0.3 mm; lip superior, oblong-ovate or nearly broadly oblong in outline, 2–3 × 1.5–2.5 mm, adaxially with 2 thick short lamellae, base with 2 short auricles decurrent backward ± embracing column, apex emarginate; auricles 0.4–0.6 mm. Column 2–2.5 mm, stout, upper part winged. Fl. Jun.

Humid places in forests; ca. 1200 m. S Yunnan [Thailand].

**8. *Crepidium mackinnonii*** (Duthie) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 128. 1995.

铺叶沼兰 pu ye zhao lan

*Microstylis mackinnonii* Duthie, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 71(2): 37. 1902; *Malaxis mackinnonii* (Duthie) Ames; *Seidenforchis mackinnonii* (Duthie) Margońska.

Leaves 2, appressed to substrate, subopposite, ovate or ovate-elliptic, 4–5 × 3–4 cm, base subcordate and amplexicaul. Inflorescence erect, slender; rachis several flowered; floral

bracts very small. Flowers 4–5 mm in diam.; pedicel and ovary 2–3 mm. Sepals oblong to ovate, ca. 3 × 1.5 mm. Petals nearly as long as sepals, linear, ca. 0.6 mm wide; lip superior, ovate in outline, 2–3 × 1.5–2 mm, shallowly 2-lobed, base with a pair of auricles decurrent backward embracing column; auricles ovate, 1.5–2 mm. Column short, stout.

C Yunnan [Bangladesh, India].

**9. *Crepidium calophyllum*** (H. G. Reichenbach) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 125. 1995.

美叶沼兰 mei ye zhao lan

*Microstylis calophylla* H. G. Reichenbach, *Gard. Chron., n.s.*, 12: 718. 1879; *Malaxis calophylla* (H. G. Reichenbach) Kuntze; *M. calophylla* var. *brachycheila* (J. D. Hooker) Tang & F. T. Wang; *Microstylis scottii* J. D. Hooker; *M. wallichii* Lindley var. *brachycheila* J. D. Hooker.

Plants terrestrial. Stem cylindrical, 2–3(–5) cm, 2–3 mm in diam., fleshy, with several nodes, ± enclosed in sheaths. Leaves 2–4, adaxially pale brown and stained with white on both sides, obliquely ovate, ovate-elliptic, or narrowly ovate, 3.5–8(–12) × 1.5–4(–5) cm, base contracted into an amplexicaul petiole 1.5–3 cm, margin ± crisped, apex acuminate. Peduncle 7–30 cm, nearly wingless; rachis 2.5–12 cm, 10–20- or more flowered; floral bracts narrowly lanceolate or nearly subulate, 1.5–2.5 mm. Flowers pale yellowish green, lip with purplish red base; pedicel and ovary 2.5–4 mm. Dorsal sepal suboblong, 4–4.5 × 1.5–1.8 mm, margin revolute, apex obtuse; lateral sepals broadly oblong-elliptic, 4–4.5 × 2–2.5 mm, margin revolute. Petals narrowly linear, ca. 4 × 0.3 mm, apex obtuse; lip superior, broadly ovate-elliptic or broadly oblong in outline, 5–5.5 × 3.5–4 mm, base with a central depression surrounded by a fleshy ridge; abruptly contracted toward apex into a short apiculus and shallowly 2-lobed, auricles ovate, 1.7–2.2 mm, decurrent backward embracing column. Column ca. 1 mm, stout, apex with 2 triangular-lanceolate wings. Capsule obovoid-ellipsoid or narrowly obovoid-oblong, 9–13 × 4–5 mm; fruiting pedicel 4–5 mm. Fl. Jul, fr. Sep.

Humus-rich soils in dense forests; 800–1200 m. Hainan, S Yunnan [Cambodia, India (Sikkim), Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

**10. *Crepidium bahanense*** (Handel-Mazzetti) S. C. Chen & J. J. Wood, **comb. nov.**

云南沼兰 yun nan zhao lan

Basionym: *Microstylis bahanensis* Handel-Mazzetti, *Symb. Sin.* 7: 1350. 1936; *Malaxis bahanensis* (Handel-Mazzetti) Tang & F. T. Wang.

Plants terrestrial. Pseudobulbs subglobose, 5–10 mm in diam. Leaves 2; petiole 13–30 cm; blade ovate or ovate-oblong, apex obtuse. Inflorescence erect; peduncle 6–9 cm; rachis 5–10-flowered; floral bracts reflexed, narrowly lanceolate, ca. 3 mm, shorter than pedicel and ovary, apex acuminate. Flowers yellow or brownish red, 3–4 mm in diam. Sepals ovate, ca. 2 mm, margin revolute, apex subacute. Petals linear-ligulate, ca. 2 mm, apex obtuse; lip superior, nearly sagittate-ovate in outline, ca. 4 × 3 mm, attenuate toward apex, apex 2-lobed, with a central

glabrous suborbicular callus; auricles ovate, ca. 1 mm, decurrent backward embracing column. Column ca. 1 mm, stout. Fl. Jul.

- On rocks; ca. 2600 m. NW Yunnan.

**11. *Crepidium sichuanicum*** (Tang & F. T. Wang) S. C. Chen & J. J. Wood, **comb. nov.**

四川沼兰 *si chuan zhao lan*

Basionym: *Malaxis sichuanica* Tang & F. T. Wang, Acta Phytotax. Sin. 26: 239. 1988.

Plants terrestrial. Stem erect, ca. 11 cm tall. Pseudobulbs ?subglobose. Leaves 3, erect to spreading, approximate, sub-oblong to oblong-lanceolate, 5–6 × ca. 1.3 cm, obscurely sheathing-petiolate, apex obtuse to acuminate. Inflorescence ca. 12-flowered, 6–7 mm wide; peduncle ca. 12 cm, narrowly winged; rachis ca. 2 cm; floral bracts spreading, narrowly lanceolate, ca. 3 mm. Flowers yellowish, ca. 5 mm in diam.; pedicel and ovary ca. 4 mm. Dorsal sepal oblong, ca. 4 × 1.2 mm, 3-veined, apex obtuse; lateral sepals broadly elliptic-oblong, ca. 3 × 2.2 mm, 3-veined, apex obtuse to rounded. Petals oblong, almost as long as dorsal sepal, ca. 1 mm wide; lip ovate-sagittate in outline, ca. 5.5 cm (including basal auricles), ca. 3.5 mm wide above middle, somewhat concave and glandular-pilose at center, apex narrowed, 2-lobed, lobes ca. 1 mm; basal auricles obliquely ovate, acute, 1.2–1.5 mm. Column fleshy, ca. 1 mm, glabrous; anther cap oblate, ca. 1 mm wide. Fl. Jul.

- Terrestrial on roadsides; 1000–1200 m. C Sichuan (Guanxian).

**12. *Crepidium insulare*** (Tang & F. T. Wang) S. C. Chen & J. J. Wood, **comb. nov.**

琼岛沼兰 *qiong dao zhao lan*

Basionym: *Malaxis insularis* Tang & F. T. Wang, Acta Phytotax. Sin. 12: 36. 1974.

Plants terrestrial, sometimes epiphytic. Stem erect, ± prostrate at base, cylindrical, 3–5 cm, 3–5 mm in diam., fleshy, with several nodes, enclosed in leaf sheaths in early stage. Leaves (2–)4 or 5; petiole 2–4 cm, sheathlike, amplexicaul; blade obliquely ovate or oblong-ovate, 3–8 × 2–3 cm, margin slightly crisped, apex acuminate or subacute. Inflorescence erect; peduncle 10–18 cm, wingless; rachis 2–4 cm, laxly 5–10-flowered; floral bracts reflexed, ovate-lanceolate, 3–4 mm, apex long acuminate. Flowers 4–5 mm in diam.; pedicel and ovary 6–7 mm. Dorsal sepal orbicular or broadly elliptic, concave, ca. 3 × 2.8 mm, 3-veined, apex obtuse; lateral sepals suboblong, ca. 1.5 mm wide, 3-veined, apex obtuse. Lip superior, ± broadly ovate-triangular or ovate-suborbicular in outline, ca. 3.5 mm, base with a pair of auricles spreading backward like bat wings embracing column, apex abruptly contracted and shallowly 2-lobed. Column short, stout, apex with 2 erect armlike appendages. Fl. Jun.

- Dense forests, cliffs. W Hainan.

**13. *Crepidium acuminatum*** (D. Don) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 123. 1995.

浅裂沼兰 *qian lie zhao lan*

*Malaxis acuminata* D. Don, Prodr. Fl. Nepal. 29. 1825; *Crepidium bilobum* (Lindley) Szlachetko; *M. acuminata* f. *biloba* (Lindley) Tuyama; *M. acuminata* var. *biloba* (Lindley) Ames; *M. allanii* S. Y. Hu & Barretto; *M. biloba* (Lindley) Ames; *M. pierrei* (Finet) Tang & F. T. Wang; *M. siamensis* (Rolfe ex Downie) Seidenfaden & Smitinand; *M. wallichii* (Lindley) Deb; *Microstylis biloba* Lindley; *M. pierrei* Finet; *M. siamensis* Rolfe ex Downie; *M. trigonocardia* Schlechter; *M. wallichii* Lindley.

Plants terrestrial, sometimes epiphytic. Stem cylindrical, (1.5–)4–7 cm, 4–6 mm in diam., fleshy, with several nodes, mostly enclosed in sheath. Leaves 3–5, obliquely ovate, ovate-oblong, or subelliptic, (4–)6–12 × 2.5–6 cm, base contracted into a sheathlike, amplexicaul petiole 2–4 cm, apex acuminate. Inflorescence erect; peduncle 12–43 cm, wingless; rachis 3–9(–16) cm, 10- or more flowered; floral bracts lanceolate, 3–4(–6) mm. Flowers purplish red, ca. 1.5 cm in diam.; pedicel and ovary 7–10 mm. Dorsal sepal narrowly oblong or broadly linear, 8–9 × ca. 2 mm, 3-veined, margin revolute, apex obtuse; lateral sepals oblong, 6–7 × 3–3.5 mm, margin revolute, apex obtuse. Petals narrowly linear, 8–9 × ca. 0.8 mm, margin revolute; lip superior, ovate-oblong or obovate-oblong in outline, 10–11 × 6–7 mm, shallowly 2-lobed, with a sinus 1(–2) mm deep, with a pair of auricles decurrent backward embracing column, adaxially with a central groove in apical half; auricles ± narrowly ovate, 1/5–2/5 length of lip. Column 1–1.5 mm, stout. Capsule obovoid-oblong, ca. 1.8 × 1 cm; fruiting pedicel ca. 7 mm. Fl. and fr. May–Jul.  $2n = 30, 36, 42$ .

Forests, shaded rocks along valleys; 300–2100 m. Guangdong, SW Guizhou, ?Taiwan, SE Xizang, S Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Myanmar, Nepal, Philippines, Thailand, Vietnam; Australia].

**14. *Crepidium khasianum*** (J. D. Hooker) Szlachetko, *Fragm. Florist. Geobot.*, Suppl. 3: 127. 1995.

细茎沼兰 *xi jing zhao lan*

*Microstylis khasiana* J. D. Hooker, Fl. Brit. India 5: 686. 1890; *Malaxis khasiana* (J. D. Hooker) Kuntze.

Plants terrestrial. Stem cylindrical, 7–8 cm, 2–3.5 mm in diam., fleshy, with several nodes, often ± naked. Leaves often 4 or 5, obliquely ovate or narrowly ovate-lanceolate, 3.5–7 × 1.5–2 cm, base contracted into an amplexicaul petiole 1.5–2 cm, apex acuminate. Peduncle 8–11 cm, nearly wingless; rachis 4–5 cm, 20- or more flowered; floral bracts narrowly lanceolate, 2.5–3 mm. Flowers yellowish green, relatively small; pedicel and ovary 3.5–4.5 mm. Sepals oblong-elliptic or ovate-elliptic, 2.4–2.8 × 1–1.2 mm, apex obtuse; lateral sepals somewhat oblique. Petals narrowly linear, 2–2.5 × ca. 0.3 mm, apex obtuse; lip superior, nearly broadly oblong in outline, 3.5–4 mm, with an indentation on either side below or near middle, formed by involute margin, base with a central depression, surrounded by a fleshy ridge, apex shallowly 2-lobed, sinus ca. 0.5 mm deep; auricles subovate or oblong-ovate, 1–1.2 mm, decurrent backward embracing column. Column erect, ca. 1 mm. Fl. Jul.  $2n = 42$ .

Rock crevices in forests; 1000–1100 m. S and W Yunnan [NE India, Thailand].

**15. *Crepidium purpureum*** (Lindley) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 131. 1995.

深裂沼兰 shen lie zhao lan

*Microstylis purpurea* Lindley, *Gen. Sp. Orchid. Pl.* 20. 1830; *Malaxis liparioides* (Schlechter) Tang & F. T. Wang; *M. purpurea* (Lindley) Kuntze; *Microstylis liparioides* Schlechter; *M. wallichii* Lindley var. *biloba* King & Pantling.

Plants terrestrial. Stem cylindric, 2–4(–15) cm, 5–7 mm in diam., fleshy, with several nodes, ± enclosed in sheaths. Leaves often 3 or 4, obliquely ovate or oblong, 8–16.5 × 3–5.8 cm, base contracted into a sheathlike, amplexicaul petiole 3–4 cm, apex acuminate or caudate-acuminate. Inflorescence erect; peduncle 15–25 cm, nearly wingless; rachis 7–15 cm, 10–30- or more flowered; floral bracts lanceolate, 3–5 mm. Flowers red or occasionally pale yellow, 8–10 mm in diam.; pedicel and ovary 6–12 mm. Dorsal sepal suboblong, 4.5–6 × ca. 1.5 mm, apex obtuse; lateral sepals broadly oblong or broadly ovate-oblong, 3–4.5 × 2–2.5 mm, apex obtuse or acute. Petals narrowly linear, 4–5.5 × 0.6–0.9 mm; lip superior, subovoid-rectangular in outline, 6–8 mm, abruptly contracted near middle and ± shoulderlike, base with a central depression, apex deeply 2-lobed, sinus 1.5–2.5 mm deep; auricles ovate or ovate-lanceolate, 2.5–3 mm, decurrent backward embracing column. Column ca. 1 mm, stout. Fl. Jun–Jul.

Forests, humid places in thickets; 400–1800 m. S Guangxi, W Sichuan, Taiwan, S and SW Yunnan [NE India, Philippines, Sri Lanka, Thailand, Vietnam].

**16. *Crepidium matsudae*** (Yamamoto) Szlachetko, *Fragm. Florist. Geobot., Suppl. 3*: 129. 1995.

鞍唇沼兰 an chun zhao lan

*Microstylis matsudae* Yamamoto, *Icon. Pl. Formosan., Suppl. 2*: 4. 1926; *Malaxis matsudae* (Yamamoto) Hatusima ex K. Nakajima.

Plants terrestrial. Stem purplish green, cylindric, 7–12 cm, fleshy, with several nodes, ± enclosed in sheaths. Leaves 4 or 5;

petiole ca. 2 cm; blade abaxially purplish, obliquely ovate-elliptic or ovate-oblong, 4–10 × 2–3.5 cm. Peduncle 9–12 cm, slender; rachis 5–8 mm, 10- or more flowered; floral bracts reflexed, green, ovate-lanceolate, ca. 3 mm. Flowers green or tinged with purple; pedicel and ovary ca. 5 mm, with 6 raised ridges. Dorsal sepal ovate-elliptic, 2.5–3 × 1.5–1.8 mm, margin revolute, apex subacute; lateral sepals broadly ovate or elliptic, slightly wider than dorsal sepal. Petals linear, ca. 2.5 × 0.5 mm; lip superior, subovate in outline, ca. 4.5 mm, narrowed near middle and shoulderlike, shallowly 2-lobed, sinus ca. 0.5 mm; auricles falcate, ca. 0.5 mm. Column short, ca. 1 mm. Fl. Jun–Jul.

Forests, bamboo forests; 1000–1500 m. S Taiwan [Japan (Ryukyu Islands)].

**17. *Crepidium hainanense*** (Tang & F. T. Wang) S. C. Chen & J. J. Wood, *comb. nov.*

海南沼兰 hai nan zhao lan

Basionym: *Malaxis hainanensis* Tang & F. T. Wang, *Acta Phytotax. Sin.* 12: 37. 1974.

Plants epiphytic or lithophytic. Stem cylindric, ca. 2 cm, 4–5 mm in diam., fleshy, attenuate toward apex, ± enclosed in sheaths. Leaves 4 or 5, ascending; petiole 2.5–3.5 cm, sheathlike, amplexicaul; blade oblong, 6–8 × 1.5–2.5 cm, apex subacuminate. Inflorescence erect, ca. 11 cm, with very narrow wings; rachis ca. 4.5 cm, laxly 6- or 7-flowered; floral bracts often reflexed, lanceolate, 4–5 mm. Flowers pale yellow; pedicel and ovary 5–6 mm. Dorsal sepal oblong, ca. 3.5 × 1.2 mm, apex obtuse; lateral sepals nearly broadly oblong or broadly ovate-oblong, ca. 3 × 1.5–1.8 mm, apex obtuse. Petals narrowly linear, ca. 3.5 × 0.5 mm; lip superior, subovate in outline, 5–6 × ca. 3.5 mm, apex deeply 2-lobed, with sinus 1–1.5 mm deep; auricles subovate, ca. 2.5 × 1.5 mm, decurrent backward embracing column. Column ca. 1 mm, stout. Fl. Jul–Aug.

● On damp rocks; ca. 600 m. S Hainan.

## 79. DIENIA Lindley, *Bot. Reg.* 10: ad t. 825. 1824.

无耳沼兰属 wu er zhao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Anaphora* Gagnepain; *Gastroglottis* Blume; *Pedilea* Lindley.

Herbs, terrestrial or rarely epiphytic. Roots hairy. Stem cylindric, fleshy, often creeping and rooting in basal part, thickened into ovoid or conic pseudobulbs which are sometimes enclosed by scarios sheaths. Leaves 2 to several, thinly textured, plicate, petiole sheathing at base. Inflorescence apical, erect, racemose, unbranched; floral bracts persistent, lanceolate or setose. Flowers not resupinate or resupinate, green, brown, yellow, pink, or purple. Dorsal sepal spreading, free; lateral sepals free or fused, spreading. Petals often narrower than sepals, free, spreading; lip parallel to column, sometimes concave at base, entire or lobed, lacking auricles at base, apical margin entire or toothed, lacking a spur, callus absent, cushionlike or obscurely transversely ridged. Column lacking a foot; anther cap dorsal, attached by a broad filament, locules opening ventrally; pollinia 4, in pairs, clavate, waxy; stigma semi-circular or transversely elliptic; rostellum obtuse at apex.

About 19 species: throughout the Asian tropics and subtropics and in Australia; two species in China.

- 1a. Plants with 1 leaf; lip apex simple, acute ..... 1. *D. cylindrostachya*  
 1b. Plants with 4 or 5 leaves; lip apex 3-lobed ..... 2. *D. ophrydis*

**1. *Dienia cylindrostachya*** Lindley, Gen. Sp. Orchid. Pl. 22. 1830.

筒穗无耳沼兰 tong sui wu er zhao lan

*Malaxis cylindrostachya* (Lindley) Kuntze; *Microstylis cylindrostachya* (Lindley) H. G. Reichenbach.

Plants terrestrial, 20–35 cm tall. Pseudobulbs conic, ca. 1 × 1 cm. Stem arising from base of pseudobulb, sheathed, 3–10 cm; sheaths 2 or 3, clasping, 2–3 cm. Leaf 1, long petiolate; petiole tubular, sheathing stem, 2–5 cm; blade elliptic or orbicular to subspatulate, 4–9 × 3–4.5 cm, finely reticulately veined, apex obtuse. Inflorescence racemose, cylindric, densely many flowered; peduncle ridged, 5–10 cm; rachis ridged, (2.5–)5–14 cm; floral bracts lanceolate, 2–2.5 mm, apex acute. Flowers ca. 2 mm, uniformly yellowish green; pedicel and ovary linear, not twisted, 1.5–2 mm. Sepals subsimilar, ovate, 2–3 × 0.4–0.5 mm, apex acuminate. Petals linear-lanceolate, 1–1.9 × 0.4–0.5 mm, apex acute; lip fleshy, broadly ovate, 1.5–2 × 1–2 mm, margin thickened, with a raised central ridge, base weakly saccate, margin denticulate, apex apiculate to mucronate. Column stout, ca. 0.25 mm tall.

Terrestrial. Xizang [Bhutan, India, Nepal].

**2. *Dienia ophrydis*** (J. Koenig) Ormerod & Seidenfaden, Contr. Orchid Fl. Thailand 13: 18. 1997.

无耳沼兰 wu er zhao lan

*Epidendrum ophrydis* J. Koenig in Retzius, Observ. Bot. 6: 46. 1791; *Anaphora liparioides* Gagnepain; *Crepidium ophrydis* (J. Koenig) M. A. Clements & D. L. Jones; *Dienia congesta* Lindley; *D. latifolia* (Smith) M. A. Clements & D. L. Jones; *D. montana* (Blume) M. A. Clements & D. L. Jones; *Gastroglottis*

*latifolia* (Smith) Szlachetko; *G. montana* Blume; *Glossochilopsis carnosula* (Rolfe ex Downie) Szlachetko & Margońska; *Liparis krempfii* Gagnepain; *L. turfosa* Gagnepain; *Malaxis carnosula* (Rolfe ex Downie) Seidenfaden & Smitinand; *M. congesta* (Lindley) Deb; *M. kizanensis* (Masamune) S. Y. Hu; *M. latifolia* Smith; *M. latifolia* var. *nana* S. S. Ying; *M. ophrydis* (J. Koenig) Ormerod; *M. parvissima* S. Y. Hu & Barretto; *M. shuicae* S. S. Ying; *Microstylis carnosula* Rolfe ex Downie; *M. congesta* (Lindley) H. G. Reichenbach; *M. kizanensis* Masamune; *M. latifolia* (Smith) J. J. Smith.

Plants terrestrial, sometimes epiphytic. Pseudobulbs cylindric, 1–2 cm, fleshy, with several nodes, ± enclosed in membranous sheaths. Leaves 4 or 5, obliquely ovate-elliptic, ovate, or narrowly elliptic-lanceolate, 7–16(–25) × (2.5–)4–9 cm, base contracted into a sheathlike, amplexicaul petiole 3–5 cm, apex acuminate. Inflorescence erect; peduncle erect, 15–60 cm, very narrowly winged; rachis 5–15(–25) cm, many flowered; floral bracts ± reflexed, narrowly lanceolate, 2.5–5(–12) mm. Flowers purplish red to greenish yellow, relatively small; pedicel and ovary 2–3 mm. Dorsal sepal narrowly oblong, 3–3.5 × 1.1–1.2 mm, apex obtuse; lateral sepals obliquely ovate, 2–2.5 × 1.2–1.4 mm. Petals linear, 2.5–3.2 × ca. 0.7 mm, apex obtuse; lip ± broadly ovate, ca. 2 × 2.5 mm, concave, subcordate to truncate at base, apex 3-lobed; mid-lobe narrowly ovate, 0.7–1.1 mm, much longer than lateral lobes, apex obtuse. Column ca. 1.2 mm, stout. Capsule erect, obovoid-ellipsoid, 6–7 × 3–4 mm; fruiting pedicel 2–3 mm. Fl. May–Aug, fr. Aug–Dec.  $2n = 26, 42$ .

Forests, thickets or shaded rocks by streamsides; below 2000 m. S Fujian, Guangdong, Guangxi, Hainan, Taiwan, S and SW Yunnan [Bhutan, Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

## 80. OBERONIOIDES Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 134. 1995.

小沼兰属 xiao zhao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, terrestrial or lithophytic, with clustered growths. Pseudobulbs ovoid, fleshy. Leaf solitary, convolute, not plicate, fleshy, petiolate, non-articulate at base. Inflorescence erect, racemose; peduncle terete, much longer than rachis, glabrous. Flowers resupinate. Sepals concave, free, subsimilar. Petals linear, 1-veined; lip sessile, not auriculate, 3-lobed; lateral lobes linear or triangular, enfolding column; mid-lobe larger, bilobed, porrect; callus basal, fleshy, bifid. Column lacking a foot; anther cap dorsal, erect; pollinia ?4, bifid, lacking viscidia; staminodes absent; rostellum erect, truncate; ovary glabrous; stigma transversely obovoid.

Two species: China, Thailand; one species (endemic) in China.

**1. *Oberonioides microtatantha*** (Schlechter) Szlachetko, Fragm. Florist. Geobot., Suppl. 3: 135. 1995.

小沼兰 xiao zhao lan

*Microstylis microtatantha* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 192. 1919; *Malaxis microtatantha* (Schlechter) Tang & F. T. Wang; *M. tairukouensis* S. S. Ying; *Microstylis minutiflora* Rolfe (1908), not Schlechter (1899); *M. pusilla* Rolfe.

Plants terrestrial, small. Pseudobulbs ovoid or subglobose, 3–8 × 2–7 mm, ± enclosed by white, thin and membranous sheaths. Leaf solitary, nearly appressed to substrate; petiole 5–10 mm, amplexicaul; leaf blade ovate to broadly ovate, 1–1.5(–2) × 0.5–1.3 cm, base subtruncate, apex acute. Inflores-

cence erect; peduncle often purple, slightly compressed, slender, both sides with very narrow wings; rachis 1–2 cm, usually 10–20-flowered; floral bracts broadly ovate, ca. 0.5 mm, ± embracing pedicel. Flowers yellow, very small; pedicel and ovary 1–1.3 mm, conspicuously longer than bracts. Dorsal sepal broadly ovate to nearly oblong, 1–1.2 × ca. 0.7 mm, margin revolute, apex obtuse; lateral sepals triangular-ovate, similar to dorsal sepal in size. Petals linear-lanceolate or sublinear, ca. 0.8 × 0.3 mm; lip inferior, sublanceolate-triangular or ligulate, ca. 0.7 × 0.6 mm, 3-lobed, apex subacuminate; lateral lobes linear or narrowly oblong, 0.6–0.7 × 0.2–0.3 mm, usually erect and enfolding column. Column ca. 0.3 mm, stout. Fl. Apr.

• Forests, humid and shaded rocks; 200–1800 m. N Fujian, C Jiangxi, E Taiwan.

**81. OBERONIA** Lindley, Gen. Sp. Orchid. Pl. 15. 1830, nom. cons.鸢尾兰属 *yuan wei lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Paul Ormerod, Jeffrey J. Wood*Iridorkis* Thouars (1809), not *Iridorchis* Blume (1859); *Titania* Endlicher.

Herbs, epiphytic. Stems often enclosed in leaf base, usually clustered, rarely borne on an elongate rhizome, erect or pendulous, short or somewhat elongate. Leaves iridiform and unifacial, rarely terete, often fleshy, articulate or not at base, distichous, usually equitant, often imbricate at base, often dilated near base into flattened sheaths, often with a narrow membranous margin on adaxial side in basal half. Inflorescences terminal, racemose, unbranched, pubescent or glabrous, usually many flowered; peduncle often with sterile bracts below; floral bracts persistent, often erose. Flowers often in whorls, not resupinate, flat, very small, usually only 1–2 mm in diam.; ovary glabrous or papillate. Sepals and petals free, spreading, petals often narrower than sepals, sometimes erose; lip usually spreading, sessile, entire or lobed, margin sometimes erose or fimbriate, occasionally concave at base, with or without calli, spur absent; lateral lobes often embracing column. Column erect, short, lacking a foot, wings usually absent; anther cap terminal, firmly attached to column apex, 2-locular; pollinia 4, cohering in 2 unequally sized pairs, waxy; viscidium absent or abbreviated; stigma transversely reniform to ovate; rostellum protruding.

Between 150 and 200 species: centered in tropical S and SE Asia but extending to tropical Africa, Madagascar, the Mascarene Islands, the Philippines, New Guinea, NE Australia, and the SW Pacific islands across to Tahiti; 33 species (11 endemic) in China.

*Oberonia teres* Kerr (Bull. Misc. Inform. Kew 1927: 214. 1927), formerly considered endemic to Thailand, was recorded from W Yunnan (Lushui: Gaoligong Shan, ca. 2400 m) by X. H. Jin, H. Li, and D. Z. Li (Acta Phytotax. Sin. 45: 805–806. 2007). The present authors could not confirm this because they have not seen the specimen (*X. H. Jin 7029*, PE).

- 1a. Rhizome elongate, to 7 cm or more, leafy stems arising at intervals of 2–25 mm along rhizome.
  - 2a. Leaves not articulate at base; petals linear, slightly falcate; leaves 10–25 × 3–8 mm; stems arising at intervals of 5–25 mm along rhizome ..... 1. *O. pumila*
  - 2b. Leaves articulate to basal sheath; petals, leaves, and stems without above combination of characters.
    - 3a. Leaves 4–7 mm wide; flowers greenish, sometimes tinged purple; lateral lobes of lip obscurely erose-denticulate ..... 2. *O. seidenfadenii*
    - 3b. Leaves 1.5–2 mm wide; flowers pale yellowish brown; margins of lip irregularly serrate ..... 3. *O. sinica*
- 1b. Rhizome abbreviated.
  - 4a. Leaves not articulate at base.
    - 5a. Peduncle connate in lower part to uppermost leaf, appearing to arise from leaf blade ..... 15. *O. obcordata*
    - 5b. Scape not connate in lower part to uppermost leaf.
      - 6a. Mid-lobe of lip bilobed, with sinus more than 1/5 length of lip; lobules acuminate to long acuminate at apex.
        - 7a. Stem very short or inconspicuous; leaves nearly basal; flowers red; lip with a callus near base.
          - 8a. Lateral lobes of lip orbicular; peduncle bracts lanceolate ..... 14. *O. recurva*
          - 8b. Lateral lobes of lip filiform; peduncle bracts filiform ..... 13. *O. rufilabris*
        - 7b. Stem 1.5–7 cm; leaves cauline, distichous; flowers green to orange-yellow, sometimes pale red; lip without callus.
          - 9a. Lateral lobes of lip ± erose or erose-fimbriate on margin ..... 16. *O. arisanensis*
          - 9b. Lateral lobes of lip entire.
            - 10a. Leaves 1–2(–3) mm wide; flowers greenish yellow or pale yellow; petals slightly longer than sepals ..... 11. *O. mannii*
            - 10b. Leaves 3–5 mm wide; flowers pale red; petals and sepals equal in length ..... 12. *O. anthropophora*
      - 6b. Mid-lobe of lip entire or shallowly lobed at apex, with sinus less than 1/6 length of lip; lobules obtuse at apex.
        - 11a. Floral bracts 4–5 mm, more than 3 × as long as pedicel and ovary ..... 8. *O. longibracteata*
        - 11b. Floral bracts 1–2 mm, less than 3 × as long as pedicel and ovary.
          - 12a. Petals conspicuously erose at margin; lateral lobes of lip slightly smaller than mid-lobe ..... 7. *O. rosea*
          - 12b. Petals entire or inconspicuously erose at margin.
            - 13a. Lateral lobes of lip ca. as large as or slightly larger than mid-lobe, margins erose, irregularly lacinate, or fimbriate ..... 6. *O. jenkinsiana*
            - 13b. Lateral lobes of lip conspicuously smaller than mid-lobe, margins entire or inconspicuously erose.
              - 14a. Sepals broader than petals.
                - 15a. Stem conspicuous, 1–2 cm; leaf blade 1–2(–3) cm; pedicel and ovary nearly as long as or slightly longer than floral bracts ..... 4. *O. japonica*
                - 15b. Stem inconspicuous; leaf blade 2.5–7 cm; pedicel and ovary shorter than floral bracts ..... 5. *O. variabilis*

- 14b. Sepals and petals equal in width.
- 16a. Mid-lobe of lip obtuse at apex; lateral lobes subovate or ovate-oblong; petals inconspicuously erose at margin ..... 10. *O. menghaiensis*
- 16b. Mid-lobe of lip emarginate at apex; lateral lobes nearly narrowly ovate-lanceolate; petals entire ..... 9. *O. delicata*
- 4b. Leaves articulate at base.
- 17a. Leaves subterete ..... 33. *O. cavaleriei*
- 17b. Leaves laterally compressed.
- 18a. Leaves 20–50 × 1.2–2.2 cm; lip with a callus at either side of sinus ..... 32. *O. ensiformis*
- 18b. Leaves commonly 1–20 cm; lip ecallose.
- 19a. Peduncle foliaceous below, ± connate to uppermost leaf; lip entire ..... 31. *O. pachyrachis*
- 19b. Peduncle cylindrical or compressed cylindrical, never connate to leaves.
- 20a. Petals conspicuously larger than lip, to 2 mm wide ..... 29. *O. latipetala*
- 20b. Petals smaller than or nearly as large as lip, less than 1 mm wide.
- 21a. Lip entire, nearly oblate ..... 30. *O. integerrima*
- 21b. Lip ± 3-lobed, never oblate.
- 22a. Floral bracts with a long apical awn ..... 19. *O. falconeri*
- 22b. Floral bracts without a long apical awn.
- 23a. Scape with narrow wings on both sides, including wings 4–5 mm wide; leaves 1–2.1 cm wide.
- 24a. Lip nearly entire, retuse, margin irregularly lacinate ..... 22. *O. segawae*
- 24b. Lip 3-lobed, apex entire or lobed.
- 25a. Mid-lobe of lip unlobed at apex ..... 27. *O. menglaensis*
- 25b. Mid-lobe of lip 2-lobed at apex.
- 26a. Petals entire ..... 21. *O. gigantea*
- 26b. Petals with erose-toothed margins.
- 27a. Raceme densely flowered, with several hundred flowers borne less than 1 mm apart from each other ..... 25. *O. mucronata*
- 27b. Raceme laxly flowered, flowers to 100, sometimes more, borne up to 3 mm apart from each other ..... 26. *O. gammiei*
- 23b. Scape wingless or nearly so, 2–3 mm in diam.; leaves 2–10 mm wide (excluding *O. gigantea*).
- 28a. Lateral lobes of lip fimbriate at margin ..... 28. *O. austroyunnanensis*
- 28b. Lateral lobes of lip never fimbriate at margin.
- 29a. Lobules of mid-lobe of lip subquadrate or broadly oblong, equal in width and length, erose at margin.
- 30a. Leaves ca. 13 cm; flowers whorled; lateral lobes of lip very small or inconspicuous ..... 23. *O. kwangsiensis*
- 30b. Leaves 1–3.5 cm; flowers scattered; lateral lobes of lip conspicuous ..... 24. *O. cathayana*
- 29b. Lobules of mid-lobe of lip oblong or triangular to lanceolate, longer than wide, nearly entire.
- 31a. Leaves 1.5–6(–8) × 0.2–0.7 cm; raceme 2–8 cm; lateral lobes of lip conspicuous.
- 32a. Stem conspicuous, longer than leaves; leaves 2–4 mm wide ..... 17. *O. caulescens*
- 32b. Stem often inconspicuous, shorter than leaves when present; leaves (3–)4–7 mm wide ..... 18. *O. pyrulifera*
- 31b. Leaves (4.5–)8–20 × 0.7–1.5 cm; raceme more than 10 cm; lateral lobes of lip inconspicuous.
- 33a. Flowers greenish white; mid-lobe of lip with suboblong lobules; leaves 7–10 mm wide, veins conspicuous when dried ..... 20. *O. acaulis*
- 33b. Flowers orange; mid-lobe of lip with triangular lobules; leaves 8–15 mm wide, veins inconspicuous when dried ..... 21. *O. gigantea*

**1. *Oberonia pumila*** (Fukuyama ex S. C. Chen & K. Y. Lang)  
Ormerod, *Taiwania* 47: 242. 2002.

宝岛鸢尾兰 bao dao yuan wei lan

*Hippeophyllum pumilum* Fukuyama ex S. C. Chen & K. Y. Lang, *Acta Phytotax. Sin.* 36: 72. 1998; ?*Oberonia insularis* Hayata.

Rhizome creeping, ca. 1.5 mm in diam., slender, branched, loosely covered by scalelike sheaths at nodes. Stems short, arising at intervals of 5–25 mm along rhizome, 3–5-leaved. Leaves ± distichous-equitant, laterally compressed, elliptic, oblong, or lanceolate, 10–25 × 3–8 mm, fleshy, base not articulate. Peduncle suberect, 3–6 cm; rachis ca. 2.5 cm, densely with many small flowers; floral bracts ovate-lanceolate, 1.5–2 mm.

Flowers opening widely, pale green to pale brownish green, ca. 2 mm in diam.; pedicel and ovary green, ca. 2 mm. Sepals  $\pm$  reflexed, ovate, slightly concave, 0.8–1  $\times$  0.4–0.5 mm, apex acute. Petals slightly falcate, linear, ca. 1  $\times$  0.2 mm, apex obtuse; lip narrowly ovate-oblong in outline, 1.3–1.7  $\times$  ca. 0.6 mm, deeply bilobed, margin irregularly serrate; apical lobes slightly divergent or slightly recurved, linear-lanceolate, ca. 0.7 mm. Column short. Fl. Apr–May or Dec.

- Forests; 800–1600 m. C Taiwan.

*Oberonia insularis* may prove to be conspecific with *O. pumila*, in which case it would have priority.

The name *Hippeophyllum pumilum* was first published by T. P. Lin (Native Orchids Taiwan 3: 141. 1987) but not validly so because no type was indicated (*Vienna Code*, Art. 37.1). Consequently, *Oberonia pumila*, as published by S. S. Ying (Coloured Ill. Indig. Orchids Taiwan 2: 610. 1990), was not validly published either.

**2. *Oberonia seidenfadenii*** (H. J. Su) Ormerod, *Taiwania* 47: 242. 2002.

密花鸢尾兰 mi hua yuan wei lan

*Hippeophyllum seidenfadenii* H. J. Su, *J. Exp. Forest Natl. Taiwan Univ.* 13: 204. 1999.

Rhizome creeping, ca. 1 mm in diam., branching, nearly completely covered by tubular sheaths. Stems arising at intervals of 6–15 mm along rhizome, 3–5-leaved. Leaves distichous-equitant, laterally compressed, ovate or ovate-lanceolate, 8–15  $\times$  4–7 mm, fleshy, base obliquely articulate. Inflorescence 1.5–2.5 cm, densely many flowered; rachis dilated at middle to 2 mm in diam.; floral bracts ovate, 1.2–1.5 mm, margin obscurely erose. Flowers greenish, sometimes slightly tinged with purple, ca. 1.3 mm in diam.; pedicel and ovary ca. 0.7 mm. Sepals ovate, 0.6–0.7  $\times$  0.4–0.5 mm. Petals linear-oblong, ca. 0.7  $\times$  0.2 mm; lip 3-lobed, basal lateral lobes ca. 1.2 mm, base  $\pm$  decurrent and slightly surrounding column, saccate-impressed at middle; lateral lobes ovate-triangular, margin obscurely erose-denticulate; mid-lobe bilobed at apex; lobules triangular, 0.2–0.3 mm. Column ca. 0.1 mm. Fl. unknown.

- Epiphytic on tree trunks in broad-leaved forests; 600–1500 m. S Taiwan.

This species is not to be confused with *Oberonia seidenfadeniana* J. Joseph & Vajravelu (*Bull. Bot. Surv. India* 13: 344. 1974), described from India.

**3. *Oberonia sinica*** (S. C. Chen & K. Y. Lang) Ormerod, *Taiwania* 48: 91. 2003.

套叶鸢尾兰 tao ye yuan wei lan

*Hippeophyllum sinicum* S. C. Chen & K. Y. Lang, *Acta Phytotax. Sin.* 36: 70. 1998.

Rhizome creeping, to 7 cm or longer, 1–1.5 mm in diam., slender, loosely covered by scalelike sheaths at nodes, often branching. Stem short, arising at intervals of 2–5 mm along rhizome, 3- or 4-leaved. Leaves distichous-equitant, laterally compressed, ensiform or narrowly oblong-lanceolate, (3–)6–11  $\times$  1.5–2 mm, fleshy, base articulate. Peduncle slightly arching, ca. 3 cm; rachis ca. 2.5 cm, many flowered; floral bracts ovate,

ca. 1 mm, margin slightly erose. Flowers solitary or 1 or 2 together, pale yellowish brown, ca. 2 mm in diam.; pedicel and ovary ca. 0.8 mm. Sepals ovate-elliptic or elliptic, ca. 0.8  $\times$  0.4 mm; lateral sepals usually narrower than dorsal sepal. Petals narrowly oblong, slightly arching, ca. 0.7  $\times$  0.15 mm; lip ovate-oblong in outline, margin irregularly serrate, deeply bilobed; apical lobes nearly parallel to each other, narrowly lanceolate, 0.3–0.4 mm. Column ca. 0.2 mm. Fl. Jun.

- Cliffs in open forests; ca. 1600 m. S Gansu.

**4. *Oberonia japonica*** (Maximowicz) Makino, *Ill. Fl. Japan* 1(7): t. 41. 1891.

小叶鸢尾兰 xiao ye yuan wei lan

*Malaxis japonica* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg* 22: 257. 1877; *Oberonia formosana* Hayata; *O. makinoi* Masamune.

Stem conspicuous, 1–2 cm. Leaves several, distichous-equitant at base, laterally compressed, linear-lanceolate, slightly falcate, 10–20(–30)  $\times$  2–3.5(–5) mm, somewhat thick, base not articulate, apex acute or acuminate. Peduncle subterete, 2–8 cm, rather slender, wingless; rachis many flowered; floral bracts ovate-lanceolate, 1(–2) mm, apex acuminate. Flowers yellowish green to reddish orange, less than 1 mm in diam.; pedicel and ovary 1–2 mm, often slightly longer than floral bracts. Sepals broadly ovate to ovate-elliptic, ca. 0.6  $\times$  0.4 mm; lateral sepals often slightly larger than dorsal sepal. Petals suboblong or ovate, ca. 0.6  $\times$  0.4 mm, apex obtuse; lip broadly oblong-ovate in outline, 0.6–0.8 mm, 3-lobed; lateral lobes obliquely spreading, ovate-triangular, entire; mid-lobe elliptic, broadly oblong, or suborbicular, conspicuously larger than lateral lobes, apex emarginate or sometimes with a small tooth in sinus. Fl. Apr–Jul. *2n* = 30.

Epiphytic on trees or lithophytic on rocks in forests; 600–1000 m. N Fujian, Taiwan [Japan (Ryukyu Islands), Korea].

**5. *Oberonia variabilis*** Kerr, *Bull. Misc. Inform. Kew* 1927: 214. 1927.

密苞鸢尾兰 mi bao yuan wei lan

Stem very short or inconspicuous. Leaves subbasal, 3–5, distichous-equitant, laterally compressed, linear, straight or slightly falcate, 2.5–7  $\times$  0.4–1 cm, veins obscure, base not articulate, margin often crisped when dried, apex acuminate or acute. Peduncle subterete, 6–10 cm, wingless, lower part often with many whorled sterile bracts; sterile bracts lanceolate, 1.5–2 mm, aristate; rachis 4–7 cm, 2–2.5 mm in diam., many flowered; floral bracts narrowly lanceolate, 1.5–2 mm, apex long acuminate. Flowers  $\pm$  whorled, green; pedicel and ovary ca. 1 mm, conspicuously shorter than floral bracts. Sepals ovate, ca. 0.8  $\times$  0.5 mm, apex obtuse. Petals suboblong, ca. 1  $\times$  0.4 mm; lip broadly oblong-ovate in outline, ca. 0.8 mm, 3-lobed; lateral lobes subovate-oblong, ca. 0.2 mm, conspicuously smaller than mid-lobe, margin inconspicuously erose or nearly entire; mid-lobe subquadrate or broadly oblong, apex irregularly incised. Column erect, short, stout. Capsule obovoid-ellipsoid, 1.5–2.5  $\times$  1.2–1.8 mm; fruiting pedicel ca. 1 mm. Fl. and fr. Jan–Apr.

Epiphytic on trees. SE Hainan [Thailand, Vietnam].

**6. *Oberonia jenkinsiana*** Griffith ex Lindley, Fol. Orchid. 8(Oberonia): 4. 1859.

条裂鸢尾兰 tiao lie yuan wei lan

*Iridorkis jenkinsiana* (Griffith ex Lindley) Kuntze; *Malaxis jenkinsiana* (Griffith ex Lindley) H. G. Reichenbach.

Stem often 1–2 cm. Leaves 4–6, distichous, laterally compressed, linear-lanceolate, slightly falcate, 3–15 × 0.4–0.7 cm, thick, veins obscure, base attenuate, not articulate, apex acuminate or obtuse. Peduncle subterete, 5–13 cm, ± connate in lower part to uppermost leaf, nearly wingless, lower part with many sterile bracts; sterile bracts subulate or narrowly lanceolate, 2–3 mm, aristate; rachis 3–11 cm, densely more than 100-flowered; floral bracts narrowly lanceolate to lanceolate, 1–2 mm. Flowers yellow; pedicel and ovary ca. 1 mm. Dorsal sepal ovate-elliptic, ca. 0.8 × 0.4–0.5 mm, apex obtuse; lateral sepals broadly ovate, ± cymbiform, ca. 0.8 × 0.5–0.6 mm, apex subacute. Petals subovate, ca. 0.6 × 0.3 mm, nearly entire or apical margin inconspicuously erose; lip ca. 0.7 mm, 3-lobed; lateral lobes subquadrate or suborbicular, ca. 0.3 mm, margin irregularly fimbriate, lacinate, or rarely erose; mid-lobe subquadrate, ca. 0.3 mm wide, subtruncate or ± erose. Column ca. 0.3 mm, stout. Capsule subellipsoid, 1.5–2 × ca. 1 mm; fruiting pedicel ca. 0.5 mm. Fl. and fr. Sep–Oct.  $2n = 30$ .

Epiphytic on trees in forests; 1100–2700 m. W to SE Yunnan [NE India, Myanmar, Thailand, Vietnam].

**7. *Oberonia rosea*** J. D. Hooker, Hooker's Icon. Pl. 21: ad t. 2005. 1890.

玫瑰鸢尾兰 mei gui yuan wei lan

*Oberonia kusukusensis* Hayata.

Stem 3–5 cm, enclosed in leaf bases. Leaves several, distichous-equitant, laterally compressed, ensiform, variable in size, to 9 × 0.5 cm, base not articulate, apex acuminate and slightly curved-tipped. Peduncle ca. 10 cm; rachis many flowered, each whorl of flowers 2–3 mm apart; floral bracts oblong, ca. 1.5 mm, apical margin erose. Flowers pale green, sometimes tinged with reddish orange, ca. 2 mm in diam.; pedicel and ovary ca. 1 mm. Dorsal sepal ovate, ca. 0.9 × 0.6 mm, apex obtuse; lateral sepals obliquely ovate, ca. 0.9 × 0.7 mm. Petals rhombic-elliptic, ca. 0.8 mm, margin conspicuously erose; lip ca. 0.9 mm, 3-lobed; lateral lobes slightly smaller than mid-lobe, margin erose; mid-lobe subrectangular, ca. 0.4 mm, margin somewhat irregularly dentate, apex subtruncate and emarginate. Column ca. 0.3 mm. Capsule ellipsoid, ca. 2.5 mm.

Epiphytic on trees in evergreen forests along streams. S Taiwan [Malaysia (Peninsular), Vietnam].

**8. *Oberonia longibracteata*** Lindley, Gen. Sp. Orchid. Pl. 15. 1830.

长苞鸢尾兰 chang bao yuan wei lan

*Iridorkis longibracteata* (Lindley) Kuntze; *Malaxis longibracteata* (Lindley) H. G. Reichenbach.

Stem rather short. Leaves subbasal, often 5 or 6 in a tuft, laterally compressed, linear or linear-lanceolate, 3–6 × 0.3–0.6 cm, slightly thickened, veins obscure, base not articulate, apex acuminate. Peduncle subcylindric, 5–7 cm, connate in lower part

to uppermost leaf, appearing to arise from leaf blade, wingless or nearly so, lower part with 1 or 2 sterile bracts; rachis 2.5–3.5 cm, laxly many flowered; floral bracts linear-lanceolate, 4–5 mm, exceeding flowers. Flowers 1–1.5 mm in diam.; pedicel and ovary 1–1.5 mm. Sepals ovate, 0.8–1 × ca. 0.5 mm, apex obtuse. Petals oblong-ovate, ca. 0.8 × 0.4 mm, margin ± erose; lip broadly ovate in outline, ca. 0.7 mm, 3-lobed; lateral lobes ovate to broadly oblong, conspicuously smaller than mid-lobe; mid-lobe subquadrate or broadly elliptic, ca. 0.6 × 0.6 mm, margin inconspicuously erose, apex mucronulate or slightly irregularly incised. Column erect, short, stout. Fl. Oct.  $2n = 30$ .

Epiphytic on trees in dense forests. SE Hainan [Sri Lanka, Thailand, Vietnam].

**9. *Oberonia delicata*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 32: 559. 1994.

无齿鸢尾兰 wu chi yuan wei lan

Stem 1–2 cm. Leaves 5 or 6, distichous-equitant, laterally compressed, ensiform, 0.8–2 × 0.3–0.4 cm, slightly fleshy, base not articulate, margin ± undulate, apex acute. Peduncle 4–10 cm; rachis densely many flowered; floral bracts lanceolate, ca. 2 × 0.6 mm, veins inconspicuous, margin entire, apex acuminate. Flowers pale red; pedicel and ovary ca. 1 mm. Dorsal sepal ovate-elliptic, ca. 0.9 × 0.7 mm, margin entire, apex obtuse; lateral sepals similar to dorsal sepal, ca. 1 × 0.8 mm, apex acute. Petals ovate or oblong-ovate, ca. 0.9 × 0.7 mm, many veined, margin entire, apex obtuse; lip 0.9–1 mm, 3-lobed; lateral lobes nearly narrowly ovate-lanceolate, 0.6–0.7 mm, margin entire, apex acuminate or acute; mid-lobe obovate or broadly obovate, ca. 0.9 mm wide, apex emarginate, sinus apiculate. Column ca. 0.4 mm, upper part slightly dilated. Fl. Aug.

• Epiphytic on trees in forests; ca. 1700 m. N Fujian, S Yunnan.

**10. *Oberonia menghaiensis*** S. C. Chen, Acta Phytotax. Sin. 20: 190. 1982.

勐海鸢尾兰 meng hai yuan wei lan

Stem conspicuous, 1–2 cm. Leaves often 3 or 4, distichous-equitant, laterally compressed, subensiform, often slightly falcate, 1–3.5 × 0.2–0.5 cm, thickened, veins inconspicuous, base not articulate, apex acuminate or obtuse. Peduncle short, with a few lanceolate sterile bracts; rachis 2.5–7.5 cm, ca. 2 mm in diam., many flowered; floral bracts linear-lanceolate, ca. 2 mm, margin nearly entire, apex long acuminate. Flowers green, ca. 1 mm in diam.; pedicel and ovary ca. 0.8 mm. Sepals ovate-elliptic, 0.8–1 × ca. 0.5 mm, apex obtuse. Petals elliptic, ca. 0.8 × 0.5 mm, margin inconspicuously erose; lip broadly ovate-elliptic in outline, 0.9–1.1 mm, 3-lobed; lateral lobes oblong or ovate-oblong, ca. 0.2 mm, margin nearly entire; mid-lobe suboblate or transversely elliptic, ca. 0.6 × 0.8 mm, margin nearly entire, apex truncate-rounded. Column ca. 0.2 mm, apex 2-winged. Capsule subellipsoid, 1.5–2 × ca. 1 mm; fruiting pedicel ca. 0.8 mm. Fl. and fr. Jul.

• Epiphytic on trees in mixed forests; ca. 1800 m. S Yunnan.

**11. *Oberonia mannii*** J. D. Hooker, Hooker's Icon. Pl. 21: ad t. 2003. 1890.

小花鸢尾兰 xiao hua yuan wei lan

Stem 1.5–7 cm. Leaves 5–9, distichous, laterally compressed, linear, ± falcate, 1–3 × 0.1–0.2(–0.3) cm, thickened, veins inconspicuous, base not articulate, apex acuminate. Peduncle subterete, 2.5–6.7 cm, wingless; sterile bracts ovate-lanceolate, ca. 1 mm; rachis 2–5.5 cm, ca. 1.5 mm in diam., many flowered; floral bracts ovate-lanceolate, ca. 0.8 mm, margin ± obtusely toothed, apex long acuminate. Flowers greenish yellow or pale yellow, ca. 1 mm in diam.; pedicel and ovary 1–1.2 mm. Dorsal sepal ovate, ca. 0.8 × 0.4 mm, apex obtuse; lateral sepals similar to dorsal sepal, ca. 0.8 × 0.5 mm. Petals suboblong, ca. 0.9 × 0.3 mm, margin inconspicuously erose; lip suboblong in outline, ca. 1.7 mm, 3-lobed and mid-lobe deeply lobed again; lateral lobes ovate, ca. 0.3 mm, apex obtuse; mid-lobe ca. 0.8 mm, with lanceolate or narrowly lanceolate divergent lobules. Column short, stout. Capsule ellipsoid, 1.8–3 × 1.2–1.7 mm; fruiting pedicel 0.7–1 mm. Fl. and fr. Mar–Jun.  $2n = 30$ .

Epiphytic on trees in forests; 1500–2700 m. N Fujian, SE Xizang, SE Yunnan [India].

**12. *Oberonia anthropophora*** Lindley, Gen. Sp. Orchid. Pl. 16. 1830.

长裂鸢尾兰 chang lie yuan wei lan

*Iridorkis anthropophora* (Lindley) Kuntze; *Malaxis anthropophora* (Lindley) H. G. Reichenbach.

Stem 2.5–4.5 cm. Leaves 5–9, distichous, laterally compressed, linear, often slightly falcate, 1.5–5 × 0.3–0.5 cm, thick, veins inconspicuous, base not articulate, margin ± crisped when dried, apex acuminate. Peduncle subterete, 8–10 cm, wingless, sometimes with large greenish foliaceous bracts below; rachis 7–9 cm, 3–4 mm in diam., more than 100-flowered; floral bracts lanceolate, 1–1.5 mm, margin often ± erose-incised, apex long acuminate or aristate. Flowers pale red, 1–1.5 mm in diam.; pedicel and ovary 1–1.5 mm. Dorsal sepal ovate, 0.7–0.8 × ca. 0.4 mm, apex obtuse; lateral sepals broadly ovate, 0.7–0.8 × 0.4–0.5 mm, apex obtuse. Petals suboblong, 0.7–0.8 × 0.2–0.3 mm; lip ca. 2 × 0.4 mm, 3-lobed; mid-lobe deeply lobed again; lateral lobes ovate-oblong to ovate-lanceolate, ca. 0.3 mm; mid-lobe ca. 1 mm, with 2 lanceolate lobules. Column ca. 0.2 mm, stout. Fl. May.

Epiphytic on trees along valleys; ca. 400 m. SE Hainan [Malaysia (Peninsular), Myanmar, Thailand, Vietnam].

**13. *Oberonia rufilabris*** Lindley, Sert. Orchid. ad t. 8a. 1838.

红唇鸢尾兰 hong chun yuan wei lan

*Iridorkis rufilabris* (Lindley) Kuntze; *Malaxis rufilabris* (Lindley) H. G. Reichenbach.

Stem short or inconspicuous. Leaves 3 or 4, subbasal, distichous-equant, laterally compressed, linear or linear-lanceolate, 1.5–6.5 × 0.3–0.8 cm, with 3–5 visible veins when dried, central vein relatively thick, base not articulate, attenuate, apex acute or obtuse. Peduncle subterete, 3.5–8 cm, wingless, lower part with many subulate or narrowly lanceolate sterile bracts; rachis 2.5–6.5 cm, 2.5–5 mm in diam., more than 100-flowered; floral bracts narrowly lanceolate, 2–3(–4) mm, apex aristate. Flowers 3 or 4 in a whorl, red, anther cap white; pedicel and ovary ca. 0.5 mm. Sepals ovate, ± cymbiform, 0.8–0.9 × 0.5–

0.6 mm, apex acute or obtuse. Petals suboblong, ca. 0.7 × 0.2 mm, margin inconspicuously erose, apex obtuse; lip 1.2–1.4 × ca. 0.4 mm, 3-lobed; mid-lobe deeply lobed again; lateral lobes transversely spreading, narrowly lanceolate, ca. 0.3 mm; mid-lobe with 2 divergent, lanceolate or linear-lanceolate lobules ca. 0.7 mm, base with a minute, elongate pit. Column ca. 0.5 mm, stout, toothed. Capsule obovoid-ellipsoid, ca. 2 × 1.2 mm; fruiting pedicel ca. 0.6 mm. Fl. and fr. Nov–Jan.

Epiphytic on trees in forests; 800–1000 m. S Hainan, SE Yunnan [Bangladesh, Cambodia, NE India, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**14. *Oberonia recurva*** Lindley, Edwards's Bot. Reg. 25(Misc.): 14. 1839.

华南鸢尾兰 hua nan yuan wei lan

*Oberonia parvula* King & Pantling; *O. setifera* Lindley.

Plants 2.7–8 cm tall. Roots fasciculate. Stem short. Leaves 3 or 4, ensiform-lanceolate, 0.7–3 × 0.15–0.5 cm, overlapping at base, tapering to an acute apex, straight to weakly falcate. Inflorescence erect to decurved, densely many flowered; peduncle terete, stout, bracteate, 0.5–1.5 cm; peduncle bracts lanceolate, acute, ca. 1 mm; rachis terete, grooved, 3.5–6 cm. Flowers ca. 1 mm in diam., uniformly reddish brown; pedicel and ovary ca. 1 mm. Sepals similar, ovate-cordate, acute, spreading, 0.5–0.8 × 0.3–0.4 mm. Petals oblong, 0.4–0.7 × 0.3–0.4 mm, margin weakly crenulate to entire, apex obtuse; lip oblong, 0.6–1 × 0.5–0.8 mm, 3-lobed, base with a large depression; lateral lobes orbicular, margin erose-dentate; mid-lobe with 2 long, obtuse, orbicular, incurved lobules, separated by a deep, obtuse sinus. Column 0.1–0.2 mm tall.

Epiphyte. Guangxi [India].

This species was recorded from Guangxi by Seidenfaden (Dansk Bot. Ark. 25(3): 97. 1968). This record needs confirmation.

**15. *Oberonia obcordata*** Lindley, Fol. Orchid. 8(Oberonia): 7. 1859.

橘红鸢尾兰 ju hong yuan wei lan

*Iridorkis obcordata* (Lindley) Kuntze; *I. orbicularis* (J. D. Hooker) Kuntze; *I. treutleri* (J. D. Hooker) Kuntze; *Malaxis obcordata* (Lindley) H. G. Reichenbach; *Oberonia orbicularis* J. D. Hooker; *O. treutleri* J. D. Hooker.

Stem ca. 1 cm. Leaves 2 or 3, distichous-equant, laterally compressed, nearly linear, slightly falcate, 3–10 × 0.5–0.8 cm, thick, veins conspicuous when dried, base not articulate, apex acuminate. Peduncle connate in lower part to uppermost leaf, appearing to arise from leaf blade, with 2 whorls of lanceolate sterile bracts ca. 2 mm below; rachis ca. 4 cm, many flowered; floral bracts lanceolate, 2–3 mm, margin slightly erose, apex acuminate-caudate. Flowers reddish orange or red, 1–1.5 mm in diam.; pedicel and ovary 1–1.5 mm. Dorsal sepal ovate, ca. 0.9 × 0.6 mm, apex acute; lateral sepals broadly ovate, ca. 0.9 × 0.8 mm, apex obtuse. Petals oblong-ovate, ca. 0.8 × 0.4 mm, apex shortly acuminate; lip ovate in outline, slightly longer than sepals, 3-lobed; lateral lobes narrowly ovate, ca. 0.4 mm; mid-lobe subobcordate or oblate, ca. 0.5 × 0.8 mm, apex emarginate. Column suberect, short, stout. Fl. Oct.  $2n = 30$ .

Lithophytic on rocks in forests; ca. 1800 m. SE Xizang [NE India, Nepal, Thailand].

**16. *Oberonia arisanensis*** Hayata, Icon. Pl. Formosan. 4: 23. 1914.

阿里山鸢尾兰 a li shan yuan wei lan

Stem 3–6 cm. Leaves many, distichous-equitant, laterally compressed, ensiform or linear, 2–4.5 × 0.3–0.5 cm, base not articulate, apex acuminate or acute. Peduncle 10–12 cm; rachis 6–10 cm, many flowered, whorls 1–2 mm apart from each other; floral bracts ovate-lanceolate, ca. 1.5 × 0.5 mm, margin inconspicuously erose. Flowers reddish orange or reddish brown; pedicel and ovary 0.8–1 mm. Dorsal sepal suboblong or oval-oblong, 0.7–1.5 × 0.5–0.7 mm; lateral sepals recurved, ovate or ovate-triangular, 0.7–1.5 × 0.6–0.8 mm. Petals ovate-oblong or oblong, ca. 1 × 0.5 mm, margin ± erose; lip 1–1.3 mm, 3-lobed; mid-lobe bilobed again, concave at base; lateral lobes obliquely ovate-oblong, 0.4–0.5 mm, margin erose or inconspicuously fimbriate; mid-lobe suboblong, ca. 1 mm, with 2 ovate-lanceolate lobules ca. 0.3 mm. Column ca. 0.2 mm, stout. Fl. Feb–Jun.

Epiphytic on trees in forests; 400–2000 m. Taiwan [Japan (Ryukyu Islands)].

**17. *Oberonia caulescens*** Lindley, Gen. Sp. Orchid. Pl. 15. 1830.

狭叶鸢尾兰 xia ye yuan wei lan

*Iridorkis caulescens* (Lindley) Kuntze; *Malaxis caulescens* (Lindley) H. G. Reichenbach; *Oberonia auriculata* King & Pantling; *O. bilobotabella* Hayata; *O. longilabris* King & Pantling; *O. pterorachis* C. L. Tso; *O. yunnanensis* Rolfe.

Stem 1–4.5 cm. Leaves 5 or 6, distichous, laterally compressed, linear, often ± falcate, 1.5–5 × 0.2–0.4 cm, thick, veins obscure, base articulate, margin often crisped when dried, apex acuminate or acute. Peduncle subterete, (3–)5–11 cm, wingless; sterile bracts several, lanceolate, 2–2.5 mm; rachis (2.5–)4–10 cm, 5–6 mm in diam., many flowered; floral bracts lanceolate, 1.5–2(–3) mm, margin irregularly incised or nearly entire, apex acuminate or obtuse. Flowers pale yellow or pale green; pedicel and ovary ca. 2 mm. Dorsal sepal ovate-elliptic, 0.8–1 × ca. 0.6 mm, apex obtuse; lateral sepals subovate, slightly concave, similar to dorsal sepal in size. Petals suboblong, 0.8–1 × ca. 0.3 mm, apex subrounded or ± truncate; lip obovate-oblong or obovate in outline, 1.6–2 × ca. 1.3 mm, deeply bilobed, base with obtuse or inconspicuous auricles; lobules narrowly ovate, ovate, or sublanceolate, 0.7–0.9 mm, apex shortly acuminate or acute. Column short, stout. Capsule obovoid-ellipsoid, 2–2.3 × ca. 1.3 mm; fruiting pedicel ca. 1 mm. Fl. and fr. Jul–Oct.  $2n = 26, 30$ .

Epiphytic on trees or lithophytic on rocks in forests; 700–2600(–3700) m. Guangdong, W Hubei, S Hunan, W Sichuan, Taiwan, SE Xizang, W to SE Yunnan [Bhutan, India, Nepal, Vietnam].

**18. *Oberonia pyrulifera*** Lindley, Fol. Orchid. 8(Oberonia): 3. 1859.

裂唇鸢尾兰 lie chun yuan wei lan

*Iridorkis pyrulifera* (Lindley) Kuntze; *Malaxis pyrulifera*

(Lindley) H. G. Reichenbach; *Oberonia verticillata* Wight var. *khasiana* Lindley.

Stem short or sometimes to 3–4 cm. Leaves subbasal or cauline, 3 or 4(or 5), laterally compressed, usually slightly falcate, 2.5–6(–8) × 0.3–0.7 cm, thick, veins obscure, base articulate, margin often crisped when dried, apex acuminate. Peduncle subterete, 3–11 cm, wingless; sterile bracts many, narrowly lanceolate or nearly subulate, 2–2.5 mm; rachis 2–8 cm, many flowered; floral bracts lanceolate, 1.5–2 mm, margin ± irregularly erose, apex acuminate. Flowers yellow; pedicel and ovary ca. 2 mm. Dorsal sepal ovate-oblong, 0.8–1 × 0.5–0.6 mm, apex obtuse; lateral sepals broadly ovate, 0.8–1 × 0.6–0.7 mm. Petals suboblong, 0.8–1 × 0.3–0.4 mm; lip obovate or obovate-oblong in outline, 1.3–1.8 × ca. 1 mm, deeply 2-lobed, base with obtuse or inconspicuous auricles on either side; lobules broadly lanceolate, ca. 0.6 × 0.3 mm, apex obtuse. Column short, stout. Capsule obovoid-oblong, 2.5–3 × 1–1.5 mm; fruiting pedicel 1–1.5 mm. Fl. and fr. Sep–Nov.

Epiphytic on trees in forests; 1700–2800 m. W to SE Yunnan [Bhutan, India, Thailand].

**19. *Oberonia falconeri*** J. D. Hooker, Hooker's Icon. Pl. 18: ad t. 1780. 1888.

短耳鸢尾兰 duan er yuan wei lan

*Iridorkis falconeri* (J. D. Hooker) Kuntze; *Oberonia siamensis* Schlechter.

Stem short or somewhat inconspicuous. Leaves subbasal, 3–6, distichous-equitant, laterally compressed, ensiform, usually slightly falcate, 1.5–8(–11) × 0.7–1 cm, thick, veins inconspicuous, base articulate, apex acuminate. Peduncle subterete, 6–18 cm, wingless, lower part with many linear-lanceolate sterile bracts 3–4 mm; rachis 6.5–13 cm, many flowered; floral bracts lanceolate to oblong-lanceolate, thinly membranous, apex aristate, awn ca. 3 mm, apical margin ± erose. Flowers ± whorled, white or green to greenish yellow; pedicel and ovary 1–1.5 mm. Dorsal sepal ovate or oblong-ovate, ca. 1 × 0.7 mm, apex obtuse or acute; lateral sepals similar to dorsal sepal, ca. 1 × 0.6 mm. Petals suboblong, ca. 1 × 0.3–0.4 mm, margin inconspicuously crisped or slightly obtusely incised, apex obtuse; lip oblong in outline, 1–1.2 × ca. 0.7 mm, base with short auricles on either side, apex bilobed and sinus apiculate; lobules suboblong, 0.1–0.2 mm. Column short, stout. Capsule obovoid-ellipsoid, 2–2.5 × ca. 1.5 mm, ± obtusely 3-ridged; fruiting pedicel 0.7–1 mm. Fl. and fr. Aug–Oct.  $2n = 30$ .

Epiphytic on tree trunks in forests or thickets; 700–2500 m. S and SW Yunnan [India, Laos, Malaysia (Peninsular), Nepal, Thailand, Vietnam].

**20. *Oberonia acaulis*** Griffith, Itin. Pl. Khasyah Mts. 76. 1848.

显脉鸢尾兰 xian mai yuan wei lan

Stem rather short or inconspicuous. Leaves subbasal, 3 or 4, distichous-equitant, laterally compressed, ensiform, subfalcate, 4.5–17 × 0.7–1 cm, slightly thickened, veins conspicuous, base articulate, apex long acuminate. Peduncle subterete, 21–23 cm, nearly wingless, with a few very small sterile bracts or sometimes with a greenish foliaceous bract; rachis 14–17.5 cm,

ca. 5 mm in diam., densely many flowered; floral bracts lanceolate, 1.5–2 mm, margin irregularly sharply toothed, apex long acuminate. Flowers greenish to yellowish white; pedicel and ovary 1–2 mm. Dorsal sepal ovate-elliptic, 0.8–1 × 0.5–0.6 mm, apex obtuse; lateral sepals broadly ovate, 0.8–1 × 0.6–0.7 mm. Petals oblong, 0.8–1 × ca. 0.5 mm, apex rounded; lip suboblong-ovate in outline, ca. 2 mm, 3-lobed; lateral lobes nearly subovate, margin erose, irregularly incised, or entire; mid-lobe bilobed at apex; lobules parallel to each other, oblong, broadly oblong, or ovate-lanceolate, 0.5–0.7 × 0.3–0.4 mm, apex obtuse, subtruncate, or acuminate. Column very short. Capsule subellipsoid, ca. 3 × 2 mm; fruiting pedicel ca. 0.5 mm.  $2n = 30$ .

Epiphytic on trees in forests or along forest margins; 1000–2400 m. SE Xizang, S and SE Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

- 1a. Margins of lateral lobes of lip erose or irregularly incised; apical lobules of mid-lobe oblong or broadly oblong, apex obtuse or subtruncate ..... 20a. var. *acaulis*  
 1b. Margins of lateral lobes of lip entire or nearly entire; apical lobules of mid-lobe nearly ovate-lanceolate, apex acuminate ..... 20b. var. *luchunensis*

**20a. Oberonia acaulis** var. *acaulis*

显脉鸢尾兰(原变种) xian mai yuan wei lan (yuan bian zhong)

*Iridorkis myriantha* (Lindley) Kuntze; *Malaxis myriantha* (Lindley) H. G. Reichenbach; *M. sikkimensis* (Lindley) H. G. Reichenbach; *Oberonia myriantha* Lindley; *O. sikkimensis* Lindley.

Lateral lobes of lip with erose or irregularly incised margins; apical lobules of mid-lobe oblong or broadly oblong, apex obtuse or subtruncate. Fl. and fr. Nov–Jan.

Epiphytic on trees in forests; 1000–1600 m. SE Xizang, S and SE Yunnan [Bhutan, N India, Myanmar, Thailand, Vietnam].

**20b. Oberonia acaulis** var. *luchunensis* S. C. Chen, Acta Phytotax. Sin. 20: 192. 1982.

绿春鸢尾兰 lü chun yuan wei lan

Lateral lobes of lip with nearly entire margins; apical lobules of mid-lobe nearly ovate-lanceolate, apex acuminate. Fl. Oct.

- Epiphytic on trees along forest margins; ca. 2400 m. S Yunnan.

**21. Oberonia gigantea** Fukuyama, Bot. Mag. (Tokyo) 49: 295. 1935.

橙黄鸢尾兰 cheng huang yuan wei lan

Stem usually pendulous, short. Leaves subbasal, 5–8, distichous, laterally compressed, ensiform, 5–20 × 0.8–1.5 cm, fleshy, base articulate, apex acuminate. Peduncle subterete, 15–20 cm, wingless, lower part with many sterile bracts; rachis relatively long, ca. 8 mm in diam., densely many flowered; floral bracts triangular-linear, ca. 2.5 mm, margin nearly entire, apex acuminate. Flowers greenish or orange, 2–3 mm in diam.; pedicel and ovary nearly as long as floral bracts. Dorsal sepal elliptic, 1–1.5 × 0.5–1 mm, apex obtuse; lateral sepals broadly

ovate, 1–1.5 × ca. 1 mm. Petals oblanceolate, 1–1.3 × 0.5–0.8 mm; lip 1.5–2 mm, 3-lobed; lateral lobes erose at margin; mid-lobe subelliptic or square, 1–1.4 mm, bilobed; apical lobules 5–7 mm. Column very short. Fl. Nov–Dec.

- Epiphytic on tree branches or trunks in broad-leaved forests; ca. 800 m. C and N Taiwan.

**22. Oberonia segawae** T. C. Hsu & S. W. Chung, Taiwania 53: 165. 2008.

齿唇鸢尾兰 chi chun yuan wei lan

Stem less than 3 cm. Leaves subbasal, 5–8, narrowly ensiform, subfalcate, variable in length, largest 6–13 × 0.3–0.5 cm, fleshy, base jointed. Inflorescences 5–10 cm; peduncle terete, 1.5–3 cm, with many small bracts; rachis many flowered; floral bracts ovate-lanceolate, 2–2.5 mm. Flowers whorled, whitish, sometimes tinged orange, ca. 1.5 mm in diam.; pedicel and ovary 1–2 mm. Sepals spreading, subequal, ovate-triangular, 0.7–0.8 × 0.4–0.5 mm, margin entire. Petals spreading, elliptic-oblong, 0.7–0.8 × ca. 0.2 mm, margin subentire; lip ± perpendicular to ovary, spreading, ovate, nearly entire, base truncate, slightly concave, margin irregularly lacinate, apex retuse; lacinate lobules progressively deeper toward apex. Column globose, ca. 0.3 mm. Capsule ellipsoid, ca. 2 mm. Fl. Aug.

- Epiphytic on branches of broad-leaved trees or on vines in moist forests along streams; 1000–2000 m. Taiwan.

**23. Oberonia kwangsiensis** Seidenfaden, Dansk Bot. Ark. 25(3): 31. 1968.

广西鸢尾兰 guang xi yuan wei lan

Stem short or nearly inconspicuous. Leaves subbasal, 3–6, distichous-equitant, linear or linear-lanceolate, 6–13 × 0.5–0.6 cm, thick, veins slightly visible when dried, base articulate, apex acuminate. Peduncle 12–13 cm, below with many narrowly lanceolate sterile bracts 3–4 mm, long acuminate; rachis relatively rigid, many flowered; floral bracts linear, ca. 2 mm. Flowers whorled, whorls 1–3 mm apart from each other; pedicel and ovary ca. 1.5 mm. Dorsal sepal ovate, ca. 1 × 0.6 mm, apex obtuse; lateral sepals ovate-elliptic, similar to dorsal sepal in size. Petals oblong, ca. 0.8 × 0.3 mm, margin sometimes inconspicuously erose; lip nearly broadly obovate in outline, ca. 1.3 mm, with a pair of basal lateral lobes erose at margins, lip dilated and deeply bilobed at apex; apical lobules nearly orbicular or square, margin ± erose. Column short, stout. Fl. ?Nov.

Lithophytic on rocks in open forests on limestone hilltops; 600–1200 m. N Guangxi, SE Xizang, SE Yunnan [Thailand, Vietnam].

**24. Oberonia cathayana** Chun & Tang ex S. C. Chen, Acta Phytotax. Sin. 20: 192. 1982.

中华鸢尾兰 zhong hua yuan wei lan

Stem short. Leaves subbasal, 3 or 4, distichous-equitant, laterally compressed, subensiform, 1–3.5 cm × 2.5–5 mm, thick, veins inconspicuous, base articulate, apex acuminate. Peduncle subterete, 4–6 cm, wingless; sterile bracts many, ovate-lanceolate or narrowly ovate, 1.2–1.6 mm, membranous; rachis 2.5–4 cm, 2–2.5 mm in diam., densely many flowered, each flower borne in a small hollow on rachis; floral bracts ovate-elliptic, ca. 1 mm, apical margin irregularly finely incised. Flowers ca. 1 mm in diam.; pedicel and ovary ca. 0.5 mm. Dorsal sepal

broadly elliptic-ovate, ca.  $0.5 \times 0.5$  mm, apex rounded; lateral sepals ovate, ca.  $0.6 \times 0.3$  mm, apex subacute. Petals suboblong, ca.  $0.4 \times 0.15$  mm; lip broadly oblong-ovate in outline, 0.8–1 mm, 3-lobed; mid-lobe deeply bilobed; lateral lobes square or oblong, margin slightly erose; mid-lobe subobovate-square, apical lobules subquadrate or broadly ovate, adaxially with small silver spots, margin slightly erose. Column short, stout. Fl. unknown.

- Guangxi.

**25. *Oberonia mucronata*** (D. Don) Ormerod & Seidenfaden in Seidenfaden, Contr. Orchid Fl. Thailand 13: 20. 1997.

鸢尾兰 yuan wei lan

*Stelis mucronata* D. Don, Prodr. Fl. Nepal. 32. 1825; *Cymbidium iridifolium* Roxburgh; *Iridorkis iridifolia* (Roxburgh) Kuntze; *Malaxis denticulata* (Wight) H. G. Reichenbach; *M. iridifolia* (Roxburgh) H. G. Reichenbach; *Oberonia brevifolia* (J. D. Hooker) Panigrahi; *O. denticulata* Wight; *O. denticulata* var. *brevifolia* (J. D. Hooker) S. Misra; *O. denticulata* var. *iridifolia* (Roxburgh) S. Misra; *O. iridifolia* Lindley var. *brevifolia* J. D. Hooker; *O. smisrae* Panigrahi.

Stem short or inconspicuous. Leaves subbasal, 5 or 6, distichous-equant, laterally compressed, 6–16 cm  $\times$  6–15 mm, thick, veins conspicuously visible when dried, base articulate, apex shortly acuminate or obtuse. Peduncle subterete, 20–25 cm, lower part with narrow wings on both sides, including wings to 4 mm wide, with a few very small sterile bracts below; rachis pendulous, to 16 cm, 5–6 mm in diam., densely many flowered; floral bracts nearly elliptic or oblong, 1.2–1.5 mm, margin erose. Flowers reddish brown; pedicel and ovary ca. 1.5 mm. Dorsal sepal ovate or broadly ovate, 1–1.3  $\times$  ca. 0.8 mm, apex obtuse; lateral sepals slightly narrower, apex acuminate. Petals ovate-oblong, 0.9–1.1  $\times$  ca. 0.6 mm, margin irregularly erose; lip broadly ovate or nearly suborbicular in outline, ca. 1.5  $\times$  1.5 mm, base decurrent backward, inconspicuously 3-lobed, margin irregularly incised or fimbriate, apex bilobed, sinus ca. 0.5 mm deep. Column short. Capsule ellipsoid, ca. 2.5  $\times$  2 mm; fruiting pedicel very short. Fl. and fr. Aug–Dec.  $2n = 30, 40$ .

Epiphytic on trees in forests; 1300–1400 m. S and SW Yunnan [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines].

**26. *Oberonia gammiei*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 578. 1897.

齿瓣鸢尾兰 chi ban yuan wei lan

*Oberonia regnieri* Finet.

Stem 1–2 cm. Leaves subbasal, 3–7, distichous-equant, laterally compressed, ensiform, sometimes slightly falcate, 5–15  $\times$  1–1.5(–2) cm, thick, veins obscure, base articulate, apex shortly acuminate or obtuse. Peduncle subcylindric or slightly compressed, 10–28 cm, lower part with narrow wings on both sides, including wings 2.5–4 mm wide, with several to many very small sterile bracts; rachis 7–18 cm, many flowered; floral bracts suboblong-ovate, 1.4–1.8 mm, margin irregularly dentate or erose. Flowers laxly arranged, borne 2–3 mm apart from each other, whitish green; pedicel and ovary 1.2–1.4 mm. Dorsal sepal broadly ovate, 1–1.3  $\times$  ca. 1 mm, apex obtuse; lateral

sepals ovate, ca. 1.2  $\times$  0.8 mm. Petals subovate, ca. 1.2  $\times$  0.8 mm, margin erose; lip subovate in outline, ca. 1.5 mm, inconspicuously 3-lobed; lateral lobes at base of lip, margin erose or inconspicuously incised; mid-lobe apex bilobed; lobules suboblong, ca. 0.6 mm, margin and apex irregularly toothed. Column erect, short. Capsule obovoid-ellipsoid, ca. 4  $\times$  2.5 mm; fruiting pedicel ca. 1.5 mm. Fl. and fr. Oct–Dec.

Epiphytic on trees or lithophytic on rocks in forests; 500–900 m. Hainan, S Yunnan [Bangladesh, Laos, Myanmar, Thailand, Vietnam].

**27. *Oberonia menglaensis*** S. C. Chen & Z. H. Tsi, Acta Phytotax. Sin. 20: 193. 1982.

勐腊鸢尾兰 meng la yuan wei lan

Stem very short. Leaves subbasal, 2 or 3, distichous-equant, laterally compressed, ensiform, slightly falcate, 4.5–7.3  $\times$  1–2.1 cm, thick, base articulate, apex obtuse or acute. Peduncle nearly compressed cylindric, 10–13 cm, with wings on both sides, including wing 2.5–3 mm wide, with several small ovate-lanceolate sterile bracts 1–1.5 mm; rachis 8–11 cm, ca. 2 mm in diam., many flowered; rachis and pedicel pale brown; floral bracts nearly broadly ovate or broadly elliptic, ca. 1.3 mm, margin erose-incised. Flowers white, tinged with pale brown, ca. 1 mm in diam.; pedicel and ovary 0.5–0.8 mm. Dorsal sepal broadly ovate, 0.7–0.8  $\times$  ca. 1 mm; lateral sepals slightly narrower. Petals suboblong, ca. 0.7  $\times$  0.5 mm, margin slightly erose; lip broadly ovate in outline, ca. 0.8  $\times$  1 mm, margin fimbriate, unlobed, apex subtruncate. Column short, stout. Capsule nearly ellipsoid-oblong, ca. 2  $\times$  1.2 mm, with a very short pedicel. Fl. and fr. Nov–Dec.

- Epiphytic on trees in forests; 700–800 m. S Yunnan.

**28. *Oberonia austroyunnanensis*** S. C. Chen & Z. H. Tsi, Acta Phytotax. Sin. 20: 193. 1982 [*“austro-yunnanensis”*].

滇南鸢尾兰 dian nan yuan wei lan

Stem conspicuous, 2–3 cm. Leaves 2–4, distichous, slightly equitant at base, laterally compressed, linear, 5–11  $\times$  0.7–1.1 cm, thick, veins visible when dried, base articulate, attenuate toward apex. Peduncle subterete, 8–9 cm, longitudinally grooved, wingless, lower part with several sterile bracts and a greenish foliaceous bract; rachis 6.5–7.5 cm, 2–2.5 mm in diam., many flowered; floral bracts ovate-lanceolate or lanceolate, 0.8–1 mm, margin toothed, apex long acuminate or shortly aristate. Flowers  $\pm$  whorled, orange; pedicel and ovary 0.8–1 mm. Dorsal sepal ovate-elliptic, ca. 0.7  $\times$  0.4–0.5 mm, apex obtuse; lateral sepals broadly ovate or broadly ovate-elliptic, ca. 0.7  $\times$  0.5–0.6 mm. Petals subovate-oblong, 0.6–0.7  $\times$  ca. 0.4 mm, margin conspicuously erose or shortly fimbriate; lip broadly ovate-oblong in outline, ca. 1 mm, base slightly concave, 3-lobed; lateral lobes nearly suborbicular, margin fimbriate, fringes to 0.3 mm; mid-lobe nearly broadly oblong, ca. 0.5 mm, margin inconspicuously erose, apex emarginate or shallowly bilobed. Column ca. 0.2 mm, stout. Fl. Nov.

- Epiphytic on trees in forests; 800–900 m. S Yunnan.

**29. *Oberonia latipetala*** L. O. Williams, Bot. Mus. Leaflet. 5: 165. 1938.

阔瓣鸢尾兰 kuo ban yuan wei lan

Stem short, ± inconspicuous. Leaves subbasal, 5–7, distichous-equitant, laterally compressed, broadly linear, slightly falcate, (2–)3.5–10 × 0.4–0.8 cm, thick, veins obscure, base articulate, apex acuminate. Peduncle subterete, 10–18 cm, wingless; sterile bracts many, subulate, 3–5 mm; rachis 7.5–10 cm, 4–5 mm in diam., many flowered; floral bracts ovate-lanceolate, apex with awn ca. 2 mm. Flowers purple; pedicel and ovary ca. 0.5 mm. Dorsal sepal ovate-oblong, 1.8–2 × ca. 1.4 mm, abaxially with small setiform projections, margin inconspicuously erose, apex acute or obtuse; lateral sepals ovate, ca. 1.7 × 1 mm, abaxially also with small setiform projections, margin slightly erose. Petals broadly elliptic or orbicular, 2–2.5 × ca. 2 mm, abaxially with small setiform projections near margin, margin inconspicuously erose-denticulate, apex acute or subrounded; lip nearly broadly obovate in outline, 1.8–2 mm, base contracted into a short claw ca. 0.5 mm, margin erose, apex mucronate. Column short, stout. Capsule obovoid-ellipsoid, 4–5 × ca. 3 mm, with a very short pedicel. Fl. Sep–Oct, fr. Mar–Apr.

- Epiphytic on trees in forests; 1500–2400 m. W Yunnan.

**30. *Oberonia integerrima*** Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 26: 692. 1954.

全唇鸢尾兰 *quan chun yuan wei lan*

Stem short. Leaves subbasal, 5–8, distichous-equitant, laterally compressed, ensiform, sometimes slightly falcate, (6–)12–21 × (0.8–)1.1–2.2 cm, thick, veins obscure, base articulate, apex acuminate. Peduncle compressed cylindrical, 13–28 cm, with narrow wings on both sides, including wings 5–6 mm wide, sometimes with several sterile bracts; rachis 6.5–11 cm, 4–5 mm in diam., densely many flowered; floral bracts nearly broadly oblong or orbicular, 1.5–2 × ca. 1.5 mm, margin minutely erose-incised, apex subtruncate. Flowers greenish yellow; pedicel and ovary ca. 0.8 mm. Sepals broadly ovate, 1–1.2 × ca. 1 mm, apex obtuse; lateral sepals somewhat oblique. Petals ovate, ca. 1.1 × 0.5 mm, margin slightly undulate or inconspicuously minutely erose-incised, apex acuminate; lip suboblate, 1.2–1.5 × 1.4–1.6 mm, entire, somewhat irregularly shallowly undulate at margin. Column short, stout. Capsule subellipsoid, 5–6 × 3–3.5 mm, with a very short pedicel. Fl. Sep, fr. next Apr.  $2n = 30$ .

Epiphytic on trees in forests on limestone; 1000–1600 m. S and SW Yunnan [Laos, Malay Archipelago (Borneo), Vietnam].

**31. *Oberonia pachyrachis*** H. G. Reichenbach ex J. D. Hooker, Fl. Brit. India 5: 681. 1890.

扁葶鸢尾兰 *bian ting yuan wei lan*

*Iridorkis pachyrachis* (H. G. Reichenbach ex J. D. Hooker) Kuntze; *Oberonia umbraticola* Rolfe.

Stem ca. 1 cm. Leaves subbasal, several, inconspicuously distichous-equitant, laterally compressed, ensiform, sometimes slightly falcate, 7–10 × 0.6–1.5 cm, thick, veins obscure, base articulate, apex acute or acuminate. Peduncle foliaceous and fused with leaf in basal half, appearing to arise from inner side of leaf blade; rachis thickly fleshy, many flowered; racemes spikelike; floral bracts ovate-orbicular, ca. 0.8 mm, margin ir-

regularly incised. Flowers pale brown, very small; pedicel and ovary very short, conspicuously shorter than floral bracts. Sepals ovate or elliptic, ca. 0.8 × 0.5 mm, apex obtuse. Petals narrowly oblong, ca. 0.7 × 0.2 mm, apex obtuse; lip ovate, slightly longer than sepals, margin entire, with obtuse basal auricles, apex obtuse or acute. Column short, stout. Capsule subovoid-ellipsoid, ca. 2 × 1.3 mm, with a very short pedicel. Fl. Nov–Mar, fr. May.  $2n = 30$ .

Epiphytic on trees in dense forests; ca. 2100 m. S Xizang, SW Yunnan [Bhutan, N India, Myanmar, Nepal, Thailand, Vietnam].

**32. *Oberonia ensiformis*** (Smith) Lindley, Fol. Orchid. 8(Oberonia): 4. 1859.

剑叶鸢尾兰 *jian ye yuan wei lan*

*Malaxis ensiformis* Smith in Rees, Cycl. 22: Malaxis no. 14. 1812; *Iridorkis ensiformis* (Smith) Kuntze; *Oberonia iridifolia* Lindley, nom. illeg. superfl.; *O. trilobata* Griffith.

Plants rather large, with a short stem. Leaves subbasal, 5 or 6, distichous-equitant, laterally compressed, ensiform, slightly falcate, 15–50 × 1.2–2.2 cm, thick, veins obscure, base articulate, apex acuminate or long acuminate. Peduncle subterete, 17–35 cm, wingless, with several sterile bracts and sometimes a large, foliaceous bract; rachis stout; raceme 10–25 cm or longer, 5–6 mm in diam., many flowered; floral bracts suberect, suboblong, 2–3 mm, irregularly denticulate on apical margin, apex long acuminate. Flowers green; pedicel and ovary 1–2 mm. Dorsal sepal broadly oblong-ovate, 1.2–1.5 × 0.8–1 mm, apex obtuse; lateral sepals broadly ovate, similar to dorsal sepal in size. Petals ovate-lanceolate, 1.2–1.5 × 0.6–0.7 mm, margin ± erose, apex acuminate; lip broadly ovate-oblong in outline, 1.8–2.2 mm, 3-lobed; lateral lobes ± subquadrate or suborbicular, margin erose; mid-lobe broadly obovate or suboblate, to 1.2 mm wide, bilobed, margin slightly erose; disk with 2 calli, lateral at base of lateral lobes. Column short, stout. Capsule obovoid-ellipsoid, 4–5.5 × ca. 2.5 mm, ridged; fruiting pedicel ca. 0.5 mm. Fl. Sep–Nov, fr. next Mar.  $2n = 30$ .

Epiphytic on trees in forests; 700–1600 m. N Guangxi, S and W Yunnan [India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**33. *Oberonia cavaleriei*** Finet, Bull. Soc. Bot. France 55: 334. 1908.

棒叶鸢尾兰 *bang ye yuan wei lan*

Stem short, often pendulous. Leaves subbasal, 4 or 5, subcylindric or compressed cylindrical, ± laterally compressed and equitant at base, often slightly curved, 4–14 cm × 3–5(–6) mm, fleshy, veins inconspicuous, base with white transparent scarious margin on one side, articulate, apex acuminate. Peduncle cylindrical, 6–9 cm, wingless; sterile bracts many, narrowly lanceolate, ca. 3 mm; raceme pendulous, cylindrical, 4–6 cm, 3–3.5 mm in diam., densely many flowered; floral bracts lanceolate, 2.5–3 mm, membranous, margin irregularly dentate, apex long acuminate. Flowers white or greenish white, lip and column often slightly tinged with pale yellowish brown; pedicel and ovary 0.5–0.8 mm. Sepals subelliptic or oblong-ovate, 1–1.3 × ca. 0.7 mm, abaxially often with setiform projections near apex, veins inconspicuous, apex obtuse; lateral sepals often slightly

wider than dorsal sepal. Petals narrowly oblong, 1–1.2 × ca. 0.2 mm, abaxially with setiform protrusions near apex, apex obtuse; lip suboblong, 1–1.3 mm, inconspicuously 3-lobed; lateral lobes with several irregularly fimbriate laciniae on margins; mid-lobe with several similar laciniae on margin, central lacinia to 1 mm, longer than lateral ones. Column short, stout. Capsule subellipsoid, ca. 4 × 2.5–3 mm; fruiting pedicel less than 0.5 mm. Fl. and fr. Aug–Oct.

Epiphytic on branches of trees in forests or thickets; 1200–1500 m. W Guangxi, S and SW Guizhou, Jiangxi, Sichuan, S and SE Yunnan [India, Myanmar, Nepal, Thailand, Vietnam].

Lindley (Gen. Sp. Orchid. Pl. 16. 1830) misapplied the name *Oberonia myosurus* (Forster) Lindley to this species when judging *Wallich 1947* to be conspecific with the Pacific island *Epidendrum myosurus* Forster, which is now referred to *Phreatia myosurus* (Forster) Ames (see Seidenfaden, Opera Bot. 124: 19. 1995).

## 82. RISLEYA King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 246. 1898.

紫茎兰属 *zi jing lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial, holomycotrophic, leafless. Rhizome subterranean, creeping, with a few widely spaced roots. Stem erect, cylindrical, leafless, glabrous, with 2 or 3 sheaths at base. Inflorescence terminal, racemose, glabrous, densely many flowered; floral bracts persistent. Flowers very small, not resupinate, fleshy. Sepals similar, free. Petals usually shorter and narrower than sepals; lip superior, unlobed, concave. Column clavate, short; anther subterminal, 2-locular; pollinia 4, in 2 pairs, waxy, without caudicle, directly attached to a thick, oblong viscidium; rostellum stout, exerted, protruding beyond anther.

One species: Bhutan, China, India (Sikkim), Myanmar.

**1. *Risleya atropurpurea*** King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 247. 1898.

紫茎兰 *zi jing lan*

Plants 6–21 cm tall. Rhizome narrowly conic to cylindrical, 1–3 cm, 1.5–2 mm in diam., fleshy. Stem dark purple, with 2 or 3 sheaths at base; sheaths tubular, amplexicaul, 0.6–2.5 cm, membranous. Rachis (1–)2.5–7 cm, densely 15–25(–40)-flowered; floral bracts triangular-lanceolate or linear-lanceolate, 0.5–0.8 mm, membranous. Flowers dark purple, ca. 2 mm in

diam.; pedicel and ovary 1.2–1.5 mm; ovary strongly twisted. Sepals spreading, suboblong, ca. 1.2 × 0.4 mm, apex obtuse. Petals spreading, suboblong-lanceolate, ca. 0.8 × 0.3 mm, apex acute; lip adnate to column at base, broadly ovate, concave, ca. 1.2 × 1 mm, basal margin denticulate, apex with an upcurved mucro. Column ca. 0.3 mm. Capsule ellipsoid, 3–3.5 × 2–2.5 mm. Fl. Jul–Aug.

*Picea* forests or thickets; 2900–3700 m. SW Sichuan, SE Xizang, NW Yunnan [Bhutan, India (Sikkim), Myanmar].

## 83. OREORCHIS Lindley, J. Proc. Linn. Soc., Bot. 3: 26. 1858.

山兰属 *shan lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

Herbs, terrestrial. Pseudobulb cormlike, subterranean, ovoid-oblong, several noded, with fibrous roots at base, occasionally persisting and remaining connected to pseudobulbs produced in subsequent years by means of a slender rhizome. Leaves 1 or 2, arising from apex of pseudobulb, linear to oblong-lanceolate, plicate, tapering into a long petiole-like stalk at base, often with 1 or 2 membranous sheaths at base. Inflorescence arising from an intermediate node of pseudobulb, erect, terminal, with several tubular sheaths, racemose; rachis several to many flowered; floral bracts persistent, membranous. Flowers small to medium-sized, resupinate. Sepals and petals free, similar, spreading; lateral sepals sometimes shallowly saccate at base. Lip 3-lobed or entire, clawed at base, without a spur; disk usually with a pair of longitudinal lamellae or a callus, rarely without either. Column long, slightly arcuate, base sometimes dilated, but without a conspicuous foot; anther terminal, incumbent; pollinia 4, subglobose, waxy, borne on a common stipe and attached to a globose viscidium.

About 16 species: Bhutan, E and SW China, NE India, Japan, Korea, Myanmar, Nepal, E Russia (Far East, Siberia); 11 species (seven endemic) in China.

- 1a. Leaves 2–4 cm, 2–4 × as long as wide, abruptly contracted at base into a distinct petiole-like stalk.  
 2a. Inflorescence subdensely (2–)5–14-flowered; sepals 6–7 mm; lip 5–7 mm, yellow, with purple spots ..... 10. *O. nana*  
 2b. Inflorescence laxly 1–3(or 4)-flowered; sepals 12–15 mm; lip 8–10 mm, white to pale purple, with purple spots ..... 11. *O. oligantha*  
 1b. Leaves 7–40 cm, 5–20 × as long as wide, tapering at base into a sometimes indistinct petiole-like stalk.  
 3a. Dorsal sepal 15–16 mm; column ca. 8 mm ..... 9. *O. nepalensis*  
 3b. Dorsal sepal 5.5–11 mm; column 2.5–6 mm.  
 4a. Lip lacking a callus, 3-lobed above middle or sometimes entire ..... 8. *O. foliosa*  
 4b. Lip with a callus or a pair of lamellae, 3-lobed at or below middle, never entire.  
 5a. Plants 2-leaved.

- 6a. Flowers yellowish brown to pale yellow, lip white with purple spots; disk of lip with a pair of lamellae ..... 3. *O. patens*
- 6b. Flowers white, lip white with red or pale brown spots on mid-lobe; disk of lip with a longitudinally channeled callus.
- 7a. Dorsal sepal 5.5–6 mm ..... 1. *O. micrantha*
- 7b. Dorsal sepal 9–11 mm ..... 2. *O. fargesii*
- 5b. Plants 1-leaved.
- 8a. Lip 3-lobed near middle; disk of lip with a longitudinally channeled, fleshy callus ..... 4. *O. bilamellata*
- 8b. Lip 3-lobed below middle; disk of lip with a pair of lamellae.
- 9a. Lip 6.5–8.5 mm; lateral lobes of lip ca. 3 mm ..... 3. *O. patens*
- 9b. Lip 4.5–5 mm; lateral lobes of lip to 1.4 mm.
- 10a. Lamellae on lip very short, less than 1 mm, positioned between bases of lateral lobes ..... 5. *O. erythrochrysea*
- 10b. Lamellae on lip ca. 2 mm, positioned at base of lip and extending onto mid-lobe.
- 11a. Plants 8–16 cm tall; petiole-like leaf base 1–3 cm ..... 6. *O. parvula*
- 11b. Plants 20–35 cm tall; petiole-like leaf base ca. 6 cm ..... 7. *O. angustata*

**1. *Oreorchis micrantha*** Lindley, J. Proc. Linn. Soc., Bot. 3: 27. 1858.

狭叶山兰 xia ye shan lan

*Oreorchis rolfei* Duthie.

Plants 20–35 cm tall. Pseudobulbs ovoid or oblong, 1–1.3 × ca. 1 cm, several noded, persisting and often forming a tight chain of pseudobulbs connected by a short rhizome. Leaves 2, linear-lanceolate or narrowly lanceolate, plicate, 17–25 × 0.5–1.2 cm, gradually tapering at base into an indistinct petiole-like stalk 4–7 cm. Inflorescence 20–32 cm, with 2 or 3 tubular sheaths below middle; rachis 4–6 cm, subdensely 8–12-flowered; floral bracts ovate-lanceolate, 1.5–3 mm. Flowers white, lip white with red spots on mid-lobe; pedicel and ovary 6–9 mm. Sepals oblong-lanceolate, 5.5–6 × 1.5–2 mm, apex subacute; lateral sepals slightly falcate. Petals lanceolate or linear-lanceolate, slightly falcate, 5–5.5 × ca. 1.2 mm, apex shortly acuminate; lip suboblong-obovate, ca. 5 × 3 mm, 3-lobed near base, shortly clawed at base; lateral lobes sublinear, ca. 1.5 mm, apex acute; mid-lobe obovate or broadly obovate, ca. 3 × 2.5 mm, apical margin irregularly incised and slightly crisped, apex obtuse and sometimes emarginate; disk with a linear, longitudinally channeled callus between lateral lobes and extending almost midway along mid-lobe. Column slightly arcuate, ca. 2.5 mm, base slightly dilated. Capsule pendulous, ellipsoid, 10–12 × ca. 5 mm. Fl. Jun.

Forests; 1500–3000 m. E and S Taiwan, S and SE Xizang [Bhutan, NE India, Myanmar, Nepal].

**2. *Oreorchis fargesii*** Finet, Bull. Soc. Bot. France 43: 697. 1897.

长叶山兰 chang ye shan lan

*Oreorchis fargesii* var. *subcapitata* Hayata; *O. intermedia* S. S. Chien; *O. ohwii* Fukuyama; *O. subcapitata* (Hayata) Schlechter.

Plants 18–30 cm tall. Pseudobulbs ellipsoid to subglobose, 1–2.5 × 1–2 cm, 2- or 3-noded, usually persisting and forming a tight chain of pseudobulbs connected by a short rhizome. Leaves 2, linear-lanceolate or linear, plicate, 15–28 × 0.8–2.5 cm, gradually tapering at base, apex acuminate; petiole-like

stalk articulate, 3–5 cm, usually enclosed in tubular sheaths and forming a pseudostem. Inflorescence 18–30 cm, with 2 or 3 tubular sheaths below middle; rachis 2–6 cm, densely more than 10-flowered; floral bracts ovate-lanceolate, 3–5 mm. Flowers white, with brown lamellate crests on lip and pale brown spots on mid-lobe of lip; pedicel and ovary 7–12 mm. Sepals oblong-lanceolate, 9–11 × 2.5–4 mm, apex acuminate; lateral sepals oblique, slightly wider than dorsal sepal. Petals narrowly ovate to ovate-lanceolate, 9–10 × 3–3.5 mm, apex acuminate; lip oblong-obovate, 7.5–9 × 4–4.5 mm, 3-lobed near base, shortly clawed at base; claw ca. 1 mm; lateral lobes linear, 2–3 × ca. 0.7 mm, margin minutely ciliate, apex obtuse; mid-lobe subelliptic-obovate or rhombic-obovate, ca. 6 × 4 mm, basal margin often ciliate, apical margin crisped, apex obtuse-rounded and irregularly incised; disk with a short lamellate, longitudinally channeled callus between lateral lobes. Column ca. 3 mm, base thickened. Capsule narrowly ellipsoid, ca. 20 × 8 mm. Fl. May–Jun, fr. Sep–Oct.

• Forests, thickets, shaded places along valleys; 700–2600 m. N Fujian, S Gansu, Hubei, Hunan, S Shaanxi, Sichuan, Taiwan, E Yunnan, Zhejiang.

**3. *Oreorchis patens*** (Lindley) Lindley, J. Proc. Linn. Soc., Bot. 3: 27. 1858.

山兰 shan lan

*Corallorhiza patens* Lindley, Gen. Sp. Orchid. Pl. 535. 1840; *Diplolabellum confluens* (Handel-Mazzetti) Garay & W. Kittredge; *Oreorchis gracilis* Franchet & Savatier; *O. gracilis* var. *gracillima* Hayata; *O. gracillima* (Hayata) Schlechter; *O. lancifolia* A. Gray; *O. patens* var. *confluens* Handel-Mazzetti; *O. patens* var. *gracilis* (Franchet & Savatier) Makino ex Schlechter; *O. patens* var. *gracillima* (Hayata) S. S. Ying; *O. setschuanica* Ames & Schlechter; *O. wilsonii* Rolfe ex Adamson; *O. yunnanensis* Schlechter.

Plants 25–70 cm tall. Pseudobulb ovoid to subellipsoid, 1–2 × 0.5–1.5 cm, 2- or 3-noded, sometimes persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, or rarely 2, linear or narrowly lanceolate, plicate, 13–30 × (0.4–)1–2 cm, gradually tapering at base into an indistinct petiole-like stalk 3–5(–8) cm, apex acuminate. Inflores-

cence 25–67 cm, with 2 or 3 tubular sheaths below middle; rachis 4–15.5 cm, laxly few to subdensely many flowered; floral bracts narrowly lanceolate, 2.5–5 mm. Flowers yellowish brown to pale yellow, lip white with purple spots; pedicel and ovary 8–12 mm. Sepals narrowly oblong, 7–9 × 1.5–2 mm, apex slightly obtuse; lateral sepals slightly falcate. Petals narrowly oblong, slightly falcate, 7–8 × 1.5–1.8 mm, apex acute; lip oblong-obovate, 6.5–8.5 × 3.5–5 mm, shortly clawed at base, 3-lobed below middle; lateral lobes slightly incurved, linear, ca. 3 × 0.7 mm, apex obtuse; mid-lobe subobovate, 5.5–7 × 3–5.5 mm, apex obtuse-rounded and irregularly incised; disk with a pair of thick lamellae, extending from base to midway along mid-lobe; lamellae to 3.5 mm. Column 4–5 mm, base thickened. Capsule oblong, ca. 15 × 7 mm. Fl. Jun–Jul, fr. Sep–Oct.  $2n = 48$ .

Forests, forest margins, thickets, grassy places, shaded places along valleys; 1000–3000 m. Gansu, Guizhou, Heilongjiang, Henan, Hunan, Jiangxi, Jilin, Liaoning, Sichuan, Taiwan, NE and NW Yunnan [Japan, Korea, Russia (Far East)].

**4. *Oreorchis bilamellata*** Fukuyama, Bot. Mag. (Tokyo) 48: 436. 1934.

大霸山兰 da ba shan lan

*Tainia bilamellata* (Fukuyama) S. S. Ying.

Plants to 50 cm tall. Pseudobulbs ovoid or globose, 2–3 × 0.7–2 cm, 2- or 3-noded, persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, linear, plicate, 20–40 × 1–2 cm, gradually tapering at base into an indistinct petiole-like stalk, apex acute. Inflorescence ca. 50 cm, with 3 or 4 sheaths; rachis ca. 14 cm, laxly 15–20-flowered; floral bracts lanceolate, ca. 5 mm. Flowers brownish yellow, sepals with dark purple striations, lip yellow or whitish with dark purple spots on mid-lobe; pedicel and ovary brown, ca. 9 mm. Sepals lanceolate, 8–9 × 1.5–3 mm. Petals narrowly oblong, slightly falcate, 7–8 × 1–1.5 mm, apex acute; lip oblong-obovate, 6–7 × ca. 3 mm, base saccate, 3-lobed near middle; lateral lobes erect and loosely embracing column, linear, falcate, ca. 5 × 0.6 mm, apex obtuse; mid-lobe reflexed, oblong, 3.8–5 × 3–3.2 mm, margin undulate, apex subtruncate; disk with a yellow, longitudinally channeled, fleshy callus between lateral lobes and extending onto mid-lobe; callus ca. 3 mm. Column ca. 4 mm, slightly dilated at base. Fl. May–Jun.

• Humid and shaded places in forests; 2000–3000 m. C and S Taiwan.

**5. *Oreorchis erythrochrysea*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 252. 1925.

短梗山兰 duan geng shan lan

Plants 16–35 cm tall. Pseudobulbs broadly ovoid to suboblong, 0.8–2 × 0.7–1.3 cm, 2- or 3-noded, sometimes persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, dark green with longitudinal silvery stripes adaxially, narrowly elliptic to narrowly oblong-lanceolate, plicate, 7–14 × 1–2.3 cm, tapering at base into a distinct petiole-like stalk 2–4.5 cm, apex acuminate or acute. Inflorescence 12–35 cm, with 2 or 3 tubular sheaths below middle; rachis 3–11

cm, laxly to subdensely 8–25-flowered; floral bracts ovate-lanceolate, ca. 2 mm. Flowers yellow or greenish yellow, lip cream-colored and with purple or chestnut spots; pedicel and ovary 3–5 mm. Sepals narrowly oblong, 6–8 × 1.5–2 mm, apex obtuse or acute; lateral sepals slightly smaller than dorsal sepal, often slightly oblique. Petals narrowly oblong-spatulate, slightly falcate, 5.5–6.5 × ca. 1.5 mm, apex obtuse; lip suboblong-obovate, ca. 5 × 3 mm, shortly clawed at base, 3-lobed below middle; lateral lobes subovate to sublinear, 0.8–1 × ca. 0.7 mm, apex acute; mid-lobe subsquare or broadly elliptic-obovate, 2.5–3 × ca. 3 mm, margin slightly undulate, apex rounded and slightly emarginate; disk with a pair of short lamellae between bases of lateral lobes; lamellae less than 1 mm. Column slightly arcuate, ca. 3 mm, relatively thick. Fl. May–Jul.

• Forests, thickets, grassy alpine slopes; 2200–3700 m. SW Sichuan, SE Xizang, NW and SW Yunnan.

**6. *Oreorchis parvula*** Schlechter, Repert. Spec. Nov. Regni Veg. 10: 483. 1912.

矮山兰 ai shan lan

Plants 8–16 cm tall. Pseudobulb oblong to ellipsoid, 1–2 × 0.8–1 cm, several noded. Leaf solitary, narrowly elliptic-lanceolate to narrowly oblong, plicate, 8–11 × 1.3–2 cm, gradually tapering at base into a petiole-like stalk 1–3 cm, apex acuminate. Inflorescence 7–16 cm, with 2 or 3 tubular sheaths below middle; rachis 2–4 cm, densely 7–12-flowered; floral bracts ovate-lanceolate or lanceolate, ca. 3 mm. Flowers yellow, outer surfaces of sepals chestnut and lip cream-colored with red-purple spots; pedicel and ovary 2–2.5 mm. Sepals narrowly oblong-lanceolate, 6–7 × 1.5–2 mm, apex obtuse; lateral sepals somewhat falcate. Petals ligulate-lanceolate, slightly falcate, 5–6 × ca. 1.5 mm, apex obtuse; lip obovate, ca. 5 × 2 mm, shortly clawed at base, 3-lobed below middle; lateral lobes ligulate, less than 1 mm, apex obtuse; mid-lobe subovate, 2–2.5 × 1.8–2 mm, margin slightly undulate, apex obtuse; disk with a pair of longitudinal lamellae at base and extending onto mid-lobe; lamellae ca. 2 mm. Column slightly arcuate, ca. 2.5 mm. Capsule ovoid, 5–8 mm. Fl. May–Jul.

• Forests, open grassy slopes; 3000–3800 m. SW Sichuan, NW Yunnan.

**7. *Oreorchis angustata*** L. O. Williams ex N. Pearce & P. J. Cribb, Edinburgh J. Bot. 54: 294. 1997.

西南山兰 xi nan shan lan

Plants 20–35 cm tall. Pseudobulbs pyriform-conic, 1–1.5 × 0.5–1 cm, several noded, sometimes persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, broadly lanceolate, plicate, ca. 19 × 2 cm, tapering at base into a petiole-like stalk ca. 6 cm, apex acute. Inflorescence 20–32 cm, with 2 tubular sheaths below middle; rachis 7–11 cm, laxly many flowered; floral bracts lanceolate, ca. 6 mm. Flower color not known; pedicel and ovary ca. 6 mm. Dorsal sepal lanceolate, ca. 5.5 × 1.2 mm, apex acute; lateral sepals lanceolate, slightly falcate, ca. 5 × 1.5 mm, apex subacute. Petals narrowly ovate-lanceolate, ca. 5 × 1.2 mm, apex subacute; lip oblong-ovate, ca. 4.5 × 2.2 mm, shortly clawed at base, 3-lobed near base; lateral lobes subovate, ca. 1.4 mm, apex obtuse-

rounded; mid-lobe subobovate, ca.  $3 \times 2.2$  mm, margin undulate, apex obtuse-rounded; disk with a pair of longitudinal lamellae at base and extending onto mid-lobe; lamellae ca. 2 mm. Column slightly arcuate, clavate, ca. 3 mm. Fl. Jun.

• Grassy slopes, open rocky places; ca. 3000 m. SW Sichuan, NW Yunnan.

**8. *Oreorchis foliosa*** Lindley var. ***indica*** (Lindley) N. Pearce & P. J. Cribb, *J. Orchid Soc. India* 10: 5. 1996.

囊唇山兰 nang chun shan lan

*Corallorhiza indica* Lindley, *J. Proc. Linn. Soc., Bot.* 3: 26. 1858; *Oreorchis indica* (Lindley) J. D. Hooker; *Tainia gokanzanensis* Masamune.

Plants 18–36 cm tall. Pseudobulbs ovoid or subellipsoid,  $0.7\text{--}1.2 \times 0.5\text{--}1$  cm, 2- or 3-noded, persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, narrowly elliptic or narrowly elliptic-lanceolate, plicate,  $10\text{--}15 \times 1.5\text{--}2.4$  cm, tapering at base into a petiole-like stalk 2–3 cm, apex acute. Inflorescence 18–36 cm, with 2 or 3 tubular sheaths below middle; rachis 3–9.5 cm, laxly 4–10-flowered; floral bracts oblong-lanceolate, 2–3 mm. Flowers dark yellow with many purplish brown striations and spots, lip white with purplish red spots; pedicel and ovary 5–7 mm. Sepals narrowly oblong-obovate,  $8\text{--}9 \times 1\text{--}1.8$  mm, apex acute; lateral sepals falcate. Petals narrowly ovate or narrowly ovate-lanceolate, falcate,  $6\text{--}7 \times$  ca. 2 mm, apex acute; lip obovate-oblong or broadly oblong,  $6\text{--}8 \times 4\text{--}5$  mm, base clawed and conspicuously saccate, 3-lobed above middle or sometimes entire; lateral lobes variable, oblong to ovate, ca. 1.5 mm, apex obtuse, or absent altogether; mid-lobe subquadrate to suborbicular, ca.  $4 \times 4$  mm, margin undulate, apex rounded and irregularly incised; disk without lamellae or calli. Column slightly arcuate, 5–6 mm, slender, base thickened. Capsule ovoid, ca.  $15 \times 6$  mm. Fl. Sep.  $2n = 42, 84$ .

Forests, alpine meadows; 2500–3400 m. SW Sichuan, Taiwan, S Xizang, NW Yunnan [Bhutan, N India, Japan, Nepal].

The typical variety occurs in India and Nepal.

**9. *Oreorchis nepalensis*** N. Pearce & P. J. Cribb, *Edinburgh J. Bot.* 54: 315. 1997.

大花山兰 da hua shan lan

Plants 20–40 cm tall. Pseudobulbs oblong-ovoid to subquadrate,  $1.5\text{--}2 \times 0.8\text{--}1$  cm, several noded, persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, lanceolate, plicate,  $15\text{--}30 \times 0.8\text{--}1.7$  cm, with conspicuous veins, tapering at base into a petiole-like stalk 5–10 cm, apex acute. Inflorescence 17–35 cm, with 2 tubular sheaths below middle; rachis 5–12 cm, subdensely 9- to more than 20-flowered; floral bracts lanceolate, ca. 5 mm. Flowers brownish green or yellowish green, lip pale pink to white with purple spots; pedicel and ovary ca. 12 mm. Dorsal sepal linear-lanceolate,  $15\text{--}16 \times$  ca. 3 mm, apex subacute; lateral sepals broadly lanceolate, falcate, ca.  $12 \times 3$  mm, apex acute. Petals oblong-lanceolate, ca.  $13 \times 3$  mm, apex obtuse; lip obovate,  $11\text{--}12 \times$  ca. 6 mm, base long clawed, 3-lobed near middle; lateral lobes slightly incurved, oblong, ca.  $4 \times 1.2$  mm, apex obtuse; mid-lobe ovate-elliptic, ca.  $7 \times 6$  mm, margin undulate, apex

rounded; disk with a pair of crescent-shaped lamellae between lateral lobes and extending to base of mid-lobe. Column ca. 8 mm, slightly dilated at base. Fl. May–Jun.

Scrub, damp open meadows. S Xizang [Nepal].

**10. *Oreorchis nana*** Schlechter, *Acta Horti Gothob.* 1: 151. 1924.

硬叶山兰 ying ye shan lan

Plants 8–16 cm tall. Pseudobulbs oblong to subovoid,  $0.5\text{--}0.9(1.5) \times 0.4\text{--}0.6$  cm, 2- or 3-noded, sometimes persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, ovate to narrowly elliptic, plicate,  $2\text{--}4 \times 0.8\text{--}1.5$  cm, base subrounded or broadly cuneate and abruptly contracted into a distinct petiole-like stalk 1–3 cm, apex acuminate. Inflorescence 8–16 cm, with 2 or 3 tubular sheaths below middle; rachis 2.5–6 cm, subdensely (2–)5–14-flowered; floral bracts ovate-lanceolate, ca. 1 mm. Flowers white, outer surfaces of sepals and petals orange-yellow or green, rarely flushed chestnut, lip yellow with purple spots; pedicel and ovary 3–5 mm. Sepals narrowly oblong,  $6\text{--}7 \times 1.5\text{--}2$  mm, apex obtuse or acute; lateral sepals somewhat falcate. Petals fusiform-oblong,  $5.5\text{--}6.5 \times$  ca. 2 mm, apex obtuse or acute; lip subobovate-oblong,  $5\text{--}7 \times$  ca. 2.5 mm, base shortly clawed or sometimes without a claw, 3-lobed below middle; lateral lobes incurved, narrowly oblong-ovate, ca.  $0.8 \times 0.5$  mm, apex obtuse; mid-lobe obovate-elliptic,  $3\text{--}4.5 \times$  ca. 2.5 mm, margin slightly undulate, apex rounded; disk with a pair of short lamellae at base. Column slightly arcuate, 2–3 mm, thick. Fl. Jun–Jul.

• Alpine grasslands, forests, thickets, soil-covered rocks; 2500–4000 m. W Hubei, W Sichuan, NW Yunnan.

**11. *Oreorchis oligantha*** Schlechter, *Acta Horti Gothob.* 1: 152. 1924.

少花山兰 shao hua shan lan

*Oreorchis rockii* Schweinfurth.

Plants 8–20 cm tall. Pseudobulbs cylindrical to ovoid,  $0.6\text{--}1 \times$  ca. 0.5 cm, 2- or 3-noded, sometimes persisting and forming a chain of pseudobulbs connected by a short rhizome. Leaf solitary, narrowly elliptic,  $1.8\text{--}4 \times 0.8\text{--}1$  cm, base rounded or cuneate and abruptly contracted into a distinct petiole-like stalk 1–2 cm, apex acuminate. Inflorescence 8–18 cm, with 2 or 3 tubular sheaths below middle; rachis 1.5–4 cm, laxly 1–3(or 4)-flowered; floral bracts ovate-deltoid, ca. 1 mm. Flowers purple, lip white to pale purple with purple spots; pedicel and ovary 3–5 mm. Sepals narrowly oblong,  $12\text{--}15 \times 2\text{--}2.8$  mm, apex obtuse or acute; lateral sepals slightly falcate. Petals oblanceolate,  $7\text{--}9 \times$  ca. 2 mm, apex obtuse or acute; lip obovate-oblong,  $8\text{--}10 \times 5\text{--}6$  mm, shortly clawed at base, 3-lobed below middle; lateral lobes slightly incurved, narrowly oblong-obovate,  $1.5\text{--}2 \times$  ca. 0.5 mm, apex obtuse; mid-lobe obovate-spatulate, ca.  $6 \times 5\text{--}6$  mm, margin slightly undulate, apex rounded; disk with a pair of subelliptic lamellae at base. Column slightly arcuate, 4.5–6 mm, thick. Fl. Jun–Jul.

• Alpine grasslands, forests, thickets, soil-covered rocks; 3000–4000 m. S Gansu, W Sichuan, E Xizang, NW Yunnan.

**84. CREMASTRA** Lindley, Gen. Sp. Orchid. Pl. 172. 1833.

杜鹃兰属 du juan lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial. Pseudobulbs cormlike, ovoid or cylindrical, noded, with many fibrous, elongate roots at base and a coraloid rhizome beneath. Leaves 1 or 2, or rarely plants leafless (in which case holomycotrophic), arising directly from apex of pseudobulb, green, sometimes blotched with purple, narrowly ovate to narrowly elliptic, plicate, gradually contracted at base into a long petiole-like stalk, glabrous, apex acute. Inflorescence arising directly from apex of pseudobulb, erect, rather long, racemose, with 2 or 3 tubular sheaths below middle, glabrous; rachis subdensely to densely few or many flowered; floral bracts narrowly elliptic to lanceolate, small, apex acute. Flowers resupinate, ascending or pendulous, narrowly tubular; pedicel and ovary usually arcuate, elongate, slender. Sepals and petals subsimilar, free, spreading or not, narrowly elliptic to linear, tapering gradually toward base; lip narrowly oblong-obovate, elongate, 3-lobed above middle, lateral margins involute, base shallowly saccate, not spurred; lateral lobes linear or narrowly oblong; mid-lobe oblong or obovate, with a fleshy callus at base. Column elongate, slightly dilated toward apex, with or without a pair of ventral wings; anther terminal, incumbent; pollinia 4, in 2 pairs, slightly laterally compressed, waxy, attached to a viscidium.

Four species: from Nepal, NE India, and Bhutan, through S and E China, to N Thailand, Vietnam, and Japan; three species (one endemic) in China.

- 1a. Leaves 2, deep green, blotched with purple; flowers suberect, opening widely; lip 13–18 mm, mid-lobe strongly deflexed ..... 3. *C. unguiculata*  
 1b. Leaf usually solitary, rarely 2, green, lacking purple blotches; flowers pendulous, not opening widely; lip 20–34 mm, mid-lobe straight.  
 2a. Pseudobulbs cormlike, ovoid or subglobose, 1.5–3 cm; callus of lip positioned at base of mid-lobe, elongate, wrinkled to verruculose ..... 1. *C. appendiculata*  
 2b. Pseudobulbs broadly cylindrical, 10–14 cm; callus of lip positioned midway along mid-lobe, subglobose, smooth ..... 2. *C. guizhouensis*

**1. *Cremastra appendiculata*** (D. Don) Makino, Bot. Mag. (Tokyo) 18: 24. 1904.

杜鹃兰 du juan lan

Plants 20–70 cm tall. Pseudobulb ovoid or subglobose, 1.5–3 × 1–3 cm, few noded. Leaf 1 or rarely 2, narrowly elliptic to narrowly oblanceolate-elliptic, 18–34 × 4–8 cm, mainly 3-veined, base subcuneate, apex acute or acuminate; petiole-like base 7–17 cm. Inflorescence 25–70 cm; rachis (5–)10–25 cm, subdensely to densely 5–22-flowered; floral bracts lanceolate to ovate-lanceolate, (3–)5–10 mm. Flowers fragrant, pendulous, not opening widely, pale purple to orange-brown, narrowly campanulate, petals and lip with darker spots; pedicel and ovary (3–)5–15 mm. Sepals narrowly oblanceolate-spatulate, 20–34 × 2–5 mm, apex acute or acuminate; lateral sepals slightly oblique. Petals narrowly oblanceolate, 18–32 × 1.5–3.5 mm, apex acuminate; lip linear, 20–34 × 2–3.5 mm (though wider across lobes at apex), saccate at base, 3-lobed at apex; lateral lobes linear to narrowly oblong, 4–6 × ca. 1 mm, apex obtuse; mid-lobe ovate to narrowly oblong, 6–8 × 3–5 mm, apex acute or obtuse; disk with a fleshy callus at base of mid-lobe; callus variable in shape and size, 1–5 mm, sparingly wrinkled or verruculose. Column 18–26 mm, slender, slightly dilated at apex, with or without narrow ventral wings below anther; anther 1–3 mm. Capsule pendulous, ellipsoid, 25–30 × 8–13 mm. Fl. May–Jun, fr. Sep–Dec.  $2n = 24, 42, 48, 52$ .

Wet places in forests, along valleys; 400–2900 m. Anhui, Chongqing, S Gansu, N Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, S Shanxi, Sichuan, Taiwan, Xizang, SE Yunnan, Zhejiang [Bhutan, India, Japan, Korea, Nepal, Thailand, Vietnam].

- 1a. Callus on lip clavate, 4–5 mm, verruculose; column wings absent ..... 1a. var. *appendiculata*  
 1b. Callus on lip linear, 1–2 mm, wrinkled; column with narrow ventral wings ..... 1b. var. *variabilis*

**1a. *Cremastra appendiculata* var. *appendiculata***

杜鹃兰(原变种) du juan lan (yuan bian zhong)

*Cymbidium appendiculatum* D. Don, Prodr. Fl. Nepal. 36. 1825; *Cremastra appendiculata* var. *triloba* (Hayata) S. S. Ying; *C. bifolia* C. L. Tso; *C. triloba* Hayata; *C. wallichiana* Lindley.

Plants 25–60 cm tall. Callus on lip clavate, 4–5 mm, verruculose. Column wings absent.

Forests; 1000–2900 m. Taiwan, Xizang, SE Yunnan [Bhutan, India, Nepal].

**1b. *Cremastra appendiculata* var. *variabilis*** (Blume) I. D. Lund, Nordic J. Bot. 8: 201. 1988.

翅柱杜鹃兰 chi zhu du juan lan

*Hyacinthorchis variabilis* Blume, Mus. Bot. 1: 48. 1849; *Cremastra appendiculata* var. *viridiflora* (Honda) Averyanov; *C. lanceolata* (Kraenzlin) Schlechter; *C. mitrata* A. Gray; *C. variabilis* (Blume) Nakai; *C. variabilis* var. *viridiflora* Honda; *Pogonia lanceolata* Kraenzlin.

Plants 20–70 cm tall. Callus on lip linear, 1–2 mm, wrinkled. Column with narrow ventral wings.

Forests; 400–2000 m. Anhui, Chongqing, S Gansu, N Guangdong,

Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, S Shanxi, Sichuan, Zhejiang [Japan, Korea, Thailand, N Vietnam].

**2. *Cremastra guizhouensis*** Q. H. Chen & S. C. Chen, *Acta Phytotax. Sin.* 41: 264. 2003.

贵州杜鹃兰 *gui zhou du juan lan*

Plants 60–70 cm tall. Pseudobulb cylindrical, 10–14 × 1.3–1.5 cm, thick, 4- or 5-noded. Leaf 1 or rarely 2, oblong-elliptic or narrowly elliptic-lanceolate, 18–31 × 3.5–9 cm, base cuneate, apex long acuminate; petiole-like base 6–8 cm. Inflorescence ca. 54 cm; rachis ca. 18 cm, densely 10–28-flowered; floral bracts linear-lanceolate, 10–15 mm. Flowers ± pendulous, not opening widely, yellow, narrowly campanulate; pedicel and ovary 7–10 mm. Sepals narrowly oblanceolate, 28–30 × 2–3.5 mm, apex acute or acuminate; lateral sepals slightly oblique. Petals narrowly oblanceolate to linear-oblanceolate, 25–28 × 2–3.5 mm, apex acuminate; lip linear-obovate, 25–28 × 2.5–4 mm (though wider across lobes at apex), 3-lobed near apex; lateral lobes linear to linear-oblong, 4–5 × 1–1.5 mm, apex acute to obtuse; mid-lobe obovate or rhombic-obovate, 6–8 × 3–5 mm, margin ± undulate, apex obtuse; disk with a fleshy callus midway along mid-lobe; callus subglobose, ca. 1.5 mm, smooth. Column 25–28 mm, slender, slightly dilated at apex. Fl. May–Jun.

• Forest margins; 1300–1400 m. S Guizhou.

**3. *Cremastra unguiculata*** (Finet) Finet, *Bull. Soc. Bot. France* 44: 235. 1897.

斑叶杜鹃兰 *ban ye du juan lan*

*Oreorchis unguiculata* Finet, *Bull. Soc. Bot. France* 43: 698. 1897; *Aplectrum unguiculatum* (Finet) F. Maekawa.

Plants 20–40 cm tall. Pseudobulbs ovoid or subglobose, ca. 1.5 cm in diam., 3- or 4-noded. Leaves 2, deep green and usually blotched with purple, narrowly elliptic, 10–15 × 2–3 cm, base cuneate, apex acuminate or acute; petiole-like base 2.5–6 cm. Inflorescence erect, to 30 cm, slender; rachis 10–13 cm, laxly 7–9-flowered; floral bracts ovate-lanceolate, 4–5 mm. Flowers suberect, opening widely, outer surface purplish brown, inner surfaces green, spotted with purplish brown, lip white; pedicel and ovary 9–13 mm. Sepals linear-oblanceolate or narrowly oblanceolate, 17–22 × ca. 2.5 mm, apex acute; lateral sepals slightly oblique. Petals narrowly oblanceolate, 15–20 × 1–1.5 mm, apex acute; lip narrowly spatulate, 13–18 × ca. 2.5 mm (though wider across lobes), 3-lobed above middle; lateral lobes linear, 1–1.5 mm, apex acute or obtuse; mid-lobe strongly deflexed, obovate, 5–6 × 2.5–3.5 mm, margin crisped and irregularly dentate-incised, apex obtuse; disk with a fleshy callus near base of mid-lobe; callus pulvinate, ca. 2 mm. Column 12–13 mm, slender. Fl. May–Jun.  $2n = 50$ .

Mixed forests; 900–1000 m. Jiangxi [Japan, Korea].

## 85. *TIPULARIA* Nuttall, *Gen. N. Amer. Pl.* 2: 195. 1818.

筒距兰属 *tong ju lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Stephan W. Gale, Phillip J. Cribb

*Didicicia* King & Prain.

Herbs, terrestrial, slender. Pseudobulbs cormlike and ovate, or narrowly cylindrical, 1–4-noded, sometimes connected to previous year's growth by a persistent slender rhizome. Leaf solitary, arising from apex of pseudobulb, broadly ovate to ovate-elliptic, sometimes with purple spots above and purple below, base abruptly contracted into a long petiole-like stalk. Inflorescence laxly racemose, arising from apex or laterally from near base of pseudobulb, erect, slender, usually enclosed at base by a few sheathing bracts; rachis laxly many flowered; floral bracts very small. Flowers resupinate, small; pedicel and ovary cylindrical-fusiform, slender. Sepals and petals similar though petals slightly smaller, free, spreading, oblong to elliptic; lip ovate or oblong-obovate, entire or 3-lobed, spurred at base; spur spreading backward or ascending, shortly saccate or long, slender. Column erect, stout; anther terminal, incumbent; pollinia 4, in 2 pairs, waxy, with or without a distinct stipe; viscidium inconspicuous; rostellum short, inconspicuous. Capsule pendulous, shortly oblong to almost spherical.

Up to seven species: Bhutan, China, NE India, Japan, Myanmar, and Nepal, and a disjunct species in E North America; four species (two endemic) in China.

- 1a. Lip with a saccate spur at base; spur less than 1 mm ..... 4. *T. cunninghamii*  
 1b. Lip with an elongate, cylindrical spur at base; spur 6–15 mm.  
   2a. Spur 12–15 mm; sepals 5.5–7 mm ..... 1. *T. szechuanica*  
   2b. Spur 6–12 mm; sepals 4–6 mm.  
     3a. Spur 10–12 mm; lip ca. 5 mm ..... 3. *T. odorata*  
     3b. Spur 6–7 mm; lip ca. 3.5 mm ..... 2. *T. josephii*

**1. *Tipularia szechuanica*** Schlechter, *Acta Horti Gothob.* 1: 153. 1924.

筒距兰 *tong ju lan*

Plants 15–25 cm tall. Pseudobulb narrowly cylindrical, tapering slightly toward base, 1.5–3 × 0.2–0.4 cm, usually 1- or

2-noded, rarely without a node, with 1 or 2 fleshy elongate roots at base. Leaf broadly ovate, 2.5–4 × 1.4–2.5 cm, with 3 prominent veins, base rounded or subtruncate, apex acuminate or obtuse; petiole-like base 1.3–2 cm, channeled. Inflorescence 12–22 cm; peduncle 9–16 cm, with 1 or 2 long tubular sheaths; rachis 3–6 cm, laxly 5–9-flowered; floral bracts deltoid, minute.

Flowers spreading horizontally, opening widely, pale purplish brown; pedicel and ovary 4–7 mm. Sepals narrowly oblong-lanceolate, 5.5–7 × ca. 1.8 mm, apex acute. Petals narrowly elliptic, 5–6 × ca. 2 mm, apex acute; lip linear-oblong, 4.5–6.5 × ca. 2.5 mm, 3-lobed near base; lateral lobes broadly ovate, ca. 1.5 × 1.5 mm, margins irregularly incised; mid-lobe ligulate, ca. 4.5 mm; spur spreading horizontally or ascending, slender, 12–15 × ca. 0.7 mm, apex obtuse. Column slightly arcuate, 2.5–3 mm. Fl. Jun–Jul.

• *Picea* and *Abies* forests; 3300–4000 m. S Gansu, S Shaanxi, NW Sichuan, NW Yunnan.

**2. *Tipularia josephii*** H. G. Reichenbach ex Lindley, J. Proc. Linn. Soc., Bot. 1: 174. 1857 [*“josephi”*].

短柄筒距兰 duan bing tong ju lan

Plants 20–38 cm tall. Pseudobulb narrowly cylindrical to squat and ovoid, 0.5–1.5 × 0.4–0.6 cm, often connected in tight clumps by a short rhizome, 1- or 2-noded, with a few elongate roots at base. Leaf broadly ovate, 2–7 × 1.5–4 cm, with 3 prominent veins, base rounded or truncate, apex acute; petiole-like base 0.8–3 cm, channeled. Inflorescence sometimes slightly pendulous toward apex, 20–35 cm; peduncle 14–28 cm, with 1 or 2 long tubular sheaths; rachis 6–12 cm, laxly 12–30-flowered; floral bracts deltoid, minute. Flowers spreading horizontally, opening widely, sepals off-white suffused with brownish purple; petals and lip pale green; pedicel and ovary 5–7 mm. Sepals narrowly oblong-lanceolate, 4–5 × ca. 1.5 mm, apex obtuse. Petals linear to narrowly oblong, ca. 4 × 1 mm, apex obtuse; lip narrowly oblong-ovate, ca. 3.5 × 1.5 mm, 3-lobed near base; disk with a pair of small, fleshy oblong calli at mouth of spur; lateral lobes broadly ovate, ca. 1.5 × 1.2 mm, margin irregularly erose, apex obtuse; mid-lobe ligulate, 2–2.2 mm, apex obtuse; spur spreading horizontally or ascending, slender, 6–7 × ca. 0.4 mm, apex acute. Column ca. 2.2 mm; pollinia borne on a distinct stipe. Fl. Aug.

Forests; ca. 2800 m. SE Xizang [Bhutan, NE India, Myanmar, Nepal].

**3. *Tipularia odorata*** Fukuyama, Bot. Mag. (Tokyo) 52: 243. 1938.

台湾筒距兰 tai wan tong ju lan

Plants 12–25 cm tall. Pseudobulbs ovoid or broadly cylindrical, 1–2.5 × 0.4–0.6 cm, 2–4-noded, with a few elongate roots at base. Leaf abaxially purplish, adaxially green and sometimes

tinged purple, ovate to ovate-elliptic, 3–7 × 1.5–3 cm, margin denticulate and slightly crisped, apex acuminate; petiole-like base purplish, 1.5–6 cm, channeled. Inflorescence purplish brown, 10–23 cm; peduncle 8–15 cm, with 2 or 3 short tubular sheaths; rachis 2.5–8 cm, laxly 10- or more flowered; floral bracts deltoid, minute. Flowers spreading horizontally to slightly pendulous, opening widely; sepals and petals green suffused with brownish purple, lip yellowish green, spur whitish yellow; pedicel and ovary 5–8 mm. Sepals narrowly oblong, 4–6 × ca. 1.5 mm, apex obtuse or acute. Petals lanceolate to linear-lanceolate, 4–5 × ca. 1.2 mm, apex obtuse or acute; lip narrowly oblong-ovate, ca. 5 × 1 mm, 3-lobed near base; disk with a pair of small, fleshy oblong calli at mouth of spur; lateral lobes nearly orbicular, ca. 0.8 mm, margins irregularly undulate; mid-lobe narrowly oblong-ligulate, ca. 3 mm, apex acute; spur spreading horizontally or ascending, slender, 10–12 × ca. 0.5 mm, apex obtuse. Column ca. 3.5 mm; pollinia borne on a distinct stipe. Fl. May–Jun.

• Mossy places in forests; 1500–2600 m. C and N Taiwan.

**4. *Tipularia cunninghamii*** (King & Prain) S. C. Chen, S. W. Gale & P. J. Cribb, **comb. nov.**

软叶筒距兰 ruan ye tong ju lan

Basionym: *Didickea cunninghamii* King & Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 119. 1896.

Plants 10–20 cm tall. Pseudobulbs often connected in clumps or rows by a slender or coralloid rhizome, whitish, ovoid, 1–2 × 0.5–0.8 cm, 2–4-noded. Leaf abaxially brownish purple, adaxially greenish, broadly ovate to cordate, 2.5–4 × 1.7–3.5 cm, with 3 prominent veins, margin slightly undulate, apex acute; petiole-like base 2–3.5 cm, channeled. Inflorescence 12–25 cm; peduncle 10–20 cm, with 2 or 3 long tubular sheaths; sheaths ca. 2 cm; rachis 2–10 cm, laxly 8–15-flowered; floral bracts ovate-deltoid, ca. 0.5 mm. Flowers spreading horizontally, not opening widely, yellowish green and sometimes tinged purple along midvein of sepals and petals; pedicel and ovary 3.5–4 mm; pedicel elongating in fruit. Sepals narrowly oblong, 1.8–2 × 0.5–0.6 mm, apex obtuse. Petals linear-lanceolate, ca. 2 × 0.6 mm, apex obtuse; lip broadly oblong-obovate, cymbiform, 1.5–1.8 × 1.6–1.9 mm, simple, fleshy, apex obtuse, saccate-spurred, fused at base to sides of column; spur saccate-conic, short, ca. 0.3 mm. Column ca. 1 mm; pollinia ovoid-clavate, lacking a stipe. Fl. May–Jul.

Coniferous forests; 2700–2900 m. C Taiwan (Hualian) [India (Sikkim, Uttarakhand)].

## 86. CALYPSO Salisbury, Parad. Lond. ad t. 89. 1807, nom. cons., not Thouars (1804).

布袋兰属 bu dai lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

*Cytherea* Salisbury, nom. illeg. superfl.

Herbs, terrestrial, small. Tuber globose-ovoid to cylindrical, small, sometimes with withered remains of previous year's tuber still attached, with several fleshy, filiform roots at base and a small coralloid rhizome beneath. Leaf solitary, arising directly from tuber apex, ovate to elliptic, plicate, conspicuously narrowed at base into a long petiole-like stalk, apex acute. Inflorescence terminal, erect, taller than leaf, with several tubular sheaths, 1(or 2)-flowered. Flower resupinate, showy. Sepals and petals similar, free, spreading, linear to lanceolate, apex acute; lip pendulous, with a broad spurlike process at base and 2 small auricles placed laterally at its mouth,

apically broadened into an ovate blade; blade spreading, apical margin sometimes slightly undulate or involute, with a pubescent patch on disk; spurlike process adpressed to abaxial surface of blade, cornute, with a large mouth, apex tapering and 2-lobed. Column erect, slightly curved, with long, broad wings; anther subterminal; pollinia 4, in 2 pairs, waxy, sessile on a square viscidium. Capsule ellipsoid.

One species: circumboreal across North America, Scandinavia, and Asia, and in montane parts of North America and Asia.

**1. *Calypso bulbosa*** (Linnaeus) Oakes var. ***speciosa*** (Schlechter) Makino, J. Jap. Bot. 3: 25. 1926.

布袋兰 bu dai lan

*Calypso speciosa* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 228. 1919; *Cytherea speciosa* (Schlechter) Makino.

Tuber ovoid to narrowly oblong, 1–3 × 0.5–0.9 cm, few noded. Leaf dark green, ovate or ovate-elliptic, 3.4–4.5 × 1.8–2.8 cm, base subtruncate, apex acute; petiole-like stalk 2–4.5 cm. Inflorescence 10–14 cm, much taller than leaf, with 2 or 3 tubular sheaths; floral bract lanceolate, 15–18 × 1–2.2 mm, membranous, basal half tubular and embracing pedicel. Flower 25–40 mm in diam.; pedicel and ovary 17–20 mm, slender. Sepals and petals pale pinkish purple, linear-lanceolate, 14–18 ×

1.5–3 mm, apex acute or acuminate; lip 12–20 × 8–14 mm; spurlike process extending beyond apex of blade, white with ochre-brown striations and tinged pale yellow toward apex, 14–23 × 6–10 mm; auricles suberect, pale whitish pink, triangular, 3–4 × 5–6 mm; blade pale whitish pink with 3 clusters of white or pale yellow barbate hairs at base, 8–11 × ca. 5 mm. Column 7–10 mm. Fl. Apr–Jun.  $2n = 28, 38$ .

*Picea* and other coniferous forests; 2900–3200 m. Gansu, Jilin, Nei Mongol, NW Sichuan, Xizang, NW Yunnan [Japan].

Flowers of the Chinese plants possess a longer spurlike process that extends beyond the apex of the lip blade and are generally paler in color than the widespread European and N Asian typical variety of this species. Further critical comparison with authentic material of *Calypso bulbosa* var. *speciosa* from Japan would be desirable.

## 87. **CHANGNIENIA** S. S. Chien, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. 10: 89. 1935.

独花兰属 du hua lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

Herbs, terrestrial, small, with subterranean pseudobulbs. Pseudobulbs cormlike, often persisting and forming a chain, few noded, with a solitary leaf and a solitary inflorescence at apex. Leaf blade elliptic to broadly ovate, plicate, base abruptly contracted into a long petiole-like stalk, apex acute. Inflorescence erect, terminal, with 2 or 3 tubular sheaths, 1-flowered. Flower terminal, rather large, resupinate. Sepals and petals free, spreading, similar. Petals slightly wider and shorter than sepals; lip relatively large, 3-lobed, spurred at base; spur ± hornlike, thick and large, attenuate toward apex; disk with lamellae. Column erect, incurved, winged; anther incumbent; pollinia 4, in 2 pairs, waxy, directly attached to a subsquare viscidium.

• One species: China.

**1. *Changnienia amoena*** S. S. Chien, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. 10: 90. 1935.

独花兰 du hua lan

Pseudobulb nearly pale yellowish white, subellipsoid to broadly ovoid, 1.5–2.5 × 1–2 cm, fleshy, 2- or 3-noded, ± covered with membranous sheaths, with a solitary leaf at apex. Leaf blade spreading, recurved, abaxially purplish red, adaxially dark green, broadly ovate-elliptic to broadly elliptic, 6.5–11.5 × 5–8.2 cm, base rounded or subtruncate, apex acute or shortly acuminate; petiole-like base suberect, purple, channeled, 3.5–8 cm. Inflorescence purple, 10–17 cm, with 2 or 3 membranous, amplexicaul sheaths; sheaths 3–4 cm; floral bract deciduous, small. Flower spreading, large, white or pink, lip white with purplish red spots in basal 2/3; pedicel and ovary 7–9 mm.

Sepals oblong-lanceolate, 27–33 × 7–9 mm, 5–7-veined, apex obtuse; lateral sepals slightly oblique. Petals narrowly obovate-lanceolate, slightly oblique, 25–30 × 12–14 mm, 7-veined, apex obtuse; lip oblate-orbicular in outline, slightly shorter than petals, 3-lobed, spurred at base; lateral lobes erect, ovate-triangular, oblique, 11–14 × 10–13 mm, apex acute; mid-lobe spreading horizontally, broadly obovate, ca. 8 × 12 mm, margin irregularly undulate-incised, apex truncate and emarginate; disk with 5 short lamellae between lateral lobes; spur slightly incurved, narrowly obconic, 20–23 × 7–10 mm, attenuate toward apex, apex obtuse. Column 18–21 mm, winged. Fl. Apr.  $2n = 46^*$ .

• Humus-rich soil in open forests, shaded places along valleys; 400–1100(–1800) m. Anhui, Hubei, Hunan, S Jiangsu, Jiangxi, Shaanxi, Sichuan, Zhejiang.

## 88. **CORALLORHIZA** Gagnebin, Acta Helv. Phys.-Math. 2: 61. 1755 [*“Corallorrhiza”*], nom. cons.

珊瑚兰属 shan hu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, leafless, heteromycotrophic. Rhizome coralloid, usually branching extensively, fleshy; roots absent. Stems erect, some-

times clustered. Inflorescence terminal, erect, racemose, with several membranous tubular sheaths, yellowish green or pale purple; rachis few to many flowered, lax or dense; floral bracts triangular-lanceolate, small, membranous. Flowers resupinate; pedicel and ovary fusiform. Sepals similar, free, sometimes connivent, lanceolate; lateral sepals slightly oblique, sometimes connate at base and forming a short mentum with base of column at apex of ovary. Petals broadly lanceolate or obovate, usually shorter than sepals; lip simple or 3-lobed, spurless, margin often involute; disk with 2 fleshy longitudinal lamellae extending from base up to midway along its length. Column elongate, sometimes with ventral wings; anther terminal, incumbent, subglobose, attached by a narrow filament; pollinia 4, separate, subglobose, waxy, without conspicuous caudicles, attached to a solitary sticky viscidium; viscidium triangular, broad; stigma surface elliptic-cordate; rostellum triangular, small. Capsule pendulous, ribbed.

Eleven species: temperate and montane areas of Central and North America, with one circumboreal species; one species in China.

**1. *Corallorhiza trifida*** Châtelain, Spec. Inaug. Corallorhiza 8. 1760.

珊瑚兰 shan hu lan

*Ophrys corallorhiza* Linnaeus, Sp. Pl. 2: 945. 1753; *Corallorhiza innata* R. Brown.

Plants slender, 10–28 cm tall. Rhizome beige to brown, extensively branching. Inflorescence reddish brown, with 3–5 sheaths; sheaths amplexicaul, reddish brown, tubular, 1–6 cm, membranous; rachis 1–3(–5) cm, laxly to densely 3–7-flowered; floral bracts ca. 1 mm. Flowers ascending, pale yellowish green to white; pedicel and ovary 3.5–5 mm. Dorsal sepal arching forward and forming a loose hood with petals, narrowly oblong-lanceolate to narrowly elliptic, 4–6 × 1–1.5 mm, 1-veined, apex obtuse or acute; lateral sepals similar to dorsal

sepal, slightly oblique, 4–6 × 1–1.5 mm, connate at base and forming an inconspicuous mentum with base of column, 1-veined, apex obtuse or acute. Petals broadly lanceolate to oblanceolate, 3–5 × ca. 1.5 mm, 1-veined, apex obtuse or acute; lip broadly oblong, 2.5–3.5 × ca. 1.5 mm, obscurely 3-lobed toward base; lateral lobes erect, small; mid-lobe elliptic to oblong, 1–1.5 × ca. 0.8 mm, apex rounded and sometimes emarginate; disk with 2 thick longitudinal lamellae extending to base of mid-lobe. Column 2.5–3 mm, with small wings; stigma transversely oblong, broad. Capsule ellipsoid, 7–9 × ca. 5 mm. Fl. and fr. Jun–Aug.  $2n = 38, 40, 42$ .

Forests, thickets; 2000–2700 m. Gansu, N Guizhou, Hebei, Jilin, Nei Mongol, Qinghai, Sichuan, Xinjiang [India, Japan, Kashmir, Korea, Nepal, Russia; Europe, North America].

The extensive extra-Chinese synonymy is not cited here.

**89. EULOPHIA R.** Brown, Bot. Reg. 7: ad t. 573 [“578”]. 1821 [“*Eulophus* ”], nom. cons.

美冠兰属 mei guan lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

*Cyrtopera* Lindley; *Donacopsis* Gagnepain; *Lissochilus* R. Brown; *Semiphajus* Gagnepain, p.p.

Herbs, terrestrial, autotrophic or rarely heteromycotrophic. Pseudobulbs subterranean or borne above ground, cornlike, tuberous, or rhizomatous, usually several noded, with several slender or thick fibrous roots at base. Leaves appearing at or after anthesis, 1 to many, basal, base tapering or contracted into a long petiole-like stalk, reduced to scales in heteromycotrophic species; petiole-like leaf base sometimes overlapping and forming a pseudostem. Inflorescence erect, lateral, racemose or rarely paniculate, laxly to subdensely many flowered or occasionally reduced to a solitary flower. Flowers resupinate, small to large, sometimes showy; pedicel and ovary slender. Sepals free, similar; lateral sepals usually slightly oblique, sometimes adnate to column foot. Petals similar to dorsal sepal or slightly wider; lip ± erect, usually 3-lobed, lateral lobes erect and embracing column, rarely entire, base usually spurred or saccate; disk usually with a callus consisting of lamellae, ridges, or fringes. Column short to long, usually winged; column foot present or less commonly absent; anther terminal, incompletely 2-locular, anther cap often with 2 projections; pollinia 2, ± cleft, waxy, attached to a suborbicular viscidium by a short, broad stipe.

About 200 species: tropical and subtropical regions, most diverse in Africa, but also widespread from Madagascar and the Mascarene Islands to C and tropical Asia, the SW Pacific islands, and N and NW Australia; 13 species (two endemic) in China.

- 1a. Plants leafless at anthesis or heteromycotrophic and lacking leaves altogether.
- 2a. Flowers lemon-yellow; lip 25–30 mm ..... 6. *E. flava*
- 2b. Flowers purple-red, brownish yellow, green, purple, maroon, or pink; lip 9–15 mm.
- 3a. Column with a prominent column foot 3–5 mm.
- 4a. Plants heteromycotrophic, lacking green leaves; sepals dull purple-red to brownish yellow; spur conic, ca. 2 mm ..... 1. *E. zollingeri*
- 4b. Plants autotrophic, with green leaves; sepals pale green with purple veins; spur saccate, ca. 4 mm ..... 2. *E. bicallosa*
- 3b. Column lacking a column foot, or if present ca. 1 mm.
- 5a. Plants 40–80 cm tall; pseudobulb borne above ground; inflorescence occasionally branched and paniculate; lip 4–5 mm wide, 3-lobed at or below middle ..... 5. *E. graminea*
- 5b. Plants 15–45 cm tall; pseudobulb subterranean; inflorescence always racemose, never paniculate; lip 6.5–12 mm wide, 3-lobed above middle.
- 6a. Leaves 3–5 cm wide; sepals ca. 2 mm wide ..... 3. *E. dentata*
- 6b. Leaves 0.4–0.8 cm wide; sepals 3–5 mm wide ..... 4. *E. dabia*

## 1b. Plants with leaves present at anthesis.

- 7a. Flower solitary ..... 7. *E. monantha*  
 7b. Flowers 3 or more.  
 8a. Leaves to 1 cm wide.  
 9a. Flowers olive-green; lip 9–10 mm; spur 3–3.5 mm ..... 5. *E. graminea*  
 9b. Flowers purplish red; lip 20–23 mm; spur 7–8 mm ..... 12. *E. siamensis*  
 8b. Leaves 2–7 cm wide.  
 10a. Flowers purplish red; spur 6–9 mm ..... 13. *E. spectabilis*  
 10b. Flowers yellow, yellowish green, or green; spur absent or 1.5–5 mm.  
 11a. Floral bracts 20–50 mm, exceeding ovary.  
 12a. Plants 25–50 cm tall; sepals 4–5 mm wide; spur 1.5–3 mm ..... 9. *E. herbacea*  
 12b. Plants 45–80 cm tall; sepals 8–9 mm wide; spur ca. 5 mm ..... 10. *E. bracteosa*  
 11b. Floral bracts 6–9 mm, shorter than ovary.  
 13a. Leaves 3–7 cm wide, petiole-like stalk 8–15 cm; rachis more than 10-flowered;  
 flowers pale green with purple or red spots and blotches; column 4–4.5 mm ..... 8. *E. pulchra*  
 13b. Leaves ca. 2 cm wide, petiole-like stalk ca. 50 cm; rachis up to 10-flowered;  
 flowers yellow; column ca. 7 mm ..... 11. *E. sooi*

**1. *Eulophia zollingeri*** (H. G. Reichenbach) J. J. Smith, Orch. Java, 228. 1905.

无叶美冠兰 wu ye mei guan lan

*Cyrtopera zollingeri* H. G. Reichenbach, Bonplandia 5: 38. 1857; *C. formosana* Rolfe; *C. papuana* Ridley (1886), not Kraenzlin (1898); *C. rufa* Thwaites; *C. sanguinea* Lindley; *Cyrtopodium rufum* (Thwaites) Trimen; *C. sanguineum* (Lindley) N. E. Brown; *Eulophia carrii* C. T. White; *E. formosana* (Rolfe) Rolfe; *E. macrorhiza* Blume; *E. ochobiensis* Hayata; *E. papuana* (Ridley) J. J. Smith (1909), not Schlechter (1905), nor F. M. Bailey (1907); *E. sanguinea* (Lindley) J. D. Hooker; *E. yushuiana* S. Y. Hu; *Graphorkis macrorhiza* (Blume) Kuntze; *G. papuana* (Ridley) Kuntze; *G. rufa* (Thwaites) Kuntze; *G. sanguinea* (Lindley) Kuntze.

Plants heteromycotrophic, without green leaves, (15–)40–80 cm tall. Pseudobulb subterranean, tuberous, pale yellow, suboblong, 3–16 × 1.5–5 cm, many noded, with many stout roots. Inflorescence brownish red, racemose, (15–)40–80 cm, stout, with several scattered, clasping sheaths; rachis 4–13 cm, laxly 8- to more than 20-flowered; floral bracts narrowly lanceolate to almost subulate, 10–25 mm, subequal in length to or exceeding ovary, apex acuminate. Flowers suberect, spreading, or nodding, dull purple-red to brownish yellow, medium-sized, 25–30 mm in diam.; pedicel and ovary 16–20 mm. Dorsal sepal elliptic-oblong, 15–23 × 4–7 mm, apex acuminate; lateral sepals suboblong, slightly oblique, 16–25 × 6–9 mm, adnate at base to column foot, apex acuminate. Petals oblanceolate, 11–18 × 5–7 mm, apex mucronate; lip adnate to column foot, subobovate or oblong-obovate, 14–15 × 15–18 mm, shortly saccate-spurred at base, 3-lobed; lateral lobes erect and loosely embracing column, subovate or oblong, 3–4 × ca. 4.5 mm, apex rounded; mid-lobe ovate, 4–7 × 3–5 mm, with 5–7 thickened, papillose veins, margin undulate, apex apiculate; disk sparsely papillose, with 2 central, suborbicular lamellae; spur broad, conic, ca. 2 mm. Column ca. 5 mm; column foot 4–5 mm. Fl. Apr–May.  $2n = 34$ .

Sparse forests, bamboo forests, grassy slopes; sea level to 500 m. Fujian, Guangdong, Guangxi, S Jiangxi, Taiwan, C Yunnan [India, In-

donesia, Japan (Ryukyu Islands), Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

**2. *Eulophia bicallosa*** (D. Don) P. F. Hunt & Summerhayes, Kew Bull. 20: 60. 1966.

台湾美冠兰 tai wan mei guan lan

*Bletia bicallosa* D. Don, Prodr. Fl. Nepal. 30. 1825; *Cyrtopera bicarinata* Lindley; *C. candida* Lindley; *C. papuana* Kraenzlin (1898), not Ridley (1886); *Eulophia bicallosa* var. *major* (King & Pantling) Pradhan; *E. bicarinata* (Lindley) J. D. Hooker; *E. bicarinata* var. *major* King & Pantling; *E. brachycentra* Hayata; *E. candida* (Lindley) J. D. Hooker; *E. fitzalanii* F. Mueller; *E. merrillii* Ames; *E. papuana* Schlechter (1905), not F. M. Bailey (1907), nor (Ridley) J. J. Smith (1909); *E. van-overberghii* Ames; *E. venosa* (F. Mueller) H. G. Reichenbach ex Benth. var. *papuana* (Schlechter) Schlechter; *E. versteegii* J. J. Smith; *Graphorkis bicallosa* (D. Don) Kuntze; *G. bicarinata* (Lindley) Kuntze; *G. candida* (Lindley) Kuntze; *G. fitzalanii* (F. Mueller) Kuntze; *Limodorum bicallosum* (D. Don) Buchanan-Hamilton ex D. Don; *Liparis bicallosa* (D. Don) Schlechter.

Plants autotrophic, 50–75 cm tall. Pseudobulb subterranean, usually whitish, subglobose to cylindrical, 5–10 cm, covered with a few sheaths. Leaf solitary, emerging after anthesis, linear, ca. 50 × 1.2 cm, gradually tapering at base into a petiole-like stalk, apex acute or acuminate; petiole-like stalk to ca. 35 cm. Inflorescence racemose, 50–75 cm, slender, with 3–5 scattered tubular sheaths; rachis to 10 cm, subdensely few to many flowered; floral bracts lanceolate, 8–14 mm, shorter than ovary, apex acuminate. Flowers medium-sized, ca. 25 mm in diam. Sepals pale green, with 5 purple veins. Petals pale green, tinged purplish red at apex, and lip pale purplish red, with dark purple venation; pedicel and ovary 10–15 mm. Dorsal sepal lanceolate, ca. 13 × 3 mm, apex acute; lateral sepals lanceolate, ca. 13 × 3–5 mm, adnate at base to column foot, apex acute. Petals lanceolate to narrowly elliptic, ca. 13 × 7–8 mm, base contracted, apex acute; lip subovate, ca. 15 mm, spurred at base, 3-lobed; lateral lobes erect, triangular, oblique; mid-lobe recurved, broadly ovate, clawed at base, apex retuse; disk with 3 purplish red ridges; spur saccate, ca. 4 mm, apex obtuse. Column ca. 6 mm, slender, with a distinct column foot ca. 3 mm. Fl. Jun.

Hainan [India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Thailand; Australia].

**3. *Eulophia dentata*** Ames, Philipp. J. Sci., C, 6: 51. 1911.

宝岛美冠兰 bao dao mei guan lan

*Eulophia graminea* Lindley var. *kitamurae* (Masamune) S. S. Ying; *E. kitamurae* Masamune; *E. segawae* Fukuyama; *E. taiwanensis* Hayata.

Plants autotrophic, 15–40 cm tall. Pseudobulb subterranean, white, ovoid, ca.  $3 \times 2.2$ – $2.5$  cm, often borne in clusters and connected to each other by short rhizomes. Leaves 2 or 3, emerging after anthesis, linear,  $10$ – $25 \times 3$ – $5$  cm, apex acute to acuminate. Inflorescence dark green to purplish, racemose, 15–40 cm, stout, with several purplish sheaths below middle; rachis 4–15 cm, laxly 3- to more than 10-flowered; floral bracts narrowly ovate-lanceolate, 5–11 mm, shorter than ovary, apex acuminate. Flowers nodding, medium-sized, ca. 30 mm in diam.; sepals and petals pale purple, white tinged pink, or occasionally pale green, lip pinkish white or green with purple venation; pedicel and ovary 10–20 mm. Sepals similar, linear,  $10$ – $13 \times$  ca. 2 mm, apex acute. Petals similar to sepals but slightly shorter,  $9$ – $12 \times$  ca. 2 mm, apex acute; lip suboblong-elliptic,  $10$ – $12 \times$  ca. 6.5 mm, spurred at base, 3-lobed above middle; lateral lobes erect and loosely embracing column, triangular-ovate, apex acute; mid-lobe orbicular to subquadrate, ca.  $3 \times 4$  mm, apical margin crisped, apex truncate; disk papillose, with 3 longitudinal ridges; ridges white tinged purple, slightly crested; spur projecting backward or slightly hooked, cylindrical, 4–5 mm, apex acute. Column white, tinged pale greenish brown, ca. 6.5 mm, slender, with a short column foot ca. 1 mm. Fl. Feb–Apr.  $2n = 54, 56$ .

Forests, grasslands. E Taiwan [Philippines].

**4. *Eulophia dabia*** (D. Don) Hochreutiner, Bull. New York Bot. Gard. 6: 270. 1910.

长距美冠兰 chang ju mei guan lan

*Bletia dabia* D. Don, Prodr. Fl. Nepal. 30. 1825; *Eulophia campestris* Wallich ex Lindley; *E. faberi* Rolfe; *E. hemileuca* Lindley; *E. hormusjii* Duthie; *E. ramentacea* (Roxburgh) Lindley; *E. rupestris* Wallich ex Lindley; *E. turkestanica* (Litvinov) Schlechter; *Geodorum ramentaceum* (Roxburgh) Voigt; *Graphorkis campestris* (Wallich ex Lindley) Kuntze; *G. dabia* (D. Don) Kuntze; *G. rupestris* (Wallich ex Lindley) Kuntze; *Limodorum dabium* (D. Don) Buchanan-Hamilton ex D. Don; *L. ramentaceum* Roxburgh; *L. turkestanicum* Litvinov.

Plants 16–45 cm tall. Pseudobulb subterranean, irregularly triangular or subglobose, 1–2 cm in diam., sometimes borne in clusters. Leaves 2 or 3, emerging after anthesis, linear,  $15$ – $20 \times 0.4$ – $0.8$  cm, gradually tapering at base into a petiole-like stalk, apex acuminate; petiole-like stalk enclosed in basal sheaths and forming a pseudostem ca. 10 cm. Inflorescence racemose, 16–45 cm, slender to stout, with several scattered sheaths 3–4 cm; rachis 6–12 cm, laxly 4–14-flowered; floral bracts ovate-lanceolate,  $6$ – $12 \times 3$ – $5$  mm, shorter than ovary, membranous, apex acuminate. Flowers nodding, pale pink to maroon, medium-sized, 18–25 mm in diam.; pedicel and ovary 11–22 mm. Sepals

similar, oblong,  $12$ – $16 \times 3$ – $5$  mm, apex acute or mucronate; lateral sepals slightly oblique. Petals narrowly obovate-oblong,  $10$ – $14 \times 2$ – $3$  mm, slightly shorter than sepals, apex acute or mucronate; lip broadly oblong-obovate,  $11$ – $15 \times 8$ – $12$  mm, spurred at base, 3-lobed above middle; lateral lobes erect and loosely embracing column, broadly ovate-triangular, apex obtuse; mid-lobe oblate to transversely oblong,  $2$ – $4$ (– $6$ )  $\times 3$ – $5$ (– $8$ ) mm, margin undulate, apex truncate; disk with 3 longitudinal fimbriate lamellae extending from base of lip to midway along mid-lobe; spur cylindrical,  $5$ – $8 \times 0.8$ – $1.5$  mm, apex obtuse. Column 7–9 mm, without a column foot. Capsule pendulous, ellipsoid, ca.  $18 \times 10$  mm. Fl. Apr–May, fr. May–Jun.  $2n = 54$ .

Grassy slopes, rocky wastelands; below 800 m. SW Guizhou, W Hubei, Jiangsu, Sichuan, SW Yunnan [Afghanistan, Bangladesh, Bhutan, India, Kashmir, Nepal, Pakistan, Tajikistan, Turkmenistan, Uzbekistan].

**5. *Eulophia graminea*** Lindley, Gen. Sp. Orchid. Pl. 182. 1833.

美冠兰 mei guan lan

*Eulophia decipiens* Kurz; *E. gusukumae* Masamune; *E. inconspicua* Griffith; *E. ramosa* Hayata (1911), not Ridley (1885); *E. sinensis* Miquel; *E. ucbii* Malhotra & Balodi; *E. venusta* Schlechter; *Graphorkis decipiens* (Kurz) Kuntze; *G. graminea* (Lindley) Kuntze; *G. inconspicua* (Griffith) Kuntze.

Plants autotrophic, 40–80 cm tall. Pseudobulb borne above ground, erect, ovoid, conic, oblong, or subglobose,  $3$ – $7 \times 2$ – $4$  cm, several noded, sometimes present in large numbers and forming clusters to 20–30 cm in diam. Leaves 3–5, present at or emerging after anthesis, linear to linear-lanceolate,  $13$ – $35 \times 0.7$ – $1$  cm, apex acuminate; petiole-like stalk enclosed in several basal sheaths and forming a pseudostem. Inflorescence racemose or occasionally 1- or 2-branched and paniculate, 40–75 cm, slender, with several scattered sheaths 1.5–3.5 cm; rachis 12–40 cm, laxly 4- to more than 10-flowered; floral bracts linear-lanceolate,  $4$ – $8 \times$  ca. 2 mm, shorter than ovary, apex acuminate. Flowers medium-sized, to ca. 30 mm in diam.; sepals and petals olive-green with dark green venation, lip white with purplish red lamellae; pedicel and ovary 15–20 mm. Dorsal sepal narrowly oblong to oblanceolate,  $11$ – $15 \times 1.5$ – $3$  mm, apex acuminate; lateral sepals similar to dorsal sepal, usually slightly longer and slightly oblique. Petals reflexed above middle, narrowly ovate,  $9$ – $10 \times 2.5$ – $3$  mm, apex shortly acuminate; lip subobovate-oblong,  $9$ – $10 \times 4$ – $5$  mm, spurred at base, 3-lobed at or below middle; lateral lobes small; mid-lobe orbicular,  $4$ – $5 \times 4$ – $5$  mm, apex with an acute mucro; disk with (3 or)5 longitudinal lamellae, extending from base of lip almost to apex of mid-lobe, divided into fimbriate fringes on mid-lobe, white tinged purplish red; spur usually curving forward, cylindrical or slightly clavate, 3–3.5 mm, apex acute to obtuse. Column 4–5 mm, without a column foot. Capsule pendulous, ellipsoid,  $25$ – $30 \times$  ca. 10 mm. Fl. Apr–May, fr. May–Jun.  $2n = 42, 48, 56$ .

Grassy places in open forests, open slopes, disturbed grasslands, forests along sandy beaches, coastal grasslands; 900–2100 m. Anhui, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, Singapore, Sri Lanka, Thailand, Vietnam].

**6. *Eulophia flava*** (Lindley) J. D. Hooker, Fl. Brit. India 6: 7. 1890.

黄花美冠兰 huang hua mei guan lan

*Cyrtopera flava* Lindley, Gen. Sp. Orchid. Pl. 189. 1833; *C. cullenii* Wight; *Cyrtopodium flavum* (Lindley) Benth (1881), not Link & Otto ex Reichenbach (1830); *Eulophia cullenii* (Wight) Blume; *Graphorkis flava* (Lindley) Kuntze; *Lissochilus flavus* (Lindley) Schlechter.

Plants autotrophic, 60–95 cm tall. Pseudobulb borne above ground, erect, pale greenish, subcylindric, 4–5 × 1.5–2 cm, many noded, with a few roots. Leaves usually 2, usually emerging after anthesis, oblong-lanceolate, 25–35 × 4.5–6 cm, papery, tapering at base into a long petiole-like stalk, apex acuminate; petiole-like stalk ca. 16 cm, equitant and forming a pseudostem. Inflorescence usually arising from an upper node of pseudobulb, racemose, 60–95 cm, thick, with several scattered sheaths 4–8 cm; rachis 18–32 cm, laxly more than 10-flowered; floral bracts lanceolate, 15–25 mm, shorter than ovary, apex acute to acuminate. Flowers lemon-yellow with purple or crimson spots inside toward base, large, 40–50 mm in diam., not scented; pedicel and ovary 25–30 mm. Sepals similar, narrowly elliptic-lanceolate, 30–36 × 9–11 mm, apex acute or acuminate; lateral sepals oblique. Petals obovate-elliptic or subobovate, 23–28 × 12–15 mm, apex rounded; lip broadly ovate, 25–30 × 20–25 mm, saccate-spurred at base, 3-lobed; lateral lobes incurved and loosely embracing column, subovate, apex rounded; mid-lobe oblate to subquadrate, 6–11 × 10–13 mm; disk with 3 papillate ridges extending from near base of lip to base of mid-lobe; outer 2 ridges longer and dilated into suborbicular lamellae at middle of disk; spur a broad sac ca. 3 mm, apex rounded. Column 12–15 mm, without a column foot. Fl. Apr–Jun.

Crevices along streamsides, open grassy slopes; below 400 m. SW Guangxi, Hainan, Hong Kong [India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**7. *Eulophia monantha*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 203. 1921.

单花美冠兰 dan hua mei guan lan

Plants autotrophic, 15–22 cm tall. Pseudobulb subterranean, subglobose, 1.5–2 cm in diam., often borne in clusters. Leaves 2, present at anthesis, linear, plicate, ca. 18 × 0.4–0.5 mm, apex acuminate; petiole-like stalk enclosed in basal sheaths. Inflorescence 15–22 cm, slender, with 2 or 3 lanceolate membranous sheaths 1.2–2 cm; rachis 1-flowered; floral bracts 8–12 mm. Flower fragrant, olive-green with brown stripes, medium-sized. Sepals similar, narrowly oblanceolate, ca. 30 × 5 mm, apex obtuse. Petals oblong, ca. 20 × 6 mm, apex obtuse; lip ca. 23 × 10 mm, spurred at base, 3-lobed; lateral lobes small and narrow; mid-lobe obscurely 3-lobed, margin undulate; disk with 7 longitudinal ridges; spur ca. 5 mm. Column ca. 9 mm, without a column foot. Fl. Aug.

• Open places in *Pinus* forests, dry crevices; ca. 2800 m. NW Yunnan.

**8. *Eulophia pulchra*** (Thouars) Lindley, Gen. Sp. Orchid. Pl. 182. 1833.

美花美冠兰 mei hua mei guan lan

Plants autotrophic, 50–70 cm tall. Pseudobulb borne above ground, erect, green, cylindric or ovoid, 8–10 × 1.5–2 cm, 2–5-noded, with several to many, long, fibrous roots. Leaves 2 or 3, present at anthesis, narrowly elliptic to suboblong, 10–25 × 3–7 cm, with 3 main veins raised abaxially, tapering at base into a petiole-like stalk, apex acute to acuminate; petiole-like stalk 8–15 cm, usually enclosed in a basal sheath and forming a pseudostem. Inflorescence arising from an intermediate node of pseudobulb, racemose, 50–70 cm, with a few scattered amplexicaul sheaths below middle; rachis 12–15 cm, laxly more than 10-flowered; floral bracts linear, 6–9 mm, shorter than ovary, apex acuminate. Flowers medium-sized, pale green with dull purple or red spots and blotches, lip white with dull purple or red venation and blotches toward base and on lateral lobes; pedicel and ovary 11–15 mm. Sepals and petals similar, suboblong-lanceolate to elliptic, 10–15 × 3–5 mm, apex acute or acuminate; lateral sepals somewhat oblique. Petals erect, loosely connivent with dorsal sepal and forming a hood; lip usually orbicular, 10–16 × 11–16 mm, spurred at base, and 3-lobed, rarely ovate-elliptic, simple, ca. 14 × 4.5 mm, and without a spur in peloric forms; lateral lobes erect and loosely embracing column, falcate, ovate, apex obtuse-rounded; mid-lobe oblate, to ca. 13 mm wide, apex deeply emarginate; disk with a pair of calli in front of mouth of spur, or ecallose in peloric forms; spur green, subglobose, ca. 3.5 mm, apex rounded. Column ca. 4 mm. Fl. Oct–Dec.  $2n = 32$ .

Forests; 100–400 m. S Taiwan [Cambodia, India, Indonesia, Laos, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, Australia, Madagascar, Mascarene Islands, Pacific islands].

- 1a. Lip 3-lobed, spurred at base; disk with a pair of calli ..... 8a. var. *pulchra*  
 1b. Lip simple, without a spur; disk ecallose ..... 8b. var. *actinomorpha*

**8a. *Eulophia pulchra* var. *pulchra***

美花美冠兰(原变种) mei hua mei guan lan (yuan bian zhong)

*Limodorum pulchrum* Thouars, Hist. Orchid. ad t. 43. 1822; *Eulophia guamensis* Ames; *E. macrostachya* Lindley; *E. silvatica* Schlechter; *E. striata* Rolfe; *Eulophidium pulchrum* (Thouars) Summerhayes; *E. silvaticum* (Schlechter) Summerhayes; *Graphorkis macrostachya* (Lindley) Kuntze; *G. pulchra* (Thouars) Kuntze; *Lissochilus pulcher* (Thouars) H. Perrier (1941), not Schlechter (1915); *Oeocloides pulchra* (Thouars) P. J. Cribb & M. A. Clements.

Lip white with dull purple or red venation and blotches toward base and on lateral lobes. Sepals and petals suboblong-lanceolate, 10–15 × 3–5 mm; lip orbicular, 10–16 × 11–16 mm, spurred at base, 3-lobed; lateral lobes erect and loosely embracing column, falcate, ovate, apex obtuse-rounded; mid-lobe oblate, to ca. 13 mm wide, apex deeply emarginate; disk with a pair of calli in front of mouth of spur; spur green, subglobose, ca. 3.5 mm, apex rounded. Column ca. 4 mm. Fl. Oct–Nov.  $2n = 32$ .

Forests; 100–400 m. S Taiwan [Cambodia, India, Indonesia, Laos, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, Australia, Madagascar, Mascarene Islands, Pacific islands].

**8b. *Eulophia pulchra* var. *actinomorpha*** W. M. Lin, Kuo Huang & T. P. Lin, *Taiwania* 51: 163. 2006.

辐花美冠兰 fu hua mei guan lan

*Eulophia pelorica* D. L. Jones & M. A. Clements.

Flowers not opening widely, lip coloration similar to that of petals. Sepals and petals elliptic, 13–14 × 3.4–4 mm; lip similar to petals, ovate-elliptic, ca. 14 × 4.5 mm, not spurred, simple, ecallose. Column ca. 4.5 mm; rostellum reduced. Fl. Oct–Dec.

Broad-leaved forests; ca. 200 m. S Taiwan [Australia (Queensland)].

This entity was independently described from both Taiwan (Lin et al., loc. cit.) and Australia (Jones & Clements, *Orchadian* 14(8: Sci. Suppl.): ix. 2004). In both cases, the authors acknowledged its similarity to typical *Eulophia pulchra* in vegetative characters, citing the peloric perianth as the only distinguishing feature. Given the broad geographic range of the typical variety, Hsu and Chung (*Taiwania* 54: 82. 2009) noted that the peloric variety is likely to be more widespread than currently known, with the requirement of flowers limiting its positive identification.

**9. *Eulophia herbacea*** Lindley, *Gen. Sp. Orchid. Pl.* 182. 1833.

毛唇美冠兰 mao chun mei guan lan

*Eulophia albiflora* Edgeworth ex Lindley; *E. brachypetala* Lindley; *E. vera* Royle; *Geodorum bicolor* (Roxburgh) Voigt; *Graphorkis bicolor* (Roxburgh) Kuntze; *G. herbacea* (Lindley) A. Lyons; *Limodorum bicolor* Roxburgh.

Plants autotrophic, 25–50 cm tall. Pseudobulb borne above ground, irregularly ovoid, ca. 2 × 1 cm, few noded, with a few slender roots. Leaves 2 or 3, present at anthesis, lanceolate, 15–29 × 2–5.5 cm, tapering at base into a long petiole-like stalk, apex acuminate; petiole-like stalk 6–25 cm, partially enclosed in several basal sheaths and forming a pseudostem to ca. 15 cm. Inflorescence arising from an intermediate node of pseudobulb, racemose, 22–50 cm, slender, with 2 or 3 scattered sheaths 3–8 cm; rachis 8–15 cm, laxly 6–10-flowered; floral bracts linear-lanceolate, 20–33 mm, usually slightly exceeding ovary, apex acuminate. Flowers medium-sized to large, 30–52 mm in diam.; sepals pale green to greenish yellow, petals and lip white flushed yellowish green at base; pedicel and ovary 20–28 mm. Sepals similar, linear-lanceolate or narrowly oblong, 22–28 × 4–5 mm, apex acuminate; lateral sepals slightly oblique. Petals obovate-oblong, 17–20 × 6–7 mm, apex obtuse; lip ovate-oblong, 17–20 × 7–10 mm, spurred at base, 3-lobed; lateral lobes incurved and loosely embracing column, subovate, narrow; mid-lobe strongly deflexed, broadly oblong, 7–8 × 5–7 mm, apex truncate-rounded; disk with several parallel rows of tall fimbriae extending to midway along mid-lobe; spur green, saccate-cylindric, 1.5–3 mm, apex rounded. Column ca. 10 mm, without a column foot. Fl. Jun.

Montane grasslands, scrub; below 1500 m. S Guangxi, S Yunnan [Bangladesh, India, Laos, Nepal, Thailand].

**10. *Eulophia bracteosa*** Lindley, *Gen. Sp. Orchid. Pl.* 180. 1833.

长苞美冠兰 chang bao mei guan lan

*Eulophia grandiflora* Lindley; *Graphorkis bracteosa* (Lindley) Kuntze.

Plants autotrophic, 45–80 cm tall. Pseudobulb subterranean, transversely ellipsoid, ca. 1.5 cm in diam., ± covered with membranous sheaths. Leaves 1–3, present at anthesis, lanceolate to narrowly oblong-lanceolate, (25–)45–65 × 2.4–5(–7) cm, papery, base cuneate and contracted into a long petiole-like stalk, apex acuminate; petiole-like stalk 23–40 cm, partially enclosed in several basal sheaths and forming a pseudostem. Inflorescence racemose or very rarely paniculate, 45–80 cm, thick, with several scattered, amplexicaul sheaths 4–8 cm; rachis 8–20 cm, subdensely to densely 8–16-flowered; floral bracts linear-lanceolate, 25–50 × 4–8 mm, exceeding ovary, membranous, apex acuminate. Flowers yellow, medium-sized, 20–25 mm in diam.; pedicel and ovary 20–30 mm. Sepals similar, obovate-elliptic to elliptic, 17–20 × 8–9 mm, apex obtuse and mucronate; lateral sepals usually slightly longer than dorsal sepal. Petals obovate-elliptic, 11–15 × 9–10 mm, membranous, apex rounded; lip obovate-oblong, 11–15 × 7–8 mm, spurred at base, obscurely 3-lobed near apex, apical margin undulate, apex rounded; disk with thickened central veins, with 5 irregularly fimbriate lamellae extending from midway along lip almost to apex of mid-lobe; spur hooked forward, cylindric, ca. 5 mm, apex obtuse. Column 5–6 mm, without a column foot. Fl. Apr–Jul.

Sunny places along valleys, scrubby grasslands; 400–600 m. N Guangdong, NE Guangxi, SE Yunnan [Bangladesh, India, Myanmar].

**11. *Eulophia sooi*** Chun & Tang ex S. C. Chen, *Fl. Reipubl. Popularis Sin.* 18: 412. 1999.

剑叶美冠兰 jian ye mei guan lan

Plants autotrophic, to 100 cm tall. Pseudobulb subterranean, transversely ellipsoid, ca. 4.5 × 2.5 cm. Leaves 1 or 2, present at anthesis, linear-lanceolate to ensiform, ca. 40 × 2 cm, contracted at base into a petiole-like stalk, apex acuminate; petiole-like stalk ca. 50 cm, enclosed in basal sheaths for ca. 2/3 of its length. Inflorescence racemose, to 100 cm, with several sheaths at blackish brown nodes; sheaths amplexicaul, tubular, 4–14 cm; rachis 8–10 cm, laxly 8–10-flowered; floral bracts lanceolate to oblong-lanceolate, 6–7 × ca. 2 mm, shorter than ovary, apex acuminate. Flowers yellow, small to medium-sized, ca. 17 mm in diam.; pedicel and ovary 10–15 mm. Dorsal sepal suboblong, 10–12 × ca. 3.5 mm, apex obtuse; lateral sepals lanceolate-oblong, slightly oblique, 12–13 × ca. 3 mm, apex subacute. Petals subelliptic, 9–11 × 6–7 mm, apex obtuse; lip broadly ovate, ca. 13 × 11 mm, spurred at base, 3-lobed above middle; lateral lobes incurved and loosely embracing column, subelliptic; mid-lobe ovate-oblong, 4–5 × 3–4 mm, apical margin slightly undulate, apex obtuse; disk with 5 thickened ridge-like veins on mid-lobe and with 4 suborbicular lamellae midway along lip; lamellae 2–3 mm, ca. 1 mm tall; spur conic, 2–3 mm. Column ca. 7 mm, margin narrowly winged, with a column foot ca. 1 mm. Fl. Jun–Jul.

• Grassy slopes; 1000–1300 m. W Guangxi, SW Guizhou.

**12. *Eulophia siamensis*** Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 380. 1925.

线叶美冠兰 xian ye mei guan lan

Plants autotrophic, 20–40 cm tall. Pseudobulb subterranean, subcylindric, ca. 4 × 1 cm, with a few fleshy roots. Leaves 3, present at anthesis, linear, 10–20 × 0.4–0.8 cm, tapering at base into a petiole-like stalk, apex acuminate; petiole-like stalk enclosed in basal sheaths and forming a pseudostem ca. 5 cm. Inflorescence racemose, ca. 30 cm, slender, with several scattered tubular sheaths; rachis ca. 12 cm, usually laxly 3-flowered; floral bracts linear-lanceolate, 8–18 × 1.5–3 mm, shorter than ovary, apex acuminate. Flowers purplish red, small to medium-sized, 15–30 mm in diam.; pedicel and ovary 18–22 mm. Sepals similar, linear, 25–30 × 3–4 mm, margin incurved, apex acute; lateral sepals usually slightly longer than dorsal sepal. Petals oblanceolate-oblong, 20–23 × ca. 7 mm, apex rounded or acute; lip obovate-oblong, 20–23 × ca. 10 mm, base cuneate, spurred, margin entire, apical margin undulate, apex slightly retuse; disk with rows of fimbriae; spur slightly arcuate, 7–8 mm. Column ca. 9 mm, without a column foot. Fl. Jun.

Damp forests; ca. 900 m. S Guizhou [Thailand].

**13. *Eulophia spectabilis*** (Dennstedt) Suresh, Regnum Veg. 119: 300. 1988.

紫花美冠兰 zi hua mei guan lan

*Wolfia spectabilis* Dennstedt, Schlüssel Hortus Malab. 38. 1818; *Cyrtopera nuda* (Lindley) H. G. Reichenbach; *Cyrtopodium bicolor* Ridley; *Eulophia bicolor* Dalzell; *E. burkei* Rolfe ex Downie; *E. holochila* Collett & Hemsley; *E. mac-*

*gregorii* Ames; *E. nuda* Lindley; *Phaius steppicola* Handel-Mazzetti; *Semiphajus chevalieri* Gagnepain.

Plants autotrophic, 30–65 cm tall. Pseudobulb subterranean, subglobose, 3–4 cm in diam., with several stout roots. Leaves 2 or 3, present at anthesis, oblong-lanceolate, 20–40 × 2.5–6 cm, contracted at base into a petiole-like stalk, apex acuminate; petiole-like stalk enclosed in several basal sheaths and forming a pseudostem 14–34 cm. Inflorescence racemose, 30–65 cm, stout, with several tubular sheaths below middle; rachis 5–20 cm, laxly 5–9(–15)-flowered; floral bracts lanceolate, 15–20 mm, shorter than ovary, membranous, apex acuminate. Flowers medium-sized, 20–35 mm in diam., purplish red, lip tinged yellow at center; pedicel and ovary 15–25 mm. Dorsal sepal linear or narrowly oblong, 18–25 × 3–6 cm, apex obtuse or acute; lateral sepals similar to dorsal sepal but slightly larger, to 10 mm wide, oblique, adnate at base to column foot. Petals suboblong, 15–17 × 5–9 mm, apex obtuse; lip ovate-oblong, 12–16 × 8–12 mm, spurred at base, obscurely 3-lobed or almost entire, margin ± crisped, apex subtruncate or emarginate; disk with slightly thickened veins or somewhat raised ridges; spur pointing down between divergent halves of broad column foot, broadly conic, 6–9 mm, apex acute. Column 6–8 mm, with a distinct, curved column foot 6–10 mm. Fl. Apr–Jun.  $2n = 54$ .

Mixed forests, grassy slopes; 200–1600 m. S Jiangxi, SE and SW Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; SW Pacific islands].

The full synonymy for this widespread species can be found in S. Thomas, Lindleyana 13: 170–202. 1998.

## 90. GEODORUM Jackson, Bot. Repos. 10: ad t. 626. 1811.

地宝兰属 di bao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

*Cistella* Blume; *Ortmannia* Opiz; *Otandra* Salisbury.

Herbs, terrestrial, medium-sized, leafy. Pseudobulbs subterranean, cormlike or tuberous, usually globose, few noded, borne on a short rhizome and usually forming clusters, with several thick roots at nodes. Leaves arising from basal node of pseudobulb, several, uppermost largest, contracted into a long petiole-like stalk at base, plicate; petiole-like stalk usually equitant and forming a pseudostem, articulate. Inflorescence arising from basal node of pseudobulb, terminal, racemose; peduncle erect at base, curved through 180° and drooping toward apex; rachis pendulous but becoming erect in fruit, short, usually densely several to many flowered and appearing capitate. Flowers medium-sized or small, not opening widely, not resupinate but, because peduncle pendulous at apex, lip positioned lowermost. Sepals and petals similar though petals usually slightly broader, free, not spreading; lip unlobed or obscurely 3-lobed, base usually saccate, without a distinct spur; disk usually with a callus composed of ridges or wartlike projections. Column short, with a short column foot; anther terminal, 1-locular or incompletely 2-locular, with cap; pollinia 2, usually cleft, waxy, attached to a broad stipe and a large viscidium.

About ten species: from tropical Asia, as far north as S Japan (Ryukyu Islands), to Australia and the SW Pacific islands; six species (two endemic) in China.

1a. Inflorescence usually taller than leaves.

- 2a. Flowers white ..... 1. *G. densiflorum*  
2b. Flowers rose-colored ..... 6. *G. eulophioides*

1b. Inflorescence much shorter than or subequal in height to leaves.

- 3a. Flowers rose-colored; lip 3-lobed ..... 5. *G. esquirolei*  
3b. Flowers white; lip unlobed.  
4a. Lip with a 2-lobed wartlike callus near base ..... 4. *G. attenuatum*

4b. Lip with a central callus composed of 2–5 longitudinal fleshy ridges.

5a. Leaves well developed at anthesis, (10–)13–21(–31) cm; lip shallowly concave at base; callus on lip composed of 2 or 3 fleshy ridges ..... 2. *G. recurvum*

5b. Leaves not fully developed at anthesis, 7–11 cm; lip conic-saccate at base; callus on lip composed of 3–5 fleshy ridges ..... 3. *G. pulchellum*

**1. *Geodorum densiflorum*** (Lamarck) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 259. 1919.

地宝兰 di bao lan

*Limodorum densiflorum* Lamarck, Encycl. 3: 516. 1792; *Cistella cernua* (Willdenow) Blume; *Cymbidium pictum* R. Brown; *Dendrobium nutans* C. Presl; *Geodorum formosanum* Rolfe; *G. fucatum* Lindley; *G. nutans* (C. Presl) Ames; *G. pacificum* Rolfe; *G. pictum* (R. Brown) Lindley; *G. purpureum* R. Brown; *G. semicristatum* Lindley; *Malaxis cernua* Willdenow; *Ortmannia cernua* (Willdenow) Opiz; *Otandra cernua* (Willdenow) Salisbury; *Tropidia grandis* Hance.

Plants 30–50 cm tall. Pseudobulbs tuberous, irregularly ellipsoid to triangular-ovoid, borne on a very short rhizome and forming dense clusters, 1.5–2 cm in diam., few noded, usually partially covered in fibrous sheaths. Leaves 2 or 3, well developed at anthesis, lustrous, elliptic, narrowly elliptic, or oblong-lanceolate, 15–35 × (2–)3–9 cm, papery, apex acuminate or acute; petiole-like stalk enclosed in several sheaths and forming a pseudostem to ca. 25 cm. Inflorescence (10–)30–40 cm, usually as tall as or taller than leaves; peduncle with 3–5 widely spaced sheaths; sheaths tubular, 4–6.5 cm, membranous; rachis pendulous, 2.5–6 cm, densely (2–)5–15-flowered; floral bracts linear-lanceolate, 5–9 × ca. 2.5 mm, apex acute to acuminate. Flowers not opening widely, white to pinkish, lip with a central yellow callus and crimson-purple venation and streaks; pedicel and ovary 7–8 mm. Sepals oblong, 10–12 × 3–4 mm, apex acute; lateral sepals somewhat oblique. Petals subobovate-oblong, 10–12 × 4–5 mm, apex acute or mucronate; lip broadly ovate-oblong, 10–11 × 9–10 mm, shallowly saccate at base, unlobed, lateral margins erect, apex subtruncate and slightly emarginate or retuse; disk with a central callus composed of a cluster of irregular, fleshy wartlike projections or a pair of short, fleshy longitudinal ridges. Column 3–5 mm, with a short column foot. Capsule oblong, 3.5–5 × ca. 1.5 cm. Fl. Jun–Jul. *2n* = 36, 52, 54.

Forests, streamsides, grassy slopes; 300–2400 m. Guangdong, Guangxi, Guizhou, Hainan, SW Sichuan, Taiwan, Yunnan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, New Guinea, Sri Lanka, Thailand, Vietnam; Australia].

The recent use of the name *Geodorum terrestre* (Linnaeus) Garay for this species (see Garay, Harvard Pap. Bot. 291: 47. 1997) cannot be justified. The specimen referred to by Garay as the type is *G. citrinum* Jackson, rather than *G. densiflorum* (P. Ormerod, pers. comm.).

**2. *Geodorum recurvum*** (Roxburgh) Alston in H. Trimen, Handb. Fl. Ceylon 6: 276. 1931.

多花地宝兰 duo hua di bao lan

*Limodorum recurvum* Roxburgh, Pl. Coromandel 1: 33. 1795; *Geodorum dilatatum* R. Brown.

Plants 14–28 cm tall. Pseudobulbs tuberous, ovoid, borne

on a short rhizome and sometimes forming clusters, 1.5–2.5 cm in diam., few noded, usually partially covered in fibrous sheaths. Leaves 2 or 3, well developed at anthesis, elliptic-oblong to elliptic, (10–)13–21(–31) × (3–)5–7(–11) cm, apex acute or shortly acuminate; petiole-like stalk enclosed in several sheaths and forming a pseudostem 8–18 cm. Inflorescence (8–)15–18 cm, much shorter than leaves; peduncle with 2 or 3 tubular, membranous sheaths; rachis pendulous, 3–4 cm, densely 10- or more flowered; floral bracts linear-lanceolate, 6–12 mm, membranous, apex acute. Flowers not opening widely, white, lip with purplish streaks and a yellowish callus at center; pedicel and ovary 5–6 mm. Sepals narrowly oblong, 10–12 × 2–2.5 mm, apex acuminate; lateral sepals slightly wider than dorsal sepal. Petals obovate-oblong, 9–11 × ca. 3.5 mm, apex obtuse or acute; lip broadly oblong-ovate, ca. 8 × 5 mm, shallowly concave at base, unlobed, lateral margins erect, apical margins slightly crisped, apex obtuse and usually slightly emarginate; disk with a central callus composed of 2 or 3 fleshy, crestlike longitudinal ridges extending from midway along lip almost to apex. Column 3–3.5 mm, with a short column foot. Fl. Apr–Jun.

Forests, thickets, forest margins; 500–900 m. S Guangdong, Hainan, S and SE Yunnan [Cambodia, India, Myanmar, Thailand, Vietnam].

**3. *Geodorum pulchellum*** Ridley, J. Straits Branch Roy. Asiat. Soc. 50: 138. 1908.

美丽地宝兰 mei li di bao lan

Plants 11–20 cm tall. Pseudobulbs tuberous, globose to ovoid, borne on a very short rhizome and forming dense clusters, ca. 1.5 cm in diam., usually partially covered in fibrous sheaths. Leaves 2 or 3, not fully developed at anthesis, broadly ovate-elliptic, 7–11 × 2.5–3 cm in flowering individuals, apex acute; petiole-like stalk enclosed in several sheaths and forming a pseudostem 4–7 cm. Inflorescence 6–13 cm, shorter than or subequal in height to leaves; peduncle with 2 or 3 tubular sheaths ca. 2 cm; rachis pendulous, 1.5–2.5 cm, densely more than 10-flowered; floral bracts linear-lanceolate, 6–7 × 2–3 mm, membranous, apex acute. Flowers not opening widely, white, lip with a yellow disk and purple venation, sweetly scented; pedicel and ovary 6–8 mm. Dorsal sepal oblong-lanceolate, 8–9 × ca. 2 mm, apex obtuse or acute; lateral sepals elliptic-oblong, slightly oblique, 9–10 × ca. 2.5 mm, apex acute and usually slightly twisted. Petals subovate or oblong-ovate, 7–8 × ca. 2.5 mm, apex acuminate and slightly twisted; lip subovate, 6–7 × ca. 4 mm, slightly contracted near middle, conic-saccate at base, unlobed, apical margin slightly crisped, apex obtuse-rounded; disk with a central callus composed of 3–5 longitudinal, fleshy and irregular crestlike ridges. Column 3–3.5 mm, with a short column foot. Fl. Apr–May.

Rocky substrates near rivers, grasslands; 400–1400 m. NW and SE Yunnan [Thailand, Vietnam].

**4. *Geodorum attenuatum*** Griffith, *Calcutta J. Nat. Hist.* 5: 358. 1844.

大花地宝兰 da hua di bao lan

*Geodorum cochinchinense* Gagnepain; *G. laoticum* Guillaumin; *G. regnieri* Gagnepain.

Plants 15–30 cm tall. Pseudobulbs tuberous, subellipsoid, 2–3 × 1–1.5 cm. Leaves 3 or 4, well developed at anthesis, oblanceolate-oblong, 9–22 × 2.5–4.2 cm, apex acuminate; petiole-like stalk enclosed in several sheaths and forming a pseudostem 4–9 cm. Inflorescence arising from base of pseudobulb, 6–12 cm, much shorter than leaves; peduncle with 2 or 3 tubular sheaths; rachis pendulous, very short, densely 2–4-flowered; floral bracts lanceolate, 8–12 mm, membranous, apex acute. Flowers not opening widely, white, lip yellow above middle; pedicel and ovary 7–9 mm. Sepals oblong or ovate-oblong, 12–15 × 4–6 mm, apex shortly acuminate or subacute; lateral sepals somewhat oblique. Petals ovate-elliptic, 11–13 × 7–8 mm, apex subacute; lip broadly ovate, 12–14 × ca. 6 mm, concave to shallowly saccate at base, unlobed, lateral margins erect, apex truncate and sometimes emarginate; disk with a brown, 2-lobed wartlike callus near base. Column stout, 2.5–3.5 × ca. 2.5 mm, with a short column foot. Fl. May–Jun.

Forest margins; 200–1400 m. Hainan, S Yunnan [Laos, Myanmar, Thailand, Vietnam].

**5. *Geodorum esquirolei*** Schlechter, *Repert. Spec. Nov. Regni Veg.* 17: 69. 1921.

西南地宝兰 xi nan di bao lan

Plants ca. 23 cm tall. Pseudobulbs tuberous, rotund, ca. 1.5 cm in diam. Leaves 2, not fully developed at anthesis, narrowly elliptic, ca. 20 × 4 cm, sheathing at base, apex acuminate. Inflorescence erect, shorter than or subequal in height to leaves; pe-

duncle with 3 scattered sheaths; rachis pendent, short, densely 7–10-flowered; floral bracts lanceolate, lower ones slightly exceeding flowers, upper ones shorter, apex acuminate. Flowers rose-colored; pedicel and ovary cylindrical, ca. 8 mm. Sepals oblong, ca. 15 mm, shortly or long acuminate; lateral sepals oblique. Petals ovate, oblique, ca. 14 mm, wider than sepals, apex apiculate; lip orbicular-ovate, ca. 13 × 8.5 mm, shallowly saccate at base, 3-lobed, apex obtuse or retuse; disk with a callus composed of 3 short, fleshy, longitudinal ridges near base, middle ridge somewhat rugulose toward apex. Column short, ca. 5 mm. Fl. Jun.

• Grasslands; ca. 800 m. Guizhou.

**6. *Geodorum eulophioides*** Schlechter, *Repert. Spec. Nov. Regni Veg.* 17: 70. 1921.

贵州地宝兰 gui zhou di bao lan

Plants ca. 32 cm tall. Pseudobulbs tuberous, irregularly cylindrical, ca. 2 cm in diam. Leaves 2, well developed at anthesis; petiole-like stalk enclosed in several sheaths. Inflorescence ca. 32 cm, taller than leaves; peduncle with 2 or 3 tubular sheaths; rachis pendulous, ca. 4.5 cm, densely many flowered; floral bracts narrowly lanceolate, lower ones ca. as long as flowers. Flowers rose-colored; pedicel and ovary ca. 10 mm. Sepals narrowly ligulate-oblong, 13–15 × 2–3 mm, apex apiculate; lateral sepals somewhat longer than dorsal sepal, slightly oblique. Petals suboblong, slightly oblique, 13–15 × 4.5–5 mm, apex apiculate; lip ovate, ca. 12 × 8 mm, concave to shallowly saccate at base, unlobed, margin undulate, apex subtruncate; disk papillate and thickened above middle. Column ca. 4.5 mm. Fl. Dec.

• Along valleys; ca. 600 m. S Guizhou (Luodian).

This species remains imperfectly known.

## 91. CYMBIDIUM Swartz, *Nova Acta Regiae Soc. Sci. Upsal.*, ser. 2, 6: 70. 1799.

兰属 lan shu

Liu Zhongjian (刘仲健), Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb

*Cyperorchis* Blume; *Iridorchis* Blume (1859), not *Iridorkis* Thouars (1809); *Jensoa* Rafinesque; *Liuguishania* Z. J. Liu & J. N. Zhang; *Semiphajus* Gagnepain, p.p.; *Wutongshania* Z. J. Liu & J. N. Zhang.

Herbs, epiphytic, lithophytic, or terrestrial, autotrophic or rarely mycotrophic, usually with pseudobulbs. Pseudobulbs ovoid, ellipsoid, or spindle-shaped, rarely absent or stemlike, often enclosed in leaf bases. Leaves several to many, distichous, usually lorate or linear, rarely oblanceolate to narrowly elliptic, often articulate toward base. Inflorescence arising from base of pseudobulb or rarely from axils of leaves, erect to pendulous; rachis several to many flowered, rarely reduced to a solitary flower; floral bracts persistent. Flowers large or medium-sized. Sepals and petals free, subsimilar; lip free or basally fused for 3–6 mm to base of column, usually 3-lobed; lateral lobes erect, often clasping column; mid-lobe often recurved; disk usually with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae sometimes inflated toward apex or broken in middle. Column rather long, often slightly arcuate, often narrowly winged; pollinia 2 and deeply cleft, or 4 and in 2 unequal pairs, waxy, commonly attached by a very short or indistinct caudicle to a usually broad viscidium.

About 55 species: tropical and subtropical Asia, south to Papua New Guinea and Australia; 49 species (19 endemic) in China.

In China, many species of *Cymbidium* have been cultivated as ornamentals for many centuries, and a number of cultivated species that have been selected from wild populations now exhibit extreme variation; this is particularly true of *C. ensifolium*, *C. goeringii*, *C. sinense*, and *C. tortisepalum*. Some of this variability may be the result of hybridization and introgression in the wild. The large number of recently described naturally occurring hybrids in *Cymbidium* can be explained by the rapid increase of disturbed habitats in China, which has allowed previously ecologically isolated but sympatric species to colonize disturbed areas, such as those left after logging or land-use change.

*Cymbidium gongshanense* H. Li & G. H. Feng (*Acta Bot. Yunnan.* 11: 39. 1989) may be a cultivated hybrid.

- 1a. Plants without green leaves at anthesis.
- 2a. Typical roots absent, or if present less than 1 cm ..... 48. *C. macrorhizon*
- 2b. Typical roots present, 8–12 cm.
- 3a. Leaves apparently not produced; flowers not opening widely; sepals, petals, and lip purple-red to yellowish ..... 49. *C. multiradicatum*
- 3b. Leaves emerging after anthesis; flowers opening widely; sepals, petals, and lip greenish to whitish with purplish red markings ..... 47. *C. rhizomatosum*
- 1b. Plants with green leaves at anthesis.
- 4a. Leaves narrowly elliptic or narrowly elliptic-oblongate, contracted into a distinct petiole-like stalk at base.
- 5a. Inflorescence 20–40-flowered; lip unlobed or obscurely 3-lobed, with 2 fleshy calli ..... 9. *C. devonianum*
- 5b. Inflorescence 1–9-flowered; lip distinctly 3-lobed, with 2 lamellae or ridges.
- 6a. Pseudobulbs nearly as long as or slightly longer than wide; lip fused at base to basal margins of column for 2–3 mm; pollinia 2 ..... 28. *C. tigrinum*
- 6b. Pseudobulbs more than 2 × as long as wide; lip not fused at base to basal margins of column; pollinia 4.
- 7a. Pseudobulbs bilaterally flattened, usually tapering toward apex; leaves basally contracted into a petiole-like stalk 3–18 cm; inflorescence usually 2–6-flowered; lateral lobes of lip white with purplish brown markings ..... 45. *C. lancifolium*
- 7b. Pseudobulbs cylindrical, not flattened nor tapering toward apex; leaves basally contracted into a petiole-like stalk 1–2.5 cm; inflorescence usually 1-flowered; lateral lobes of lip purple ..... 46. *C. recurvatum*
- 4b. Leaves lorate or nearly so, usually not contracted into a petiole-like stalk at base (except in *C. baoshanense*, *C. qiubeiense*, and *C. teretipetiolatum*).
- 8a. Lip fused to basal margins of column for 2–10 mm.
- 9a. Inflorescence pendulous, 13–35-flowered.
- 10a. Flowers not pendulous, opening widely, not bell-shaped ..... 25. *C. concinnum*
- 10b. Flowers pendulous, not opening widely, bell-shaped.
- 11a. Flowers cream-yellow to pale yellow-green; leaves 1–1.7(–2) cm wide ..... 26. *C. elegans*
- 11b. Flowers tawny-brown; leaves 0.8–1(–1.2) cm wide ..... 27. *C. cochleare*
- 9b. Inflorescence erect or arching, 1–11(–15)-flowered.
- 12a. Inflorescence arising from leaf axils; leaves usually 10–18, bilobed at apex.
- 13a. Pseudobulb stemlike, continuously elongating, 10–30 cm ..... 24. *C. mastersii*
- 13b. Pseudobulb not stemlike, generally less than 10 cm.
- 14a. Lip with a purple-red V-shaped patch on mid-lobe ..... 23. *C. changningense*
- 14b. Lip without a V-shaped patch on mid-lobe.
- 15a. Inflorescence 1- or rarely 2(or 3)-flowered; petals 55–70 × 13–18 mm ..... 21. *C. eburneum*
- 15b. Inflorescence 2–11(–15)-flowered; petals 46–52 × 8–12 mm ..... 22. *C. maguanense*
- 12b. Inflorescence arising from base of pseudobulb; leaves usually 3–9, unlobed at apex.
- 16a. Sepals and petals white or pinkish, sometimes tinged pale red-brown or cream-yellow.
- 17a. Inflorescence suberect, longer than or nearly as long as leaves; lateral sepals spreading horizontally or nearly so; petals spreading, never clasping column; lip mid-lobe ovate, apex acute ..... 19. *C. insigne*
- 17b. Inflorescence arching to pendulous, usually shorter than leaves; lateral sepals pendulous or downcurved; petals clasping column; lip mid-lobe obovate to nearly obovate, apex obtuse to slightly emarginate ..... 20. *C. wenshanense*
- 16b. Sepals and petals green, olive-green, apple-green, yellowish green, or brown-yellow.
- 18a. Mid-lobe of lip with a large, red to chestnut V-shaped patch; patch densely velvety hairy ..... 17. *C. lowianum*
- 18b. Mid-lobe of lip with or without a V-shaped patch but patch never velvety hairy.
- 19a. Mid-lobe of lip with 2 or 3 rows of long hairs running from middle of mid-lobe to apices of lamellae.
- 20a. Lip without a row of long hairs between 2 lamellae on disk ..... 12. *C. iridioides*
- 20b. Lip with a row of long hairs between 2 lamellae on disk.
- 21a. Flowers 13–14 cm in diam.; sepals and petals with distinct dark red-brown venation and spots; lip 45–60 mm, with dark red-brown marks and 3 rows of suberect hairs 5–6 mm on mid-lobe ..... 10. *C. tracyanum*

- 21b. Flowers 7–8 cm in diam.; sepals and petals usually without red-brown venation, or, if present, indistinct and pale; lip 30–32 mm, without dark red-brown markings, with 3 rows of soft hairs 1–3 mm on mid-lobe ..... 11. *C. gaoligongense*
- 19b. Mid-lobe of lip without rows of long hairs.
- 22a. Column purple-red at apex, with purple-red spots below; mid-lobe of lip yellow with many purple-red striations and irregular dashes ... 13. *C. sichuanicum*
- 22b. Column not tinged purple-red at apex; mid-lobe of lip without markings as above.
- 23a. Sepals and petals green with heavy reddish brown longitudinal stripes and irregular spots ..... 14. *C. erythraeum*
- 23b. Sepals and petals usually without striations and spots, or, if present, inconspicuous and pale red-brown.
- 24a. Leaves somewhat oblanceolate, base contracted into a distinct petiole-like stalk ..... 29. *C. baoshanense*
- 24b. Leaves lorate, not or indistinctly contracted at base.
- 25a. Mid-lobe of lip with a large, V-shaped, chestnut patch not composed of spots or blotches ..... 18. *C. schroederi*
- 25b. Mid-lobe of lip without or with a V-shaped patch composed of spots and blotches.
- 26a. Sepals and petals green, without longitudinal reddish brown veins; mid-lobe of lip with chestnut spots and striations; lateral lobes with chestnut stripes composed of small spots ..... 15. *C. hookerianum*
- 26b. Sepals and petals yellowish green, indistinctly with a few longitudinal reddish brown veins; mid-lobe of lip with a submarginal V-shaped reddish brown patch composed of dense spots and blotches along apical margin; lateral lobes with brown striations ..... 16. *C. wilsonii*
- 8b. Lip not fused to basal margins of column.
- 27a. Pollinia 2, each cleft.
- 28a. Inflorescence erect to suberect, densely 15–50-flowered.
- 29a. Leaves 0.8–1.8 cm wide, midvein usually raised more than 2 lateral veins on abaxial surface; column not auriculate at base ..... 7. *C. floribundum*
- 29b. Leaves 2–3.5 cm wide, midvein not usually raised; column auriculate at base ..... 8. *C. suavissimum*
- 28b. Inflorescence usually arcuate to pendulous, laxly 5–35-flowered.
- 30a. Apices of sepals acute or acuminate, porrect.
- 31a. Dorsal sepal 42–48 mm, whitish or yellowish brownish with purple-brown veins ..... 6. *C. aestivum*
- 31b. Dorsal sepal 14–33 mm, white with a central purple stripe ..... 5. *C. dayanum*
- 30b. Apices of sepals usually obtuse, spreading or pendulous.
- 32a. Sepals 28–33 mm; lip white with 4 purple spots or short streaks on mid-lobe ..... 4. *C. atropurpureum*
- 32b. Sepals and petals 14–23 mm; lip mid-lobe with longitudinal purple stripes, dense spots, or flushed purple.
- 33a. Lip with longitudinal purple stripes on mid-lobe, lateral lobes acute, callus interrupted ..... 1. *C. aloifolium*
- 33b. Lip densely spotted or flushed with purple, lateral lobes obtuse or rounded, callus ridges entire.
- 34a. Leaves 2–4; sepals and petals dark purplish red or blackish purple, with yellow margins ca. 0.8 mm wide; fl. Oct–Nov ..... 3. *C. paucifolium*
- 34b. Leaves 4–6; sepals and petals yellowish to whitish, with a central purplish red or maroon-brown longitudinal stripe 3–4 mm wide; fl. Mar–Apr ..... 2. *C. mannii*
- 27b. Pollinia 4, in 2 pairs.
- 35a. Leaves not articulate toward base.

- 36a. Lip unlobed or obscurely 3-lobed, disk without keels or lamellae ..... 44. *C. teretipetiolatum*
- 36b. Lip distinctly 3-lobed, disk with keels or lamellae.
- 37a. Plants with a many-noded, cylindric, usually shortly branched, subterranean rhizome usually more than ca. 1 cm in diam.; column 6–7 mm ..... 43. *C. nanulum*
- 37b. Plants without a rhizome as above; column more than 10 mm.
- 38a. Pseudobulbs inconspicuous; leaves with translucent veins; floral bracts ca. 1/2 as long as ovary ..... 42. *C. faberi*
- 38b. Pseudobulbs conspicuous, 0.8–2 cm; leaves without translucent veins; floral bracts exceeding ovary.
- 39a. Leaves 3–5, usually 23–38 cm; inflorescence usually 1-flowered; flower thickly textured; sepals 11–13 mm wide ..... 40. *C. serratum*
- 39b. Leaves 5–7(–10), usually 40–65 cm; inflorescence 2–7-flowered; flowers thinly textured; sepals 8–9 mm wide ..... 41. *C. tortisepalum*
- 35b. Leaves articulate toward base.
- 40a. Only terminal pseudobulb with leaves; leaves deciduous in winter ..... 34. *C. defoliatum*
- 40b. Most of pseudobulbs with leaves; leaves persistent in winter.
- 41a. Flowers 2–3 cm in diam.; sepals and petals to 17 mm; lip obscurely 3-lobed ... 35. *C. micranthum*
- 41b. Flowers 4–7 cm in diam.; sepals and petals 17 mm or longer; lip distinctly 3-lobed.
- 42a. Leaves 9–13 or more, strongly distichous-equant and with broad membranous margins 1–3 mm wide at base ..... 30. *C. cyperifolium*
- 42b. Leaves 2–7(–10), base not strongly distichous-equant, lacking broad membranous margins at base.
- 43a. Inflorescence 1- or very rarely 2-flowered; floral bract exceeding ovary ..... 39. *C. goeringii*
- 43b. Inflorescence 3- to many flowered; floral bracts shorter than or nearly as long as ovary.
- 44a. Pseudobulbs inconspicuous; floral bracts nearly as long as ovary; plant flowering twice per year ..... 38. *C. omeiense*
- 44b. Pseudobulbs conspicuous; floral bracts shorter than ovary; plant flowering once per year.
- 45a. Floral bracts at middle part of inflorescence ca. as long as or more than 1/2 length of pedicel and ovary.
- 46a. Leaves usually slightly tinged purplish, base contracted into a long, filiform petiole-like stalk ..... 37. *C. qiubeiense*
- 46b. Leaves not tinged purplish, not contracted at base into a petiole-like stalk ..... 36. *C. kanran*
- 45b. Floral bracts at middle part of inflorescence shorter than 1/2 length of ovary.
- 47a. Leaves dark glossy green, (1.5–)2–3 cm wide, articulate 3.5–7 cm from base; inflorescence 10–20-flowered ..... 32. *C. sinense*
- 47b. Leaves green, 1–1.5(–2.5) cm wide, articulate 2–4 cm from base; inflorescence 3–9(–13)-flowered.
- 48a. Leaves 30–60 cm, margin sometimes serrate toward apex; lip mid-lobe ovate, with a few red spots, margin kinked ..... 31. *C. ensifolium*
- 48b. Leaves 50–200 cm, usually lacking serrations along margin; lip mid-lobe triangular-elliptic, with transverse fine red spots, margin undulate, not kinked ..... 33. *C. haematodes*

**1. *Cymbidium aloifolium*** (Linnaeus) Swartz, Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 73. 1799.

纹瓣兰 wen ban lan

*Epidendrum aloifolium* Linnaeus, Sp. Pl. 2: 953. 1753;  
*Cymbidium pendulum* (Roxburgh) Swartz; *C. simulans* Rolfe;  
*E. pendulum* Roxburgh.

Plants epiphytic, autotrophic. Pseudobulbs ovoid, bilaterally flattened, 3–6(–10) × 2.5–4 cm, usually enclosed in leaf bases. Leaves 4 or 5, lorate, 40–90 × 1.5–4(–6) cm, thickly leathery, articulate 8–16 cm from base, apex obtuse and unequally 2-lobed. Inflorescence arising from within sheaths at base of pseudobulb, pendulous, 20–60 cm; rachis (20–)25–35-flowered; floral bracts 2–5 mm. Flowers slightly fragrant, medi-

um-sized; pedicel and ovary 12–20 mm; sepals and petals pale yellow to cream-yellow, with a broad, central maroon-brown stripe; lip white or cream-colored, with dense, maroon venation on lateral lobes and longitudinal maroon stripes on mid-lobe. Sepals spreading, narrowly oblong to narrowly elliptic, 15–20 × 4–6 mm, apex obtuse. Petals narrowly elliptic, 14–18 × 4–6 mm, apex obtuse to acute; lip subovate, 13–20 mm, not fused to basal margins of column, base slightly saccate, 3-lobed; lateral lobes acute, loosely clasping column and exceeding column and anther; mid-lobe recurved; disk minutely papillate or puberulent, with 2 sigmoid lamellae; lamellae usually broken in middle and inflated toward base and apex. Column slightly arcuate, 10–12 mm; pollinia 2. Capsule oblong-ellipsoid, 35–65 × 20–30 mm. Fl. Apr–May, fr. Aug.  $2n = 40^*$ .

Large branches or tree trunks in open forests and thickets, cliffs along streamsides and valleys, rocks in monsoon forests; 100–1100 m. Guangdong, Guangxi, Guizhou, S and SE Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

**2. *Cymbidium mannii*** H. G. Reichenbach, *Flora* 55: 274. 1872.

硬叶兰 ying ye lan

*Cymbidium bicolor* Lindley subsp. *obtusum* Du Puy & P. J. Cribb; *C. flaccidum* Schlechter.

Plants epiphytic, autotrophic. Pseudobulbs narrowly ovoid, slightly bilaterally flattened, 2.5–5 × 2–3 cm, enclosed in leaf bases. Leaves (4 or) 5–7, lorate, 22–80 × 1–1.8 cm, thickly leathery, apex acute and unequally 2-lobed, sometimes emarginate; basal sheaths with black membranous margins 1–1.5 mm wide. Inflorescence arising from within sheaths at base of pseudobulb, pendulous or arching, 17–28 cm; rachis usually 10–20-flowered; floral bracts subtriangular, 1.5–4.5 mm. Flowers medium-sized, 3–4 cm in diam.; pedicel and ovary 10–15 mm; sepals and petals yellowish to whitish, with a central purplish red or maroon-brown longitudinal stripe 3–4 mm wide; lip white or cream-yellow, spotted, striped, or sometimes heavily tinged purple-red or purple-brown except at base and margins. Sepals spreading, narrowly oblong, 14–20 × 3–5 mm, apex obtuse to acute. Petals narrowly subelliptic, 12–17 × 3–4 mm, apex obtuse to subacute; lip subovate, 12–14 mm, not fused to basal margins of column, base slightly saccate, 3-lobed; lateral lobes shorter than or ca. as long as column and anther; mid-lobe recurved; disk minutely papillate or puberulent, with 2 longitudinal lamellae slightly inflated toward base and apex. Column slightly arcuate, 8–12 mm, base with a very short foot; pollinia 2. Capsule subellipsoid, 35–50 × 25–30 mm. Fl. Mar–Apr, fr. Jul–Aug.

Trees in forests and thickets; 100–1600 m. Guangdong, Guangxi, Guizhou, Hainan, SE and SW Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**3. *Cymbidium paucifolium*** Z. J. Liu & S. C. Chen, *J. Wuhan Bot. Res.* 20: 350. 2002.

少叶硬叶兰 shao ye ying ye lan

Plants epiphytic, autotrophic. Pseudobulbs narrowly ovoid, slightly bilaterally flattened, 7–8 × 4–5 cm, enclosed in leaf

bases when young. Leaves 2–4, deep green, lorate, 33–64 × 3–4.7 cm, rigid, thickly leathery, articulate 7–8 cm from base, apex obtuse and unequally 2-lobed. Inflorescence arising from within sheaths at base of pseudobulb, arching or pendulous, 25–40 cm; rachis 14.5–23 cm, 6–11-flowered; floral bracts triangular, ca. 3 mm. Flowers slightly scented, ca. 4 cm in diam.; pedicel and ovary 22–25 mm; sepals and petals dark purplish red or blackish purple with yellow margins ca. 0.8 mm wide; lip purple-red, with yellowish spots near base, white speckles on lateral lobes and yellow margins on mid-lobe. Sepals spreading, narrowly oblong or narrowly ligulate-elliptic, 20–23 × 5.5–6.5 mm, apex obtuse. Petals narrowly oblong, 18–20 × 4.5–5.5 mm, apex obtuse; lip subovate in outline, 17–20 × 14–15 mm, not fused to basal margins of column, base saccate, 3-lobed; lateral lobes erect, subovate, weakly clasping and exceeding column and anther; mid-lobe recurved, broadly oblong-elliptic, 8–9 × 8–9 mm; disk with 2 cream-white or yellow lamellae. Column slightly arcuate, ca. 12 mm, base with a very short foot; pollinia 2. Fl. Oct–Nov.

• Trees. S Yunnan.

This species is very close to *Cymbidium mannii* in its floral morphology. It has fewer, broader leaves, similar to those of *C. aloifolium*, and is said to flower at a different time. The possibility of a hybrid origin between these species cannot be dismissed.

**4. *Cymbidium atropurpureum*** (Lindley) Rolfe, *Orchid Rev.* 11: 190. 1903.

椰香兰 ye xiang lan

*Cymbidium pendulum* (Roxburgh) Swartz var. *atropurpureum* Lindley, *Gard. Chron.* 1854: 287. 1854; *C. atropurpureum* var. *olivaceum* J. J. Smith; *C. finlaysonianum* Wallich ex Lindley var. *atropurpureum* (Lindley) Veitch; *C. pendulum* var. *purpureum* W. Watson.

Plants epiphytic or rarely lithophytic, autotrophic. Pseudobulb ovoid, often weakly inflated, bilaterally flattened, to 10 × 6 cm, enclosed in persistent leaf bases and ca. 4 scarious cataphylls. Leaves usually 7–9, arching, ligulate, to 50–90(–125) × 1.5–4 cm, leathery, rigid, articulate to a broadly sheathing base to 15–20 cm, apex obtuse and unequally bilobed; shortest leaves reduced to cataphylls with an abscission zone near apex and a short blade. Inflorescence arising from within cataphylls, arching or pendulous, 28–75 cm; peduncle 5–16 cm, covered basally by 6–8 overlapping, cymbiform, acute, spreading sheaths to 7 cm; rachis pendulous, pale green, often flushed with purple, 20–55 cm, (7–)10–33-flowered; floral bracts triangular, 1–4 mm. Flowers usually coconut-scented, 3.5–4.5 cm in diam.; pedicel and ovary 15–26 mm, pale green, often flushed with purple; sepals deep maroon to dull yellow-green, strongly stained maroon; lip white, becoming yellow with age, lateral lobes stained maroon-purple, mid-lobe yellow in front of callus ridges and with maroon blotches; callus ridges bright yellow toward apex, stained maroon below; column deep maroon, sometimes paler at apex, anther cap white or pale yellow. Dorsal sepal spreading, suberect, narrowly ligulate-elliptic, 28–33 × 7–10 mm, margin revolute, apex obtuse; lateral sepals pendulous, similar, falcate, oblique. Petals weakly porrect, narrowly elliptic, 25–30 × 7.5–11 mm, margins sometimes revolute, apex

obtuse or subacute; lip 21–25 × 13–15 mm when flattened, not fused to basal margins of column, 3-lobed, usually broadest across mid-lobe; lateral lobes erect, much shorter than column, apices obtuse and appearing truncate; mid-lobe weakly recurved, broadly ovate to rhombic, 11–13 × 13–14 mm, margin entire, apex obtuse to emarginate; disk minutely papillose to minutely pubescent (hairs longest on tips of lateral lobes), with a callus of 2 sigmoid raised ridges rounded and confluent at their apices and merging gradually with base of mid-lobe. Column arcuate, 16–18 × ca. 3.5 mm, winged; pollinia 2, triangular, 2–2.5 mm, deeply cleft, borne on a broadly triangular viscidium, tapering to acuminate apices. Fl. Mar–May.

Forks of forest trees, occasionally on rocks, evergreen and riverine forests; sea level to 1200 m. Hainan [Indonesia (Borneo, Java, Sumatra), Malaysia, Philippines, S Thailand, S Vietnam].

*Cymbidium atropurpureum* may be a naturalized species in China. The present authors have seen no Chinese specimens in any herbarium; nor have they seen any living plants in the wild, although one of us (Cribb) has seen a photograph by Gloria Siu of a wild plant of *C. atropurpureum* in Hainan. The species was misidentified as *C. bicolor* subsp. *obtusum* (a synonym of *C. mannii* in the present treatment) in S. Y. Ding and J. M. Yin (Ill. Wild Orchids Hainan Island, 36. 2005).

**5. *Cymbidium dayanum*** H. G. Reichenbach, Gard. Chron. 1869: 710. 1869.

冬凤兰 dong feng lan

*Cymbidium alborubens* Makino; *C. dayanum* var. *albiflorum* S. S. Ying; *C. dayanum* var. *austrojaponicum* Tuyama; *C. dayanum* subsp. *leachianum* (H. G. Reichenbach) S. S. Ying; *C. dayanum* var. *leachianum* (H. G. Reichenbach) S. S. Ying; *C. eburneum* Lindley var. *austrojaponicum* (Tuyama) Hiroe; *C. leachianum* H. G. Reichenbach; *C. poilanei* Gagnepain; *C. simonsianum* King & Pantling; *C. sutepense* Rolfe ex Downie.

Plants epiphytic, autotrophic. Pseudobulbs nearly fusiform, ± bilaterally flattened, 2–5 × 1.5–2.5 cm, enclosed in leaf bases. Leaves 4–9, deep green, lorate, 32–60(–110) × 0.7–1.3 cm, papery, usually with 2 lateral veins raised more than midvein abaxially (especially toward base), articulate 7–12 cm from base, apex acuminate. Inflorescence arising from within sheaths at base of pseudobulb, arching or pendulous, 18–35 cm; rachis laxly 5–9-flowered; floral bracts subtriangular, 4–5 mm. Flowers usually not fragrant, 4–5 cm in diam.; pedicel and ovary 10–20 mm, elongating in fruit; sepals and petals white or cream-yellow, with a central maroon stripe extending from base to slightly above middle or occasionally wholly tinged pale purplish red; lip maroon, tinged white at its base and at center of mid-lobe, lateral lobes with dense white stripes. Sepals porrect, narrowly oblong-elliptic, 22–27 × 5–7 mm, apex acute or acuminate. Petals narrowly ovate-oblong, 17–23 × 4–6 mm, apex acute; lip subovate, 15–19 mm, not fused to basal margins of column, 3-lobed; lateral lobes nearly as long as column; mid-lobe recurved, 7–9 mm; disk densely glandular-papillose, with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae continuous with 2 glandular-hairy lines that extend from apices of lamellae to middle of mid-lobe. Column slightly arcuate, 9–10 mm; pollinia 2. Capsule ellipsoid, 40–50 × 20–28 mm. Fl. Aug–Dec, fr. Feb–Apr.  $2n = 40^*$ .

Trees in open forests, cliffs along streamsides; 300–1600 m. S Fujian, Guangdong, Guangxi, Hainan, Taiwan, S Yunnan [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**6. *Cymbidium aestivum*** Z. J. Liu & S. C. Chen, J. Wuhan Bot. Res. 22: 323. 2004.

夏凤兰 xia feng lan

Plants lithophytic, autotrophic. Pseudobulbs subfusiform, slightly bilaterally flattened, 1.5–2.5 × 1.5–2 cm, enclosed in leaf bases. Leaves 4–8, lorate, 32–36 × 0.8–1.6 cm, papery, with midvein raised abaxially, articulate 3–6 cm from base, apex acuminate. Inflorescence lateral, spreading horizontally or arching; rachis laxly 10–13-flowered; floral bracts lanceolate, 10–15 mm. Flowers not scented, 4–6 cm in diam.; pedicel and ovary 25–35 mm; pedicel elongating in fruit; sepals and petals whitish or yellowish heavily tinged pale purple-brown, dorsal sepal with purple-brown veins; lip dark purple with a yellow-green, triangular-lanceolate patch at center. Dorsal sepal porrect, lanceolate or linear-lanceolate, 42–48 × 8–9 mm, apex acuminate or sharply acute; lateral sepals porrect, slightly narrower and oblique. Petals narrowly oblong-lanceolate, 28–32 × 7–8 mm, apex sharply acute; lip ovate-oblong, 27–30 × 10–12 mm, not fused to basal margins of column, 3-lobed below middle; lateral lobes erect, suborbicular, slightly clasping column; mid-lobe recurved, ovate-oblong, 16–18 × 8–11 mm; disk with 2 glandular-pubescent lamellae extending from base of lip to near base of mid-lobe. Column 13–14 mm; pollinia 2. Fl. Jun–Aug.

• Mossy rocks in forests along valleys; 1500–1600 m. S Yunnan (Mengla).

This species is morphologically similar to *Cymbidium dayanum*, differing in its larger flowers more heavily tinged with purple. *Cymbidium dayanum* in Borneo has dark purple flowers. The possibility that it is a polyploid of *C. dayanum*, or a hybrid of it, should be investigated.

**7. *Cymbidium floribundum*** Lindley, Gen. Sp. Orchid. Pl. 162. 1833.

多花兰 duo hua lan

*Cymbidium chawalongense* C. L. Long, H. Li & Z. L. Dao; *C. floribundum* var. *pumilum* (Rolfe) Y. S. Wu & S. C. Chen; *C. illiberale* Hayata; *C. pumilum* Rolfe.

Plants epiphytic, autotrophic. Pseudobulbs subovoid, slightly bilaterally flattened, 2.5–3.5 × 2–3 cm, enclosed in leaf bases and surrounded by several green sheaths. Leaves usually 5 or 6, lorate, 22–50 × 0.8–1.8 cm, papery, with midvein usually raised more than 2 lateral veins abaxially (especially toward base), articulate 2–6 cm from base, apex obtuse or acute. Inflorescence arising from within sheaths at base of pseudobulb, suberect, 16–28(–35) cm; rachis usually densely 10–40-flowered; floral bracts 2–10 mm. Flowers usually not scented, 3–4 cm in diam.; pedicel and ovary 15–30 mm; sepals and petals reddish brown or occasionally greenish yellow, very rarely grayish brown; lip white, mottled purplish red on lateral lobes and mid-lobe. Sepals narrowly oblong, 16–18 × 4–7 mm, apex obtuse. Petals narrowly elliptic, 14–16 × 4–7 mm, apex obtuse; lip subovate in outline, 16–18 mm, not fused to basal margins

of column, 3-lobed; lateral lobes erect; mid-lobe slightly recurved; disk minutely papillate, with 2 longitudinal lamellae nearly convergent at their apices. Column slightly arcuate, 11–14 mm; pollinia 2, deltoid. Capsule suboblong, 3–4 × 1.3–2 cm. Fl. Apr–Aug, fr. Oct–Dec.  $2n = 40^*$ .

Trees in forests or at forest margins, rocks and cliffs along stream-sides or valleys; 100–3300 m. N Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, E Sichuan, Taiwan, Xizang, NW and SE Yunnan, Zhejiang [Vietnam].

**8. *Cymbidium suavisimum*** Sander ex C. H. Curtis, Gard. Chron., ser. 3, 84: 137. 1928.

果香兰 guo xiang lan

Plants lithophytic or terrestrial, autotrophic. Pseudobulbs subovoid, slightly bilaterally flattened, 5–6 × 2–3 cm, enclosed in leaf bases, surrounded by several purple sheaths when young. Leaves 5–7, arching, lorate, 40–70 × 2–3.5 cm, papery, rather soft, articulate 3–6 cm from base, apex acute. Inflorescence arising from base of pseudobulb, usually suberect, 40–50 cm; rachis densely 20–50-flowered; floral bracts small. Flowers sweetly fruit-scented, 3–4 cm in diam.; pedicel and ovary 25–40 mm; sepals and petals usually dull yellowish, flushed reddish brown; lip white with purple-red markings. Sepals similar, subelliptic, 20–25 × 6–8 mm, apex obtuse. Petals oblong-elliptic, ca. 20 × 6 mm, apex obtuse; lip subovate, 16–17 × 10–12 mm, not fused to basal margins of column, 3-lobed; lateral lobes erect; mid-lobe recurved, broadly ovate; disk minutely papillate, with 2 lamellae slightly convergent at their apices. Column slightly arcuate, ca. 14 mm, with 2 small auricles placed laterally at base; pollinia 2. Fl. Jul–Aug.

Open forests; 700–1100 m. SW Guizhou, W Yunnan [Myanmar, N Vietnam].

**9. *Cymbidium devonianum*** Paxton, Paxton's Mag. Bot. 10: 97. 1843.

福兰 fu lan

*Cymbidium rigidum* Z. J. Liu & S. C. Chen.

Plants terrestrial or lithophytic, autotrophic. Pseudobulbs subcylindric, 1.5–2.5 × ca. 1 cm, enclosed in leaf bases. Leaves 2–4, suberect, oblong-oblancheolate, 22–27 × 3.5–4.7 cm, leathery, with a prominent midvein, tapering into a petiole-like stalk at base, apex acute or obtuse; petiole-like stalk slender, 15–23 × 0.4–0.5 cm, channeled, articulate near middle. Inflorescence arising from base of pseudobulb, suberect or slightly arching, 36–50 cm, with several sheaths toward base; rachis 20–30 cm, 20–40-flowered; floral bracts ovate-lanceolate, 4–5 mm. Flowers purplish brown, ca. 3.5 cm in diam.; pedicel and ovary 15–20 mm. Sepals narrowly elliptic to ovate-lanceolate, 20–22 × 6–7 mm, apex acuminate. Petals narrowly elliptic-lanceolate, 16–19 × 5.5–6 mm, apex acuminate; lip slightly recurved, subrhombic or obovate-rhombic, 13–15 × ca. 10 mm, not fused to basal margins of column, unlobed or sometimes obscurely 3-lobed, apical margins slightly crisped; disk with 2 fleshy calli centrally. Column slightly arcuate, 10–12 mm. Fl. Mar–Apr.  $2n = 40$ .

In shade on rocks and trees. SE Yunnan (Pingbian) [Bhutan, India, Nepal, NE Thailand, N Vietnam].

**10. *Cymbidium tracyanum*** L. Castle, J. Hort. Cottage Gard., ser. 3, 21: 513. 1890.

西藏虎头兰 xi zang hu tou lan

*Cyperorchis tracyana* (L. Castle) Schlechter.

Plants epiphytic, autotrophic. Pseudobulbs ellipsoid-ovoid or oblong-ovoid, 5–11 × 2–5 cm, mostly enclosed in leaf bases. Leaves 5–8 or more, lorate, 55–80 × (1.5–)2–3.4 cm, articulate 7–14 cm from base, apex acute. Inflorescence arising from within sheaths at base of pseudobulb, arching or suberect, 65–100 cm or longer; rachis usually more than 10-flowered; floral bracts ovate-triangular, 3–5 mm. Flowers fragrant, 13–14 cm in diam.; pedicel and ovary 30–55 mm; sepals and petals yellowish green to olive-green, with irregular dark red-brown venation and spots; lip pale yellow to cream-yellow with dark red-brown venation on lateral lobes and with vertical dashes and scattered spots of same color on mid-lobe, lamellae cream and red spotted. Sepals narrowly elliptic, (45–)55–70 × 17–20 mm, apex acute; lateral sepals slightly oblique and twisted. Petals falcate, slightly twisted, 45–65 × 7–12 mm, apex acute; lip ovate-elliptic, 45–60 mm, base fused to basal margins of column for 4–5 mm, 3-lobed; lateral lobes erect; mid-lobe recurved, elliptic; disk long ciliate and with reddish brown hairs on veins of lateral lobes, sparsely ciliate on mid-lobe, with 2 central lamellae and with a row of long hairs 5–6 mm between lamellae; lamellae each with a row of long hairs 5–6 mm which extend to middle of mid-lobe. Column arcuate, 35–43 mm, winged, shortly hairy below middle on ventral surface; pollinia 2, deltoid, 3–4 mm. Capsule ellipsoid, 80–90 × 45–50 mm. Fl. Sep–Dec, fr. Feb–Mar.  $2n = 40$ .

Tree trunks and branches in forests, rocks by stream-sides; 1200–1900 m. SW Guizhou, SE Xizang, SE and SW Yunnan [Myanmar, N Thailand, N Vietnam].

**11. *Cymbidium gaoligongense*** Z. J. Liu & J. Yong Zhang, J. Wuhan Bot. Res. 21: 316. 2003.

金蝉兰 jin chan lan

Plants epiphytic, autotrophic. Pseudobulbs ellipsoid-ovoid or narrowly ovoid, 5–10 × 3–5 cm, enclosed in leaf bases. Leaves distinctly distichous at base, 6–11, lorate, 70–90 × 2–3 cm, leathery, articulate 8–11 cm from base, apex acuminate. Inflorescence arising from within sheaths at base of pseudobulb, suberect or arching, 65–100 cm, rather slender, with 8–10 sheaths below middle; sheaths to 15 cm; rachis 30–40 cm, usually 8–10-flowered; floral bracts ovate-triangular, 3–5 mm. Flowers 7–8 cm in diam.; pedicel and ovary green, 15–38 mm; sepals and petals yellow-green or olive-green, sometimes with indistinct pale red-brown venation; lip yellow or sometimes cream-white with irregular yellow dashes and spots. Dorsal sepal narrowly obovate-oblong, 40–60 × 13–16 mm, apex acute; lateral sepals narrowly oblong, oblique, 34–50 × 12–15 mm, apex acute. Petals narrowly oblong, falcate, 37–56 × 6–9 mm, apex acute; lip subelliptic, 30–32 × 17–18 mm, base fused to basal margins of column for ca. 3 mm, 3-lobed; lateral lobes erect, subovate, minutely hairy on veins, margins strongly crisped and golden ciliate; mid-lobe recurved, broadly ovate, 8–10 × 8–10 mm, margin strongly crisped; disk sparsely hairy toward base, with 2 central lamellae bearing long hairs 1–3 mm

and with a third, shorter row of hairs 1–3 mm between lamellae which merges with 2 other rows on mid-lobe. Column 30–38 mm, wings ca. 1.5 mm wide. Fl. Sep–Dec.

• Trees in forests; ca. 1500 m. W Yunnan (Baoshan: Gaoligong Shan).

This taxon is an albinistic form. It may be of hybrid origin or is possibly a form of *Cymbidium tracyanum*. It is somewhat intermediate in its floral and vegetative morphology between *C. tracyanum* and *C. erythraeum*, having the lip shape and callus type of the former and the leaf type, flower size, and petal shape of the latter. The latter is often found as an albinistic form in Gaoligong Shan. Further study is needed to establish the nature of *C. gaoligongense*.

**12. *Cymbidium iridioides*** D. Don, Prodr. Fl. Nepal. 36. 1825.

黄蝉兰 huang chan lan

*Cymbidium giganteum* Wallich ex Lindley, nom. illeg.; *Cyperorchis gigantea* Schlechter, nom. illeg.; *Iridorchis gigantea* Blume, nom. illeg.

Plants epiphytic, autotrophic. Pseudobulbs ellipsoid-ovoid to narrowly ovoid, bilaterally flattened, 4–11 × 2–5 cm, partially enclosed in leaf bases. Leaves 6–10, lorate, 45–70(–90) × (1.6–)2–4 cm, articulate 6–15 cm from base, apex acute. Inflorescence arising from within sheaths at base of pseudobulb, suberect or spreading horizontally, 40–70 cm or longer; rachis 3–17-flowered; floral bracts subtriangular, 2–3 mm. Flowers fragrant, 9–10 cm in diam.; pedicel and ovary 40–45 mm; sepals and petals yellowish green, with 7–9 brownish or reddish brown longitudinal stripes; lip yellowish, with reddish brown stripes on lateral lobes and similarly colored mottling on mid-lobe. Sepals narrowly obovate-oblong, 37–45 × 12–15 mm, apex acute. Petals slightly falcate, narrowly ovate-oblong, 35–46 × 7–9 mm, not twisted, apex acute; lip ovate-triangular, slightly shorter than petals, base fused to basal margins of column for 4–5 mm, 3-lobed; lateral lobes shortly ciliate; mid-lobe strongly recurved, margin erose and undulate; disk sparsely hairy, with 2 central lamellae extending to base of mid-lobe, lamellae thickened and with long hairs from midway along their length to their apices. Column arcuate, 25–29 mm, shortly hairy at base on ventral surface; pollinia 2, subtriangular. Capsule subellipsoid, 60–110 × 30–45 mm. Fl. Aug–Dec, fr. Feb–Apr.  $2n = 40, 80$ .

Trees or rocks in forests or thickets, shaded cliffs; 900–2800 m. SW Guizhou, SW Sichuan, SE Xizang, NW to SE Yunnan [Bhutan, India, Myanmar, Nepal, N Vietnam].

**13. *Cymbidium sichuanicum*** Z. J. Liu & S. C. Chen, Gen. Cymbidium China, 82. 2006.

川西兰 chuan xi lan

Plants epiphytic, autotrophic. Pseudobulbs subellipsoid, 6–10 × 2.8–3.3 cm, enclosed in leaf bases. Leaves 5–8, lorate, (30–)60–110 × 2–2.5 cm, leathery, articulate 10–15 cm from base, apex subacuminate. Inflorescence arising from base of pseudobulb, suberect, 50–70 cm, with 7–9 sheaths toward base; sheaths 2.5–12.5 cm; rachis 10–15-flowered; floral bracts lanceolate, 6–20 mm. Flowers slightly scented, 6–7 cm in diam.; pedicel and ovary 40–55 mm, red-brown; sepals and petals yellow-green, tinged pale purple-red, with 9–11 purple-red longitudinal stripes (stripes on petals usually composed of small spots toward base); lip yellow, tinged red-brown along margins, with purple-red striations and irregular dashes on both lateral lobes and mid-lobe; column purple-red at apex, with purple-red spots below. Sepals narrowly elliptic, 55–59 × 18–20 mm, apex acute; lateral sepals slightly oblique, carinate on outer surface. Petals obovate-oblong, slightly falcate, 52–55 × 17–19 mm, apex acute; lip ovate-orbicular in outline, 43–46 mm, base fused to basal margins of column for 3–4 mm, 3-lobed; lateral lobes white ciliate; mid-lobe recurved, ovate, 17–19 × 21–23 mm, margin undulate; disk sparsely hairy along striations on lateral lobes, white pubescent on mid-lobe, with 2 lamellae extending from near base of lip almost to base of mid-lobe; lamellae white hairy. Column arcuate, 36–39 mm, hairy on ventral surface, narrowly winged. Fl. Feb–Mar.

low-green, tinged pale purple-red, with 9–11 purple-red longitudinal stripes (stripes on petals usually composed of small spots toward base); lip yellow, tinged red-brown along margins, with purple-red striations and irregular dashes on both lateral lobes and mid-lobe; column purple-red at apex, with purple-red spots below. Sepals narrowly elliptic, 55–59 × 18–20 mm, apex acute; lateral sepals slightly oblique, carinate on outer surface. Petals obovate-oblong, slightly falcate, 52–55 × 17–19 mm, apex acute; lip ovate-orbicular in outline, 43–46 mm, base fused to basal margins of column for 3–4 mm, 3-lobed; lateral lobes white ciliate; mid-lobe recurved, ovate, 17–19 × 21–23 mm, margin undulate; disk sparsely hairy along striations on lateral lobes, white pubescent on mid-lobe, with 2 lamellae extending from near base of lip almost to base of mid-lobe; lamellae white hairy. Column arcuate, 36–39 mm, hairy on ventral surface, narrowly winged. Fl. Feb–Mar.

• Trees in forests or rocks at forest margins; 1200–1600 m. NC Sichuan (Maonian, Wenchuan).

**14. *Cymbidium erythraeum*** Lindley, J. Proc. Linn. Soc., Bot. 3: 30. 1858.

长叶兰 chang ye lan

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs ovoid, bilaterally flattened, 2–6 × 1.5–3 cm, enclosed in leaf bases. Leaves distichous, 5–12, deep green tinged purple at base, lorate, 35–90 × 0.7–1.5 cm, articulate 2.5–6.5 cm from base. Inflorescence arising from within sheaths at base of pseudobulb, suberect or arching, 40–75 cm, slender; rachis 23–29 cm, 3–8-flowered; floral bracts subtriangular, 2–4 mm. Flowers fragrant, 6.5–8 cm in diam.; pedicel and ovary 25–43 mm; sepals and petals green with heavy reddish brown longitudinal stripes and irregular spots of same color, or uniformly greenish yellow; lip pale yellow or white with red-brown venation on lateral lobes and a few red-brown spots and a central longitudinal dash on mid-lobe, or white with yellow venation on lateral lobes and scattered yellow spots on mid-lobe. Sepals narrowly oblong-oblong to narrowly obovate-oblong, 34–52 × 7–14 mm, apex acute to obtuse. Petals falcate, ligulate, 33–53 × 4–7 mm, apex acute; lip elliptic-ovate, 24–43 mm, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes erect, subovate, sometimes shortly ciliate; mid-lobe slightly recurved, cordate to ensiform, 8–9 × 10–11 mm, sometimes sparsely shortly hairy; disk densely hairy at apices of lateral lobes, papillate near base and on mid-lobe, with 2 puberulent lamellae extending to base of mid-lobe; lamellae slightly swollen toward apices. Column 23–32 mm, narrowly winged, sparsely hairy toward base; pollinia 2, subtriangular. Capsule fusiform-ellipsoid, 40–50 × 20–30 mm. Fl. Oct–Jan, fr. Mar–May.  $2n = 40, 42$ .

Trees and rocks at forest margins and in forests; 1400–2800 m. C and SW Guizhou, SW Sichuan, SE Xizang, NW, SE, and W Yunnan [Bhutan, India, Myanmar, Nepal, Vietnam].

- 1a. Sepals and petals green, heavily flushed red-brown; lip pale yellow or white with red-brown venation on lateral lobes and red-brown spots on mid-lobe ..... 14a. var. *erythraeum*

- 1b. Sepals and petals uniformly greenish yellow; lip white with yellow venation on lateral lobes and yellow spots on mid-lobe ..... 14b. var. *flavum*

**14a. *Cymbidium erythraeum* var. *erythraeum***

长叶兰(原变种) chang ye lan (yuan bian zhong)

*Cyperorchis longifolia* (D. Don) Schlechter.

Sepals and petals green, heavily flushed red-brown; lip pale yellow or white with red-brown venation on lateral lobes and red-brown spots on mid-lobe, 30–43 cm.

Trees and rocks at forest margins and in forests; 1400–2800 m. C and SW Guizhou, SW Sichuan, SE Xizang, NW and SE Yunnan [Bhutan, India, Myanmar, Nepal].

**14b. *Cymbidium erythraeum* var. *flavum*** (Z. J. Liu & J. Yong Zhang) Z. J. Liu, S. C. Chen & P. J. Cribb, **comb. et stat. nov.**

黄花长叶兰 huang hua chang ye lan

Basionym: *Cymbidium flavum* Z. J. Liu & J. Yong Zhang, *Orchidee* (Hamburg) 53: 94. 2002.

Sepals and petals uniformly greenish yellow; lip white with yellow venation on lateral lobes and yellow spots on mid-lobe, 24–27 mm.

• Trees in evergreen broad-leaved Fagaceae forests; 2400–2800 m. SE and W Yunnan (Gaoligong Shan, Wenshan).

**15. *Cymbidium hookerianum*** H. G. Reichenbach, *Gard. Chron.* 1866: 7. 1866.

虎头兰 hu tou lan

*Cymbidium giganteum* Wallich ex Lindley var. *hookerianum* (H. G. Reichenbach) Bois; *C. grandiflorum* Griffith; *Cyperorchis grandiflora* (Griffith) Schlechter.

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs narrowly ellipsoid to narrowly ovoid, bilaterally flattened, 3–8 × 1.5–3 cm, partially enclosed in leaf bases. Leaves 4–6(–8), lorate, 35–60(–80) × 1.4–2.3 cm, articulate (4–)6–10 cm from base, apex acute. Inflorescence arising from near base of pseudobulb, arching or suberect, 45–60(–70) cm; rachis 7–14-flowered; floral bracts ovate-triangular, 3–4 mm. Flowers slightly fragrant, 11–12 cm in diam.; pedicel and ovary 30–50 mm; sepals and petals apple-green or yellowish green with a few deep red spots or occasionally tinged pale reddish brown at base; lip white or cream-yellow with chestnut spots and striations on lateral lobes and mid-lobe, becoming purplish red following pollination. Sepals suboblong, 50–55 × 15–17 mm, apex acute. Petals narrowly oblong-oblong, 50–55 × 10–13 mm, apex acute; lip subelliptic, 45–50 mm, base fused to basal margins of column for 4–4.5 mm, 3-lobed; lateral lobes erect, ciliate; mid-lobe recurved, margin erose and undulate; disk sparsely minutely papillate or puberulent and densely so toward apices of lateral lobes, with 2 shortly hairy lamellae extending from base of lip to base of mid-lobe. Column arcuate, 33–40 mm, papillate or puberulent near base on ventral surface; pol-

linia 2, subtriangular. Capsule narrowly ellipsoid, 90–110 × ca. 40 mm. Fl. Jan–Apr, fr. Jun–Aug.  $2n = 38^*$ ,  $40^*$ .

Trees in forests, rocks along valleys; 1100–2700 m. S Guangxi, SW Guizhou, SW Sichuan, SE Xizang, Yunnan [Bhutan, NE India, Nepal, N Vietnam].

**16. *Cymbidium wilsonii*** (Rolfe ex E. T. Cook) Rolfe, *Orchid Rev.* 12: 79. Mar 1904 [“*wilsonii*”].

滇南虎头兰 dian nan hu tou lan

*Cymbidium giganteum* Wallich ex Lindley var. *wilsonii* Rolfe ex E. T. Cook, *Garden* (London, 1871–1927) 65: 158. 27 Feb 1904 [“*wilsonii*”]; *Cyperorchis wilsonii* (Rolfe ex E. T. Cook) Schlechter.

Plants epiphytic, autotrophic. Pseudobulbs narrowly ovoid, bilaterally flattened, ca. 6 × 3 cm. Leaves 7, lorate, ca. 90 × 2.5 cm, articulate 6–11 cm from base, apex acute. Inflorescence suberect or arching, 25–70 cm; rachis 5–15-flowered; floral bracts triangular, very small. Flowers slightly fragrant, 9–10 cm in diam.; pedicel and ovary 22–42 mm; sepals and petals green or yellowish green with inconspicuous reddish brown longitudinal venation and more distinct reddish brown speckles along veins; lip cream-yellow with dark reddish brown striations on lateral lobes and with a submarginal V-shaped reddish brown patch composed of dense spots and blotches along apical margin of mid-lobe, becoming purplish red following pollination. Sepals narrowly obovate, 44–57 × 12–19 mm, apex acuminate. Petals narrowly obovate, 40–53 × 7–13 mm, apex acuminate; lip broadly ovate-elliptic, base fused to basal margins of column for 3.5–5 mm, 3-lobed; lateral lobes erect, ciliate; mid-lobe 15–18 mm, margin undulate; disk papillate or puberulent. Column 27–32 mm, broadly winged at apex, sparsely puberulent and papillate near base on ventral surface; pollinia 2, deltoid. Fl. Feb–Apr.

Trees in forests; ca. 2000 m. S Yunnan (Mengzi) [Vietnam].

**17. *Cymbidium lowianum*** (H. G. Reichenbach) H. G. Reichenbach, *Gard. Chron.*, n.s., 11: 332. 1879.

碧玉兰 bi yu lan

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs narrowly ellipsoid, slightly bilaterally flattened, 6–13 × 2–6 cm, enclosed in leaf bases. Leaves 5–7, lorate, 65–80 × 2–3.6 cm, articulate 6–9 cm from base, apex shortly acuminate or subacute. Inflorescence arising from within sheaths at base of pseudobulb, suberect or arching, 60–80 cm; rachis 10–20- or more flowered; floral bracts ovate-triangular, ca. 3 mm. Flowers not scented, 7–11.5 cm in diam.; pedicel and ovary 30–40 mm; sepals and petals apple-green or yellowish green with reddish brown longitudinal venation; lip pale yellow to whitish, mid-lobe with a large V-shaped red to pale chestnut or pale brown patch at apex. Sepals narrowly obovate-oblong, 40–50 × 14–16 mm, apex acute. Petals narrowly obovate-oblong, 40–50 × 8–10 mm, apex acute; lip broadly ovate, 35–40 mm, base fused to basal margins of column for 3–4 mm, 3-lobed; lateral lobes erect, triangular; mid-lobe cordate, ca. 16 × 18 mm, margin erose and slightly undulate; disk velvety hairy toward apices of lateral lobes and at center and base of mid-lobe, V-shaped patch at apex of mid-lobe also composed of dense velvety hairs, with

2 short lamellae near base of lip; lamellae minutely hairy, not extending onto mid-lobe. Column arcuate, 27–30 mm, winged, papillate or puberulent near base; pollinia 2, deltoid.

Trees in forests, cliffs along valleys; 1300–1900 m. SE and SW Yunnan [Myanmar, Thailand, Vietnam].

*Cymbidium lowianum* var. *ailaoense* X. M. Xu (J. S. China Agric. Univ. 26(4): 121. 2005) was described from Yunnan but could not be treated here because no specimens were seen by the present authors.

- 1a. V-shaped blotch on mid-lobe of lip  
red to pale chestnut ..... 17a. var. *lowianum*  
1b. V-shaped blotch on mid-lobe of lip  
pale brown ..... 17b. var. *iansonii*

**17a. *Cymbidium lowianum* var. *lowianum***

碧玉兰(原变种) bi yu lan (yuan bian zhong)

*Cymbidium giganteum* Wallich ex Lindley var. *lowianum* H. G. Reichenbach, Gard. Chron., n.s., 7: 685. 1877; *C. hookerianum* H. G. Reichenbach var. *lowianum* (H. G. Reichenbach) Y. S. Wu & S. C. Chen; *Cyperorchis lowiana* (H. G. Reichenbach) Schlechter.

Flowers 7–9 cm in diam.; lip pale yellow, mid-lobe with a large V-shaped red to pale chestnut blotch at apex. Fl. Apr–May.  $2n = 38, 40, 44$ .

Trees in forests, cliffs along valleys; 1300–1900 m. SE and SW Yunnan [Myanmar, Thailand].

**17b. *Cymbidium lowianum* var. *iansonii* (Rolfe) P. J. Cribb & Du Puy, Kew Bull. 40: 432. 1985 [“*iansonii*”].**

浅斑碧玉兰 qian ban bi yu lan

*Cymbidium ×iansonii* Rolfe, Orchid Rev. 8: 191. 1900; *C. grandiflorum* Griffith var. *kalawense* Colyear; *C. lowianum* var. *kalawense* (Colyear) Govaerts; *C. mandaiantum* Gower.

Flowers 10–11.5 cm in diam.; lip yellowish to whitish, mid-lobe with a large V-shaped pale brown blotch at apex.

Trees in forests; ca. 1900 m. SW Yunnan [Myanmar].

**18. *Cymbidium schroederi* Rolfe, Gard. Chron., ser. 3, 37: 243. 1905.**

薛氏兰 xue shi lan

*Cyperorchis schroederi* (Rolfe) Schlechter.

Plants epiphytic, autotrophic. Pseudobulbs subellipsoid, bilaterally flattened, 13–16 × 4–5 cm. Leaves 6–8, lorate, 55–70 × 2.5–3 cm, articulate 8–9 cm from base, apex acute. Inflorescence arising from base of pseudobulb, suberect or arching, 45–70 cm; rachis 14–25-flowered; floral bracts triangular, 1–3 mm. Flowers not scented, 7–9.5 cm in diam.; pedicel and ovary 25–48 mm; sepals and petals greenish or pale yellow-green with irregular brown striations and spots; lip yellowish to whitish with red-brown striations on lateral lobes and a red-brown, V-shaped patch and a longitudinal line of same color on mid-lobe; column longitudinally striped red-brown on ventral surface. Dorsal sepal narrowly obovate, 45–50 × 13–16 mm,

apex acuminate; lateral sepals falcate, oblong, slightly narrower than dorsal sepal. Petals narrowly obovate, 42–46 × 9–12 mm, apex acuminate; lip subovate, 25–28 mm, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes triangular, ciliate; mid-lobe ovate-cordate or broadly ovate, 13–17 × 13–16 mm, apex obtuse or mucronate; disk puberulent on lateral lobes and at center of mid-lobe, V-shaped patch at apex of mid-lobe composed of dense, short hairs, with 2 lamellae near base of lip; lamellae pubescent, tapering to base of lip. Column 25–30 mm, winged, minutely hairy at base. Fl. Mar–Jun.

Trees in forests; 1000–1600 m. SE Yunnan [N Vietnam].

**19. *Cymbidium insigne* Rolfe, Gard. Chron., ser. 3, 35: 387. 1904.**

美花兰 mei hua lan

*Cyperorchis insignis* (Rolfe) Schlechter.

Plants terrestrial or lithophytic, autotrophic. Pseudobulbs ovoid or narrowly ovoid, slightly bilaterally flattened, 5–9 × 2.5–4 cm, enclosed in leaf bases. Leaves 6–9, lorate, 60–90 × 0.7–1.2 cm, articulate 7.5–10 cm from base, apex acuminate. Inflorescence suberect or arching, 28–90 cm or longer, somewhat robust; rachis 4–9- or more flowered; floral bracts subtriangular, 3–5 mm, though lower ones 11–15 mm. Flowers not scented, 6–7 cm in diam.; pedicel and ovary 30–40 mm; sepals and petals white or pinkish, sometimes with red spots at base; lip white, often with purplish red spots and striations particularly on lateral lobes, and with a central yellow patch on mid-lobe. Sepals elliptic-obovate, concave, 30–35 × 10–14 mm, apex acute; lateral sepals spreading horizontally or nearly so, slightly oblique. Petals spreading, narrowly obovate, 28–30 × 10–12 mm, apex acute; lip subovate, slightly shorter than petals, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes inconspicuously ciliate; mid-lobe slightly recurved, ovate, margin crisped, apex acute; disk minutely papillate, mid-lobe with a densely hairy patch at center, with 3 lamellae; lamellae densely pubescent, lateral lamellae extending from base of lip to base of mid-lobe and inflated at their apices, central one shorter. Column arcuate, 24–28 mm, winged, puberulent at base on ventral surface; pollinia 2, triangular to subsquare. Fl. Nov–Dec.  $2n = 40$ .

Rocky and grassy places in open forests, shaded and mossy cliffs; 1700–1900 m. E Hainan [N Thailand, Vietnam].

**20. *Cymbidium wenshanense* Y. S. Wu & F. Y. Liu, Acta Bot. Yunnan. 12: 291. 1990.**

文山红柱兰 wen shan hong zhu lan

Plants epiphytic, autotrophic. Pseudobulbs ovoid, slightly bilaterally flattened, 3–6 × 1.5–3 cm, enclosed in leaf bases. Leaves distichous, 4–9, lorate, 45–98 × 1.3–2.1 cm, articulate 8–15 cm from base, apex subacuminate. Inflorescence arching or subpendulous, 28–39 cm; peduncle 5–13 cm, with 5 or 6 sheaths; rachis 3–12-flowered; floral bracts deep purple to yellowish, triangular or linear-lanceolate, 7–16 mm. Flowers fragrant, usually not opening very widely; pedicel and ovary 45–60 mm; sepals and petals white, usually slightly tinged pale

purplish red on outer surfaces, petals occasionally with a few purple-red spots at base; lip white or yellowish with dark purple or purplish brown striations and spots, turning reddish brown, lamellae yellow; column purple-red at apex, white tinged pink toward base. Sepals similar, narrowly obovate-elliptic or broadly oblanceolate, slightly concave, 58–80 × 18–30 mm, apex obtuse to acute; lateral sepals pendulous or downcurved, oblique, outer surfaces carinate. Petals incurved and clasping column, subobovate, oblique, 57–65 × 21–33 mm, apex acute; lip broadly obovate, 56–65 × 58–78 mm, base fused to basal margins of column for 2–3 mm, 3-lobed or obscurely 5-lobed above middle, margin white ciliate, lateral lobes erect and embracing column; lateral lobes in plants with a 3-lobed lip obovate, to 20 mm wide; lateral lobes in plants with a 5-lobed lip composed of a small, ovate to linear basal pair of lobes to ca. 5 mm wide, and a larger, subsquare upper pair to 20 mm wide; mid-lobe deflexed, obovate to nearly oblate, 18–25 × 22–30 mm, apex rounded-obtuse and slightly erose to emarginate, ciliate; disk pubescent, with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae conspicuously inflated and converging at apex. Column arcuate, 40–48 mm, narrowly winged, sparsely pubescent on ventral surface; pollinia 2, nearly pear-shaped. Fl. Feb–Mar.

Trees in forests; ca. 1500 m. SE Yunnan (Maguan) [Vietnam].

- 1a. Inflorescence arching, 3–7-flowered; sepals 58–64 × 18–21 mm; lip 3-lobed; column ca. 40 mm ..... 20a. var. *wenshanense*  
 1b. Inflorescence arching or subpendulous, 7–12-flowered; sepals 65–80 × 23–26 mm; lip obscurely 5-lobed; column 42–48 mm ..... 20b. var. *quinquelobum*

**20a. *Cymbidium wenshanense* var. *wenshanense***

文山红柱兰(原变种) wen shan hong zhu lan (yuan bian zhong)

Inflorescence arching, 3–7-flowered. Sepals 58–64 × 18–21 mm. Lip 3-lobed. Column ca. 40 mm.

Trees in forests; ca. 1500 m. SE Yunnan (Maguan) [Vietnam].

**20b. *Cymbidium wenshanense* var. *quinquelobum* (Z. J. Liu & S. C. Chen) Z. J. Liu, S. C. Chen & P. J. Cribb, *comb. et stat. nov.***

五裂红柱兰 wu lie hong zhu lan

Basionym: *Cymbidium quinquelobum* Z. J. Liu & S. C. Chen, *Acta Bot. Yunnan*. 28: 13. 2006.

Inflorescence arching or subpendulous, 7–12-flowered. Sepals 65–80 × 23–26 mm. Lip obscurely 5-lobed. Column 42–48 mm.

- Trees in broad-leaved forests; ca. 1500 m. SE Yunnan (Maguan).

This variety grows in the same region as the typical variety. Its 5-lobed lip is probably an abnormality rather than a typical feature.

**21. *Cymbidium eburneum* Lindley, Edwards's Bot. Reg. 33: ad t. 67. 1847.**

独占春 du zhan chun

Plants epiphytic, autotrophic. Pseudobulbs nearly fusiform or ovoid-globose, bilaterally flattened, 4–8 × 2.5–3.5 cm, enclosed in leaf bases, produced every 2 or 3 years (not annually). Leaves 6–11(–17), lorate, 57–65 × 1.4–2.1 cm, articulate 4–8 cm from base, base distichous-equant and with brown membranous margins 1–1.5 mm wide, apex acute and slightly 2-lobed, sometimes with a minute mucro in sinus. Inflorescence arising from leaf axils, erect or suberect, 25–40 cm; rachis 1- or rarely 2(or 3)-flowered; floral bracts ovate-triangular, 6–7 mm. Flower slightly fragrant, rather large, 8–12 cm in diam.; pedicel and ovary 25–35 mm; sepals and petals white, sometimes slightly tinged pink; lip white with a central yellow patch and sometimes mottled purplish pink on lateral lobes and mid-lobe, lamellae yellow; column white, sometimes tinged pale pink, sometimes with yellow spots at base. Sepals oblong-obovate, 55–70 × 15–20 mm, apex often subobtuse. Petals narrowly obovate, 55–70 × 13–18 mm, apex acute; lip broadly elliptic, slightly shorter than sepals, base fused to basal margins of column for 3–5 mm, 3-lobed; lateral lobes erect, loosely clasping column, not ciliate; mid-lobe slightly recurved, ovate-triangular, margin undulate; disk papillate or puberulent, with a densely hairy patch on basal half of mid-lobe, with 2 converging lamellae extending from base of lip to near base of mid-lobe. Column 35–45 mm, narrowly winged, subglabrous; pollinia 2, subsquare; viscidium with filiform appendages at base. Capsule subellipsoid, 50–70(–100) × 30–40 mm.

Rocks along valleys and in open forests; 800–2000 m. S and SW Guangxi, S and W Hainan, W Yunnan [India, Myanmar, Nepal, Vietnam].

- 1a. Lip white, not mottled purplish pink on lateral lobes and mid-lobe ..... 21a. var. *eburneum*  
 1b. Lip white, mottled purplish pink on lateral lobes and mid-lobe ..... 21b. var. *longzhouense*

**21a. *Cymbidium eburneum* var. *eburneum***

独占春(原变种) du zhan chun (yuan bian zhong)

*Cyperorchis eburnea* (Lindley) Schlechter.

Sepals and petals white, sometimes tinged pink; lip white, occasionally sparsely mottled purplish pink on mid-lobe only. Fl. Feb–May, fr. Aug–Sep.  $2n = 38^*$ , 40.

Rocks along valleys; ca. 2000 m. S Guangxi, S and W Hainan, W Yunnan [India, Myanmar, Nepal].

**21b. *Cymbidium eburneum* var. *longzhouense* Z. J. Liu & S. C. Chen, *Acta Phytotax. Sin.* 44: 179. 2006.**

龙州兰 long zhou lan

Sepals and petals white, usually tinged pink on outer surfaces; lip white, conspicuously mottled purplish pink on lateral lobes and mid-lobe. Fl. Apr.

- Rocks in open forests; ca. 800 m. SW Guangxi.

**22. *Cymbidium maguanense* F. Y. Liu, *Acta Bot. Yunnan*. 18: 412. 1996.**

象牙白 xiang ya bai

Plants epiphytic, autotrophic. Pseudobulbs subcylindric,

4–10 × 2–2.5 cm, enclosed in leaf bases. Leaves 8 or 9, distichous, lorate, 37–76 × 1.2–2.4 cm, base with narrow membranous margins, articulate, apex acuminate and unequally bilobed. Inflorescences 1 or 2, arising from leaf axils, suberect, 20–45 cm; rachis 2–11(–15)-flowered; floral bracts ovate-triangular, 5–6 mm. Flowers fragrant, not opening widely; pedicel and ovary 20–30 mm; sepals and petals white or pinkish, sometimes tinged purplish on outer surfaces; lip white or pinkish, with a suboblong yellow patch at center of mid-lobe; column purplish to pink. Sepals narrowly oblong-elliptic, 48–60 × 15–20 mm, apex acuminate; lateral sepals slightly oblique. Petals narrowly oblong-lanceolate, 46–52 × 8–12 mm, apex acuminate; lip subobovate or obovate-elliptic, 45–52 × 20–32 mm, base fused to basal margins of column for ca. 5 mm, 3-lobed; lateral lobes erect and loosely embracing column; mid-lobe broadly subovate, 12–13 × 14–18 mm, margin crisped; disk densely pubescent on lateral lobes and at center of mid-lobe, with 2 longitudinal lamellae; lamellae inflated and confluent at their apices, forming a subdeltoid callus at base of mid-lobe. Column slightly arcuate, 36–40 mm. Fl. Oct–Dec.

- Trees in forests; 1000–1800 m. SE Yunnan (Maguan, Malipo).

Given that this entity is intermediate in morphology between the sympatric species *Cymbidium eburneum* and *C. mastersii*, it may be of hybrid origin. This possibility needs to be explored.

**23. *Cymbidium changningense*** Z. J. Liu & S. C. Chen, Acta Bot. Yunnan. 27: 378. 2005.

昌宁兰 *chang ning lan*

*Cymbidium lowianum* (H. G. Reichenbach) H. G. Reichenbach var. *changningense* X. M. Xu.

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs narrowly ovoid, 6–8 × 3–4 cm, bilaterally flattened. Leaves 10–13, distichous, lorate, 52–75 × 1.2–1.7 cm, articulate 6–9 cm from base, apex obliquely bilobed. Inflorescence arising from leaf axils, arching, 35–41 cm; peduncle with 3–5 sheaths 4–11 cm; rachis 16–21 cm, 3–7-flowered; floral bracts triangular, 4–6 × 4–5 mm. Flowers scented, 10–11 cm in diam.; pedicel and ovary 45–55 mm, yellowish green; sepals and petals pale green-yellow or cream-yellow, with purplish red venation or occasionally tinged purplish red; lip yellowish white, with minute purplish red spots and dashes at base and a purplish red patch near apical margins of lateral lobes, and with a purplish red, V-shaped patch and a narrow longitudinal line on mid-lobe; column yellowish white, with irregular purplish red spots and dashes on ventral surface. Sepals narrowly elliptic, 65–71 × 18–20 mm, margins slightly recurved, apex acute; lateral sepals slightly falcate. Petals falcate, narrowly oblong, 63–65 × 9–10 mm, apex acute; lip ovate, 50–55 mm, base fused to basal margins of column for ca. 6 mm, 3-lobed; lateral lobes 35–38 × 12–13 mm; mid-lobe subcordate-ovate, 19–20 × 17–19 mm, margin undulate; disk puberulent, with 2 lamellae; lamellae 13–14 mm, densely white pubescent. Column ca. 40 mm, winged. Fl. Feb–Mar.

- Trees at forest margins, shaded rocks; ca. 1700 m. W Yunnan (Changning).

This entity may be of hybrid origin. It is morphologically intermediate between *Cymbidium lowianum* and *C. mastersii*, both of which grow sympatrically in W Yunnan. Its flower color and shape show dis-

tinct similarities to the former, while the smaller flower size and habit are reminiscent of the latter. Further investigation is needed.

X. M. Xu published the name *Cymbidium lowianum* var. *changningense* one month earlier (J. S. China Agric. Univ. 26(3): 120. Jul 2005) than Z. J. Liu and S. C. Chen published *C. changningense* (Aug 2005). The latter authors published the name of a new species, not a new combination, because they made no reference to the varietal name. The two names have the same type (Z. J. Liu 2708).

**24. *Cymbidium mastersii*** Griffith ex Lindley, Edwards's Bot. Reg. 31: ad t. 50. 1845.

大雪兰 *da xue lan*

*Cyperorchis mastersii* (Griffith ex Lindley) Benth.

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs stemlike, usually 10–30 cm, sometimes to 1 m, growing indeterminate, completely enclosed in distichous leaf bases, rooting from basal part, occasionally producing a small plant at base. Leaves several to many, sometimes to 15–17 or more, lorate, 24–75 × 1.1–1.7(–2.5) cm, subleathery, articulate 3–6(–10) cm from base, apex unequally 2-lobed, with a mucro in sinus. Inflorescences 1 or 2, arising from leaf axils, suberect, 25–45 cm, 2–5- or more flowered; floral bracts triangular, 2–5 mm. Flowers almond-scented, usually not opening widely, 6–6.5 cm in diam.; pedicel and ovary 40–50 mm; sepals and petals white, tinged pink on outer surfaces; lip white with a central yellow patch at base of mid-lobe, lamellae yellow and occasionally with scattered purplish red spots. Sepals narrowly elliptic or broadly lanceolate-oblong, concave, 45–55(–60) × 10–15(–20) mm, apex acute. Petals broadly linear, 42–50 × 7–10 mm, apex acute; lip oblong-ovate, 40–45 mm, base fused to basal margins of column for 3–4 mm, 3-lobed; lateral lobes erect and loosely clasping column, ca. 8 mm wide; mid-lobe ovate, small, ca. 11 × 11 mm, margin undulate; disk puberulent and with a densely hairy patch at center of mid-lobe, with 2 longitudinal lamellae; lamellae convergent at their apices. Column ca. 35 mm; pollinia 2. Capsule fusiform-ellipsoid, ca. 40 × 25 mm. Fl. Oct–Dec, fr. Feb–Apr. *2n* = 40.

Trees or rocks in forests; 1600–1800 m. S and W Yunnan [Bhutan, India, Myanmar, Thailand, N Vietnam].

**25. *Cymbidium concinnum*** Z. J. Liu & S. C. Chen, Acta Phytotax. Sin. 44: 179. 2006.

丽花兰 *li hua lan*

Plants epiphytic, autotrophic. Pseudobulbs subovoid, bilaterally flattened, 4–8 × 2.5–3.6 cm, enclosed in leaf bases. Leaves 13–18, lorate, 30–75 × 0.9–1.4 cm, leathery, articulate 5–12 cm from base, apex acuminate and unlobed. Inflorescence arising from leaf axils, arching, 40–60 cm; peduncle with several sheaths; rachis laxly 18–22-flowered; floral bracts triangular, 2–3 mm. Flowers scented, opening widely, 5–6 cm in diam.; pedicel and ovary 22–27 mm; sepals and petals cream-yellow with pale purple-red venation composed of many small spots; lip cream-yellow with pale purple-red striations on lateral lobes and a purple-red, V-shaped patch and short longitudinal line of same color on mid-lobe, lamellae yellowish with purple-red spots. Sepals narrowly obovate-oblong, slightly concave, 43–46 × ca. 10 mm, apex acute; lateral sepals slightly oblique. Petals falcate, broadly linear, 42–44 × 7–9 mm, apex acute; lip

elliptic-obovate, 35–38 mm, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes erect and clasping column; mid-lobe subcordate or broadly ovate, 9–11 × 9–11 mm, margin undulate; disk minutely hairy, with 2 lamellae; lamellae extending to near base of mid-lobe, hairy, convergent and sometimes fusing with each other at their apices. Column 30–32 mm, winged, hairy on ventral surface. Fl. Oct–Nov.

- Trees in broad-leaved forests; ca. 2300 m. W Yunnan (Lushui).

Among the present authors, Cribb observes that this taxon is close to *Cymbidium mastersii* and may be of hybrid origin, with *C. mastersii* likely to be one of the parents, possibly with introgression from *C. iridoides* or *C. lowianum*. Artificial hybrids of *C. mastersii* with *C. lowianum* and its allies closely resemble *C. concinnum*. Chen observes that, if *C. concinnum* is of hybrid origin, the parents may be *C. mastersii* and *C. tigrinum*.

**26. *Cymbidium elegans* Lindley, Gen. Sp. Orchid. Pl. 163. 1833.**

莎草兰 suo cao lan

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs subovoid, bilaterally flattened, 4–9 × 2–3 cm, enclosed in persistent leaf bases. Leaves 6–16, distichous, lorate, 45–80 × 1–1.7(–2) cm, articulate 4–10 cm from base, apex acuminate or obtuse and usually slightly 2-lobed. Inflorescence arising from lower part of pseudobulb, usually arching, 40–50 cm; rachis pendulous or nodding, centrifugal or centripetal, densely 18–35-flowered; floral bracts small, 2–3 mm. Flowers slightly fragrant, pendulous, narrowly bell-shaped, not opening widely; pedicel and ovary 12–21 mm; sepals and petals cream-yellow to pale yellowish green, sometimes tinged pale pink; lip cream-yellow to pale yellowish green, occasionally with reddish spots, lamellae bright orange. Sepals narrowly obovate-lanceolate, 34–43 × 7–11 mm, apex acute. Petals broadly linear-ob lanceolate, 30–40 × 5–8 mm, apex obtuse; lip oblanceolate-triangular, 30–40 × 4–8 mm, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes loosely clasping column, not ciliate; mid-lobe small, 6–10 × 5–8 mm, margin slightly undulate, apex slightly bilobed and incurved; disk minutely papillate on lateral lobes and densely pubescent at center of mid-lobe, with 2 longitudinal lamellae extending from base of lip to near base of mid-lobe; lamellae sparsely pubescent, convergent at their apices and with a longitudinal channel between them, sometimes each lamella with a lanceolate appendage 3–5 mm on outside below middle. Column 28–32 mm, puberulent toward base, narrowly winged; pollinia 2, subclavate-obovoid.

Trees in forests, cliffs; 1700–2800 m. SW Sichuan, SE Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, N Vietnam].

- 1a. Lamellae on lip without appendages ..... 26a. var. *elegans*  
 1b. Lamellae on lip each with a lanceolate  
 appendage on outside ..... 26b. var. *lushuiense*

**26a. *Cymbidium elegans* var. *elegans***

莎草兰(原变种) suo cao lan (yuan bian zhong)

*Cymbidium longifolium* D. Don, nom. utique rej.; *Cyperorchis elegans* (Lindley) Blume.

Plants epiphytic. Leaves 6–13. Rachis with 20–35 centrifugal flowers. Lamellae on lip without any appendages. Fl. Oct–Dec.  $2n = 40$ .

Trees in forests, cliffs; 1700–2800 m. SW Sichuan, SE Xizang, Yunnan [Bhutan, India, Myanmar, Nepal].

**26b. *Cymbidium elegans* var. *lushuiense* (Z. J. Liu, S. C. Chen & X. C. Shi) Z. J. Liu & S. C. Chen, Gen. Cymbidium China, 144. 2006.**

泸水兰 lu shui lan

*Cymbidium lushuiense* Z. J. Liu, S. C. Chen & X. C. Shi, Shenzhen Sci. Technol. 139: 200. 2005.

Plants lithophytic. Leaves 8–16. Rachis with 18–26 centripetal flowers. Lamellae on lip each with a lanceolate appendage 3–5 mm on outside below middle. Fl. Dec–Jan.

- Cliffs. SW Yunnan (Lushui).

**27. *Cymbidium cochleare* Lindley, J. Proc. Linn. Soc., Bot. 3: 28. 1858.**

垂花兰 chui hua lan

*Cymbidium babae* (Kudô ex Masamune) Masamune; *C. kanran* Makino var. *babae* (Kudô ex Masamune) S. S. Ying; *Cyperorchis babae* Kudô ex Masamune; *C. cochlearis* (Lindley) Benth.

Plants epiphytic, autotrophic. Pseudobulbs often fusiform, slightly bilaterally flattened, 3–5 × 1–1.5 cm, enclosed in persistent leaf bases. Leaves 9–16(–18), distichous, lorate, 40–60(–100) × 0.8–1(–1.2) cm, articulate 3–5 cm from base, margin slightly revolute, apex acuminate. Inflorescence lateral, pendulous, 50–60 cm; peduncle dark brown, slender, with several widely spaced sheaths 10–12 cm; rachis centrifugal, 13–16(–22)-flowered; floral bracts whitish, ca. 3 mm. Flowers pendulous, bell-shaped, not opening widely; pedicel and ovary 10–18 mm; sepals and petals tawny-brown; lip yellow-green, with dense, small, purple-red spots. Sepals oblanceolate-spatulate, 40–42 × 6–7 mm, apex acute. Petals oblanceolate, 40–42 × 5–6 mm, apex acute; lip obovate, ca. 43 × 26 mm, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes erect and clasping column, triangular, 10–12 mm wide; mid-lobe deflexed, suborbicular, 7–7.5 mm, margin undulate; disk with a dense patch of short hairs at center of mid-lobe, with 2 lamellae; lamellae inflated and white hairy toward apex. Column ca. 35 mm, slender; pollinia 2, deeply cleft. Fl. Nov–Jan.  $2n = 40$ .

Trees in forests; 300–1800 m. Taiwan, SW Yunnan [India, Myanmar, N Vietnam].

**28. *Cymbidium tigrinum* E. C. Parish ex Hooker, Bot. Mag. 90: ad t. 5457. 1864.**

斑舌兰 ban she lan

*Cyperorchis tigrina* (E. C. Parish ex Hooker) Schlechter.

Plants epiphytic or lithophytic, autotrophic. Pseudobulbs subglobose or globose-ovoid, strongly bilaterally compressed, lens-shaped, 3–5 × 3–3.5 cm, naked, with several sheaths at base. Leaves usually 2–4, borne at apex of pseudobulb, narrowly elliptic, 15–20 × ca. 3.5 cm, articulate 1–1.5 cm from base, base contracted into a distinct petiole-like stalk, apex long acuminate. Inflorescence arising from base of pseudobulb,

arching, 10–20 cm; rachis 2–5-flowered; floral bracts triangular, 4–9 mm. Flowers slightly fragrant; pedicel and ovary 20–45 mm; sepals and petals yellowish green, tinged reddish brown and with purplish brown spots near base; lip white tinged purplish brown on lateral lobes and with reddish brown spots and short transverse dashes on mid-lobe, becoming pink following pollination. Sepals narrowly elliptic-lanceolate, 35–40 × 8–12 mm, apex acuminate. Petals narrowly elliptic, 34–38 × 6–10 mm, apex acute; lip subobovate, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes erect, ca. 12 mm wide; mid-lobe recurved, margin undulate; disk minutely papillate, with 2 glabrous longitudinal lamellae extending from base of lip to near base of mid-lobe. Column 25–30 mm; pollinia 2. Fl. Mar–Jul.  $2n = 40$ .

Bare rocks, rocky crevices in open situations; 1500–2700 m. W Yunnan [NE India, Myanmar].

**29. *Cymbidium baoshanense*** F. Y. Liu & H. Perner, *Orchidee* (Hamburg) 52: 61. 2001.

保山兰 bao shan lan

Plants epiphytic, autotrophic. Pseudobulbs ovoid-globose, bilaterally flattened, 3.5–4.5 × 2.5–3 cm, partially enclosed in leaf bases. Leaves 2–7, distichous, somewhat oblanceolate, 20–40 × 2.5–3.2 cm, articulate 3–7 cm from base, base contracted into a distinct petiole-like stalk, apex acuminate and apiculate. Inflorescence arising from base of pseudobulb, suberect or arching, 29–40 cm; peduncle with several long sheaths; rachis 6–9-flowered; floral bracts triangular, ca. 5 mm. Flowers scented, 5–8 cm in diam.; sepals and petals pale green-yellow to pale brown-yellow, sometimes tinged pinkish on outer surfaces; lip white, with a purple-red, submarginal, V-shaped patch and a central line of same color on mid-lobe, lamellae yellowish with many purple-red spots; column yellow, with a few red spots on ventral surface. Sepals lanceolate, concave, 45–58 × 12–15 mm, apex acute. Petals lanceolate, ca. 50 × 8 mm, apex acute; lip broadly subovate, ca. 33 × 25 mm, base fused to basal margins of column for 2–3 mm, 3-lobed; lateral lobes suborbicular, ca. 7 × 7 mm; mid-lobe ovate, ca. 12 × 9 mm; disk with 2 glabrous lamellae extending to base of mid-lobe. Column 29–34 mm. Fl. Mar.

- Forests; 1600–1700 m. SW Yunnan (Longling).

This is a variable taxon. Its pseudobulbs and leaves resemble those of *Cymbidium tigrinum*, and its flowers are intermediate between *C. lowianum* and *C. tigrinum*. Lip patterning is variable, with the apical purple V-shape sometimes being broken up and irregular. It may be a hybrid between the above named species. The artificial hybrid of *C. lowianum* and *C. tigrinum* (registered as *C. 'Lowtiger'*) matches it closely.

**30. *Cymbidium cyperifolium*** Wallich ex Lindley, *Gen. Sp. Orchid. Pl.* 163. 1833.

莎叶兰 suo ye lan

Plants terrestrial or lithophytic, autotrophic. Pseudobulbs produced biennially or annually, small, 1–3 × ca. 1 cm, enclosed in leaf bases. Leaves usually 9–13(–20), lorate, 30–120 × (0.6–)1–1.3 cm, usually distichous-equitant at base, often with membranous margin 1–3 mm wide toward base, articulate 4–5

cm from base, apex acute. Inflorescence arising from near base of pseudobulb, erect, 20–50 cm; peduncle with several sheaths 2–8.5 cm; rachis 3–7-flowered; floral bracts sublanceolate or linear-lanceolate, 14–41 mm, usually exceeding 1/2 length of ovary. Flowers lemon-scented; pedicel and ovary 12–25 mm; sepals and petals usually yellowish green or apple-green, with 5–7 longitudinal red-brown or purple lines; lip yellowish green to pale yellow, with purple striations on lateral lobes and purple spots or patches on mid-lobe. Sepals linear to linear-lanceolate, 20–37 × 4–8 mm, apex acuminate. Petals narrowly ovate, 16–29 × 5–9 mm, apex acuminate; lip ovate or oblong, 14–22 mm, not fused to basal margins of column, slightly 3-lobed; lateral lobes small; mid-lobe strongly recurved, broadly ovate to ovate-elliptic, 9–13 × 8–12 mm, margin sometimes finely crenulate; disk minutely papillate on lateral lobes and toward apex of mid-lobe, with 2 longitudinal lamellae extending from base of lip to near base of mid-lobe; lamellae slightly incurved toward their apices. Column slightly arcuate, 11–16 mm, narrowly winged; pollinia 4, in 2 pairs.

Forests, rocky places, crevices of rocks; 700–1800 m. Guangdong, S Guangxi, Guizhou, Hainan, Sichuan, Yunnan [Bhutan, Cambodia, India, Myanmar, Nepal, Philippines, Thailand, Vietnam].

- 1a. Pseudobulbs produced biennially; leaves distinctly distichous-equitant at base, with broad membranous margins toward base; fl. Oct–Nov ..... 30a. var. *cyperifolium*
- 1b. Pseudobulbs produced annually; leaves weakly distichous-equitant at base, with narrow membranous margins toward base; fl. Feb–Apr ..... 30b. var. *szechuanicum*

**30a. *Cymbidium cyperifolium* var. *cyperifolium***

莎叶兰(原变种) suo ye lan (yuan bian zhong)

*Cymbidium carnosum* Griffith; *C. viridiflorum* Griffith; *Cyperorchis wallichii* Blume.

Pseudobulbs produced biennially. Leaves 9–20, distichous, distinctly distichous-equitant at base, with membranous margins 2–3 mm wide. Fl. Oct–Nov.  $2n = 36, 40, 42$ .

Forests, rocky places, crevices of rocks; 700–1800 m. Guangdong, S Guangxi, SW Guizhou, Hainan, W Sichuan, S and SE Yunnan [Bhutan, Cambodia, India, Myanmar, Nepal, Philippines, Thailand, Vietnam].

**30b. *Cymbidium cyperifolium* var. *szechuanicum*** (Y. S. Wu & S. C. Chen) S. C. Chen & Z. J. Liu, *Acta Phytotax. Sin.* 41: 83. 2003.

送春 song chun

*Cymbidium szechuanicum* Y. S. Wu & S. C. Chen, *Acta Phytotax. Sin.* 11: 33. 1966; *C. faberi* Rolfe var. *szechuanicum* (Y. S. Wu & S. C. Chen) Y. S. Wu & S. C. Chen.

Pseudobulbs produced annually. Leaves 9–13, slightly distichous, slightly distichous-equitant at base, with narrow membranous margins ca. 1 mm wide. Fl. Feb–Apr.

Guizhou, Sichuan, Yunnan [Bhutan].

*Cymbidium ×nujiangense* X. P. Zhou, S. P. Lei & Z. J. Liu (J. S.

China Agric. Univ. 28: 87. 2007) is a hybrid of *C. cyperifolium* var. *szechuanicum* and *C. tortisepalum*.

**31. *Cymbidium ensifolium*** (Linnaeus) Swartz, Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 77. 1799.

建兰 jian lan

*Epidendrum ensifolium* Linnaeus, Sp. Pl. 2: 954. 1753; *Cymbidium arrogans* Hayata; *C. ensifolium* f. *arcuatum* T. K. Yen; *C. ensifolium* f. *falcatum* T. K. Yen; *C. ensifolium* var. *misericors* (Hayata) T. P. Lin; *C. ensifolium* var. *rubrigemmum* (Hayata) T. S. Liu & H. J. Su; *C. ensifolium* var. *striatum* Lindley; *C. ensifolium* var. *susin* T. K. Yen; *C. ensifolium* var. *xiphiifolium* (Lindley) S. S. Ying; *C. ensifolium* var. *yakibaran* (Makino) Y. S. Wu & S. C. Chen; *C. gyokuchin* Makino var. *arrogans* (Hayata) S. S. Ying; *C. kanran* Makino var. *misericors* (Hayata) S. S. Ying; *C. micans* Schauer; *C. misericors* (Hayata) S. S. Ying; *C. prompoenium* Z. J. Liu & J. N. Zhang; *C. rubrigemmum* Hayata; *C. xiphiifolium* Lindley; *C. yakibaran* Makino; *C. yongfuense* Z. J. Liu & J. N. Zhang; *Jensoa ensata* (Thunberg) Rafinesque; *Limodorum ensatum* Thunberg; *Liugui-shania taiwanensis* Z. J. Liu & J. N. Zhang.

Plants terrestrial, autotrophic. Pseudobulbs ovoid, 1.5–2.5 × 1–1.5 cm, enclosed in leaf bases. Leaves 2–4(–6), lorate, 30–60 × 1–1.5(–2.5) cm, articulate 2–4 cm from base, margin sometimes serrate toward apex, apex acute. Inflorescence arising from base of pseudobulb, erect, 20–35 cm or longer, but usually shorter than leaves; rachis 3–9(–13)-flowered; floral bracts 5–8 mm and mostly less than 1/2 length of ovary, though basal bract to 20 mm. Flowers fragrant, variable in color, usually pale yellowish green, spotted with purple, mid-lobe with a few red spots; pedicel and ovary 20–25(–30) mm. Sepals narrowly oblong or narrowly elliptic, 23–28 × 5–8 mm, apex acute; lateral sepals usually oblique. Petals spreading horizontally, narrowly elliptic or narrowly ovate-elliptic, 15–24 × 5–8 mm, apex acute; lip subovate, 15–23 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes erect and loosely clasping column; mid-lobe recurved, ovate, 8–12 × 7–10 mm, margin kinked; disk minutely papillate, with 2 fleshy lamellae; lamellae extending almost to base of mid-lobe, converging in their apical half and forming a short tube. Column slightly arcuate, 10–14 mm, narrowly winged; pollinia 4, in 2 pairs, broadly ovoid. Capsule narrowly ellipsoid, 50–60 × ca. 20 mm. Fl. usually Jun–Oct, fr. Dec–Feb.  $2n = 40^*$ .

Open forests, thickets, grassy places along valleys; 600–1800 m. Anhui, N Fujian, Guangdong, Guangxi, Guizhou, Hainan, W Hubei, Hunan, Jiangxi, SW Sichuan, Taiwan, SE Xizang, SE and W Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

*Cymbidium* × *oblancifolium* Z. J. Liu & S. C. Chen, a natural hybrid of *C. ensifolium* and *C. lancifolium*, was recently described (Forestry Stud. China 3: 23. 2000).

**32. *Cymbidium sinense*** (Jackson ex Andrews) Willdenow, Sp. Pl. 4: 111. 1805.

墨兰 mo lan

*Epidendrum sinense* Jackson ex Andrews, Bot. Repos. 3: ad t. 216. 1802; *Cymbidium albojucundissimum* Hayata; *C.*

*chinense* Heynhold; *C. fragrans* Salisbury; *C. hoosai* Makino; *C. sinense* f. *albojucundissimum* (Hayata) Fukuyama; *C. sinense* var. *albojucundissimum* (Hayata) Masamune; *C. sinense* var. *album* T. K. Yen; *C. sinense* f. *aureomarginatum* T. K. Yen; *C. sinense* var. *autumnale* Y. S. Wu; *C. sinense* var. *bellum* T. K. Yen; *C. sinense* var. *margicoloratum* Hayata; *C. sinense* f. *pallidiflorum* S. S. Ying; *C. sinense* f. *taiwanianum* S. S. Ying; *C. sinense* f. *viridiflorum* T. K. Yen; *Wutongshania guangdongensis* Z. J. Liu & J. N. Zhang.

Plants terrestrial, autotrophic. Pseudobulbs ovoid, 2.5–6 × 1.5–2.5 cm, enclosed in leaf bases. Leaves 3–5, deep green, lorate, 45–110(–200) × (1.5–)2–3 cm, thinly leathery, articulate 3.5–7 cm from base. Inflorescence arising from base of pseudobulb, erect, somewhat robust, (40–)50–90 cm, usually slightly longer than leaves; rachis 10–20- or more flowered; floral bracts 4–8 mm and mostly less than 1/2 length of ovary, though basal bract more than 10 mm. Flowers usually strongly fragrant, variable in color, usually dark purple or purplish brown with a paler lip; pedicel and ovary 20–25 mm. Sepals narrowly oblong or narrowly elliptic, 22–35 × 5–7 mm, apex acute. Petals nearly narrowly ovate, 20–27 × 6–10 mm, apex acute; lip ovate-oblong, 17–25(–30) mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes erect, loosely clasping column; mid-lobe recurved, oblong-ovate, ca. 14 × 10 mm, margin slightly undulate; disk minutely papillate-pubescent, with 2 longitudinal lamellae extending from near base of lip to base of mid-lobe; lamellae converging in their apical half and forming a short tube. Column slightly arcuate, 12–15 mm, narrowly winged; pollinia 4, in 2 pairs, broadly ovoid. Capsule narrowly ellipsoid, 60–70 × 15–20 mm. Fl. (Oct–)Nov–Mar, fr. Dec–May.  $2n = 40$ .

Forests, wet and well-drained shaded places in thickets along streamsides; 300–2000 m. S Anhui, Fujian, Guangdong, Guangxi, SW Guizhou, Hainan, S Jiangxi, SC Sichuan (Emei Shan), Taiwan, Yunnan [India, Japan (Ryukyu Islands), Myanmar, Thailand, Vietnam].

**33. *Cymbidium haematodes*** Lindley, Gen. Sp. Orchid. Pl. 162. 1834.

秋墨兰 qiu mo lan

*Cymbidium ensifolium* (Linnaeus) Swartz subsp. *haematodes* (Lindley) Du Puy & P. J. Cribb; *C. ensifolium* var. *haematodes* (Lindley) Trimen; *C. siamense* Rolfe ex Downie; *C. sinense* (Jackson ex Andrews) Willdenow var. *haematodes* (Lindley) Z. J. Liu & S. C. Chen; *C. sundaicum* Schlechter; *C. sundaicum* var. *estriatum* Schlechter.

Plants terrestrial, autotrophic. Pseudobulbs ca. 3 × 1.5 cm, enclosed in leaf bases. Leaves 2–4(or 5), arching, 50–200 × 0.8–1.7 cm, usually lacking serrations along margin. Inflorescence usually held clear of and longer than leaves; rachis to 9-flowered; floral bracts to 20 mm. Flowers 3.5–4 cm in diam.; sepals and petals straw-yellow to light brown, with a strong central red-brown stripe, and several weaker stripes often only distinct toward base; mid-lobe of lip with transverse fine red spots. Sepals slightly obovate, 19–31 × 6–10 mm, apex sub-acute; lateral sepals pendulous, somewhat oblique. Petals ca. as broad as sepals or slightly narrower; lip not fused to basal margins of column, 3-lobed; lateral lobes narrowly subelliptic;

mid-lobe triangular-elliptic, margin undulate, not kinked, apex rounded or obtuse; disk with 2 incurved ridges between lateral lobes. Column 13–18 mm. Fl. Sep–Oct, fr. Nov–Apr.

Forests; 500–1900 m. Hainan, SW Yunnan [India, Indonesia, Laos, New Guinea, Sri Lanka, Thailand].

**34. *Cymbidium defoliatum*** Y. S. Wu & S. C. Chen, Acta Phytotax. Sin. 29: 549. 1991.

落叶兰 *luo ye lan*

Plants terrestrial, autotrophic. Pseudobulbs very small, often borne in a row and somewhat rhizomelike, with several thickened roots to 5–8 mm in diam. at base. Leaves 2–4, lorate, deciduous in winter (but often not completely deciduous in cultivation), emerging in spring, only terminal pseudobulb with leaves during growing period, (10–)25–40 × 0.5–1 cm, inconspicuously articulate toward base, apex subobtuse. Inflorescence arising from base of pseudobulb, erect, 10–20 cm; rachis 3- or 4-flowered; floral bracts sublinear-lanceolate, mostly 5–6 mm, though basal one to 10 mm. Flowers fragrant, small, 2–3 cm in diam., very variable in color, greenish white, pale green, pale red, pale yellow, or pale purple; pedicel and ovary 13–17 mm. Sepals narrowly oblong, 12–20 × 3–6 mm, usually 5-veined, apex acute; lateral sepals spreading horizontally. Petals loosely clasping column, narrowly ovate, 10–16 × 2.5–5 mm; lip suboblong-ovate, 10–12 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes incurved, small, narrow; mid-lobe recurved, suborbicular, 3–4 × 3–4 mm; disk with 2 longitudinal lamellae extending from near center of lip to base of mid-lobe, ca. 3 mm. Column 7–8 mm; pollinia 4, in 2 pairs. Fl. Jun–Aug.

• N Fujian, Guizhou, Sichuan, Yunnan.

This species is often cultivated in orchid greenhouses. It was reported to be found in Zhejiang, but no specimen has been seen.

**35. *Cymbidium micranthum*** Z. J. Liu & S. C. Chen, J. Wuhan Bot. Res. 22: 500. 2004.

细花兰 *xi hua lan*

Plants terrestrial, autotrophic. Pseudobulbs narrowly ovoid, 1–1.5 × 0.6–0.8 cm, enclosed in leaf bases. Leaves 1–4, suberect, lorate or linear-lanceolate, 7–22 × 0.5–0.8 cm, leathery, articulate toward base, apex acuminate. Inflorescence lateral, suberect, 8–10 cm, slender; peduncle with many sheaths; sheaths greenish, with brownish red venation, 1.5–1.8 cm; rachis slightly zigzag, 2–2.5 cm, 2- or 3-flowered; floral bracts green, with purple-red venation, lanceolate, 4–5 mm. Flowers rather small, 2–3 cm in diam.; pedicel and ovary 10–15 mm, greenish, with purple-red stripes; sepals purple-brown with deeper-colored venation; petals pale yellow-green with purple-red venation; lip yellowish white, mottled with purplish red. Sepals narrowly elliptic-oblong, 15–17 × 3–4 mm, apex acute and incurved; lateral sepals oblique. Petals narrowly elliptic, 13–15 × 6–7 mm, loosely embracing column, apex acute; lip subovate, 13–15 × 11–12 mm, not fused to basal margins of column, obscurely 3-lobed, apical margins slightly crisped, apex obtuse and incurved; disk with 2 fleshy lamellae ca. 6 mm. Column slightly arcuate, 10–12 mm; pollinia 4, in 2 pairs. Fl. Dec.

• Shrubby and rocky slopes; ca. 1500 m. SE Yunnan (Maguan).

This is another species based upon a specimen with apparently underdeveloped flowers, in which the flowers have not opened fully and the lip remains bent around the column apex. Further investigation, including exploring any possible relationship to the sympatric *Cymbidium kanran*, is needed.

**36. *Cymbidium kanran*** Makino, Bot. Mag. (Tokyo) 16: 10. 1902.

寒兰 *han lan*

*Cymbidium kanran* var. *aestivale* Y. S. Wu; *C. kanran* var. *purpureohiemale* (Hayata) S. S. Ying; *C. linearisepalum* Yamamoto; *C. linearisepalum* f. *atropurpureum* Yamamoto; *C. linearisepalum* var. *atropurpureum* (Yamamoto) Masamune; *C. linearisepalum* f. *atrovirens* Yamamoto; *C. linearisepalum* var. *atrovirens* (Yamamoto) Masamune; *C. misericors* Hayata var. *oreophilum* (Hayata) Hayata; *C. nigrovenium* Z. J. Liu & J. N. Zhang; *C. oreophilum* Hayata; *C. purpureohiemale* Hayata; *C. sinokanran* T. K. Yen; *C. sinokanran* var. *atropurpureum* T. K. Yen; *C. tosaense* Masamune.

Plants terrestrial, autotrophic. Pseudobulbs narrowly ovoid, 2–4 × 1–1.5 cm, enclosed in leaf bases. Leaves 3–5(–7), deep green, lorate, 40–70 × 0.9–1.7 cm, thinly leathery, articulate 4–5 cm from base, apical margin often finely toothed. Inflorescence arising from base of pseudobulb, erect, 25–60(–80) cm; rachis laxly 5–12-flowered; floral bracts narrowly lanceolate, mostly 15–26 × 1–2 mm, though basal one to 40 mm. Flowers usually strongly fragrant, variable in color; pedicel and ovary 20–25(–30) mm; sepals and petals pale yellowish green with purplish red striations; lip yellowish, mottled purplish red. Sepals sublinear or linear-lanceolate, 30–50 × 3.5–5(–7) mm, apex acuminate. Petals narrowly ovate or ovate-lanceolate, 20–30 × 5–10 mm; lip subovate, 20–30 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes erect, loosely clasping column; mid-lobe recurved, oblong-ovate, 11–16 × 8–12 mm, margin slightly incised; disk minutely papillate-pubescent, with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae convergent toward apices and forming a short tube. Column slightly arcuate, 10–17 mm, narrowly winged; pollinia 4, in 2 pairs, broadly ovoid. Capsule narrowly ellipsoid, ca. 45 × 18 mm. Fl. Aug–Dec, fr. Feb–Apr.  $2n = 40, 41$ .

Forests, streamsides, shaded places, moist and rocky slopes; 400–2400 m. Anhui, N Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [S Japan, S Korea].

*Cymbidium ×nishiuchianum* Makino ex J. M. H. Shaw (Orchid Rev. 110: 13. 2002) was recently described as a hybrid of *C. goeringii* and *C. kanran*.

**37. *Cymbidium qiubeiense*** K. M. Feng & H. Li, Acta Bot. Yunnan. 2: 334. 1980.

邱北冬蕙兰 *qiu bei dong hui lan*

Plants terrestrial, autotrophic. Pseudobulbs ovoid, small, 1–1.5 × 0.6–0.9 cm, enclosed in green-purplish brown sheaths; Leaves 2 or 3, deep green, tinged dull purple, lorate, 30–80 × 0.5–1 cm, base contracted into a long petiole-like stalk, margin

serrulate, apex acuminate; petiole-like stalk purplish black, hard and filiform, wiry, 10–20 cm, articulate. Inflorescence arising from near base of pseudobulb, erect, purple, 25–30 cm, laxly 5- or 6-flowered; floral bracts purple, lanceolate, 20–25 mm. Flowers fragrant; pedicel and ovary 25–35 mm; sepals and petals green, petals mottled dark purple at base; lip white, tinged red on lateral lobes and tinged green and spotted with purple on mid-lobe. Sepals linear-lanceolate, ca. 25 × 6 mm, 5-veined. Petals narrowly oblong-lanceolate, ca. 22 × 7 mm; lip elliptic-pandurate, ca. 20 × 10 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes erect; mid-lobe recurved, suborbicular, 10–12 mm; disk with 2 longitudinal lamellae extending from base of lip almost to base of mid-lobe. Column slightly arcuate, ca. 13 mm; pollinia 4, in 2 pairs. Fl. Oct–Dec.

- Forests; 700–1800 m. SW Guizhou, SE Yunnan.

*Cymbidium* ×*purpuratum* L. J. Chen, L. Q. Li & Z. J. Liu (J. S. China Agric. Univ. 28(2): 84. 2007) is a hybrid of *C. qiubeiense* and *C. kanran*; *C. ×latifolium* L. J. Chen, L. Q. Li & Z. J. Liu (loc. cit.: 85. 2007) is a hybrid of *C. qiubeiense* and *C. lancifolium*; and *C. ×uniflorum* L. J. Chen, L. Q. Li & Z. J. Liu (loc. cit.: 86. 2007), not T. K. Yen (1964), is a hybrid of *C. qiubeiense* and *C. serratum*.

**38. *Cymbidium omeiense*** Y. S. Wu & S. C. Chen, Acta Phytotax. Sin. 11: 32. 1966.

峨眉春蕙 e mei chun hui

*Cymbidium faberi* Rolfe var. *omeiense* (Y. S. Wu & S. C. Chen) Y. S. Wu & S. C. Chen.

Plants terrestrial, autotrophic. Pseudobulbs indistinct. Leaves 4 or 5, lorate, 15–30(–35) × 0.6–1 cm, subleathery, without transparent veins, not articulate toward base, margin slightly serrulate, apex acuminate. Inflorescence subbasal, slightly arching or curved, 15–17 cm; peduncle with 4–6 sheaths 5–25 mm; rachis laxly 3- or 4-flowered; floral bracts linear-lanceolate, 15–25 × 2–4 mm. Flowers fragrant, appearing twice per year, ca. 5 cm in diam.; pedicel and ovary 15–25 mm; sepals and petals pale yellow-green, sepals with a purplish red midvein in basal half, petals with purplish red spots; lip pale yellow-green with a central narrowly cordate purplish red patch; column yellowish with purplish red stripes on ventral surface. Sepals linear-lanceolate, 25–30 × 3–5 mm, apex acuminate. Petals rhombic-lanceolate, oblique, 16–18 × 3–4 mm, apex acuminate; lip ovate, ca. 20 mm, not fused to basal margins of column, 3-lobed near middle; lateral lobes erect, suborbicular; mid-lobe recurved, ovate, ca. 11 × 8 mm; disk minutely papillate, with 2 arcuate, glabrous lamellae. Column ca. 11 mm; pollinia 4, in 2 pairs. Fl. Mar–Apr.

- SC Sichuan (Emei Shan).

On further study, this taxon might well prove to be of hybrid origin, probably with *Cymbidium tortisepalum* being one of its parents.

**39. *Cymbidium goeringii*** (H. G. Reichenbach) H. G. Reichenbach, Ann. Bot. Syst. 3: 547. 1852.

春兰 chun lan

*Maxillaria goeringii* H. G. Reichenbach, Bot. Zeitung (Berlin) 3: 334. 1845; *Cymbidium formosanum* Hayata; *C. formosanum* f. *albiflorum* S. S. Ying; *C. forrestii* Rolfe; *C.*

*goeringii* f. *albiflorum* (S. S. Ying) S. S. Ying; *C. goeringii* var. *formosanum* (Hayata) S. S. Ying; *C. goeringii* var. *papyriflorum* Y. S. Wu; *C. pseudovirens* Schlechter; *C. tentyozanense* Masamune; *C. uniflorum* T. K. Yen (1964), not L. J. Chen, L. Q. Li & Z. J. Liu (2007); *C. virens* H. G. Reichenbach; *C. virescens* Lindley; *C. yunnanense* Schlechter.

Plants terrestrial, autotrophic. Pseudobulbs ovoid, small, 1–2.5 × 1–1.5 cm, enclosed in leaf bases. Leaves 4–7, lorate, 20–40(–60) × 0.5–0.9 cm, articulate toward base, margin usually slightly serrate. Inflorescence arising from near base of pseudobulb, erect, usually 2–5 cm, shorter than leaves; rachis usually 1-flowered; floral bracts 40–50 × 7–10 mm, exceeding ovary, loosely embracing ovary. Flowers scented, variable in color, usually yellowish green with purplish brown venation, sometimes olive-green, membranous; pedicel and ovary 20–40 mm. Sepals suboblong to oblong-obovate, 25–40 × 8–12 mm, apex obtuse to acute. Petals spreading forward or loosely embracing column, obovate-elliptic to oblong-ovate, 17–30 × 8–12 mm; lip subovate, 14–28 mm, obscurely 3-lobed; lateral lobes erect, not fused to basal margins of column; mid-lobe strongly recurved, broadly ovate, 7–10 × 7–10 mm, margin slightly undulate; disk minutely papillate, with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae convergent in apical half and forming a short tube. Column 12–18 mm, broadly winged; pollinia 4, in 2 pairs.

Rocky slopes, forest margins, open places in forests; 300–2200(–3000) m. Anhui, N Fujian, S Gansu, Guangdong, Guangxi, Guizhou, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NW India, Japan, Korea].

**40. *Cymbidium serratum*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 73. 1919.

豆瓣兰 dou ban lan

*Cymbidium formosanum* Hayata var. *gracillimum* (Fukuyama) T. S. Liu & H. J. Su; *C. goeringii* (H. G. Reichenbach) H. G. Reichenbach var. *gracillimum* (Fukuyama) Govaerts; *C. goeringii* var. *serratum* (Schlechter) Y. S. Wu & S. C. Chen; *C. gracillimum* Fukuyama.

Plants terrestrial, autotrophic. Pseudobulbs ovoid, small, 0.8–1.2 × 0.7–1 cm, with thick roots at base. Leaves 3–5, subterminal, lorate, 23–38(–70) × 0.5–0.7 cm, often slightly conduplicate, with translucent veins, not articulate at base, margin usually serrate, apex acuminate. Inflorescence arising from base of pseudobulb, erect, usually 20–30 cm; peduncle with 5 or 6 sheaths; sheaths to 7 cm, with purple-red venation; rachis 1- or very rarely 2-flowered; floral bracts 40–50 mm, much longer than ovary. Flowers not scented, thickly textured; pedicel and ovary 30–35 mm, usually pale purple-red; sepals and petals green, with a purple-red midvein and finer lateral venation; lip white with purple-red markings; column greenish, with minute purple-red spots and striations, tinged purple-red at apex. Sepals narrowly oblong-ovate or suboblong, 36–38 × 11–13 mm, apical margin often incurved, apex subacute. Petals spreading forward and loosely clasping column, suboblong, 20–28 × 9–13 mm, apex obtuse; lip ovate, 20–25 mm, not fused to basal margins of column, 3-lobed; lateral lobes erect; mid-lobe recurved, oblong-ovate, 10–14 × 8–10 mm, apex obtuse; disk with 2 lamellae extending from near base of lip almost to base of mid-

lobe; lamellae convergent at their apices and forming a short tube. Column 12–18 mm, narrowly winged. Fl. Feb–Mar.

• Rocky places, open forests or well-drained and grassy slopes; 1000–3000 m. Guizhou, Hubei, Sichuan, Taiwan, Yunnan.

This species can be distinguished easily from *Cymbidium goeringii* by its narrow and non-articulate leaves, its much longer inflorescence, and its thickly textured and unscented flower with green sepals and petals.

**41. *Cymbidium tortisepalum*** Fukuyama, Bot. Mag. (Tokyo) 48: 304. 1934.

莲瓣兰 *lian ban lan*

Plants terrestrial, autotrophic. Pseudobulbs ellipsoid or ovoid, small, 1–2 × 0.5–1 cm, enclosed in leaf bases, with thick roots 5–10 mm in diam. Leaves 5–7(–10), stiff or flexuous, lorate, (30–)40–65 × 0.4–1.8 cm, thinly leathery, not articulate at base, margin serrulate, apex acute to acuminate. Inflorescence arising from near base of pseudobulb, erect, 20–30 cm; peduncle with several sheaths; rachis (2 or)3–7-flowered; floral bracts linear-lanceolate, usually 25–40 × 6–9 mm, exceeding ovary. Flowers scented, variable in color; pedicel and ovary 24–32 mm; sepals and petals usually pale greenish yellow or whitish; lip pale greenish yellow or whitish, sometimes with purplish red markings. Sepals oblong or oblong-lanceolate, 30–38 × 7–8 mm, apex acute, sometimes slightly twisted. Petals ovate-lanceolate or oblong, 25–30 × 8–9 mm, apex acute; lip ovate to elliptic, 18–20 × 8–10 mm, not fused to basal margins of column, 3-lobed; lateral lobes erect, small; mid-lobe recurved, ovate or broadly ovate, 10–11 × 9–10 mm; disk with 2 longitudinal lamellae extending from base of lip almost to base of mid-lobe. Column 14–15 mm, with purplish striations on ventral surface; pollinia 4, in 2 pairs.

• Open forests, forest margins, grassy slopes, rocky and scrubby slopes; 800–2500 m. Guizhou, Sichuan, Taiwan, Yunnan.

- 1a. Leaves flexuous, arching, 0.4–1.2 cm wide; floral bracts nearly as long as ovary, usually not exceeding ovary ..... 41a. var. *tortisepalum*  
 1b. Leaves stiff, suberect, 1.3–1.8 cm wide; floral bracts exceeding ovary ..... 41b. var. *longibracteatum*

**41a. *Cymbidium tortisepalum* var. *tortisepalum***

莲瓣兰(原变种) *lian ban lan* (*yuan bian zhong*)

*Cymbidium goeringii* (H. G. Reichenbach) H. G. Reichenbach var. *tortisepalum* (Fukuyama) Y. S. Wu & S. C. Chen; *C. lianpan* Tang & F. T. Wang ex Y. S. Wu; *C. longibracteatum* Y. S. Wu & S. C. Chen var. *tortisepalum* (Fukuyama) Y. S. Wu; *C. tortisepalum* f. *albiflorum* S. S. Ying; *C. tortisepalum* var. *viridiflorum* S. S. Ying; *C. tsukengense* C. Chow.

Leaves flexuous, arching, 40–65 × 0.4–1.2 cm. Floral bracts usually 25–35 × 6–7 cm, nearly as long as ovary. Fl. Dec–Mar.

• Grassy slopes, open forests, forest margins; 800–2500 m. W Sichuan, Taiwan, W Yunnan.

**41b. *Cymbidium tortisepalum* var. *longibracteatum*** (Y. S.

Wu & S. C. Chen) S. C. Chen & Z. J. Liu, Acta Phytotax. Sin. 41: 81. 2003.

春剑 *chun jian*

*Cymbidium longibracteatum* Y. S. Wu & S. C. Chen, Acta Phytotax. Sin. 11: 31. 1966; *C. goeringii* var. *longibracteatum* (Y. S. Wu & S. C. Chen) Y. S. Wu & S. C. Chen; *C. longibracteatum* var. *flaccidifolium* Y. S. Wu; *C. longibracteatum* var. *rubisepalum* Y. S. Wu; *C. longibracteatum* var. *tonghaiense* Y. S. Wu.

Leaves stiff, suberect, 50–65 × 1.3–1.8 cm. Floral bracts usually 30–40 × 8–10 mm, exceeding ovary, often embracing ovary. Fl. Jan–Mar.

• Rocky and scrubby slopes; 1000–2000 m. Guizhou, Sichuan, Yunnan.

**42. *Cymbidium faberi*** Rolfe, Bull. Misc. Inform. Kew 1896: 198. 1896.

蕙兰 *hui lan*

*Cymbidium cerinum* Schlechter; *C. faberi* f. *viridiflorum* S. S. Ying; *C. fukienense* T. K. Yen; *C. oiwakense* Hayata; *C. scabroserrulatum* Makino; *Eulophia yunnanensis* Rolfe; *Semiphajus evrardii* Gagnepain.

Plants terrestrial, autotrophic. Pseudobulbs inconspicuous. Leaves 4–8, suberect, 25–80 × 0.7–1.2 cm, with transparent veins, conduplicate at base, not articulate, margin sharply serrate. Inflorescence arising from axil of uppermost leaf, suberect or slightly curved, 35–50(–80) cm; peduncle with many long sheaths; rachis 5–11- or more flowered; floral bracts linear-lanceolate, usually 10–20 × 2–5 mm, ca. 1/2 as long as ovary. Flowers usually very fragrant; pedicel and ovary 20–26 mm; sepals and petals pale yellowish green; lip pale yellowish green with purplish red patches. Sepals sub lanceolate-oblong or narrowly obovate, 25–35 × 6–8 mm, apex acute. Petals oblong-ovate, 22–30 × 7–9 mm, apex acute; lip oblong-ovate, 20–25 mm, not fused to basal margins of column, 3-lobed; lateral lobes erect; mid-lobe strongly recurved, ligulate, 12–16 × 5–10 mm, margin usually crisped; disk papillate or puberulent, with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae convergent toward their apices and forming a short tube. Column slightly arcuate, 12–16 mm, narrowly winged; pollinia 4, in 2 pairs, broadly ovoid. Capsule narrowly subellipsoid, 50–55 × ca. 20 mm. Fl. Mar–May, fr. Jul–Sep.  $2n = 40, 42^*, 43, 44$ .

Damp but well-drained slopes, open shrubby places; 700–3000 m. Anhui, N Fujian, S Gansu, Guangdong, Guangxi, Guizhou, S Henan, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, E Xizang, Yunnan, Zhejiang [N India, Nepal].

**43. *Cymbidium nanulum*** Y. S. Wu & S. C. Chen, Acta Phytotax. Sin. 29: 551. 1991.

珍珠矮 *zhen zhu ai*

Plants terrestrial, autotrophic, with a slightly fleshy subterranean rhizome, lacking pseudobulbs. Rhizome compressed, cylindrical, 5–6 cm or longer, usually more than 1 cm in diam., many noded. Leaves 2 or 3, erect, lorate, 25–30 × 1–1.2 cm,

midvein concave on both surfaces, base enclosed by several purplish sheaths, not articulate, margin denticulate, apex subacute. Inflorescence arising from base of plant, erect, 10–13 cm; rachis laxly 3- or 4-flowered; floral bracts linear or linear-lanceolate, 4–9 mm. Flowers fragrant, 2.5–3.2 cm in diam.; pedicel and ovary 16–20 mm; sepals and petals usually yellowish green with 5 purplish red longitudinal striations; lip yellowish green with purplish red striations on lateral lobes and purplish red markings on mid-lobe. Sepals oblong, 13–16 × 6–7 mm, apex obtuse-rounded and apiculate; lateral sepals spreading horizontally. Petals oblong, 11–14 × 6–7 mm, loosely clasping column, apex obtuse-rounded; lip oblong-ovate, 8–10 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes suberect, small; mid-lobe ovate-elliptic, ca. 3 × 2 mm; disk with 2 longitudinal lamellae; lamellae convergent toward their apices. Column 6–7 mm; pollinia 4, in 2 pairs. Fl. Jun.

• Rocky places in forests. SW Guizhou, Hainan, SE and SW Yunnan.

**44. *Cymbidium teretipetiolatum*** Z. J. Liu & S. C. Chen, *Orchidee* (Hamburg) 53: 338. 2002.

奇瓣红春素 qi ban hong chun su

Plants terrestrial, autotrophic. Pseudobulbs ovoid, 1–1.4 × 0.7–1 cm, 2- or 3-noded, usually borne on a rhizome; rhizome subterranean, 4–5 × 0.4–0.5 mm. Leaves 3–5, lorate, 40–50 × 0.6–0.9 cm, contracted at base into a petiole-like stalk, apex acute; petiole-like stalk not articulate, basally cylindrical-tubular and sometimes equitant to form a pseudostem. Inflorescence arising from base of pseudobulb, 19–21 cm; peduncle with several sheaths 4–5 cm; rachis 2–4-flowered; floral bracts greenish, linear-lanceolate, 25–30 mm. Flowers not scented, 6–7 cm in diam.; pedicel and ovary 30–35 mm; sepals and petals white-green, tinged brownish or pinkish, with green venation; lip similar in color to sepals and petals but somewhat paler and usually with red spots along basal margins of lateral lobes. Sepals oblong-lanceolate or suboblong, 30–40 × 6–7 mm, apex acuminate. Petals similar to sepals though sometimes slightly shorter; lip ovate, 19–21 × 9–10 mm, not fused to basal margins of column, unlobed or obscurely 3-lobed; lateral lobes suborbicular; mid-lobe oblong-ovate, ca. 15 × 6 mm, apex obtuse; disk without keels or lamellae. Column slightly arcuate, greenish, flushed ivory-white at apex, ca. 13 mm; pollinia 4, in 2 pairs. Fl. Jan–Feb.

• Open forests; ca. 1000 m. S Yunnan.

This species may be based on a plant with deformed flowers. The petals of the type appear deformed and the lip is petaloid, lacking the callus ridges that are typical of the species in this group. Its relationship with *Cymbidium tortisepalum* needs further investigation.

**45. *Cymbidium lancifolium*** Hooker, *Exot. Fl.* 1: ad t. 51. 1823.

兔耳兰 tu er lan

*Cymbidium aspidistrifolium* Fukuyama; *C. bambusifolium* Fowlie (1986), not Roxburgh (1832); *C. javanicum* Blume; *C. javanicum* var. *aspidistrifolium* (Fukuyama) F. Maekawa; *C. lancifolium* f. *aspidistrifolium* (Fukuyama) T. P. Lin; *C. lancifolium* var. *aspidistrifolium* (Fukuyama) S. S. Ying; *C. lancifolium* var. *papuanum* (Schlechter) S. S. Ying; *C. lancifolium* var.

*syunitianum* (Fukuyama) S. S. Ying; *C. maclehoseae* S. Y. Hu; *C. nagifolium* Masamune; *C. papuanum* Schlechter; *C. syunitianum* Fukuyama.

Plants lithophytic or terrestrial, autotrophic. Pseudobulbs usually somewhat tufted, cylindrical to narrowly fusiform, usually tapering toward apex, slightly bilaterally flattened, 2–7(–15) × 0.5–1(–1.5) cm, several noded, naked. Leaves 2–4, borne at apex of pseudobulbs, oblanceolate-oblong to narrowly elliptic, 6–17(–25) × 1.9–4(–6) cm, base contracted into a petiole-like stalk, apical margin finely toothed, apex acuminate; petiole-like stalk 3–18 cm, articulate. Inflorescence lateral, arising from an intermediate node of pseudobulb, erect, 8–20 cm or longer; rachis (1 or)2–6-flowered; floral bracts lanceolate, 10–15 mm. Flowers usually not scented, 2–2.5 cm in diam.; pedicel and ovary 20–25 mm; sepals and petals white or pale green, midvein sometimes purplish brown; lip white or pale green with purplish brown markings. Sepals oblanceolate-oblong, 22–27(–30) × 5–7 mm, apex acute. Petals suboblong, 15–23 × 5–7 mm, apex acute; lip ovate-oblong, 15–20 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes erect and loosely clasping column; mid-lobe recurved, broadly ovate, 6–11 × 6–12 mm; disk with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae convergent toward their apices and forming a short tube. Column ca. 15 mm; pollinia 4, in 2 pairs. Capsule narrowly ellipsoid, ca. 50 × 15 mm. Fl. May–Aug, fr. Oct–Dec.  $2n = 38^*$ , 39, 40, 42.

Open forests, bamboo forests, forest margins, broad-leaved forests, humus-rich rocks along valleys; 300–2200 m. N Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Hunan, S Sichuan, Taiwan, SE Xizang, Yunnan, S Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Thailand, Vietnam].

**46. *Cymbidium recurvatum*** Z. J. Liu, S. C. Chen & P. J. Cribb, *sp. nov.*

长茎兔耳兰 chang jing tu er lan

Type: China. Yunnan: Baoshan Shi, Xishan Qu, Ban Tou Po, in thicket, alt. 1700 m, 11 May 2005, Z. J. Liu 3043 (holotype, NOCC).

*Species nova* Cymbidio caulescenti similis, a quo inflorescentia multo brevior uniflora, labello maculis duabus purpureis et lobis lateralibus purpureis praedito differt.

Plants terrestrial, autotrophic. Pseudobulbs usually borne in fascicles of 2 or 3, erect, greenish, stemlike, cylindrical, 18–23 × 0.5–0.7 cm, fleshy, 6–8-noded, with a sheath at each node; sheaths persistent, amplexicaul, lanceolate, 1.8–6.5 cm, membranous. Leaves 2–4, subterminal, elliptic-oblong or obovate-oblong, 6–9 × 1.2–2.4 cm, base contracted into a petiole-like stalk, apical margin serrulate, apex shortly acuminate; petiole-like stalk 1–2.5 cm, articulate. Inflorescence lateral, arising from a node toward apex of pseudobulb, erect, 9–11 cm; peduncle with 3–5 sheaths; sheaths greenish white, lanceolate, 1–1.6 cm, membranous, amplexicaul at base; rachis usually 1-flowered; floral bract lanceolate, 9–11 mm. Pedicel and ovary 20–24 mm; sepals pale green-yellow, midvein purple toward base; petals white, midvein purple and with purple spots; lip

whitish, with purple lateral lobes and 2 or 3 purple patches on mid-lobe; column white with purple markings. Sepals narrowly oblong or oblanceolate-oblong, 23–26 × 2–5 mm, apex acuminate and recurved. Petals ovate-oblong, 21–23 × 6–7 mm, apex acuminate; lip subovate, 17–20 mm, not fused to basal margins of column, 3-lobed; lateral lobes suberect, subovate, loosely embracing column; mid-lobe recurved, subovate, 9–11 × 6–8 mm; disk with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae convergent toward their apices and forming a short tube. Column 10–12 mm; pollinia 4, in 2 pairs. Fl. Aug–Sep.

• Well-drained shrubby slopes; ca. 1700 m. SW Yunnan (Baoshan).

This taxon is characterized by its cylindric, rather long, stemlike pseudobulb and by its subterminal leaves. It has a 1-flowered inflorescence, but this could be atypical. The lip has purple lateral lobes and two or three purple patches on the mid-lobe. It is quite unlike *Cymbidium caulescens* Ridley (the type of which is at K), which has a several-flowered inflorescence and has a non-elongated pseudobulb, the base of which is covered in acute sheaths. Some plants of *C. lancifolium* have elongated pseudobulbs (as illustrated under its synonyms by Mark et al., *Orchid Digest* 13: 36. 1986), suggesting that the utility of this character to distinguish the two species could be misleading. Green sepals and petals are found in *C. lancifolium* var. *aspidistrifolium*, but that entity has a shorter pseudobulb and leaves without serrated margins.

**47. *Cymbidium rhizomatosum*** Z. J. Liu & S. C. Chen, *J. Wuhan Bot. Res.* 20: 421. 2002.

二叶兰 er ye lan

Plants terrestrial, autotrophic, with a subterranean rhizome. Rhizome whitish yellow, cylindric, 7–10 × 0.6–1.5 cm, branched, several noded, with small wartlike outgrowths, with several fleshy roots to 9 × 0.8 cm. Leaves 2, basal, emerging after anthesis, narrowly elliptic to elliptic, 6–8 × 1.8–2.5 cm, thinly leathery, contracted into a short petiole-like stalk at base, apex acute; petiole conduplicate or somewhat tubular, ca. 2 cm, articulate. Inflorescence arising from apical node of rhizome, erect, 15–20 cm, slender; peduncle greenish with several green sheaths 1–2.5 cm; rachis (1 or)2- or 3-flowered; floral bracts greenish, narrowly ovate, 9–15 × 5–7 mm. Flowers opening widely; pedicel and ovary 15–25 mm; sepals and petals greenish to whitish, petals with a purplish red longitudinal line at base; lip greenish to whitish with purplish red markings. Dorsal sepal narrowly obovate-elliptic, ca. 27 × 5 mm, apex acute-acuminate; lateral sepals linear-obovate, ca. 25 × 4 mm, apex acute. Lip ovate, ca. 14 × 11 mm, not fused to basal margins of column, obscurely 3-lobed; lateral lobes erect, small; mid-lobe recurved, ovate, ca. 7 × 6 mm; disk with 2 convergent lamellae extending from base of lip to base of mid-lobe. Column 11–13 mm; pollinia 4, in 2 pairs. Capsule erect, narrowly ellipsoid, ca. 35 × 10 mm. Fl. Aug–Sep, fr. Nov–Dec.

• SE Yunnan.

Among the present authors, Cribb observes that this taxon is probably best treated as a variety of the widespread and variable *Cymbidium lancifolium*. It does not differ significantly from *C. lancifolium* var. *papuanum* (a synonym of *C. lancifolium* in the present treatment), which also has long rhizomes, short pseudobulbs, and small leaves. The

latter has been found in New Guinea and Thailand. On the other hand, Chen observes that *C. rhizomatosum* is quite different from *C. lancifolium* and differs by its leaves appearing after anthesis.

**48. *Cymbidium macrorhizon*** Lindley, *Gen. Sp. Orchid. Pl.* 162. 1833.

大根兰 da gen lan

*Cymbidium aphyllum* Ames & Schlechter (1919), not (Roxburgh) Swartz (1799); *C. szechuanense* S. Y. Hu; *Pachyrhizanthus aphyllum* (Ames & Schlechter) Nakai; *P. macrorhizon* (Lindley) Nakai.

Plants terrestrial, mycotrophic, lacking green leaves and pseudobulbs. Rhizome subterranean, white, ascending or suberect, 5–10 × 0.3–0.7 cm, fleshy, often branched, several noded, slightly papillate, with 1 or 2 short roots to 1 cm. Inflorescence usually arising from apex of rhizome, erect, 11–18 cm or longer; peduncle usually purplish red or cream-yellow tinged purplish red at base, green above, with several sheaths 1–2.5 cm; rachis 2–5-flowered; floral bracts linear-lanceolate, 6–11 mm. Flowers 3–4 cm in diam.; pedicel and ovary 20–25 mm; sepals and petals white or yellowish with a purplish red longitudinal line; lip white or yellowish with purplish red markings. Sepals narrowly obovate-oblong, 20–22 × 4–5 mm, apex acute. Petals narrowly elliptic, 15–18 × 5–6 mm, apex acute; lip subovate, 13–16 mm, not fused to basal margins of column, slightly 3-lobed; lateral lobes erect; mid-lobe slightly recurved, triangular-ovate, 5–7 × 4–6 mm; disk papillate, with 2 longitudinal lamellae extending from base of lip to base of mid-lobe; lamellae convergent at their apices and forming a short tube. Column slightly arcuate, ca. 10 mm, narrowly winged; pollinia 4, in 2 pairs, broadly ovoid. Capsule erect, green. Fl. Jun–Aug.  $2n = 38$ .

Forests along riversides, forest margins, open grassy slopes; 700–1500 m. Chongqing, SW Guizhou, SW Sichuan, NE Yunnan [N India, Japan, Laos, Myanmar, Nepal, Pakistan, Thailand].

**49. *Cymbidium multiradicatum*** Z. J. Liu & S. C. Chen, *Acta Bot. Yunnan.* 26: 297. 2004.

多根兰 duo gen lan

Plants terrestrial, lacking green leaves and pseudobulbs at anthesis (and possibly afterward). Rhizome subterranean, yellowish white, 9–12 × 0.6–1.2 cm, fleshy, often branched, several noded, slightly papillate, with several hairy roots 8–12 cm. Inflorescence arising from apex of rhizome, suberect, 40–45 cm; peduncle greenish, tinged purplish red, with 4 or 5 pale yellow-green sheaths 4–5 cm; rachis 5–10 cm, 3–10-flowered; floral bracts pale yellow-green, narrowly triangular, 12–15 mm. Flowers not opening widely, purple-red to yellowish; pedicel and ovary greenish, 15–17 mm. Sepals narrowly elliptic-lanceolate, 17–19 × 3–5 mm, apex acuminate; lateral sepals slightly oblique. Petals narrowly elliptic, 11–13 × 4–5 mm, apex acuminate; lip elliptic-ovate, 13–14 × 5–7 mm, not fused to basal margins of column, 3-lobed; lateral lobes suberect; mid-lobe slightly recurved, ovate, 5–6 × 4–4.5 mm, apical margin crisped; disk with 2 fleshy lamellae. Column slightly arcuate, 11–12 mm; pollinia 4, in 2 pairs. Capsule erect, green. Fl. Jun–Jul.

• Humus-rich places in dense forests; ca. 1500 m. SE Yunnan (Malipo).

Among the current authors, Cribb observes that this is unlikely to be a mycotrophic species, given that it has typical autotrophic roots, not the rhizomatous structure found in all mycotrophic orchids. It also has green capsules, thus it is photosynthetic at least when in fruit. This taxon is close to *Cymbidium lancifolium* but probably warrants specific

rank. It is not known whether it has been grown in cultivation to ascertain if it develops leaves after flowering. As mentioned under *C. rhizomatosum*, elongate rhizomes are found in *C. lancifolium* var. *papuanum* (a synonym of *C. lancifolium* in the present treatment). On the other hand, Chen observes that the flowers of *C. multiradicatum* differ greatly from either *C. lancifolium* or other species, showing little relationship with them.

## 92. ACRIOPSIS Blume, Bijdr. 376. 1825.

合萼兰属 he e lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic. Rhizome creeping, branched; roots slender, branched, fleshy, with ascending catch-roots. Pseudobulbs crowded, ovoid or subovoid, with 2 or 3 nodes, covered at base by slender, silvery sheaths, 2- or 3-leaved. Leaves apical, midrib sunken above, prominently raised beneath, petiolate. Inflorescence racemose or paniculate, heterantherous, many flowered, arising from base of pseudobulb; peduncle terete, long; floral bracts persistent. Flowers not resupinate, twisted, widely open, small. Sepals lanceolate, concave at apex; lateral sepals fused to form a synsepal. Petals spreading, oblong to obovate; lip 3-lobed, pandurate to entire; disk 2-keeled. Column straight to sigmoid; stelia 2, long, parallel, porrect or decurved; rostellum beaklike, bifurcate; pollinia 4, connate in 2 pairs.

Six species: N India, Myanmar, Thailand, and Indochina eastward through Malaysia and Indonesia to the Philippines, New Guinea, Solomon Islands, and Australia; one species in China.

**1. *Acriopsis indica*** Wight, Icon. Pl. Ind. Orient. 5: t. 1748. 1851.

合萼兰 he e lan

Roots white, ca. 1.5 mm in diam., well developed, fleshy. Pseudobulbs oblong-ovoid, 2–2.5 × 1–1.3 cm, often narrowed at base, usually with 5–8 internodes, with lacerate sheaths on nodes. Leaves terminal, 2 or 3, appearing after anthesis; leaf blade narrowly oblong, 7–7.5 × 0.3–0.4 cm, base slightly contracted into a short petiole, apex acuminate. Inflorescence paniculate, arising from basal node of pseudobulb, erect or slightly drooping, much longer than leaves, 11–38 cm, laxly many flowered; peduncle 6–7 cm, with 2 or 3 small sheaths; floral bracts 0.5–2.5 × 0.3–0.8 mm. Flowers yellowish green,

slightly spotted with purple, lip white; ovary 2.3–2.5 mm. Dorsal sepal suboblong, 4–5 × ca. 1 mm, 3-veined, base contracted, slightly concave, apex acuminate; synsepal similar to dorsal sepal, but slightly larger, with 5 inconspicuous veins. Petals obovate-spatulate, 3–4 × ca. 1.3 mm, margin sometimes irregularly crisped, apex obtuse; lip suboblong, 4–5 × ca. 1.4 mm, adaxially with 2 suborbicular central lamellae, apex obtuse or subrounded. Column ca. 4 mm, stelia ca. 0.8 mm, without foot; anther cap ca. 0.7 mm in diam.; pollinia narrowly obconic, ca. 0.7 mm. Capsule ellipsoid or globose. Fl. May.

Epiphytic on trunks of *Quercus* trees; ca. 1300 m. S Yunnan [Cambodia, Indonesia, Laos, Malaysia, Myanmar, ?NE India, Philippines, Thailand, Vietnam].

## 93. NEPHELAPHYLLUM Blume, Bijdr. 372. 1825.

云叶兰属 yun ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Cytheris* Lindley.

Herbs, terrestrial (rarely epiphytic). Rhizome creeping; roots sometimes villous, with root hairs. Pseudobulbs ascending, articulate at junction with petiole and peduncle, scales tubular, membranous, often soon caducous. Leaf 1 per pseudobulb, convolute, petiolate; petiole suborbicular, channeled, not sheathing; blade ovate to cordate, main veins prominent, often mottled. Inflorescence an erect raceme, unbranched, 2–16-flowered; peduncle and rachis usually elongating after anthesis, peduncle with few internodes, scales persistent, tubular; rachis erect, unbranched; floral bracts sessile, not tubular. Flowers not resupinate, turned to all sides, most open simultaneously. Sepals reflexed or not, lanceolate to linear. Petals reflexed or not, lanceolate to linear, falcate or not; lip immobile, broadly attached to column foot, parallel to column, blade flat or shallowly concave, or basal half tubular and open at upper side and front part recurved, entire or 3-lobed; disk with central 3 veins either keeled or with a platelike appendage or 1 or more rows of fleshy papillae or laciniae, adaxially glabrous, velvety hairy or with patches of hairs or both; spur clavate, cylindrical, or saccate. Column with a flat foot, without a spur; anther cap imperfectly 4-locular, with 2 horns; pollinia 8 in 2 groups of 4, solid, with caudicles, stipe and viscidium absent. Capsule with persistent perianth.

About 15 species: from India, Bhutan, Myanmar, Thailand, and Indochina north to China and Japan, eastward through Malaysia and Indonesia to the Philippines; one species in China.

*Nephelaphyllum pulchrum* Blume (Bijdr. 373. 1825) was recorded from Hainan (Baisha and Changjiang) by X. Q. Song, Q. W. Meng and Y. B.

Luo (Acta Phytotax. Sin. 45: 325–326. 2007). This is a widespread species distributed from India and Bhutan, through Malaysia and Indonesia to Palawan in the Philippines. Although the occurrence in Hainan is not unlikely, the present authors could not confirm it because they have not seen the specimens (*X. Q. Song 121* and *X. Q. Song 134*, both at PE).

### 1. *Nephelaphyllum tenuiflorum* Blume, Bijdr. 373. 1825.

云叶兰 yun ye lan

*Nephelaphyllum cristatum* Rolfe; *N. cristigerum* Averyanov, nom. illeg. superfl.; *Tainia cristata* (Rolfe) Gagnepain; *T. tenuiflora* (Blume) Gagnepain.

Plants ± prostrate. Rhizome 2–5 mm in diam., fleshy, with membranous sheaths ca. 1 cm. Pseudobulbs narrowly cylindrical, 1–2 cm × 1.5–2 mm, petiole-like, fleshy. Leaf sessile, ovate-cordate, 2.2–4(–7) × 1.3–3.5 cm, slightly fleshy, base subcordate, apex acute. Inflorescence erect, 9–20 cm, laxly 1–3-flowered; peduncle somewhat thickened at base; floral bracts lan-

ceolate, 4–6 mm, membranous. Flowers widely opening, green, with purple stripes; pedicel and ovary ca. 1 cm. Sepals similar, narrowly obovate-lanceolate, ca. 10 × 2.5 mm, 1-veined, shortly acuminate. Petals spatulate, ca. as long as but wider than sepals, 3-veined, subacute; lip subelliptic, slightly concave, ca. 10 × 6–7 mm, base shortly spurred, inconspicuously 3-lobed; lateral lobes narrow; mid-lobe ± suborbicular, margin crisped, apex emarginate, base with a cluster of fimbriate laciniae ± extending to disk; disk with dense long hairs; spur ca. 3 mm, apex slightly concave. Column ca. 6 mm. Fl. Jun.

Wooded slopes; ca. 900 m. C and S Hainan, Hong Kong [Indonesia, Malaysia, Thailand, Vietnam].

## 94. TAINIA Blume, Bijdr. 354. 1825.

带唇兰属 dai chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Ania* Lindley; *Ascotainia* Ridley; *Mischobulbum* Schlechter; *Mitopetalum* Blume.

Herbs, terrestrial, glabrous. Rhizome with persistent or decaying tubular scales; roots not branched, villous, with root hairs. Pseudobulb erect, rarely prostrate, with 1 or few internodes. Leaf 1 per pseudobulb, deciduous, articulate, petiolate or not, petiole not sheathing, convolute, plicate or not, glabrous; blade elliptic to (ob)ovate, base decurrent along petiole, margin straight, undulate to crenulate. Inflorescence an erect raceme arising heteranthous on a leafless shoot or lateral from base of pseudobulb, often alternating with fertile shoots; peduncle with few internodes; scales tubular; floral bracts persistent. Flowers resupinate, open simultaneously. Sepals and petals ovate, elliptic, or obovate to linear, entire; lateral sepals decurrent on column foot when present. Lip immobile, entire or 3-lobed, with or without spur, saccate; keels (2 or)3–9. Column straight, with narrow seams that continue onto column foot when present; column foot absent or inconspicuous (rarely long), flat or swollen, without spur; anther cap with 2 thecae, usually 4-locular; pollinia 8, rarely 6 in (3 or)4 pairs, subequal, hard, caudicles present, stipe and viscidium absent. Capsule ellipsoid.

About 32 species: Sri Lanka and India, north to China and Japan, south from Myanmar to New Guinea and the Pacific islands; 13 species (two endemic) in China.

The genus *Tainia* has been monographed by Turner (Orchid Monogr. 6: 43–100. 1992) and treated in a broader sense to include *Ania* and *Mischobulbum* by de Vogel in Pridgeon et al. (Gen. Orchid. 4(1): 158–161. 2005).

*Tainia hualienia* S. S. Ying (Coloured Ill. Indig. Orchids Taiwan 1: 321. 1977) was described from Taiwan but was not included in either Fl. Taiwan (1978) or Fl. Taiwan, ed. 2 (2000). Its original description seems to be indicative of belonging to *Oreorchis* rather than *Tainia*.

- 1a. Leaves sessile, non-plicate, with a cordate base ..... 1. *T. cordifolia*  
 1b. Leaves not as above.  
 2a. Pseudobulbs swollen, globose or ovoid, usually consisting of several internodes; inflorescence lateral; lip with a ± distinct spur; petiole usually with an articulation ± halfway (absent in *T. viridifusca*).  
 3a. Leaves sessile, 4.5–7 × 3–5 cm, broadly ovate, fleshy or thickly leathery, dark purple abaxially ..... 2. *T. longiscapa*  
 3b. Leaves not as above.  
 4a. Lip entire or subentire (when subentire mid-lobe broadest at base), never distinctly 3-lobed, elliptic to slightly obovate in outline ..... 3. *T. hongkongensis*  
 4b. Lip distinctly 3-lobed; mid-lobe distinctly narrowed toward base.  
 5a. Lip blade more than 2 × as long as broad, keels always straight; lateral lobes ca. 1 mm wide, acuminate ..... 4. *T. angustifolia*  
 5b. Lip blade less than 2 × as long as broad.  
 6a. Lip with 3 lamellae on disk ..... 5. *T. penangiana*  
 6b. Lip with 5 lamellae on disk.  
 7a. Pseudobulb obliquely ovoid to ellipsoid, usually prostrate; petiole without an articulation ± halfway; keels on lip sometimes decreasing in height halfway between base of lip and base of lateral lobes, always ± at base of mid-lobe, then increasing in height again; sepals and petals brownish green or purplish brown ..... 6. *T. viridifusca*

- 7b. Pseudobulb ± conic, erect; petiole with an articulation ± halfway; keels increasing in height uninterruptedly toward tip of lip; sepals and petals dull reddish yellow ..... 7. *T. ruybarrettoi*
- 2b. Pseudobulbs thin, cylindrical, sometimes swollen toward base, usually consisting of 1 internode; inflorescence terminal; lip at most very slightly saccate; petiole with an articulation.
- 8a. Lip entire ..... 8. *T. emeiensis*
- 8b. Lip 3-lobed.
- 9a. Inflorescence arising directly from a node.
- 10a. Mature plant less than ca. 15 cm high excluding inflorescence; leaves mottled and tessellate ..... 9. *T. laxiflora*
- 10b. Mature plant usually well over 25 cm high, rarely smaller; leaves uniformly colored ..... 10. *T. dunnii*
- 9b. Inflorescence arising at least 2 mm above a node.
- 11a. Lip with 5 lamellae on mid-lobe ..... 11. *T. minor*
- 11b. Lip with 3 lamellae.
- 12a. Lip elliptic to ovate, shorter than 20 mm; column foot shorter than 3 mm ..... 12. *T. latifolia*
- 12b. Lip rhombic-hastate, longer than 30 mm; column foot longer than 10 mm ..... 13. *T. macrantha*

**1. *Tainia cordifolia*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1861. 1889.

心叶带唇兰 xin ye dai chun lan

*Mischobulbum cordifolium* (J. D. Hooker) Schlechter;  
*Tainia fauriei* Schlechter.

Pseudobulbs ca. 8 cm × 3–4 mm, petiole-like, becoming thinner toward base, often ± enclosed in 2 tubular sheaths. Leaf sessile, abaxially with grayish white stripes, adaxially dirty green with deep green blotches, ovate-cordate, 7–15 × 4–8 cm, fleshy, main veins 3, base cordate, apex acute. Inflorescence erect; peduncle to 25 cm, with 2 or 3 tubular sheaths; rachis ca. 6 cm, 3–5-flowered; floral bracts ca. 7 mm, narrowly lanceolate, acuminate. Flowers large; sepals and petals brown with purplish brown stripes, lip lateral lobes white and spotted with purplish red, mid-lobe yellow, with purple spots along margin, lamellae yellow, column with purplish red spots; pedicel and ovary 1.5–1.8 cm. Sepals similar, lanceolate, ca. 22 × 4–5 mm, 3-veined, acuminate; lateral sepals adnate to column foot forming a broad mentum. Petals lanceolate, ca. 20 × 6–7 mm, 5-veined; lip subovate, 2.5–3 cm, slightly 3-lobed; lateral lobes nearly subovate; mid-lobe reflexed, subtriangular, apex acute; disk with 3 lamellae running from base to apex of mid-lobe; lateral lamellae arcuate. Column ca. 1 cm, broadly winged; foot ca. 1.4 cm. Fl. May–Jul.

Damp places in forests along valleys; 500–1000 m. Fujian, Guangdong, Guangxi, Taiwan, SE Yunnan [Vietnam].

**2. *Tainia longiscapa*** (Seidenfaden ex H. Turner) J. J. Wood & A. L. Lamb, Malesian Orchid J. 2: 54. 2008.

卵叶带唇兰 luan ye dai chun lan

*Mischobulbum longiscapum* Seidenfaden ex H. Turner, Orchid Monogr. 6: 67. 1992; *M. ovifolium* (Z. H. Tsi & S. C. Chen) Averyanov; *Tainia ovifolia* Z. H. Tsi & S. C. Chen.

Pseudobulbs close, purplish, narrowly ovoid, ca. 4 cm, base ca. 1.5 cm in diam. Petiole ca. 3 mm; leaf blade abaxially purple, adaxially deep green, broadly ovate, 4.5–7 × 3–5 cm, somewhat fleshy or thickly leathery, base rounded, apex acute. Inflorescence erect; peduncle ca. 18 cm, 2–3 mm in diam., near middle with 1 membranous tubular sheath; rachis 4- or 5-flowered; floral bracts narrowly lanceolate, ca. 1 cm, acuminate.

Flowers yellowish green; pedicel and ovary ca. 1 cm. Dorsal sepal lanceolate, ca. 12 × 2 mm, 3-veined, long acuminate; lateral sepals similar to dorsal sepal, base adnate to column foot forming a conspicuous mentum. Petals similar to sepals in shape, ca. 12 × 1.2 mm, 3- or 4-veined, acute; lip obovate, 3-lobed near middle; lateral lobes ovate-triangular, small, ca. 7 mm wide at apex, acute; mid-lobe obovate, ca. 6 mm wide, mucronate; disk with 3 lamellae, median smaller. Column ca. 4 mm; foot ca. 0.4 mm. Fl. Mar.

Rocky places in evergreen broad-leaved forests; 600–1200 m. Hainan (Changjiang), S Yunnan [Thailand, N Vietnam].

**3. *Tainia hongkongensis*** Rolfe, Bull. Misc. Inform. Kew 1896: 195. 1896.

香港带唇兰 xiang gang dai chun lan

*Ania hongkongensis* (Rolfe) Tang & F. T. Wang; *Asco-tainia hongkongensis* (Rolfe) Schlechter.

Pseudobulbs ovoid, 1–2 cm in diam., sheathing when young. Petiole 13–16 cm, slender, base with 1 tubular sheath ca. 6 cm; leaf blade oblong, ca. 26 × 3–4 cm, plicate, apex acuminate. Inflorescence erect; peduncle to 50 cm, ca. 3 mm in diam., with 4 tubular sheaths below inflorescence; rachis to 15 cm, laxly several flowered; floral bracts narrowly lanceolate, 6–12 mm, membranous, long acuminate. Flowers: pedicel and ovary purplish brown, sepals and petals yellowish green with purplish brown spots and stripes, lip white with yellowish green stripes, anther cap with 2 purple cornute appendages, column white, tinged with purple; pedicel and ovary ca. 15 mm. Sepals similar, oblong-lanceolate, ca. 20 × 2.2–3.5 mm, 5-veined, acuminate; lateral sepals adnate to column base. Petals obovate-lanceolate, ca. 20 × 3 mm, 5-veined, base contracted, apex acuminate; lip obovate, ca. 11 × 6 mm, ± embracing column below middle, spurred at base, entire, mucronate; disk with 3 narrow lamellae; spur projecting beyond base of lateral sepals, sub-oblong, ca. 3 × 2.5 mm. Column ca. 7 mm, slightly dilated toward apex. Fl. Apr–May.

Wooded slopes or open places in hilly areas; 100–500 m. S Fujian, S Guangdong [Vietnam].

**4. *Tainia angustifolia*** (Lindley) Benth & J. D. Hooker, Gen. Pl. 3: 515. 1883.

狭叶带唇兰 xia ye dai chun lan

*Ania angustifolia* Lindley, Gen. Sp. Orchid. Pl. 129. 1831; *Ascotainia angustifolia* (Lindley) Schlechter; *Eulophia evrardii* Guillaumin; *Mitopetalum angustifolium* (Lindley) Blume; *Nephelaphyllum evrardii* (Guillaumin) Tang & F. T. Wang.

Pseudobulbs ovoid, to 2 cm in diam., ± covered with sheaths. Petiole 20–30 cm, slender, articulate near middle, base with 2 tubular sheaths; leaf blade oblong or narrowly elliptic, ca. 30 × 3–5.5 cm, apex shortly acuminate. Inflorescence erect; peduncle ca. 45 cm, with 3 or 4 tubular sheaths below; rachis 7–15 cm, laxly few flowered; floral bracts lanceolate, ca. 7 mm, membranous. Flowers not opening widely, yellowish green; lip whitish, tinged with dark purple, mid-lobe dark purple, apical margin white, lamellae deep purple, column whitish, upper part purplish, anther cap brownish green; pedicel and ovary ca. 1 cm. Sepals similar, oblong, 15–17 × 4.5–5 mm, 5-veined, acute; lateral sepals adnate to column base. Petals elliptic, 13–15 × 3.5–4.5 mm, 5-veined, acute; lip oblong or suboblong, 15–17 mm, 3-lobed; lateral lobes erect, embracing column, triangular-lanceolate, ca. 1 mm wide, acuminate; mid-lobe nearly oblate, ca. 4 mm wide, rounded; disk with 5 lamellae extending to mid-lobe; lamellae parallel to each other, highly raised and undulate or denticulate on mid-lobe; spur slightly flattened, ca. 4 × 3 mm, obtuse and slightly concave. Column ca. 1 cm × 5 mm, broadly winged; rostellum slightly decurved, suborbicular. Fl. Sep–Oct.

Wooded slopes; 500–1200 m. SW Guizhou, S Yunnan [Myanmar, Thailand, Vietnam].

**5. *Tainia penangiiana*** J. D. Hooker, Fl. Brit. India 5: 820. 1890.

绿花带唇兰 lǜ huā dài chūn lán

*Ania hookeriana* (King & Pantling) Tang & F. T. Wang ex Summerhayes; *A. penangiiana* (J. D. Hooker) Summerhayes; *Ascotainia hookeriana* (King & Pantling) Ridley; *A. penangiiana* (J. D. Hooker) Ridley; *Tainia hookeriana* King & Pantling; *T. taiwaniana* S. S. Ying.

Pseudobulbs close, purplish red or dark brownish green, ovoid, to 3 cm in diam., ± covered with sheaths. Petiole 27–32 cm; leaf blade oblong, ca. 35 × 6–9 cm, apex acuminate. Peduncle to 60 cm, 4–5 mm in diam., with 3 or 4 membranous sheaths below; rachis 15–20 cm, laxly few to 10-flowered; floral bracts narrowly lanceolate, usually 6–7 mm, membranous. Flowers yellowish green with orange-red spots and stripes, lip white with reddish spots and yellow tip; pedicel and ovary ca. 15 mm. Sepals similar, oblong-lanceolate, 18–21 × 3–5 mm, 7-veined, acuminate. Petals oblong, 17–20 × 3–4 mm, 7-veined, acute; lip obovate, ca. 15 mm, adaxially ± finely papillate, 3-lobed; lateral lobes suberect, ovate-oblong, obtuse and slightly incurved; mid-lobe orbicular or ovate-triangular, acute; disk with 3 lamellae extending to mid-lobe where raised or sometimes crestlike; spur exerted beyond base of lateral sepals, 3–5 mm, obtuse. Column subcylindric, ca. 1 cm; rostellum nearly ligulate, unlobed; anther cap without appendages. Fl. Feb–Mar.  $2n = 40$ , 72.

Evergreen broad-leaved forests, streamside; 700–1000 m. S and W Hainan, Taiwan [NE India, Malaysia (Peninsular), Thailand, Vietnam].

**6. *Tainia viridifusca*** (Hooker) Benth & J. D. Hooker, Fl. Brit. India 5: 820. 1890.

高褶带唇兰 gāo zhē dài chūn lán

*Calanthe viridifusca* Hooker, Bot. Mag. 78: ad t. 4669. 1852; *Ania elata* (Schlechter) S. Y. Hu; *A. viridifusca* (Hooker) Tang & F. T. Wang ex Summerhayes; *Ascotainia elata* Schlechter; *A. viridifusca* (Hooker) Schlechter; *Tainia elata* (Schlechter) P. F. Hunt.

Pseudobulbs close, dark green to purple, broadly ovoid, to 4 cm in diam. Leaf blade oblong or narrowly elliptic, plicate, ca. 50 × 3 cm, with long petiole at base, apex long acuminate. Inflorescence erect; peduncle purplish in lower part, to 73 cm, ca. 4 mm in diam., with 3 or 4 sheaths; rachis laxly 9- or 10-flowered; floral bracts yellowish green, narrowly lanceolate, 1–1.5 cm, long acuminate. Flowers opening widely, brownish green or purplish brown, lip and column white, anther cap with 2 purple spots at apex; pedicel and ovary ca. 2 cm. Sepals similar, oblong, 20–22 × ca. 5 mm, acute and aristate; lateral sepals sometimes with midvein extending keel-like beyond tip abaxially, base mostly adnate to column foot. Petals similar to sepals, and smaller, acute and aristate; lip obovate, ca. 14 × 8–9 mm, 3-lobed; lateral lobes erect, ovate-oblong, obtuse; mid-lobe orbicular, base without conspicuous claw, mucronate; disk with 3–5 lamellae extending to mid-lobe and becoming 5-undulate or crestlike there; spur extending beyond 2 lateral sepals, saccate-conic, ca. 4 mm, obtuse. Column subcylindric, ca. 9 mm; rostellum broadly triangular, fleshy, obtuse. Fl. Apr–May.  $2n = 40$ .

Evergreen broad-leaved forests; 1500–2000 m. NE, S, and SE Yunnan [NE India, Myanmar, Thailand, Vietnam].

**7. *Tainia ruybarrettoi*** (S. Y. Hu & Barretto) Averyanov, Oprel. Orkhid. Vetnama, 403. 1994.

南方带唇兰 nán fāng dài chūn lán

*Ania ruybarrettoi* S. Y. Hu & Barretto, Chung Chi J. 13(2): 25. 1976.

Pseudobulbs slightly spaced, dark green or purplish red, ovoid, 2.5–5.5 × 2.5–4 cm, with 2 sheaths. Petiole 15–25 cm; leaf blade dark green, lanceolate, 30–45 × 4.5–5.3 cm, acute. Inflorescence erect; peduncle 30–45 cm, with 3 reddish sheath-like bracts below; rachis 10–30 cm, glabrous, laxly 5–28-flowered; floral bracts dark purple, narrowly lanceolate, 8–13 mm. Flowers: sepals and petals dull reddish yellow, purple-veined, margin yellow, lip white, with purple stripes and spots on lateral lobes, mid-lobe white, spotted with purple, spur orange, column white, spotted with purple, anther cap creamy yellow, with deep purple spots; pedicel and ovary longer than floral bracts. Sepals and petals 3–5-veined; dorsal sepal narrowly lanceolate, 2.7–3.5 × 0.4–0.5 cm, acute; lateral sepals similar to dorsal sepal, slightly falcate. Petals obliquely oblanceolate, 2.7–3.5 × 0.4–0.5 cm, acute; lip ca. 2.2 cm, 3-lobed; lateral lobes erect, embracing column, ovate-oblong, 4–5 × ca. 3 mm, adaxially purple hairy, obtuse-rounded; mid-lobe slightly recurved, suborbicular, ca. 7 × 7 mm, base narrowed into a claw, margin undulate, apex acute; disk with 5 lamellae extending from base to mid-lobe and thickened there, median longer; spur 3–5 × ca. 2 mm. Column slightly arcuate, ca. 12 mm; rostellum triangular. Fl. Mar.

Shady and damp places in forests, beside rivers, bamboo forests; 600–900 m. E Guangxi, Hainan, Hong Kong [N Vietnam].

**8. *Tainia emeiensis*** (K. Y. Lang) Z. H. Tsi, Fl. Reipubl. Popularis Sin. 18: 236. 1999.

峨眉带唇兰 e mei dai chun lan

*Mischobulbum emeiense* K. Y. Lang, Acta Phytotax. Sin. 20: 185. 1982 [*“emeiensis”*].

Pseudobulbs ascending, almost narrowly cylindrical, 4.5–8 cm × ca. 4 mm, narrowed from base toward apex. Petiole 4–4.5 cm; leaf blade elliptic, 12.5–14 × 4.5–6 cm, base subrounded, apex acute. Inflorescence erect; peduncle ca. 10 cm, with 2 or 3 tubular sheaths, basal one ca. 5 cm; rachis 3-flowered; floral bracts lanceolate, ca. 1.5 cm, longer than pedicel and ovary, acuminate. Sepals similar, lanceolate, ca. 20 × 4 mm, 5-veined, long acuminate; lateral sepals adnate at base to column foot forming a broad mentum ca. 3 mm. Petals ovate-lanceolate, ca. 17 × 6 mm, 5-veined, acuminate; lip ovate-lanceolate, ca. 18 × 8 mm, entire, acuminate; disk with 3 lamellae, lateral 2 dilated and triangular near or slightly above base, median somewhat fleshy and ridgelike. Column ca. 4 mm; rostellum acute at apex. Fl. Jul.

- Wooded slopes; ca. 800 m. SW Sichuan.

Turner (Orchid Monogr. 6: 73. 1992) stated that he had seen no specimens of this taxon and wrote “The description and figure given in the original publication resemble *T[ainia]. macrantha*, but show a smaller species with a short column and column foot.”

**9. *Tainia laxiflora*** Makino, Bot. Mag. (Tokyo) 23: 138. 1909.

疏花带唇兰 shu hua dai chun lan

*Ascotainia laxiflora* (Makino) C. D. Darlington & Wylie; *Tainia laxiflora* var. *piyananensis* (Fukuyama) Masamune; *T. minor* J. D. Hooker var. *laxiflora* (Makino) T. Hashimoto; *T. piyananensis* Fukuyama.

Pseudobulbs cylindrical, 1–1.3 × 0.2–0.5 cm, scale of subterminal node ± persistent. Petiole 1–3.5 cm; leaf blade tessellate, elliptic, 6.7–11.1 × 1.3–2 cm, slightly acuminate. Inflorescence terminal, arising from base of pseudobulb; peduncle 9.5–27 cm, 1–2 mm in diam.; rachis 2.2–8.3 cm; floral bracts triangular, 3–8 mm. Flowers mostly open simultaneously, opening widely; sepals and petals pale brownish to pale brownish yellow, lip lateral lobes white, mid-lobe yellow, keels white; pedicel and ovary 6–11 mm, longer than bracts. Dorsal sepal elliptic to obovate, 11.5–14 × ca. 1.5 mm, acute to obtuse; lateral sepals elliptic to triangular, strongly falcate, ca. 11 × 2 mm, acute to obtuse. Petals elliptic to obovate, strongly falcate, 11–13 × ca. 2 mm; lip 8–9 × 6.5–7 mm, 3-lobed; lateral lobes obliquely triangular, falcate, 1–1.5 mm, obtuse; mid-lobe transversely elliptic, ca. 3 × 6–7 mm, slightly acuminate; disk with 3 keels, sometimes raised platelike distally. Column 5.5–6 mm; foot 1–1.5 mm.

Taiwan [Japan].

**10. *Tainia dunnii*** Rolfe, J. Linn. Soc., Bot. 38: 368. 1908.

带唇兰 dai chun lan

*Tainia flabellilobata* C. L. Tso; *T. gracilis* C. L. Tso (1933), not Gagnepain (1932); *T. laxiflora* Makino var. *shimadae* (Hayata) Miroe; *T. parvifolia* C. L. Tso; *T. procera* Senghas; *T. quadriloba* Summerhayes; *T. shimadae* Hayata.

Pseudobulbs dark purple to purplish, cylindrical, rarely narrowly ovoid, 1–7 cm × 5–10 mm, often ± covered with membranous sheaths. Petiole 2–6 cm; leaf blade narrowly oblong or elliptic-lanceolate, plicate, 12–35 × (0.6–)1.5–6 cm, 3-veined, acuminate. Inflorescence erect; peduncle 30–60 cm, slender, with 3 membranous tubular sheaths; rachis reddish brown, to 20 cm, laxly many flowered; floral bracts red, narrowly lanceolate, 3–7 mm, acuminate. Flowers yellowish brown or brownish purple, lateral lobes of lip pale yellow, with many purplish black spots, mid-lobe yellow, anther cap with 2 purple conic projections; pedicel and ovary reddish brown, ca. 1 cm. Dorsal sepal narrowly oblong-lanceolate, 11–12(–18) × 2.5–3 mm, acute or subobtuse, midvein rather conspicuous; lateral sepals narrowly oblong-falcate, base adnate to column foot forming a conspicuous mentum. Petals similar to sepals, acute, midvein rather conspicuous; lip orbicular in outline, ca. 1 cm, base adnate to end of column foot, 3-lobed; lateral lobes erect, deltoid, ca. 2.5 mm, ca. 1 cm wide when flattened, acute; mid-lobe transversely oblong, apex subtruncate or emarginate and sinus mucronate; disk glabrous or slightly hairy, with 3 lamellae. Column arcuate, ca. 8 mm, slender; foot ca. 2 mm. Fl. Mar–Apr.

- Evergreen broad-leaved forests, streamsides; 600–1900 m. N Fujian, Guangdong, N Guangxi, C Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang.

**11. *Tainia minor*** J. D. Hooker, Fl. Brit. India 5: 821. 1890.

滇南带唇兰 dian nan dai chun lan

Pseudobulbs close or slightly spaced, cylindrical-ovoid, 2.5–6.5 × 0.3–0.6 cm, ± covered with membranous tubular sheaths. Petiole 7–8 cm, slender; leaf blade oblong, 18–20 × 5–5.5 cm, 3-veined, base truncate or suborbicular, apex acute. Inflorescence erect, much longer than leaves, laxly few flowered; rachis pale purplish brown; floral bracts narrowly ovate-lanceolate, 3–5 mm. Flowers suberect; sepals and petals pale purplish brown with deep purple spots, lateral lobes of lip white, tinged with pale purplish brown, mid-lobe white, anther cap green; pedicel and ovary shorter than floral bracts. Dorsal sepal narrowly oblong, ca. 15 × 2 mm, 3-veined, slightly obtuse; lateral sepals narrowly falcate-oblong, ca. 15 × 2 mm, base adnate to column foot forming a short mentum. Petals narrowly falcate-oblong, ca. 15 × 2.5 mm, 3-veined, acute; lip elliptic in outline, ca. 1.2 cm, 3-lobed; lateral lobes erect, narrowly triangular, ca. 7 mm wide when flattened, acute; mid-lobe suborbicular, ca. 5 mm wide, apex rounded and emarginate; disk with 5 lamellae. Column ca. 7 mm; foot ca. 1 mm. Fl. May. *2n* = 40.

Damp places on wooded slopes; 1900–2100 m. SE Xizang, W to SE Yunnan [NE India, Myanmar].

**12. *Tainia latifolia*** (Lindley) H. G. Reichenbach, Bonplandia 5: 54. 1857.

阔叶带唇兰 kuo ye dai chun lan

*Ania latifolia* Lindley, Gen. Sp. Orchid. Pl. 130. 1831;

*Eulophia hastata* Lindley; *Mitopetalum latifolium* (Lindley) Blume; *Tainia cordata* J. D. Hooker; *T. elliptica* Fukuyama; *T. hastata* (Lindley) J. D. Hooker; *T. khasiana* J. D. Hooker; *T. shimadae* Hayata var. *elliptica* (Fukuyama) S. S. Ying.

Pseudobulbs close, cylindric-ovoid, ca. 7 cm, base 1–1.5 cm in diam., usually ± covered with membranous sheaths. Petiole 8–30 cm, slender; leaf blade elliptic or elliptic-lanceolate, plicate, 18–32 × 5–7 cm, papery, acuminate. Inflorescence erect; peduncle 20–80 cm, with 3 tubular sheaths 5–8 cm; rachis deep brown, ca. 20 cm, laxly many flowered; floral bracts narrowly lanceolate, ca. 2 mm. Flowers fragrant; pedicel, ovary, sepals, and petals dark brown, lip yellow, column yellow, anther cap with 2 purplish red appendages; pedicel and ovary ca. 1.3 cm, ovary dilated, clavate. Dorsal sepal narrowly oblong, 11–13 × 1.7–2 mm, 3-veined, obtuse; lateral sepals narrowly falcate-oblong, ca. 12 × 2 mm, base adnate to column foot forming a short mentum. Petals similar to lateral sepals, 12–13 × 2–3 mm, 3-veined, subacute; lip elliptic to ovate, 8–12 × 4–9 mm, normally 3-lobed; lateral lobes erect, ovate-triangular, 5–7 mm wide when flattened, acute; mid-lobe suborbicular or obovate, ca. 4 mm wide, apex emarginate; disk with 3 lamellae extending to apex of mid-lobe, lateral ones broader and arcuate. Column arcuate, ca. 7 mm, distal margin entire to slightly denticulate; foot ca. 2 mm. Fl. Mar.  $2n = 32, 40$ .

Wooded slopes; 700–1400 m. Hainan, C and S Taiwan, S and SW Yunnan [Bangladesh, Bhutan, NE India, Laos, Myanmar, Thailand, Vietnam].

*Tainia latifolia* is represented in China by subsp. *latifolia*; *T. lati-*

*folia* subsp. *elongata* (J. J. Smith) H. Turner, from Sumatra and Java, is a smaller plant with shorter pseudobulbs and a denticulate to slightly erose distal column margin.

**13. *Tainia macrantha*** J. D. Hooker, Hooker's Icon. Pl. 19: ad t. 1860. 1889.

大花带唇兰 da hua dai chun lan

*Mischobulbum macranthum* (J. D. Hooker) Rolfe.

Pseudobulbs prostrate on rhizome and then arching-ascending, narrowly cylindric, 4–9 cm × 5–7 mm. Petiole 4–5 cm; leaf blade elliptic, plicate, 14–20 × 4–7 cm, thinly papery, base truncate or subrounded, apex acuminate or shortly acuminate. Inflorescence erect, with 3 sheaths 1.5–6 cm; rachis 3–6-flowered; floral bracts ovate-lanceolate, 7–14 mm, acuminate. Flowers large, apical half bright red, basal half greenish white, spotted with bright red; pedicel and ovary ca. 1.5 mm. Dorsal sepal narrowly lanceolate, ca. 3.5 × 0.5–0.6 cm, 3-veined, acuminate; lateral sepals similar to dorsal sepal, ca. 3.8 × 0.7–0.8 cm, apex long acuminate, base broadly adnate to column foot forming a broadly conic mentum. Petals lanceolate, ca. 3.5 × 1 cm, 3-veined, acuminate; lip rhombic-hastate, ca. 3.5 × 2.1–2.2 cm, base cuneate, adnate to end of column foot, upper part slightly 3-lobed; lateral lobes erect, subtriangular, small, slightly obtuse; mid-lobe ovate-triangular, acute; disk with 3 lamellae, lateral 2 broader and arcuate. Column ca. 1.5 cm, winged; foot 1.1–1.5 cm. Fl. Jul–Aug.

Wooded slopes or rocky places along valleys; 700–1200 m. S and SW Guangdong, Guangxi [Vietnam].

## 95. **ERIODES** Rolfe, Orchid Rev. 23: 327. Nov 1915.

毛梗兰属 mao geng lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Tainiopsis* Schlechter, Orchis 9: 10. Feb 1915, not Hayata (1914); *Neotainiopsis* Bennet & Raizada, nom. illeg. superfl.

Herbs, epiphytic or lithophytic. Rhizome creeping. Pseudobulbs conic to globose, subtended by fibrous sheaths. Leaves 1–3, arising from apex of pseudobulb, suberect, plicate, lanceolate to elliptic-ovate, tapering below to a conduplicate petiole, base subtended by an acute sheath. Inflorescence basal, erect, longer than leaves, racemose, laxly flowered; peduncle and rachis terete, pubescent; floral bracts persistent, ciliate. Flowers erect; ovary pubescent with brown ramenta. Dorsal sepal free, hooded over column; lateral sepals reflexed, basally connate, forming a mentum with column foot. Petals reflexed, free, linear-spatulate; lip movable, simple, ligulate, recurved toward apex. Column ca. 1/2 as long as dorsal sepal, shallowly winged on each side, with a prominent foot hooked apically to form a shallow sac; anther 8-locular; pollinia 8, in 2 groups of 4, attached to a small amorphous viscidium; stigma transversely reniform; rostellum a shallowly bilobed flap.

One species: Bhutan, SW China, NE India, Myanmar, Thailand, Vietnam.

**1. *Eriodes barbata*** (Lindley) Rolfe, Orchid Rev. 23: 327. 1915.

毛梗兰 mao geng lan

*Tainia barbata* Lindley, Gard. Chron. 1857: 68. 1857; *Eria barbata* (Lindley) H. G. Reichenbach; *Neotainiopsis barbata* (Lindley) Bennet & Raizada; *Pinalia barbata* (Lindley) Kuntze; *Tainiopsis barbata* (Lindley) Schlechter.

Pseudobulbs glossy, subglobose, to 3 cm in diam. Leaves 2 or 3; leaf blade oblong or narrowly elliptic, ca. 37 × 3 cm,

base contracted into a petiole ca. 7 cm, ± embraced by 2 or 3 sheaths, apex long acuminate. Inflorescence erect, laxly ca. 9-flowered; peduncle erect, 25–40 cm, 4–5 mm in diam., narrowed from a broad base, sheathed, pubescent, with 3 densely pubescent long sheaths; rachis 24–40 cm, slender, weakly zigzag, pubescent; floral bracts lanceolate, 13–20 mm, abaxially densely pubescent, apex acuminate. Flowers fragrant, 2–2.5 cm in diam.; sepals pale yellow and with purplish red veins, petals purplish red, lip yellowish with purplish red stripes; pedicel and ovary 2–3 cm, densely brown pubescent and with broad and compressed hairs. Dorsal sepal oblong, 14–18 × ca. 4 mm, 3-

veined, apex obtuse; lateral sepals falcate-oblong, 14–18 × 4–5 mm, 5-veined, apex acute; mentum 2–3 mm. Petals narrowly oblong or linear, 14–18 × 1.2–1.4 mm, 3-veined, apex obtuse; lip attached to column foot, broadly ovate, 6–9 × 3–5 mm, entire, strongly recurved, strongly veined, apex sagittate with 2

small side projections. Column 3–5 mm, broadly winged; foot ca. 5 mm. Fl. Oct–Nov.

Epiphytic on tree trunks at forest margins or in open forests; 1400–1700 m. S and SW Yunnan [Bhutan, NE India, Myanmar, Thailand, Vietnam].

## 96. HANCOCKIA Rolfe, J. Linn. Soc., Bot. 36: 20. 1903.

滇兰属 dian lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Chrysoglossella* Hatusima.

Herbs, terrestrial, glabrous. Rhizome slender, creeping; roots unbranched, villous, with root hairs, arising mainly from nodes. Shoot arising from base of terminal or subterminal internode, with a persistent, tubular, acute, membranous scale at each node; sterile shoots with 1 terminal leaf, alternating with fertile ones, terminal internode not swollen or differentiated. Leaf spreading to suberect, plicate-venose, ovate, with a crimped or crenulate margin. Inflorescence terminal, 1-flowered; floral bracts similar to rhizome scales. Flower resupinate, not opening widely; ovary cylindrical, glabrous. Sepals and petals entire, free; lateral sepals decurrent on column foot. Lip adnate to column foot, 3-lobed, spurred at base; lateral lobes erect; mid-lobe porrect; callus of 2 low, linear ridges. Column clavate, with a foot; anther cap with 2 4-locular thecae, incumbent, glabrous; pollinia 8, stipe present; stigma subelliptic; rostellum flaplike.

One species: SW China, S Japan, Vietnam.

### 1. *Hancockia uniflora* Rolfe, J. Linn. Soc., Bot. 36: 20. 1903.

滇兰 dian lan

*Chrysoglossella japonica* Hatusima; *Hancockia japonica* (Hatusima) Maekawa.

Pseudobulbs loosely arranged on rhizome, borne ca. 2 cm apart from each other, narrowly cylindrical, 1–1.5 cm × 1.5–2.5 mm. Petiole ca. 5 mm; leaf blade elliptic-ovate or ovate-lanceolate, 5–7.5 × 2–3.3 cm, papery, base subrounded, apex acute. Inflorescence ca. 2 cm, base with membranous tubular sheaths,

terminating in a flower; floral bracts cymbiform, ca. 2 cm. Flower pink; pedicel and ovary 2.5–3 cm. Sepals similar, free, slightly connivent, linear or narrowly oblong, ca. 20 × 3 mm, 3-veined, apex acuminate. Petals similar to sepals, ca. 20 × 3–4 mm, 3-veined, apex acuminate; lip elliptic-oblong, ca. 1.7 cm, 3-lobed; lateral lobes ovate-triangular; mid-lobe subreniform, apex obtuse; disk with 3 longitudinal ridges; spur ca. 2.2 cm, apex obtuse. Column ca. 1.5 cm. Fl. Jul.

Damp places in forests or along valleys; 1300–1600 m. S and SE Yunnan [Japan (Ryukyu Islands), N Vietnam].

## 97. PACHYSTOMA Blume, Bijdr. 376. 1825.

粉口兰属 fen kou lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Apaturia* Lindley; *Pachychilus* Blume.

Herbs, terrestrial, with a distinct dormant period. Rhizome cylindrical. Pseudobulb fleshy, cylindrical or tuberlike with distinct fertile and vegetative shoots. Leaves 1 or 2, erect, linear, plicate-venose, papery, subtended by a few sterile sheaths. Inflorescence axis erect, leafless, with many brown sheaths along length, racemose; floral bracts persistent, suberect, lanceolate. Flowers subnutant, hairy; ovary hairy. Sepals subequal, not widely spreading, pubescent on both surfaces; dorsal sepal free; lateral sepals with oblique bases surrounding saccate lip base to form a blunt mentum. Petals free, linear, narrower than sepals, both surfaces pubescent; lip attached to apex of column foot, fleshy, porrect, 3-lobed in apical half, subgibbous or saccate at base but lacking a spur; disk papillose; lateral lobes erect; mid-lobe recurved at blunt apex; callus of several papillose or verrucose linear ridges from base to apex of blade. Column clavate, incurved and winged at apex, pubescent; anther cap terminal, pubescent; pollinia 8, clavate, waxy, without conspicuous viscidium and stipe; stigma transversely reniform-elliptic or dumbbell-shaped; rostellum obtuse. Capsule oblong, rostrate, ridged.

About 20 species: tropical Asia and the Malay Archipelago, N Australia, New Guinea, and New Caledonia; two species (one endemic) in China.

- 1a. Pseudobulbs subcylindrical; flowers yellow, tinged with purplish or pink; mid-lobe of lip usually ± ciliate on margin ..... 1. *P. pubescens*  
 1b. Pseudobulbs subglobose or ellipsoid; flowers yellowish; mid-lobe of lip densely long hairy on margin ..... 2. *P. ludaensis*

### 1. *Pachystoma pubescens* Blume, Bijdr. 376. 1825.

粉口兰 fen kou lan

*Apaturia chinensis* Lindley; *A. senilis* Lindley; *Pachychilus chinensis* (Lindley) Blume; *P. pubescens* (Blume) Blume; *Pachystoma brevilibium* Schlechter; *P. chinense* (Lindley) H.

G. Reichenbach; *P. chinense* var. *formosanum* (Schlechter) S. S. Ying; *P. formosanum* Schlechter.

Rhizome tuberous, subcylindric, 4–8 mm in diam. Leaves 1 or 2, appearing after anthesis, linear, 10–50 × 0.8–1 cm, papery, main veins 4 or 5. Inflorescence erect; peduncle whitish, slender, with 6–8 membranous scalelike sheaths 3–8.5 cm; rachis 8–15 cm, laxly to 10- or more flowered, sparsely pubescent; floral bracts erect, narrowly lanceolate, 1.5–2 cm, membranous, abaxially sparsely pubescent, apex long acuminate. Flowers yellowish green, tinged with purplish or pink; pedicel and ovary ca. 1 cm, densely pubescent; ovary clavate. Dorsal sepal elliptic, ca. 11 × 3.5–5 mm, abaxially densely hairy, 5-veined, apex acute or subobtusate; lateral sepals oblong-lanceolate, ca. 11 × 3–4 mm, abaxially densely hairy, 5-veined, apex acuminate or acute. Petals narrowly spatulate or oblanceolate, 10–11 × 1.5–2.2 mm, 3–5-veined, subobtusate or acute; lip obovate, ca. 1 cm, adnate to column foot, 3-lobed above middle; lateral lobes erect, suboblong, ca. 3 mm wide, obtuse; mid-lobe obovate, usually ± ciliate, obtuse and mucronulate; disk with 3–5 longitudinal papillate ridges running from base to apex of mid-lobe. Column ca. 1 cm, densely hirsute, base with short foot; pollinia ca. 1 mm. Fl. Mar–Sep.

Grassy slopes; 800–1900 m. Guangdong, S Guangxi, SW Guizhou, Hainan, Taiwan, S Yunnan [Bangladesh, Bhutan, Cambodia, In-

dia, Indonesia, Laos, Malaysia, Myanmar, ?Nepal, New Guinea, Philippines, Vietnam; Australia].

**2. *Pachystoma ludaense*** S. C. Chen & Y. B. Luo, Acta Phytotax. Sin. 40: 140. 2002.

绿岛粉口兰 lü dao fen kou lan

*Eulophia hirsuta* T. P. Lin, Native Orchids Taiwan 3: 68. 1987, not J. Joseph & Vajravelu (1978).

Pseudobulbs subglobose or ellipsoid, with several nodes. Leaves appearing after anthesis, not seen. Inflorescence erect; peduncle to 50 cm, with many membranous sheaths below; basal sheaths ca. 8 cm; rachis ca. 15 cm, laxly 7–15-flowered; floral bracts lanceolate, 2–5 cm, apex long acuminate. Flowers pendulous, not opening widely, yellowish; pedicel and ovary ca. 8 mm, densely brown hirsute. Sepals ± narrowly oblong, 10–12 × ca. 3 mm, abaxially densely pubescent-hirsute. Petals ± spatulate, ca. 11 × 2.3 mm, margin and abaxial surface sparsely hairy; lip ± broadly ovate, ca. 9 mm, base saccate and finely hairy around entrance of sac, 3-lobed above middle; lateral lobes suborbicular, ca. 3.2 mm wide; mid-lobe suboblong, ca. 3.5 mm, margin densely hairy, apex mucronate, with 3–5 papillae and irregularly rugose ridges from base to apex. Column ca. 6 mm, slender, sparsely puberulent. Fl. Jul.

• Grassy slopes; ca. 200 m. S Taiwan.

## 98. SPATHOGLOTTIS Blume, Bijdr. 400. 1825.

苞舌兰属 bao she lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Alexandra Bell

Herbs, terrestrial. Pseudobulbs ovoid or globose, with a few leaves. Leaf blade plicate, narrow, base contracted into a long petiole-like stalk, not articulate, apex acuminate. Inflorescence terminal, erect, racemose, arising from base of pseudobulb; peduncle with several sheaths; rachis sparsely few flowered; floral bracts shorter than pedicel and ovary. Flowers opening widely, medium-sized. Sepals similar. Petals similar to sepals but usually wider; lip not spurred, adnate to base of column, 3-lobed; lateral lobes suberect; mid-lobe clawed at base; disk and claw of mid-lobe often with keels or other appendages. Column arcuate, slender, upper part enlarged, winged, without column foot; rostellum not lobed; pollinia 8, in 2 groups, narrowly obovoid, subequal in size, waxy, commonly adherent to a solitary triangular viscidium.

About 46 species: tropical Asia to Australia and the Pacific islands; three species in China.

- 1a. Flowers purple; floral bracts and ovary glabrous ..... 1. *S. plicata*  
 1b. Flowers yellow; floral bracts and ovary hairy.  
     2a. Inflorescence 20–50 cm, densely pubescent; lateral lobes of lip oblong, mid-lobe distinctly clawed in basal half 3–6 mm ..... 2. *S. pubescens*  
     2b. Inflorescence 8–13 cm, sparsely pubescent; lateral lobes of lip ovate-triangular, mid-lobe with short claw at base ca. 2 mm or less ..... 3. *S. ixioides*

### 1. *Spathoglottis plicata* Blume, Bijdr. 401. 1825.

紫花苞舌兰 zi hua bao she lan

Pseudobulbs ovoid-conic, ca. 3 × 1–1.7 cm, ± enclosed in sheaths, with 3–5 leaves. Leaf blade linear-lanceolate, 30–80 × 5–7 cm, petiole-like stalk 10–20 cm. Inflorescence to 100 cm, with many tubular sheaths; rachis 8–15 cm, 9–16-flowered; floral bracts reflexed, purple, ovate, ca. 1.5 cm. Flowers opening successively, purple; pedicel and ovary purplish, 25–35 mm. Sepals ovate, concave, 15–17 × ca. 9 mm, sparsely pubes-

cent, apex acute; lateral sepals oblique. Petals subelliptic, ca. 18 × 13 mm, apex acute; lip 3-lobed, 16–23 mm, with 2 small, triangular, pubescent auricles at base of claw; disk with 2 short keels arising from base of lip; lateral lobes falcate, ca. 6 × 3 mm, apex dilated and truncate; mid-lobe dilated toward apex and flabellate, ca. 10 mm, apex subtruncate and often shallowly 2-lobed, with a distinct claw at base; claw and lower part of lip sometimes yellow; keels expanded toward apex into 2 large, fleshy, erect, rounded extensions terminating near base of claw, extensions pubescent adaxially. Column ca. 1.5 cm. Fl. Jan–Dec.  $2n = 40, 42, 60$ .

Sunny places at forest margins, grassy slopes. S Taiwan [S India, Indonesia, Japan (Ryukyu Islands), Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

**2. *Spathoglottis pubescens*** Lindley, Gen. Sp. Orchid. Pl. 120. 1831.

苞舌兰 bao she lan

*Spathoglottis fortunei* Lindley; *S. plicata* Blume var. *pubescens* (Lindley) M. Hiroe.

Pseudobulbs dorsiventrally compressed, globose, usually 1–2.5 cm in diam., ± covered with leathery scalelike sheaths, with 1–3 leaves. Leaf blade linear-lanceolate, ca. 43 × 1–1.7(–4.5) cm, base acute. Inflorescence (11–)20–50 cm, densely pubescent, lower part covered with several amplexicaul tubular sheaths; rachis 2–9 cm, sparsely 2–8(–12)-flowered; floral bracts lanceolate to ovate-lanceolate, 5–9 mm, pubescent, apex acute. Flowers yellow, base of lip spotted violet; pedicel and ovary 2–2.5 cm, densely pubescent. Sepals ovate-elliptic, 12–19 × 5–8 mm, outer surface pubescent, with 5–7 main veins, apex acute. Petals broadly oblong, 12–17 × 8–10 mm, with 5 or 6 main veins, apex obtuse; lip 12–17 mm, saccate at base, sometimes with 2 small obtuse auricles at base of claw, 3-lobed; disk with 3 keels; lateral lobes oblong, deeply incised, apex rounded or truncate; mid-lobe obovate-cuneate, ca. 13 mm, base with a distinct claw, apex subtruncate and emarginate; disk with a low, central ridge running from middle of claw to midway along mid-lobe; keels arising from base of lip, sometimes pubescent, outer 2 terminating at base of claw, central one divided at apex in 2 large, fleshy, rounded-truncate extensions and terminating at base of mid-lobe. Column 8–10 mm. Fl. Jul–Nov.  $2n = 38, 40$ .

Sparse forests, grassy slopes; 300–1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Cambodia, NE India, Laos, Myanmar, Thailand, Vietnam].

**3. *Spathoglottis ixioides*** (D. Don) Lindley, Gen. Sp. Orchid. Pl. 120. 1831.

少花苞舌兰 shao hua bao she lan

*Cymbidium ixioides* D. Don, Prodr. Fl. Nepal. 36. 1825.

Pseudobulbs subglobose, usually 0.5–1 cm in diam., with 2 or 3 leaves. Leaf blade linear-lanceolate, 6–12 × 0.3–1.1 cm, base acute, petiole-like stalk 1–2 cm, sheathing; leaf base usually forming a pseudostem, sheathing at base. Inflorescence 8–13 cm, slender, with 2 tubular sheaths at base, sparsely pubescent; rachis short, ca. 1 cm, 1- or 2-flowered; floral bracts ovate-lanceolate, ca. 8 mm, sparsely pubescent, apex acute. Flowers yellow; pedicel and ovary 15–20 mm, densely villous. Dorsal sepal elliptic, 18–22 × 8–10 mm, 5- or 6-veined, outer surface sparsely villous, apex acute; lateral sepals ovate-lanceolate to oblong-lanceolate, 15–20 × 5–9 mm, outer surface sparsely villous. Petals 7-veined, apex subobtusely; lip erect, 14–18 mm, saccate at base, 3-lobed, with 2 acute auricles at base of claw; disk with 1 keel; lateral lobes ovate-triangular, shallowly incised, apex obtuse; mid-lobe obovate, ca. 8 × 6 mm, with a short claw at base, apex subtruncate; disk with a low, central ridge running from middle of claw to midway along mid-lobe; keel arising from base of lip, usually densely pubescent, dividing before claw into 2 large, fleshy, rounded-obtusely extensions and terminating at base of mid-lobe. Column 1–1.7 cm. Fl. Aug–Sep.

Rocky slopes; 2300–2800 m. S Xizang [Bhutan, India (Sikkim), Nepal].

## 99. CEPHALANTHEROPSIS Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 32: 188. 1960.

黄兰属 huang lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial or rarely epiphytic. Rhizome creeping. Stem erect, cylindric, reedlike, many noded, enclosed in tubular sheaths toward base, leafy above. Leaves many, plicate, base decurrent into an amplexicaul sheath, articulate. Inflorescences usually 1–3, arising laterally from nodes in lower half of stem, erect or ascending, racemose; peduncle with several amplexicaul sterile bracts at base; rachis many flowered; floral bracts caducous, lanceolate. Flowers spreading horizontally or nodding, small to medium-sized, opening widely or not. Sepals and petals similar, free, spreading to reflexed; petals sometimes broader than sepals; lip adnate to base of column, 3-lobed above middle, spurless but base shallowly saccate or concave; lateral lobes erect, loosely embracing column; mid-lobe expanding from a short claw, usually 2-lobulate, apical margin usually strongly crisped; disk sometimes with a callus composed of 2 ridges. Column stout, winged, slightly dilated at base but without a column foot; anther terminal, incumbent; rostellum ovate, small; stigma subterminal, suborbicular; pollinia 8, in 2 groups of 4, equal in size, narrowly obovoid, waxy, borne on a globose viscidium.

About five species: from NE India through S China to S Japan (Ryukyu Islands), mainland SE Asia, the Philippines, and Sumatra; three species in China.

- 1a. Plants 35–100 cm tall; flowers green or yellowish green, opening widely; lateral lobes of lip with distinct subtriangular-falcate auricles projecting forward, apices acute to subacuminate ..... 1. *C. obcordata*
- 1b. Plants 30–50 cm tall; flowers white or pale yellow, not opening widely; lateral lobes of lip without terminal auricles, apices subtruncate and irregularly incised.
  - 2a. Flowers nodding; lip 6–8 × 4–5 mm ..... 2. *C. halconensis*
  - 2b. Flowers spreading horizontally; lip 4.5–5 × 3–4 mm ..... 3. *C. longipes*

**1. *Cephalantheropsis obcordata*** (Lindley) Ormerod, *Orchid Digest* 62: 157. 1998.

黄兰 huang lan

*Bletia obcordata* Lindley, *Gen. Sp. Orchid. Pl.* 123. 1831; *Calanthe bursicola* Gagnepain; *C. gracilis* Lindley; *C. gracilis* var. *venusta* (Schlechter) F. Maekawa; *C. ramosii* Ames; *C. tubifera* J. D. Hooker; *C. venusta* Schlechter; *Cephalantheropsis gracilis* (Lindley) S. Y. Hu; *C. venusta* (Schlechter) S. Y. Hu; *Gastrochis gracilis* (Lindley) Averyanov; *Limatodis gracilis* (Lindley) Lindley; *Paracalanthe gracilis* (Lindley) Kudô; *P. venusta* (Schlechter) Kudô; *Phaius gracilis* (Lindley) S. S. Ying (1977), not Hayata (1911); *P. ramosii* (Ames) Ames.

Plants 35–100 cm tall. Stem erect, cylindrical, to 60 cm, many noded (internodes 5–10 cm), with tubular membranous sheaths toward base, 5–9-leaved above. Leaves oblong or oblong-lanceolate, 15–35 × 3–8 cm, papery, base contracted into a short petiole-like stalk, apex acute or acuminate. Inflorescences 1–3, erect, 35–60 cm, unbranched or rarely 1- or 2-branched near base; peduncle densely puberulent, with a few scattered sheaths; rachis 5–20 cm, laxly 6- to many flowered; floral bracts narrowly lanceolate, 20–40 cm, membranous, apex acuminate. Flowers slightly fragrant, spreading horizontally, opening widely; sepals and petals green to yellowish green, lip white with a central orange-yellow patch, all parts turning orange-brown with age; pedicel and ovary 10–20 mm, densely puberulent. Sepals and petals strongly reflexed; sepals similar, elliptic-lanceolate or ovate-lanceolate, 9–11 × 3.5–4 mm, outer surfaces densely puberulent, inner surfaces glabrous or sparsely puberulent, 3–5-veined, apex aristate. Petals ovate-elliptic, 8–10 × 3.5–4 mm, outer surfaces puberulent, 3-veined, apex subobtusate and mucronate; lip spreading, suboblong, 9–12 × 5–7 mm, slightly concave at base, 3-lobed above middle; lateral lobes suberect and embracing column, with distinct subtriangular-falcate auricles projecting forward, apices acute to subacuminate; mid-lobe subreniform, 2–3 × 5–7 mm (excluding claw), shortly clawed at base, margin strongly crisped, apex emarginate; claw at base of mid-lobe ca. 1.5 mm; disk with a pair of yellow lamellae extending from near base of lip onto claw of mid-lobe and with many orange-red papillae between lamellae. Column 3–5 mm, base often dilated, winged below middle, hairy; rostellum ovate-triangular, small, ca. 0.8 mm; pollinia ca. 0.8 mm. Capsule cylindrical, 15–20 × 8–10 mm, ridged. Fl. Sep–Dec, fr. Nov–Mar.  $2n = 40, 42$ .

Dense forests; 400–1400 m. S Fujian, Guangdong, Hainan, Taiwan, S and SE Yunnan [NE India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**2. *Cephalantheropsis halconensis*** (Ames) S. S. Ying, *Coloured Ill. Fl. Taiwan* 3: 622. 1988.

铃花黄兰 ling hua huang lan

*Phaius halconensis* Ames, *Philipp. J. Sci., C*, 2: 323. 1907; *Calanthe kooshunensis* Fukuyama; *Cephalantheropsis calanthoides* (Ames) T. S. Liu & H. J. Su; *C. gracilis* (Lindley) S. Y. Hu var. *calanthoides* (Ames) T. P. Lin; *Gastrochis calanthoides* (Ames) Z. H. Tsi, S. C. Chen & K. Mori; *Phaius calanthoides* Ames; *P. gracilis* (Lindley) S. S. Ying var. *calanthoides*

(Ames) S. S. Ying; *P. longipes* (J. D. Hooker) Holttum var. *calanthoides* (Ames) T. P. Lin.

Plants 30–40 cm tall. Stem erect, cylindrical, to 40 cm, ca. 5 mm in diam., several noded (internodes 3–5 cm), with several tubular sheaths toward base, 4–7-leaved above. Leaves narrowly oblong or oblong, 12–24 × 1.8–4 cm, base contracted and decurrent into sheaths, apex shortly acuminate. Inflorescence solitary, erect or ascending, slender, usually 20–35 cm, densely puberulent; peduncle with 3 or 4 scattered sheaths; rachis 6–14 cm, laxly 6- to more than 10-flowered; floral bracts caducous. Flowers nodding, not opening widely, white to pale yellow, all parts turning orange with age, lip white to pale yellow with a central yellow patch; pedicel and ovary ca. 15 mm. Sepals connivent, similar, ovate-lanceolate, 8–9 × 3.2–4 mm, outer surfaces puberulent, 3-veined, apex acute to shortly acuminate. Petals ovate-oblong, 8–9 × 3–5 mm, glabrous, 3-veined, apex acute; lip spreading, oblong-obovate, 6–8 × 4–5 mm, 3-lobed above middle; lateral lobes erect, oblong, ca. 2 mm, without terminal auricles, apices subtruncate and irregularly incised; mid-lobe transversely oblong, ca. 1.5 × 4–4.5 mm (excluding claw), shortly clawed at base, margin usually strongly undulate, apex slightly emarginate; claw at base of mid-lobe ca. 1 mm; disk with a pair of yellow lamellae and many yellowish brown papillae between them. Column ca. 4 mm. Fl. Oct–Nov.  $2n = 40$ .

Damp places in broad-leaved forests; 500–1300 m. Taiwan [Philippines].

**3. *Cephalantheropsis longipes*** (J. D. Hooker) Ormerod, *Orchid Digest* 62: 156. 1998.

白花黄兰 bai hua huang lan

*Calanthe longipes* J. D. Hooker, *Fl. Brit. India* 6: 195. 1890; *Alismorkis longipes* (J. D. Hooker) Kuntze; *C. dolichopoda* Fukuyama; *Phaius longipes* (J. D. Hooker) Holttum; *P. mindorensis* Ames.

Plants 30–50 cm tall. Stem erect, cylindrical, to 40 cm, 3–7 mm in diam., several noded (internodes 5–8 cm), with several tubular sheaths toward base, 5–8-leaved above. Leaves elliptic to elliptic-oblong, oblique, 8–20 × 2–5 cm, base contracted and decurrent into sheaths, apex acute to shortly acuminate. Inflorescences 1 or 2, erect, 10–20 cm, slender, puberulent; peduncle with 3 or 4 scattered sheaths; rachis 2–9 cm, laxly 5–15-flowered; floral bracts caducous. Flowers spreading horizontally, not opening widely; sepals and petals white, lip white with a yellow band at center, all parts turning orange with age; pedicel and ovary 10–20 mm, puberulent. Sepals connivent or spreading, similar, lanceolate, 6–8 × ca. 2.5 mm, outer surfaces puberulent, apex acuminate. Petals ovate, 5–6 × 2–3 mm, glabrous, apex acute; lip spreading, ovate-oblong, 4.5–5 × 3–4 mm, 3-lobed above middle; lateral lobes erect, triangular-ovate, ca. 1.5 mm, without terminal auricles, apices subtruncate and irregularly incised; mid-lobe transversely oblong, ca. 1.5 × 3 mm (excluding claw), shortly clawed at base, margin strongly undulate-crenulate, apex emarginate; claw at base of mid-lobe ca. 1.5 mm; disk with a pair of yellow lamellae extending from base of lip to base of mid-lobe. Column ca. 3 mm. Fl. Oct.

Forests; ca. 1200 m. SW Guangxi, Taiwan, SE Xizang, SE and W Yunnan [Bhutan, NE India, Myanmar, Philippines, Vietnam].

**100. PHAIUS** Loureiro, Fl. Cochinch. 2: 517, 529. 1790.

鹤顶兰属 he ding lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Alexandra Bell

Herbs, terrestrial, with pseudobulbs, sometimes stemlike. Roots densely hairy. Pseudobulb sometimes stemlike, tufted, with few to many nodes, often sheathing, with several leaves on upper part. Leaves large, plicate, petiolate, apex acuminate to acute, with long, tubular sheath tightly embracing stem or sometimes equitant forming a pseudostem. Inflorescences 1 or 2, lateral on nodes of pseudobulb, higher or lower than leaves; peduncle with a few sparse sheaths; raceme with a few sparse or with many dense flowers, unbranched or rarely with a few branches at base; floral bracts large, apex acute; flowers ascending on raceme, often large. Sepals and petals subsimilar; lip adnate to column at base, separated from column or  $\pm$  adnate to basal wings of column, base with short spur or spurless, nearly 3-lobed or unlobed,  $\pm$  embracing column. Column long and stout, upper part enlarged, usually winged; rostellum large or inconspicuous, unlobed; stigma lateral; anther terminal, 2-locular; pollinia 8, waxy, in 2 groups, attached by caudicles to a sticky substance.

About 40 species: tropical Africa, Madagascar, tropical and subtropical Asia to Oceania; nine species (four endemic) in China.

- 1a. Plants with cylindrical stemlike pseudobulbs (15–)20–80 cm.  
 2a. Pseudobulb stout, 3–5 cm in diam.; inflorescences shorter than 25 cm; flowers cream-white, not widely opening ..... 5. *P. columnaris*  
 2b. Pseudobulb slender, less than 3 cm in diam.; inflorescences longer than 35 cm.  
 3a. Flowers yellowish green ..... 1. *P. takeoi*  
 3b. Flowers purplish red or pink.  
 4a. Mid-lobe of lip with white hairy ridges adaxially ..... 3. *P. mishmensis*  
 4b. Mid-lobe of lip glabrous ..... 4. *P. wenshanensis*
- 1b. Plants with conic, ovoid, or cylindrical-ovoid pseudobulbs 1–14 cm.  
 5a. Inflorescences not exceeding leaves; leaves with yellow spots; flowers yellow ..... 2. *P. flavus*  
 5b. Inflorescences exceeding leaves; leaves green.  
 6a. Inflorescences (peduncle, rachis, floral bracts) with blackish brown scaly hairs ..... 8. *P. hainanensis*  
 6b. Inflorescences glabrous.  
 7a. Plants 20–35 cm tall; sepals and petals 1.5–2.2 cm ..... 9. *P. delavayi*  
 7b. Plants ca. 100 cm or more tall; sepals and petals 4–7 cm.  
 8a. Pseudobulb 6–8 cm; flowers nutant; petals lacking brown-red spots abaxially; spur shorter than 1 cm ..... 6. *P. tancarvilleae*  
 8b. Pseudobulb 10–14 cm; flowers spreading; petals with brown-red spots above middle abaxially; spur longer than 1 cm ..... 7. *P. wallichii*

**1. *Phaius takeoi*** (Hayata) H. J. Su, Quart. J. Exp. Forest. Natl. Taiwan Univ. 3(4): 77. 1989.

长茎鹤顶兰 chang jing he ding lan

*Calanthe takeoi* Hayata, Icon. Pl. Formosan. 9: 111. 1920;  
*Phaius longicuris* Z. H. Tsi.

Plants to 100 cm tall. Pseudobulb stemlike, cylindrical, 20–40  $\times$  1.3–2 cm. Leaves 5–8, on upper part of pseudobulb; blade green, elliptic or elliptic-lanceolate, 22–40  $\times$  5–8 cm, glabrous, apex long acuminate. Inflorescences arising from basal or lower nodes of pseudobulb, not exceeding height of leaves, 30–55 cm, 4–10-flowered, glabrous; floral bracts persistent, ovate-lanceolate, 0.5–1 cm. Flowers widely opening, 4–5 cm in diam.; pedicel and ovary 2–2.5 cm, sparsely puberulent; sepals and petals pale yellowish green. Sepals subsimilar, oblong to oblanceolate, 2.8–3.5  $\times$  0.7–1 cm, abaxially sparsely puberulent, apex obtuse. Petals obovate-lanceolate, 2.8–3  $\times$  0.6–0.8 cm, apex obtuse to acute; lip white, often tinged yellow, nearly orbicular, 2–2.5  $\times$  ca. 2 cm, shallowly 3-lobed; lateral lobes subovate, margin undulate, apex obtuse; mid-lobe orbicular-square, margin undulate, apex emarginate and sinus mucronate; disk with 2 or 3 yellow to yellowish green ridges; spur yellow or greenish yellow, hornlike, 0.3–0.8 cm, apex unlobed, slightly hooked. Column

white, 1.5–2.5 cm, densely pubescent ventrally; rostellum ligulate; anther cap white. Fl. Oct–Nov.

Moist broad-leaved forests, dense forests along valleys; 500–1400 m. C Taiwan, S Yunnan [Vietnam].

**2. *Phaius flavus*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 128. 1831.

黄花鹤顶兰 huang hua he ding lan

*Limodorum flavum* Blume, Bijdr. 375. 1825; *Bletia flava* (Blume) Wallich ex Lindley; *B. woodfordii* Hooker; *Phaius maculatus* Lindley; *P. minor* Blume; *P. somae* Hayata; *P. tancarvilleae* (L'Héritier) Blume f. *veronicae* S. Y. Hu & Barretto; *P. undulatomarginatus* Hayata; *P. woodfordii* (Hooker) Merril.

Plants 40–100 cm tall. Pseudobulb ovoid-conic, 5–10  $\times$  1.5–4 cm. Leaves 4–8, on upper part of pseudobulb; blade normally green with yellow or white spots, ovate-elliptic or elliptic-lanceolate, 25–60  $\times$  5–20 cm, glabrous, apex acuminate or acute. Inflorescences arising from basal or lower nodes of pseudobulb, normally not exceeding height of leaves, 50–90 cm, 8–25-flowered, glabrous; floral bracts persistent, ovate-lanceolate, 2.5–4  $\times$  0.5–0.7 cm, glabrous. Flowers not widely opening, 4–7 cm in diam.; pedicel and ovary 2–3 cm, glabrous; sepals and

petals pale yellow to mid-yellow, sepals often green tipped, often turning indigo-blue when dried. Sepals subsimilar, oblong-obovate, 2.5–4 × 0.7–1.5 cm, glabrous, apex obtuse to subacute. Petals oblong-elliptic, 2.5–4 × 0.7–1.5 cm, apex obtuse-subacute; lip yellow with orange or brown marks, apical margin brown, obovate, 2.5–4.5 × 2.2–4.5 cm, shallowly 3-lobed; lateral lobes subobovate, margin undulate, apex rounded-truncate; mid-lobe orbicular, undulate-crisped, apex emarginate; disk with 3 or 4 brown ridges, glabrous; spur slightly curved, white, conic, 0.5–0.8 × ca. 0.2 cm, apex obtuse. Column white, 1.5–2 cm, densely white pubescent ventrally; rostellum suborbicular; anther cap white. Fl. Apr–Oct.  $2n = 38, 42$ .

Shaded and humid places in forests; 300–2000 m. N Fujian, Guangdong, Guangxi, Guizhou, Hainan, N Hunan, Sichuan, Taiwan, SE Xizang, Yunnan [Bhutan, NE India, Indonesia, Japan, Laos, Malaysia, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

"*Plocoglottis* sp." was reported by R. A. Rolfe to be found on Emei Shan in SC Sichuan based on a specimen collected by Faber (*No. 947*). *Plocoglottis* Blume is a genus similar in habit to *Phaius*, particularly *P. flavus*. We have collected orchids several times on Emei Shan and have found *P. flavus* but not *Plocoglottis*. It seems that the *Plocoglottis* species on Emei Shan may be a misidentification of this species.

**3. *Phaius mishmensis*** (Lindley & Paxton) H. G. Reichenbach, *Bonplandia* 5: 43. 1857.

紫花鹤顶兰 *zi hua he ding lan*

*Limatodis mishmensis* Lindley & Paxton, *Paxt. Fl. Gard.* 3: 36. 1852; *Calanthe crinita* Gagnepain; *C. ramosa* Gagnepain; *Phaius crinitus* (Gagnepain) Seidenfaden; *P. gracilis* Hayata.

Plants 40–140 cm tall. Pseudobulb stemlike, cylindrical, 30–80 × 0.6–1.5 cm. Leaves 4–7; blade green, elliptic or obovate-lanceolate, (10–)15–30 × 4–8 cm, glabrous, apex acute. Inflorescences arising from middle nodes of pseudobulb or axils of upper leaves above middle, ca. as tall as or taller than height of leaves, (30–)35–45 cm, sparsely 2–10-flowered, glabrous; floral bracts caducous, oblong-lanceolate, 3–4 cm, glabrous. Flowers not widely opening, 5–6 cm in diam.; pedicel and ovary 2–3 cm, glabrous; sepals and petals pale pink to dark red or purple-brown. Sepals similar, elliptic, 2.5–3.5 × 0.5–1.2 cm, glabrous, apex subacute. Petals oblanceolate, 2–3.5 × 0.4–0.7 cm, apex obtuse; lip white to pink, densely reddish brown spotted, obovate-triangular, 2–3.5 × 1.5–2.5 cm, 3-lobed; lateral lobes ovate, margins flat or slightly undulate, apex obtuse or rounded; mid-lobe subsquare or broadly obovate, margin undulate, apex emarginate to retuse; disk with 3 or 4 densely hirsute-pubescent ridges extending to mid-lobe; spur slightly curved, yellow-green, narrowly cylindrical, 1–1.6 × ca. 0.2 cm, apex obtuse. Column yellow or whitish, ca. 2.2 cm, densely villous ventrally; rostellum triangular. Fl. Oct–Jan.  $2n = 42, 44 + 4f, 50, 62$ .

Shaded and wet places in evergreen broad-leaved forests; 800–1400 m. NW Guangdong, Guangxi, C and S Taiwan, SE Xizang, S and SE Yunnan [Bhutan, NE India, Japan (Ryukyu Islands), Laos, Myanmar, Philippines, Thailand, Vietnam].

**4. *Phaius wenshanensis*** F. Y. Liu, *Acta Bot. Yunnan.* 13: 372. 1991.

文山鹤顶兰 *wen shan he ding lan*

Plants 55–100 cm tall. Pseudobulb stemlike, cylindrical, 40–50 × 0.6–1 cm. Leaves 6 or 7; blade elliptic, 10–34 × 5–12 cm, glabrous, apex acute. Inflorescences arising from lower or basal nodes of pseudobulb, not exceeding height of leaves, to 45 cm, sparsely 5- or 6-flowered, glabrous; floral bracts caducous, ca. 3 cm. Flowers widely opening, 6–8 cm in diam.; pedicel and ovary 2.5–3 cm, glabrous; sepals and petals yellow outside, purplish red or pink inside. Sepals subsimilar, elliptic, 3.8–4.2 × 1.4–1.6 cm, glabrous, apex obtuse. Petals oblanceolate, 3.7–3.9 × 1–1.2 cm, apex obtuse; lip lateral lobes densely purplish red spotted, obovate-triangular, ca. 3.5 × 3.2–3.7 cm, 3-lobed; lateral lobes subobovate, margin undulate, apex obtuse; mid-lobe broadly obovate, margin crisped, apex emarginate; disk with 2 or 3 yellow ridges, glabrous; spur yellow, horn-shaped, 2–2.3 × ca. 0.4 cm, apex forming a hook. Column yellow, with purplish red spots, ca. 2.7 cm, glabrous; anther cap pale yellow. Fl. Sep.

• Forests; ca. 1300 m. SE Yunnan.

**5. *Phaius columnaris*** C. Z. Tang & S. J. Cheng, *Bull. Bot. Res.*, Harbin 5(2): 141. 1985.

仙笔鹤顶兰 *xian bi he ding lan*

*Phaius guizhouensis* G. Z. Li.

Plants 60–100 cm tall. Pseudobulb cylindrical, resembling robust stems, 15–40 × 3–5 cm. Leaves 6 or 7, on upper part of pseudobulb; blade green, elliptic, 30–70 × 9–14 cm, apex acuminate. Inflorescence arising from first node of pseudobulb, not exceeding height of leaves, ca. 20 cm, ca. 12-flowered; floral bracts caducous, ovate-triangular, 1.5–2 × ca. 1.4 cm. Flowers not widely opening, 8–5.5 cm in diam.; pedicel and ovary 2–3.5 cm, with sparse brown hairs; sepals and petals cream-white with green tops on dorsal sepals. Sepals subsimilar, suboblong or falcate-oblong, 3.5–4.5 × 1.3–1.5 cm, glabrous, apex acute. Petals falcate-oblong, 3.3–4 × ca. 1.5 cm, apex acute; lip cream-white with adaxial surface tinged orange-red on mid-lobe, suborbicular, slightly 3-lobed; lateral lobes suborbicular, margin undulate, apex rounded; mid-lobe ovate, margin crisped, apex rounded-obtuse; disk with 2 or 3 yellow ridges, glabrous; spur yellowish green with whitish green stripes, narrowly conic or horn-shaped, short, 3.5–7 × 2–3 mm, apex slightly concave. Column cream-white, ventral side with orange-red stripes, ca. 2 cm, sparsely white hairy ventrally; anther cap cream-white. Fl. Jun.

• Open places between rocks in limestone forests; 200–1700 m. N Guangdong, SW Guizhou, S Yunnan (Mengla).

**6. *Phaius tancarvilleae*** (L'Héritier) Blume, *Mus. Bot.* 2: 177. 1856 [*"tankervillii"*].

鹤顶兰 *he ding lan*

*Limodorum tancarvilleae* L'Héritier, *Sert. Angl.* 28. 1789; *Bletia tancarvilleae* (L'Héritier) R. Brown; *Phaius grandifolius* Loureiro; *P. grandifolius* var. *superbus* Houtte; *P. sinensis* Rolfe; *P. tancarvilleae* var. *superbus* (Houtte) S. Y. Hu.

Plants (60–)100–200 cm tall. Pseudobulb conic, ovoid, or subglobose, (2.5–)6–8 × 3–6 cm. Leaves 2–6, on upper part of pseudobulb; blade green, elliptic-lanceolate, 30–100 × 8–20 cm, glabrous, apex acuminate. Inflorescences arising from base of pseudobulb or axils of leaves, exceeding height of leaves,

50–200 cm, loosely 10–25-flowered, glabrous; floral bracts usually caducous, lanceolate, 4–5.5 × ca. 1.8 cm, glabrous. Flowers nutant, widely opening, large, 7–12.5 cm in diam.; pedicel and ovary 2.5–4.5 cm, glabrous; sepals and petals whitish outside, reddish brown or brown inside. Sepals similar, oblong-lanceolate, 4–6.5 × 1–1.5 cm, glabrous, apex acuminate to acute. Petals lanceolate-oblong, 4–6.5 × 0.8–1.5 cm, apex acuminate to acute; lip white toward base, pink or red-pink toward entrance with white stripes on inside, 3.5–6 × 2–5 cm, broadly rhombic-ovate, shallowly 3-lobed; lateral lobes short, margin undulate, apex rounded; mid-lobe orbicular or transversely oblong, margin slightly undulate, apex truncate and emarginate or rounded and mucronulate; disk usually with 2 or 3 ridges, densely puberulent; spur hooked, whitish yellow, narrowly cylindrical, 0.6–1 × 0.1–0.2 cm, apex unequally 2-lobed or unlobed. Column white, 2–2.2 cm, puberulent ventrally; rostellum subligulate. Fl. Mar–Jun.  $2n = 38, 44 + 4B, 46, 48, 52$ .

Shaded and damp places in forests, at forest margins, along valleys, or by streamsides; 700–1800 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, Yunnan [widely distributed in tropical and subtropical Asia and Oceania].

**7. *Phaius wallichii*** Lindley in Wallich, Pl. Asiat. Rar. 2: 46. 1831.

大花鹤顶兰 da hua he ding lan

*Phaius magniflorus* Z. H. Tsi & S. C. Chen.

Plants to 100 cm tall (occasionally taller). Pseudobulb fusiform or cylindrical-ovoid, 10–14 × 4.5–5.7 cm. Leaves ca. 4; blade green, oblong-elliptic, 49–70 × 15–24 cm, glabrous, apex acuminate. Inflorescences arising from lower nodes of pseudobulb, ca. as tall as or taller than height of leaves, to 100 cm, more than 10-flowered, glabrous; floral bracts caducous, ovate-lanceolate, ca. 6 cm, glabrous. Flowers widely opening, to 14 cm in diam.; pedicel and ovary ca. 5.5 cm, glabrous; sepals and petals yellow-green outside, inside brown-red with yellow-green at apex, petals densely brownish red spotted above middle. Sepals subsimilar, oblong-lanceolate, ca. 7 × 1.5 cm, glabrous, apex shortly acuminate. Petals oblong-lanceolate, ca. 6.3 × 1.2 cm, apex shortly acuminate; lip red with yellow stripes toward base, white at entrance turning cream-yellow with age, ca. 5.5 × 5.3 cm, broadly ovate-triangular, shallowly 3-lobed; lateral lobes short, margin slightly undulate, apex rounded; mid-lobe ovate-triangular, margin slightly undulate, apex acute; disk with yellow veins; spur yellow, narrowly cylindrical, bowl-like, 1–2 cm, apex unequally 2-lobed or unlobed. Column pale yellowish green, ca. 2 cm, pubescent on dorsal surface in upper half; rostellum ligulate; anther cap yellowish white. Fl. May–Jun.

Shaded and damp places in forests or along valleys; 700–1000 m. Hong Kong, Xizang, S Yunnan [Bhutan, NE India, Vietnam].

**8. *Phaius hainanensis*** C. Z. Tang & S. J. Cheng, Acta Phytotax. Sin. 20: 199. 1982.

海南鹤顶兰 hai nan he ding lan

Plants 50–80 cm tall. Pseudobulb ovoid-conic, 5–9 × 3.5–5 cm. Leaves ca. 4; blade green, oblong-ovate or broadly lanceolate, 25–70 × 6–12 cm, with brown scaly hairs, apex acuminate. Inflorescences arising from base of pseudobulb, ca. 40 cm, 5–12-flowered, exceeding height of leaves, with sparse blackish brown scaly hairs; floral bracts caducous, ovate, 3–5.5 × ca. 2.5 cm, with sparse blackish brown scaly hairs. Flowers widely opening, 8–9 cm in diam.; pedicel and ovary ca. 3 cm; sepals and petals white, turning yellow with age. Sepals similar, ovate-lanceolate or lanceolate, ca. 4.3 × 1.2 cm, abaxially with yellowish brown bristles, apex acuminate and hooked. Petals obovate-lanceolate, ca. 4 × 1.2 cm, apex acuminate and hooked; lip yellow toward base and turning deep yellow with age, ivory white at entrance, obovate, ca. 4 × 3.2 cm, 3-lobed; lateral lobes suborbicular, margin slightly undulate, apex obtuse; mid-lobe broadly suborbicular, margin crisped, apex rounded; disk with 3 yellow ridges, glabrous; spur curved, pale yellow, cylindrical, 1.6–1.8 × ca. 0.2 cm, apex unequally 2-lobed. Column ca. 1.3 cm, sparsely pubescent ventrally. Fl. May.

• Crevices along valleys; 100–200 m. C Hainan.

**9. *Phaius delavayi*** (Finet) P. J. Cribb & Perner, Alpine Gardener 70: 293. 2002.

少花鹤顶兰 shao hua he ding lan

*Calanthe delavayi* Finet, Bull. Soc. Bot. France 46: 434. 1900; *C. coelogyneformis* Kraenzlin.

Plants 20–35 cm tall. Pseudobulb subglobose, 1–2 × 0.8–1.5 cm. Leaves 3 or 4, on upper part of pseudobulb; blade green, elliptic or obovate-lanceolate, 12–22 × 3–5.5 cm, glabrous, apex acute. Inflorescences arising from leaf axis, exceeding height of leaves, 25–30 cm, sparsely 2–7-flowered, glabrous; floral bracts persistent, lanceolate, 1.2–3 × 0.3–0.6 cm, glabrous. Flowers widely opening, purplish red or yellowish; pedicel and ovary 1.5–2.3 cm, glabrous; sepals and petals with purple spots on margins. Sepals similar, oblong-lanceolate, 1.5–2.2 × 0.3–0.6 cm, glabrous, apex acuminate. Petals narrowly oblong to obovate-lanceolate, 1.5–2 × 0.3–0.4 cm, apex acuminate; lip white with purple marks and purple flush, subrhombic, ca. 2 × 2 cm, shallowly 3-lobed, apical margin erose, apex subtruncate and emarginate; disk with 3 shortly hairy ridges; spur straight, purple-red or yellow, cylindrical, 0.6–1 × ca. 0.15 cm, apex obtuse. Column 0.7–0.8 cm, pubescent ventrally; rostellum nearly square. Fl. Jun–Sep.

• Streamsides, mixed forests; 2700–3500 m. S Gansu, SE to W Sichuan, SE Xizang, SW Yunnan.

## 101. CALANTHE R. Brown, Bot. Reg. 7: ad t. 573 [“578”]. 1821, nom. cons.

虾脊兰属 xia ji lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

*Alismorkis* Thouars.

Herbs, terrestrial, small to large. Rhizome present or not. Pseudobulbs usually small, conic, ovoid, or subglobose, rarely inconspicuous or cylindric, with roots at base and a few leaves at apex; roots long, stout, pubescent. Leaves sometimes not well developed or not completely spreading at anthesis; blade rarely narrowly ensiform or lorate,  $\pm$  plicate, but often convolute when young, base contracted into a petiole-like stalk or subsessile, sheathing, articulate or not. Scape arising from leaf axil or from base of pseudobulb, rarely from apex of leafless pseudobulb, erect, usually densely puberulent; inflorescence a terminal raceme, few to many flowered; floral bracts persistent or caducous. Flowers resupinate, small to medium-sized, often opening widely. Sepals similar, free. Petals often smaller than sepals; lip adnate to base of column wings and forming a tube, or adnate only to base of column, or to column foot and free from column itself, lobed or unlobed, base spurred or not; disk often lamellate or ridged, sometimes with callose appendages at base. Column often short and thick, without or with a short foot at base, winged, rostellum lobed or unlobed; stigma lateral; pollinia waxy, 8, in 2 groups, nearly equal or unequal in size; caudicle conspicuous or inconspicuous, commonly adherent to a sticky viscidium.

About 150 species: tropical and subtropical Asia, Australia, New Guinea, and the SW Pacific islands, as well as tropical Africa and Central and NW South America; 51 species (21 endemic) in China.

- 1a. Leaves deciduous in dry season; inflorescence (including rachis, bracts, and flowers) densely villous; column with a distinct column foot; lip adnate to column foot ..... 51. *C. labrosa*
- 1b. Leaves not deciduous; inflorescence glabrous or puberulent; column without a column foot; lip adnate to column wings or adnate to base of column.
- 2a. Floral bracts caducous; rostellum unlobed.
- 3a. Lip similar to petals, spurless ..... 1. *C. actinomorpha*
- 3b. Lip different from petals, spurred at base.
- 4a. Flowers white ..... 2. *C. angustifolia*
- 4b. Flowers yellow.
- 5a. Lip obscurely 3-lobed; lateral lobes very small, to 1 mm, sometimes inconspicuous ..... 3. *C. lyroglossa*
- 5b. Lip distinctly 3-lobed; lateral lobes relatively large, 2–5 mm.
- 6a. Spur cylindric; lip adnate to base of column wings; column slender, ca. 12 mm ..... 4. *C. densiflora*
- 6b. Spur clavate; lip adnate to entire length of column wings; column thick, 5–7 mm.
- 7a. Leaves narrowly elliptic; lip with 2 triangular lamellae at base of disk ..... 5. *C. clavata*
- 7b. Leaves oblong-elliptic to oblanceolate; lip with 2 lunar calli between lateral lobes of disk ..... 6. *C. speciosa*
- 2b. Floral bracts persistent; rostellum 2- or 3-lobed.
- 8a. Lip spurless.
- 9a. Flowers small; sepals to 7 mm ..... 7. *C. tsoongiana*
- 9b. Flowers large; sepals 10–20 mm.
- 10a. Lip clawed at base, claw forming a shallow sac at base ..... 8. *C. sacculata*
- 10b. Lip not clawed.
- 11a. Lip with 3–5 crested lamellae on disk ..... 9. *C. tricarinata*
- 11b. Lip without lamellae or calli on disk.
- 12a. Flowers pale yellow ..... 10. *C. ecarinata*
- 12b. Flowers pink or pale purplish pink.
- 13a. Sepals and petals not reflexed ..... 11. *C. puberula*
- 13b. Sepals and petals strongly reflexed ..... 12. *C. reflexa*
- 8b. Lip spurred.
- 14a. Lip unlobed.
- 15a. Lip margin fimbriate ..... 13. *C. alpina*
- 15b. Lip margin entire, undulate, erose, or emarginate, but not fimbriate.
- 16a. Floral bracts and sepals reflexed ..... 14. *C. whiteana*
- 16b. Floral bracts and sepals not reflexed.
- 17a. Leaves 4 or 5, narrowly oblong, 1.5–2.6 cm wide ..... 15. *C. fargesii*
- 17b. Leaves 2 or 3, oblong or oblanceolate, 4–8 cm wide.
- 18a. Flowers yellowish green; lip reniform; spur 11–14 mm ..... 16. *C. simplex*
- 18b. Flowers white, tinged purple; lip elliptic; spur ca. 28 mm ..... 17. *C. petelotiana*
- 14b. Lip 2- or 3-lobed.
- 19a. Lip 2-lobed ..... 18. *C. biloba*
- 19b. Lip 3-lobed.
- 20a. Lip adorned with wartlike calli on disk.
- 21a. Mid-lobe of lip entire or shallowly emarginate, mucronate at apex or not.
- 22a. Flowers yellow-green; spur ca. 5.5 mm ..... 19. *C. dulongensis*
- 22b. Flowers pinkish purple or purple-red; spur 25–50 mm.
- 23a. Leaves densely pubescent on both surfaces; pedicel and ovary ca. 20 mm; lip 8–9 mm ..... 20. *C. sinica*

- 23b. Leaves sparsely pubescent abaxially; pedicel and ovary ca. 35 mm; lip 11–17 mm ..... 21. *C. sylvatica*
- 21b. Mid-lobe of lip divided by a deep sinus into 2 lobules.
- 24a. Scape arising from previous year's leafless pseudobulb ..... 23. *C. odora*
- 24b. Scape arising from leaf axil of current year's growth.
- 25a. Spur 2–3 mm ..... 22. *C. ×dominyi*
- 25b. Spur 5–30 mm.
- 26a. Leaves ensiform or lorate, 0.8–2(–5) cm wide; floral bracts reflexed; dorsal sepal to 9 mm ..... 24. *C. davidii*
- 26b. Leaves elliptic, elliptic-lanceolate, ovate-elliptic, or ovate-lanceolate, 4–12 cm wide; floral bracts not reflexed; dorsal sepal 10–15 mm.
- 27a. Flowers yellowish green; lateral lobes of lip ovate or flabellate, 5–7 mm wide.
- 28a. Leaves uniformly green, without silver-gray bands on adaxial surface; spur longer than 20 mm ..... 25. *C. herbacea*
- 28b. Leaves with several silver-gray bands on adaxial surface; spur less than 20 mm .... 26. *C. argenteostriata*
- 27b. Flowers white, sometimes tinged purplish violet, or occasionally purplish red; lateral lobes of lip linear, oblong, or narrowly obovate-cuneate, 2–3 mm wide.
- 29a. Pedicel and ovary 10–20 mm; lobules of lip mid-lobe subrhombic, 5–6 mm wide ..... 27. *C. alismatifolia*
- 29b. Pedicel and ovary 30–40 mm; lobules of lip mid-lobe linear-oblong, ca. 3 mm wide ..... 28. *C. triplicata*
- 20b. Lip adorned with ridges or lamellae, or without any appendages on disk.
- 30a. Lip without any appendages on disk.
- 31a. Mid-lobe of lip obovate, ca. 8 mm wide ..... 29. *C. yuana*
- 31b. Mid-lobe of lip oblong-ligulate, ca. 2 mm wide ..... 30. *C. limprichtii*
- 30b. Lip adorned with ridges or lamellae on disk (sometimes inconspicuous in *C. arisanensis* and *C. plantaginea*).
- 32a. Ovary and capsule with 6 longitudinal winglike ridges ..... 46. *C. arisanensis*
- 32b. Ovary and capsule without longitudinal ridges.
- 33a. Ridges on lip connecting to column wings.
- 34a. Lip with 3–5(–7) ridges on disk; spur 20–32 mm ..... 45. *C. aristulifera*
- 34b. Lip with 3 ridges on disk; spur 5–20 mm.
- 35a. Lip with 4 brown marks on disk; sepals 12–13 mm ..... 43. *C. graciliflora*
- 35b. Lip lacking brown marks on disk; sepals 15–17 mm.
- 36a. Ridges on disk of lip inconspicuous; lip mid-lobe as broad as or broader than long .... 42. *C. plantaginea*
- 36b. Ridges on disk of lip tall and conspicuous, running onto mid-lobe; lip mid-lobe much longer than broad ..... 44. *C. henryi*
- 33b. Ridges and lamellae on lip free from column wings.
- 37a. Lateral lobes of lip distinctly broader than mid-lobe.
- 38a. Petiole-like leaf base 30–37 cm; lip ca. 5.5 mm ..... 39. *C. trifida*
- 38b. Petiole-like leaf base 3–9 cm; lip 10–13 mm.
- 39a. Spur much shorter than pedicel and ovary, 5–10 mm; lip mid-lobe emarginate ..... 40. *C. discolor*
- 39b. Spur longer than pedicel and ovary, 20 mm or more; lip mid-lobe shortly apiculate ..... 41. *C. alleizettei*
- 37b. Lateral lobes of lip narrower than mid-lobe.
- 40a. Spur 8–15 mm.
- 41a. Flowers bright yellow; lip with 5 ridges on disk ..... 50. *C. sieboldii*
- 41b. Flowers white, pink, or pale red; lip with 3 lamellae or ridges on disk.
- 42a. Margins of lip mid-lobe fimbriate ..... 47. *C. metoensis*
- 42b. Margins of lip mid-lobe slightly erose or emarginate, but not fimbriate.
- 43a. Leaf solitary; flowers pale red; lip mid-lobe broadly ovate-cuneate, ca. 10 × 10 mm ..... 48. *C. lechangensis*
- 43b. Leaves 2; flowers white; lip mid-lobe obovate, ca. 7 × 8 mm ..... 49. *C. nankunensis*
- 40b. Spur to 6 mm.
- 44a. Dorsal sepal 7–9 mm ..... 31. *C. mannii*
- 44b. Dorsal sepal 12–35 mm.
- 45a. Leaves 0.7–3.5 cm wide.
- 46a. Flowers with purplish red striations; lip with 7 crested lamellae on disk ..... 36. *C. emeishanica*
- 46b. Flowers without striations; lip with 3–5 ridges or lamellae.
- 47a. Mid-lobe of lip elliptic-rhombic, 8–10 × 6–7 mm, apex aristate ..... 37. *C. arcuata*
- 47b. Mid-lobe of lip suboblong, ca. 6 × 4.5 mm, apex acute ..... 38. *C. nipponica*

- 45b. Leaves 5–12 cm wide.  
 48a. Lip with a single lamella on mid-lobe ..... 35. *C. griffithii*  
 48b. Lip with 3 lamellae on mid-lobe.  
 49a. Lateral lobes of lip broader than long; spur adnate to ovary, 4.5–6 mm; lip  
 disk lamellae taller than long ..... 34. *C. fugongensis*  
 49b. Lateral lobes of lip longer than broad; spur free from ovary, 2–3 mm; lip  
 disk lamellae longer than tall.  
 50a. Sepals and petals buff colored, with pinkish red striations; lip  
 6–10 mm wide ..... 32. *C. brevicornu*  
 50b. Sepals and petals yellow; lip 14–15 mm wide ..... 33. *C. hancockii*

**1. *Calanthe actinomorpha*** Fukuyama, Bot. Mag. (Tokyo) 49: 668. 1935.

辐射虾脊兰 fu she xia ji lan

*Phaius actinomorphus* (Fukuyama) T. P. Lin.

Plants 40–60 cm tall, without a distinct rhizome. Pseudobulbs very small, enclosed in sheaths. Leaves 3 or 4, basal, well developed at anthesis, not deciduous; blade oblanceolate, 20–55 × 3–8 cm, glabrous, 5-veined, apex acuminate; petiole-like base 10–20 cm, not articulate. Scape arising from leaf axil, erect, 40–50 cm, glabrous, with several scattered tubular sheaths; rachis ca. 10 cm, densely many flowered; floral bracts caducous, whitish, lanceolate, 30–40 mm, membranous, glabrous, apex acuminate. Flowers lemon-yellow, not opening widely; pedicel and ovary ca. 10 mm, glabrous. Sepals similar, oblong-ligulate, 8–9 × 3.5–4 mm, membranous, 3–5-veined, apex acute or mucronate. Petals elliptic, concave, 8–9 × 3.5–4.5 mm, membranous, 3-veined, margin slightly undulate, apex acute; lip similar to petals, ca. 8 × 4.7 mm, glabrous, 3-veined, apex mucronate, base spurless and slightly contracted and adnate to base of column, free from column wings, unlobed, slightly undulate at margin, embracing column on both sides. Column subcylindric, ca. 4 mm, slightly contracted near middle, glabrous; rostellum absent; anther terminal; pollinia clavate, equal in size, ca. 1.5 mm. Fl. Dec.  $2n = 38^*$ ,  $40^*$ .

• Damp places in forests; 800–1000 m. Taiwan.

**2. *Calanthe angustifolia*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 251. 1833.

狭叶虾脊兰 xia ye xia ji lan

*Amblyglottis angustifolia* Blume, Bijdr. 369. 1825; *Alismorkis angustifolia* (Blume) Kuntze; *Calanthe phajoides* H. G. Reichenbach; *C. pumila* Fukuyama; *C. striata* (Swartz) R. Brown var. *pumila* (Fukuyama) S. S. Ying.

Plants 30–40 cm tall, with small cylindrical pseudobulbs and a creeping rhizome. Leaves 4–10, subbasal, usually well developed at anthesis, not deciduous; blade linear-lanceolate to narrowly elliptic, ca. 30 × 2–3.5 cm, glabrous, with 5 or 6 main veins, apex acuminate; petiole-like base 4–16 cm, conduplicate, articulate. Scapes 1 or 2, arising from axil of outer sheaths, erect, ca. 35 cm, with 3 or 4 widely spaced tubular sheaths; rachis 3–7 cm, laxly 10–15-flowered; floral bracts caducous, narrowly lanceolate, 20–40 mm, glabrous, apex acuminate. Flowers white; pedicel and ovary 12–20 mm, glabrous. Sepals similar, oblong-elliptic, 10–13 × 4–5 mm, 3–5-veined, apex acute. Petals ovate-elliptic, 8–11 × 4–6 mm, 3–5-veined, apex obtuse-rounded and apiculate; lip adnate to base of column

wings, ca. 10 × 6 mm, deeply 3-lobed; lateral lobes subovate, ca. 6 mm across their apices; mid-lobe obcordate, ca. 5 × 6 mm, apex retuse; disk with 2 triangular ridges at base; spur slightly curved, somewhat clavate, 6–9 × 2–3 mm, slightly contracted at middle. Column ca. 5 mm; rostellum triangular, unlobed. Fl. Sep.

Evergreen broad-leaved forests or mossy forests; 1000–1500 m. Guangdong, Hainan, S Taiwan [Indonesia, Malaysia, Philippines].

**3. *Calanthe lyroglossa*** H. G. Reichenbach, Otia Bot. Hamburg. 1: 53. 1878.

南方虾脊兰 nan fang xia ji lan

*Alismorkis foerstermannii* (H. G. Reichenbach) Kuntze; *A. lyroglossa* (H. G. Reichenbach) Kuntze; *Calanthe foerstermannii* H. G. Reichenbach; *C. forsythiiflora* Hayata; *C. liukiuensis* Schlechter; *C. lyroglossa* var. *forsythiiflora* (Hayata) S. S. Ying.

Plants 30–50 cm tall. Rhizome short, stout. Pseudobulbs clavate-cylindric, 2–3 cm. Leaves 3–5, basal, well developed at anthesis, not deciduous; blade oblanceolate, plicate, 30–60(–100) × 3–8.5 cm, glabrous, apex acuminate; petiole-like base 5–8 cm, sheathing, articulate. Scape arising from base of pseudobulb, erect, 30–50 cm, stout, lower part with 3 or 4 tubular sheaths; rachis 8–14 cm, densely many flowered; floral bracts caducous, lanceolate, to 40 mm, membranous, glabrous. Flowers small, yellow, turning black when dried; ovary and pedicel ca. 10 mm, glabrous. Sepals similar, elliptic or elliptic-lanceolate, 6–9 × ca. 3 mm, 3-veined, apex acuminate. Petals elliptic, ca. 6 × 3 mm, 3-veined, apex acute or apiculate; lip adnate to base of column wings, ca. 5 × 5 mm, obscurely 3-lobed; lateral lobes suborbicular, small, to 1 mm, sometimes inconspicuous; mid-lobe reniform or nearly transversely oblong, ca. 3 × 5 mm, apex emarginate; disk with 2 triangular lamellae at base; spur clavate, ca. 5 mm, apex slightly 2-lobed. Column 3–4 mm, thick, dilated at apex; rostellum ovate-triangular, large, unlobed; anther cap beaked; pollinia obovoid or clavate, subequal in size, ca. 1.2 mm, with a conspicuous caudicle; viscidium peltate. Capsule ± pendulous, ellipsoid-globose, ca. 1 × 0.7 cm. Fl. Dec–Feb.  $2n = 40$ .

Forests, along streamsides and valleys; below 1500 m. C and S Hainan, Taiwan [Cambodia, NE India, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**4. *Calanthe densiflora*** Lindley, Gen. Sp. Orchid. Pl. 250. 1833.

密花虾脊兰 mi hua xia ji lan

*Alismorkis densiflora* (Lindley) Kuntze; *Calanthe kazuoi* Yamamoto.

Plants 50–60 cm tall, with long creeping rhizome 3–4 mm in diam. Shoots spaced 5–6 cm apart along rhizome. Pseudobulbs small or inconspicuous, enclosed in basal sheaths of leaves. Leaves usually 3, basal, well developed at anthesis, not deciduous; blade lanceolate or narrowly elliptic, 35–40 × 2.3–6.5 cm, glabrous, apex acute; petiole-like base ca. 10 cm, articulate, enclosed by tubular sheaths and forming a slender pseudostem 10–16 cm. Scapes 1 or 2, arising from rhizome, erect, ca. 20 cm, 3–4 mm in diam., with 3–5 tubular sheaths toward base; rachis short, densely many flowered; floral bracts caducous, narrowly lanceolate, 1.5–3 cm, glabrous. Flowers arranged in a dense head, pale yellow, turning black when dried; pedicel and ovary ca. 20 mm, glabrous. Sepals similar, oblong, 13–14 × ca. 5 mm, 3–5-veined, apex aristate. Petals subspatulate, 13–14 × ca. 4 mm, 3-veined, apex acute; lip adnate to base of column wings, ovate-orbicular, 7–11 × 5–11 mm, 3-lobed above middle; lateral lobes ovate-triangular, ca. 5 × 3 mm, ca. 10 mm across their apices, apex obtuse; mid-lobe subsquare, ca. 5 × 4 mm, apex emarginate; disk with 2 lamellae; lamellae deltoid, ca. 2 × 3 mm; spur straight, cylindrical, 12–16 × ca. 3 mm, apex obtuse. Column ± arcuate, ca. 12 mm, slender, base dilated; rostellum broadly ovate-triangular, ca. 1.2 mm, unlobed; anther cap beaked; pollinia obovoid, subequal in size, ca. 1.2 mm, with short caudicles. Capsule nearly pendulous, ellipsoid-globose, ca. 1.3 × 0.8 cm. Fl. Aug–Sep, fr. Oct.  $2n = 40$ .

Broad-leaved and mixed forests, along streamsides and valleys; 1000–3000 m. Guangdong, Guangxi, Hainan, Sichuan, Taiwan, S and SE Xizang, NW and SE Yunnan [Bhutan, NE India, Vietnam].

**5. *Calanthe clavata*** Lindley, Gen. Sp. Orchid. Pl. 251. 1833.

棒距虾脊兰 *bang ju xia ji lan*

*Alismorkis clavata* (Lindley) Kuntze; *Calanthe clavata* var. *malipoensis* Z. H. Tsi.

Plants ca. 40 cm tall. Rhizome stout, ca. 1 cm in diam., with scalelike sheaths and thick roots on nodes. Pseudobulbs very small, completely enclosed in sheaths. Leaves 2 or 3, basal, well developed at anthesis, not deciduous; blade narrowly elliptic, 50–65 × 4–10 cm, apex acute; petiole-like base 8–12 cm, articulate, conduplicate, enclosed by tubular sheaths and forming a pseudostem ca. 13 cm. Scapes 1 or 2, arising from base of pseudobulb, erect, to 40 cm, 7–13 mm in diam., with several scattered tubular sheaths; rachis 6–8 cm, densely many flowered; floral bracts caducous, lanceolate, 1–3.5 cm, membranous, glabrous. Flowers yellow; pedicel and ovary ca. 15 mm, glabrous. Dorsal sepal elliptic, ca. 12 × 5–6 mm, 5-veined, apex acute; lateral sepals suboblong, ca. 12 × 4–5 mm, 5-veined, apex aristate. Petals obovate-elliptic to elliptic, ca. 10 × 5 mm, 5-veined, apex acute; lip adnate to entire length of column wings, 6–8 × 4–5 mm, 3-lobed; lateral lobes erect, auriculate or subovate-triangular, 2–3 mm, ca. 7 mm across their apices; mid-lobe orbicular, ca. 4 × 5–5.5 mm, apex truncate and emarginate; disk with 2 triangular lamellae at base; spur straight, clavate, ca. 9 × 3.5 mm. Column ca. 7 mm, thick, dilated at apex; rostellum triangular, ca. 0.8 mm, unlobed; pollinia subclavate or narrowly obovoid, subequal in size, ca. 1.2 mm,

with short caudicles; viscidium subcordate, thick. Fl. Nov–Dec.  $2n = 40$ .

Dense forests, rocky places along valleys; 800–1300 m. Fujian, S Guangdong, S Guangxi, Hainan, Taiwan, SE Xizang, S and SE Yunnan [NE India, Myanmar, N Thailand, N Vietnam].

**6. *Calanthe speciosa*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 250. 1833.

二列叶虾脊兰 *er lie ye xia ji lan*

*Amblyglottis speciosa* Blume, Bijdr. 371. 1825; *Alismorkis speciosa* (Blume) Kuntze; *Calanthe disticha* Tang & F. T. Wang; *C. formosana* Rolfe; *C. patsinensis* S. Y. Hu; *C. pulchra* (Blume) Lindley var. *formosana* (Rolfe) S. S. Ying; *C. yushunii* K. Mori & Yamamoto.

Plants 50–70(–120) cm tall. Rhizome ca. 1 cm in diam., fleshy. Pseudobulbs cylindrical-ovoid to clavate, 4–5 × 1–3 cm, several noded, usually enclosed by leaf sheaths. Leaves 5–10, nearly distichous, well developed at anthesis, not deciduous; blade oblong-elliptic to oblanceolate, 40–95 × 4–9 cm, glabrous, apex acuminate; petiole-like base to 20 cm, ca. 1 cm in diam., articulate. Scape arising from base of pseudobulb, 30–45 cm, with several tubular sheaths below middle; rachis 10–15 cm, densely many flowered; floral bracts caducous, narrowly lanceolate, 2.5–3.5 cm, membranous, glabrous. Flowers yellow; pedicel and ovary 15–20 mm, glabrous. Sepals similar, ovate-lanceolate, 9–12 × 4–5 mm, 5-veined, apex acuminate. Petals ovate-elliptic, 9–12 × 4–6 mm, 7-veined, apex subacute; lip adnate to entire length of column wings, 8–9 × 5–6 mm, 3-lobed above base; lateral lobes subsquare to ovate-triangular, ca. 2.5 × 2.5 mm, ca. 5 mm across their apices; mid-lobe flabellate or sometimes subobovate-cuneate, ca. 5 × 5–6 mm, margin undulate, apex truncate and mucronate; disk with 2 lunar calli between lateral lobes, though sometimes inconspicuous; spur slightly arcuate, clavate, 7–9 mm. Column ca. 5 mm, thick, dilated toward apex; rostellum triangular, ca. 3 mm, unlobed; pollinia clavate, subequal in size, ca. 2.1 mm, with conspicuous caudicles; viscidium sublinear, ca. 2.2 mm. Fl. (Apr–)Jul–Oct.  $2n = 20^*$ ,  $40^*$ .

• Damp places in forests along valleys; 500–1500 m. S Hainan, Hong Kong, Taiwan.

**7. *Calanthe tsoongiana*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 88. 1951.

无距虾脊兰 *wu ju xia ji lan*

Plants ca. 32 cm tall. Rhizome short. Pseudobulbs subconic, ca. 1 cm in diam., with 3 or 4 sheaths. Leaves 2 or 3, well developed at anthesis, not deciduous; blade obovate-lanceolate or oblong, (13–)27–37 × (2–)5.5–6 cm, abaxially puberulent, apex acuminate; petiole-like base 8–19 cm, usually forming a pseudostem, though sometimes short and pseudostem inconspicuous. Scape arising from axil of current year's leaves, erect, 33–55 cm, densely hairy, with a scalelike sheath near middle; rachis 14–16 cm, laxly many flowered; floral bracts persistent, ovate-lanceolate, 3–4 × 1.5–2 mm, membranous, glabrous, apex acute. Flowers pale purple, small; pedicel and ovary 10–15 mm, puberulent. Sepals similar, oblong, 6–7 × 3–4 mm, abaxially puberulent below middle, 5- or 6-veined, apex

acute or subobtusate. Petals subspatulate, 5–6 × ca. 1.7 mm, 3-veined, apex acute or obtuse; lip adnate to base of column wings, ca. 3.2 × 3 mm, spurless, deeply 3-lobed; lateral lobes suboblong or axe-shaped, 2–2.5 × 1.3–2.5 mm, apex rounded; mid-lobe oblong or ovate, 2–2.5 × 1–2 mm, apex slightly dilated, truncate or retuse and apiculate; disk without lamellae or calli. Column ca. 3 mm, thick, dilated at apex, adaxially with short hairs; rostellum small, 2-lobed; pollinia obovoid or pear-shaped, equal in size, ca. 1 mm, with caudicles.

• Forests, damp rocks; 400–1500 m. Fujian, Guizhou, Jiangxi, Zhejiang.

- 1a. Lateral lobes of lip suboblong,  
ca. 2 × 1.3 mm; mid-lobe oblong,  
ca. 2 × 1 mm ..... 7a. var. *tsoongiana*
- 1b. Lateral lobes of lip nearly axe-shaped,  
ca. 2.5 × 2.5 mm; mid-lobe ovate,  
ca. 2.5 × 2 mm ..... 7b. var. *guizhouensis*

**7a. *Calanthe tsoongiana* var. *tsoongiana***

无距虾脊兰(原变种) wu ju xia ji lan (yuan bian zhong)

Lateral lobes of lip suboblong, ca. 2 × 1.3 mm; mid-lobe oblong, ca. 2 × 1 mm. Fl. Apr–May.

• Forests, damp rocks; 400–1500 m. Fujian, Guizhou, Jiangxi, Zhejiang.

**7b. *Calanthe tsoongiana* var. *guizhouensis* Z. H. Tsi, Acta Phytotax. Sin. 23: 386. 1985.**

贵州虾脊兰 gui zhou xia ji lan

Lateral lobes of lip nearly axe-shaped, ca. 2.5 × 2.5 mm; mid-lobe ovate, ca. 2.5 × 2 mm. Fl. Apr.

• Dense forests; ca. 800 m. NE Guizhou.

**8. *Calanthe sacculata* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 67. 1919.**

囊爪虾脊兰 nang zhao xia ji lan

*Calanthe sacculata* var. *tchenkeoutinensis* Tang & F. T. Wang.

Plants 25–30 cm tall. Leaves 3, basal, not deciduous; blade elliptic, 14–17 × 3–4.5 cm, glabrous, base petiole-like, apex subacute or acute. Scape arising from leaf axil, erect, to ca. 27 cm, with 1 or 2 bractlike sheaths, puberulent; rachis laxly 4–6-flowered; floral bracts persistent, ovate, apex acuminate. Flowers medium-sized; pedicel and ovary ca. 10 mm, puberulent. Sepals oblong, ca. 15 mm, base contracted, apex subacute; lateral sepals oblique. Petals lanceolate-ligulate, oblique, slightly shorter than sepals, apex acuminate; lip adnate to base of column wings, 3-lobed, spurless, clawed at base, claw concave and forming a shallow sac at base; lateral lobes spreading horizontally, ovate, oblique, ca. 11 mm across their apices, apex obtuse; mid-lobe orbicular, ca. 7 mm wide, apex emarginate and mucronate; disk with 1–3 lamellae; lamellae subovoid, ca. 9 mm. Column short, glabrous. Fl. unknown.

• About 1800 m. Chongqing, Guizhou.

**9. *Calanthe tricarinata* Lindley, Gen. Sp. Orchid. Pl. 252. 1833.**

三棱虾脊兰 san leng xia ji lan

*Alismorkis tricarinata* (Lindley) Kuntze; *Calanthe lamellata* Hayata; *C. megalopha* Franchet; *C. undulata* Schlechter; *Paracalanthe lamellata* (Hayata) Kudô; *P. megalopha* (Franchet) Miyabe & Kudô; *P. tricarinata* (Lindley) Kudô.

Plants 35–50 cm tall. Rhizome inconspicuous. Pseudobulbs globose, ca. 2 cm in diam., with 3 sheaths. Leaves 3 or 4, basal, not well developed at anthesis, not deciduous; blade elliptic or obovate-lanceolate, 20–30 × 5–11 cm, abaxially densely puberulent, margin undulate, apex acute or acuminate; petiole-like base sheathing, forming a stout pseudostem 4–15 cm long and 1–2.5 cm in diam.; sheaths large, apex obtuse, lowest one ca. 2 cm, upper sheaths longer. Scape arising from leaf axil, erect, to 60 cm, to 1.5 cm in diam., stout, puberulent, with several to many ovate-lanceolate sterile bracts; rachis 3–20 cm, laxly few to many flowered; floral bracts persistent, ovate-lanceolate, 5–10 mm, membranous, glabrous. Flowers pale yellow, with reddish brown lip; pedicel and ovary 10–20 mm, puberulent. Sepals similar, oblong-lanceolate, 16–18 × 5–8 mm, abaxially sparsely puberulent at base, 5–8-veined, apex acuminate. Petals obovate-lanceolate, 11–15 × 3–5 mm, 3-veined, apex acute or subobtusate; lip adnate to base of column wings, reddish brown, 10–16 × 7–15 mm, spurless, 3-lobed; lateral lobes auriculate or nearly suborbicular, small, ca. 4 × 4–5 mm; mid-lobe reniform, 8–10 × 10–15 mm, margin strongly undulate, apex emarginate and mucronate in sinus; disk with 3–5 crested lamellae. Column ca. 6 mm, thick, ventrally sparsely puberulent; rostellum 2-lobed; anther cap beaked; pollinia narrowly obovoid-globose, ca. 2 mm, with conspicuous caudicles; viscidium elliptic, small, ca. 1 mm. Fl. May–Jun. *2n* = 40, 42, 60.

Grassy slopes, forests; 1300–3500 m. S Gansu, Guizhou, Hubei, Shaanxi, Sichuan, Taiwan, SE Xizang, Yunnan [Bhutan, NE India, Japan, Kashmir, Nepal].

**10. *Calanthe ecarinata* Rolfe, J. Linn. Soc., Bot. 29: 318. 1892.**

天全虾脊兰 tian quan xia ji lan

Plants to 30 cm tall, without distinct rhizome. Pseudobulbs conic, small, ca. 1 cm in diam., with 3 sheaths. Leaves usually 3, not well developed at anthesis, not deciduous; blade obovate-oblong, 14–15 × 4.5–5 cm, margin slightly undulate, apex acute or obtuse; petiole-like base sheathing, usually forming a pseudostem to ca. 9 cm. Scape arising from leaf axil, erect, densely puberulent; rachis ca. 4 cm, usually ca. 10-flowered; floral bracts persistent, ovate-lanceolate, 4–5 mm, membranous, glabrous, apex acuminate. Flowers pale yellow; pedicel and ovary ca. 10 mm, puberulent. Dorsal sepal elliptic, 10–11 × 5–5.5 mm, abaxially densely puberulent, 5-veined, apex acute; lateral sepals oblong-lanceolate, 10–11 × 4.5–5 mm, abaxially densely puberulent, 5-veined, apex acute. Petals oblong, ca. 4.5 × 3 mm, abaxially often sparsely puberulent at base, apex obtuse; lip adnate to base of column wings, 5.5–7 × 5.5–7 mm, spurless, 3-lobed at base; lateral lobes subsquare, 3–4 × 2.5–3 mm; mid-lobe flabellate, ca. 5 × 6 mm, margin ± undulate, apex emarginate and mucronate in sinus; disk without lamellae or calli.

Column ca. 7 mm, dilated at apex, wings not decurrent to base of lip, ventrally puberulent at base; rostellum 2-lobed; lobes ca. 0.8 mm; anther cap ovate, ± beaked; pollinia slightly compressed obovoid, equal in size, ca. 1 mm, with short caudicles; viscidium peltate, small. Fl. Jun.

- Forests; 2400–2500 m. W Sichuan.

**11. *Calanthe puberula*** Lindley, Gen. Sp. Orchid. Pl. 252. 1833.

镰萼虾脊兰 *lian e xia ji lan*

*Alismorkis puberula* (Lindley) Kuntze; *Calanthe amoena* W. W. Smith; *C. lepida* W. W. Smith; *Paracalanthe reflexa* (Maximowicz) Kudô var. *puberula* (Lindley) Kudô.

Plants 25–60 cm tall. Rhizome usually inconspicuous. Pseudobulbs narrowly cylindrical, ca. 2 × 1.5 cm, enclosed in leaf sheaths. Leaves 4 or 5, basal, well developed at anthesis, not deciduous; blade elliptic or elliptic-oblong, 12–22 × 5–7 cm, glabrous or sparsely puberulent along veins abaxially, with 5 main veins, apex acute or acuminate; petiole-like base to 13 cm. Scapes 1 or 2, arising from near apex of pseudobulb, erect, 23–40 cm, slender, with several lanceolate sterile bracts; rachis 6–14 cm, laxly 4–10-flowered; floral bracts persistent, lanceolate, 13–20 mm, abaxially puberulent, apex long acuminate. Flowers pink; pedicel and ovary 15–20 mm, densely puberulent. Sepals similar, ovate-lanceolate, 11–16(–20) × ca. 5 mm, abaxially puberulent, 5-veined, apex cuspidate; lateral sepals oblique. Petals linear, 11–13 × 1–2(–3) mm, 1–3-veined, apex acuminate; lip adnate to base of column wings, 11–13 × 6–11 mm, spurless, 3-lobed; lateral lobes oblong-falcate, 7–9 mm across their apices, margin entire, apex obtuse; mid-lobe rhombic-elliptic to obovate-cuneate, apical margin irregularly dentate or fringed, apex acute; disk without lamellae or calli. Column ca. 6 mm, glabrous; rostellum 3-lobed; anther cap narrowly ovate-cordate, ca. 4 mm; pollinia clavate, ca. 2 mm, with conspicuous caudicles; viscidium linear, ca. 1 mm. Fl. Jun–Aug.  $2n = 40, 40 + 1B, 42$ .

Evergreen broad-leaved forests; 1200–3000 m. SE Xizang, SE and W Yunnan [Bhutan, NE India, Japan, Nepal, N Vietnam].

**12. *Calanthe reflexa*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 18: 68. 1873.

反瓣虾脊兰 *fan ban xia ji lan*

*Alismorkis reflexa* (Maximowicz) Kuntze; *Calanthe puberula* Lindley var. *reflexa* (Maximowicz) M. Hiroe; *C. similis* Schlechter; *Paracalanthe reflexa* (Maximowicz) Kudô.

Plants 20–45 cm tall. Rhizome inconspicuous. Pseudobulbs short, ca. 1 cm in diam., sometimes inconspicuous. Leaves 4 or 5, basal, well developed at anthesis, not deciduous; blade elliptic, 15–20 × 3–6.5 cm, apex acute; petiole-like base 2–4 cm. Scapes 1 or 2, erect, 20–40 cm, puberulent; rachis 5–20 cm, laxly 10–18-flowered; floral bracts persistent, narrowly lanceolate, 18–24 mm, glabrous, apex acuminate. Flowers pale purplish pink; pedicel and ovary ca. 20 mm, glabrous. Sepals similar, strongly reflexed, ovate-lanceolate, 15–20 × ca. 5 mm, abaxially puberulent, 5-veined, apex cuspidate-acute; lateral sepals oblique. Petals reflexed, linear, 15–18 × 1–3 mm, 1–3-veined, apex acuminate; lip adnate to base of column wings, 9–

11 × 7–10 mm, spurless, 3-lobed; lateral lobes oblong-falcate, ca. 8 mm across their apices, margin entire, apex obtuse; mid-lobe subelliptic or obovate-cuneate, ca. 8 × 8 mm, apical margin irregularly dentate, apex acute; disk without lamellae or calli. Column ca. 6 mm, glabrous; rostellum 3-lobed; lobes narrowly falcate, mid-lobe shorter and sharply tooth-shaped. Fl. May–Jun.  $2n = 40, 42$ .

Evergreen broad-leaved forests, mossy rocks on streamsides or along valleys; 600–2500 m. Anhui, N Guangdong, N Guangxi, Guizhou, Hubei, Hunan, Jiangxi, W Sichuan, Taiwan, NE and SW Yunnan, Zhejiang [Japan, Korea].

**13. *Calanthe alpina*** J. D. Hooker ex Lindley, Fol. Orchid. 6–7(Calanthe): 4. 1855.

流苏虾脊兰 *liu su xia ji lan*

*Alismorkis alpina* (J. D. Hooker ex Lindley) Kuntze; *Calanthe buccinifera* Rolfe; *C. fimbriata* Franchet; *C. fimbriatomarginata* Fukuyama; *C. schlechteri* H. Hara.

Plants 25–50 cm tall. Rhizome inconspicuous. Pseudobulbs narrowly conic, small, ca. 7 mm in diam. Leaves 3, well developed at anthesis, not deciduous; blade elliptic or obovate-elliptic, 11–26 × 3–6(–9) cm, apex obtuse-rounded and mucronate or acute; petiole-like base sheathing, sometimes forming a pseudostem to ca. 7 cm. Scape 1 or rarely 2, arising from leaf axils, erect, 30–50 cm, sparsely puberulent; rachis 3–12 cm, laxly to densely 3- to more than 10-flowered; floral bracts persistent, narrowly lanceolate, ca. 1.5 cm, glabrous, apex acuminate. Flowers pale yellow-green, with pink-purple blotches and striations; pedicel and ovary ca. 20 mm, sparsely puberulent. Dorsal sepal subelliptic, 15–20 × 5–6 mm, 5-veined, apex aristate; lateral sepals ovate-lanceolate, 15–20 × 6–7 mm, 5-veined, apex aristate. Petals narrowly oblong to ovate-lanceolate, 12–13 × 4–4.5 mm, 3-veined, apex acute to acuminate; lip basally adnate to base of column wings, pale greenish white, basal half yellow, apical half with purplish red striations, suborbicular-flabellate, ca. 8 × 15 mm, base broadly truncate, unlobed, apical margin fimbriate, apex emarginate; spur straight, yellow or pale violet, cylindrical, 15–35 × 3–5 mm, apex obtuse. Column white, ca. 8 mm, dilated at apex, glabrous; rostellum 2-lobed; lobes ca. 1 mm; pollinia obovoid, ca. 1.3 mm, with short caudicles; viscidium suboblong, small. Capsule obovoid-elliptic, ca. 2 × 1.5 cm. Fl. Nov.  $2n = 40, 42$ .

Forests, grassy slopes; 1500–3500 m. S Gansu, Shaanxi, Sichuan, Taiwan, S and SE Xizang, W Yunnan [Bhutan, NE India, Japan, Nepal].

**14. *Calanthe whiteana*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 121. 1896.

四川虾脊兰 *si chuan xia ji lan*

*Calanthe wardii* W. W. Smith.

Plants ca. 80 cm tall. Rhizome inconspicuous. Pseudobulbs conic, ca. 1 cm in diam., enclosed in leaf sheaths. Leaves usually 3, not well developed at anthesis, suberect, not deciduous; blade ensiform or narrowly oblong-oblancheolate, ca. 32 × 2.5–4.5 cm, apex acute; petiole-like base usually forming a pseudostem to ca. 7 cm long and ca. 1.5 cm in diam. Scape arising from leaf axil, erect, to 70 cm, stout, puberulent, with 1

or 2 tubular sheaths; rachis 9–20 cm, laxly 10–20-flowered; floral bracts persistent, reflexed, narrowly lanceolate, 10–30 mm, sparsely puberulent. Flowers pale yellow to yellowish green, turning black when dried; pedicel and ovary ca. 10 mm, puberulent. Dorsal sepal reflexed, ovate-lanceolate, 9–10 × 3.5–4 mm, abaxially slightly puberulent, apex obtuse; lateral sepals reflexed, ovate, oblique, 9–10 × 4.5–5 mm, abaxially slightly puberulent, apex obtuse. Petals narrowly elliptic or ovate-lanceolate, 8–9 × 2.5–3 mm, midvein conspicuous, apex obtuse; lip yellowish white, reniform, ca. 5 × 13 mm, base adnate to column wings, unlobed, entire or slightly erose at margin, apex emarginate and mucronate in sinus; disk with 3 crested, papillose lamellae; spur cylindrical, 8–10 × ca. 1.3 mm, outside and inside puberulent, ± attenuate toward apex. Column white, ca. 3 mm, thick, dilated toward apex, puberulent, wings decurrent to base of lip; rostellum 2-lobed; lobes ca. 1 mm; anther small; pollinia unequal in size, 4 subovoid and others subclavate; viscidium suborbicular. Fl. May–Jun.

Forests, shrubby slopes; 1000–1800 m. N and SW Sichuan [Bhutan, NE India, N Myanmar].

**15. *Calanthe fargesii*** Finet, Bull. Soc. Bot. France 46: 434. 1900.

天府虾脊兰 *tian fu xia ji lan*

Plants 30–45 cm tall. Pseudobulbs short, partially covered with sheaths. Leaves 4 or 5, not deciduous; blade narrowly oblong, 30–40 × 1.5–2.6 cm, apex acute; petiole-like base sheathing, ca. 15 cm, usually forming a pseudostem 3–4 cm. Scape arising from leaf axil, to 65 cm, densely puberulent, with a sheath near middle; rachis ca. 20 cm, laxly many flowered; floral bracts persistent, narrowly lanceolate, 15–20 mm, glabrous, apex acute. Flowers yellowish green, tinged with brown, opening widely; pedicel and ovary ca. 20 mm, densely puberulent. Sepals similar, narrowly ovate-lanceolate, 16–25 × 4.2–6 mm, abaxially sparsely puberulent, 5-veined, apex acute; lateral sepals somewhat oblique, abaxially sparsely puberulent only at base. Petals linear, 12–24 × 2–2.4 mm, glabrous, 1–3-veined, apex acute; lip adnate to entire length of column wings, 8–12 × 6–11 mm, 3-lobed; lateral lobes ovate-triangular, small, apex acute; mid-lobe purplish red, rhombic-obovate, 6–11 × 6–11 mm, margin undulate and slightly erose, apex acute; disk glabrous or sparsely puberulent; spur slightly curved, cylindrical, ca. 6 × 1 mm, outside puberulent. Column ca. 5 mm, dilated toward apex, sparsely puberulent; anther cap beaked; pollinia narrowly ovoid, unequal in size; rostellum 2-lobed; lobes ca. 1.7 mm. Fl. Jul–Aug.

• Damp places in dense forests; 1300–1700 m. Chongqing, S Gansu, W Guizhou, NE and S Sichuan.

**16. *Calanthe simplex*** Seidenfaden, Dansk Bot. Ark. 29(2): 42. 1975.

匙瓣虾脊兰 *chi ban xia ji lan*

Plants 30–60 cm tall. Rhizome inconspicuous. Pseudobulbs conic, ca. 2 cm in diam., enclosed in leaf sheaths. Leaves 3, well developed and spreading at anthesis, not deciduous; blade oblong, ca. 30 × 4–7 cm, apex acute; petiole-like base sheathing, ca. 10 cm. Scape arising from leaf axil, erect, to 70

cm, stout, densely puberulent, with 2 tubular sheaths above middle; rachis 20–32 cm, laxly ca. 20-flowered; floral bracts persistent, lanceolate, 10–25 mm, abaxially densely puberulent. Flowers yellowish green; pedicel and ovary ca. 15 mm, densely puberulent. Dorsal sepal elliptic, 9–11 × 5–5.5 mm, abaxially densely villous, 5-veined, apex acute; lateral sepals oblong, slightly oblique, 11–13 × ca. 6 mm, abaxially densely villous, 5-veined, apex acute. Petals obovate-lanceolate or spatulate, ca. 10 × 4–4.5 mm, abaxially densely villous, 3-veined, apex acute; lip adnate to entire length of column wings, reniform, ca. 6 × 12 mm, ± fleshy, unlobed, undulate at margin, apex slightly emarginate and with a recurved mucro in sinus; disk with 3 slightly fleshy ridges at base, irregularly papillose; spur cylindrical, 11–14 mm, slightly dilated toward apex. Column 7–8 mm, thick, dilated toward apex, densely villous, wings decurrent to base of lip; rostellum 2-lobed; lobes ca. 1 mm; pollinia narrowly ovoid, equal in size, ca. 1 mm. Fl. Oct–Dec.

Mixed forests; 2400–2600 m. SW Yunnan [N Thailand].

**17. *Calanthe petelotiana*** Gagnepain, Bull. Soc. Bot. France 79: 163. 1932.

圆唇虾脊兰 *yuan chun xia ji lan*

Plants ca. 30 cm tall. Rhizome inconspicuous. Pseudobulbs very small, enclosed in leaf sheaths. Leaves 2 or 3, not deciduous; blade oblanceolate, ca. 30 × 5.5–8 cm, abaxially puberulent, apex subacute; petiole-like base 14–22 cm, usually forming a pseudostem 15–17 × ca. 1 cm. Scape arising from leaf axil, erect, 20–22 cm, puberulent; rachis 6–12 cm, ca. 10-flowered; floral bracts persistent, lanceolate, 5–7 mm, puberulent. Flowers white, tinged with pale purple, thinly textured; pedicel and ovary ca. 18 mm, puberulent. Dorsal sepal ovate-lanceolate, ca. 16 × 7 mm, abaxially puberulent, 5-veined, apex acute; lateral sepals ovate, slightly oblique, ca. 18 × 9 mm, abaxially puberulent, 5-veined, apex acute. Petals oblong, ca. 15 × 4–5 mm, glabrous, 3-veined, apex acute; lip adnate to entire length of column wings, elliptic, ca. 8 × 14 mm, base subtruncate, margin unlobed, apical margin undulate, apex emarginate and mucronate in sinus; disk with 3 or 5 fleshy lamellae; lamellae thickened toward apex, sometimes minutely crested; spur straight, cylindrical, ca. 28 mm, attenuate toward apex, outside puberulent, densely villous around mouth. Column ca. 5 mm, thick, dilated toward apex, puberulent, wings slightly decurrent to lip and connecting to lamellae on disk; rostellum 2-lobed; lobes ca. 2.1 mm; anther cap beaked; clinandrium densely puberulent; pollinia obovoid, ca. 2 mm; viscidium suboblong, small. Fl. Mar.

Damp places in forests; ca. 1700 m. NW Guizhou, SE Yunnan [N Vietnam].

**18. *Calanthe biloba*** Lindley, Fol. Orchid. 6–7(Calanthe): 3. 1855.

二裂虾脊兰 *er lie xia ji lan*

*Alismorkis biloba* (Lindley) Kuntze.

Plants to 60 cm tall. Pseudobulbs cylindrical, ca. 10 × 0.8 cm, 4- or 5-noded, internodes ca. 2 cm. Leaves 2 or 3, well developed at anthesis, not deciduous; blade broadly elliptic, 12–

17 × 7–8 cm, papery, apex mucronate; petiole-like base sheathing, ca. 8 cm. Scape arising from leaf axil, erect, ca. 50 cm, densely puberulent, with 2 tubular sheaths below middle; rachis ca. 11 cm, laxly more than 10-flowered; floral bracts persistent, narrowly lanceolate, 10–17 mm, glabrous, apex acuminate. Flowers large, purplish with a yellowish lip; pedicel and ovary 20–25 mm, densely puberulent. Dorsal sepal broadly ovate, ca. 15 × 6–7 mm, abaxially puberulent, 5-veined, apex aristate; lateral sepals ovate, oblique, ca. 15 × 7–8 mm, abaxially densely puberulent, 5-veined, apex aristate. Petals oblong, ca. 15 × 4.5 mm, glabrous, 3-veined, apex aristate; lip adnate to base of column wings, subreniform, ca. 15 × 20 mm, clawed, deeply 2-lobed, apiculate in sinus; lobes subrhombic, margin erose, apex obtuse; disk without lamellae and other appendages; spur narrowly conic, ca. 2 mm, apex slightly obtuse. Column ca. 5 mm, thick, slightly dilated toward apex, glabrous; rostellum 2-lobed; pollinia slightly narrowly ovoid, similar in size; viscidium narrowly oblong, ca. 1 mm. Fl. Oct.  $2n = 38, 48, 80$ .

Thickets on streambanks; ca. 1800 m. SW and W Yunnan [Bhutan, NE India, Myanmar, Nepal].

**19. *Calanthe dulongensis*** H. Li, R. Li & Z. L. Dao, Acta Phytotax. Sin. 41: 267. 2003.

独龙虾脊兰 du long xia ji lan

Plants ca. 50 cm tall. Rhizome ca. 6.5 cm, ca. 1 cm in diam. Pseudobulbs subovoid, ca. 1.5 × 2 cm, enclosed in sheaths. Leaves 3, subbasal, well developed at anthesis, not deciduous; blade elliptic or obovate-elliptic, 16–22 × 4.5–7.5 cm, glabrous, apex acute or acuminate; petiole-like base sheathing, 14–18 cm, usually forming a pseudostem. Scape axillary, to 38 cm, densely puberulent, with 2 or 3 sheaths; rachis ca. 16 cm, laxly 20–25-flowered; floral bracts persistent, white, lanceolate, 9–11 mm, abaxially puberulent. Flowers yellow-green, lip yellow and flushed white; pedicel and ovary 18–25 mm, densely puberulent. Dorsal sepal oblong-elliptic, ca. 18 × 6 mm, apex acute; lateral sepals elliptic, ca. 15 × 4 mm, apex mucronate. Petals obovate-lanceolate, ca. 15 × 5 mm; lip adnate to column wing, base clawed, deeply 3-lobed; lateral lobes narrowly oblong, ca. 6 × 2 mm; mid-lobe reniform, ca. 5 × 7.5 mm, apex broadly emarginate and mucronate in sinus; disk with 3 golden yellow, globose, wartlike calli near base; spur straight, yellow, cylindrical, ca. 5.5 mm, outside sparsely puberulent. Column ca. 8 mm, glabrous; rostellum 2-lobed. Fl. Apr.

• Mixed forests; 1900–2300 m. SW Yunnan.

**20. *Calanthe sinica*** Z. H. Tsi, Bull. Bot. Res., Harbin 15: 419. 1995.

中华虾脊兰 zhong hua xia ji lan

Plants 25–34 cm tall. Rhizome short or inconspicuous. Pseudobulbs ovoid-conic, 1–2 × ca. 1 cm. Leaves 4, well developed and spreading at anthesis, not deciduous; blade elliptic, 12–22 × 4–7.5 cm, both surfaces densely pubescent, apex acute; petiole-like base 3–7 cm. Scape arising from leaf axil, erect, to 34 cm, densely puberulent; rachis 2–3 cm, laxly ca. 10-flowered; floral bracts persistent, green, ovate-lanceolate, ca. 15 mm, abaxially densely puberulent. Flowers purplish red; pedicel with ovary ca. 20 mm, densely puberulent. Sepals similar,

elliptic, ca. 18 × 8 mm, abaxially densely puberulent, 3- or 4-veined, apex acute. Petals elliptic, ca. 13 × 7 mm, abaxially sparsely puberulent near apex, 3- or 4-veined, apex acute; lip adnate to entire length of column wings, 8–9 mm, 3-lobed; lateral lobes suborbicular or square, ca. 2.2 × 2.1 mm; mid-lobe flabellate, ca. 9 mm wide, base cuneate, apex slightly emarginate; disk with 4 brown spots, base with 3 yellow wartlike calli; spur narrowly clavate, ca. 25 mm, outside sparsely puberulent. Column thick, ca. 5 × 4 mm, wings sparsely puberulent; rostellum 2-lobed; anther cap narrow, beaked. Fl. Jul–Aug.

• Evergreen broad-leaved forests; ca. 1100 m. SE Yunnan.

**21. *Calanthe sylvatica*** (Thouars) Lindley, Gen. Sp. Orchid. Pl. 250. 1833.

长距虾脊兰 chang ju xia ji lan

*Centrosia sylvatica* Thouars, Hist. Orchid. ad t. 35, 36. 1822; *Alismorkis masuca* (D. Don) Kuntze; *A. textorii* (Miquel) Kuntze; *Bletia masuca* D. Don; *B. sylvatica* (Thouars) Bojer; *Calanthe furcata* Bateman ex Lindley f. *masuca* (D. Don) M. Hiroe; *C. furcata* f. *textorii* (Miquel) M. Hiroe; *C. kintaroi* Yamamoto; *C. longicalcarata* Hayata ex Yamamoto; *C. masuca* (D. Don) Lindley; *C. masuca* var. *sinensis* Rendle; *C. seikooensis* Yamamoto; *C. textorii* Miquel; *C. textorii* var. *longicalcarata* (Hayata ex Yamamoto) Garay & H. R. Sweet; *Zoduba masuca* (D. Don) Buchanan-Hamilton.

Plants to 80 cm tall, without distinct rhizome. Pseudobulbs conic, 1–2 × ca. 1 cm. Leaves 3–6, well developed and spreading at anthesis, not deciduous; blade elliptic to obovate, 20–40 × ca. 10.5 cm, abaxially sparsely pubescent, apex acute or acuminate; petiole-like base 11–23 cm. Scape arising from leaf axil, erect, 45–75 cm, stout, with 2 tubular sheaths below middle; rachis laxly to subdensely many flowered; floral bracts persistent, lanceolate, 10–18 mm, densely puberulent. Flowers pale pinkish purple with purple lip sometimes flushed orange; pedicel and ovary ca. 35 mm, densely puberulent. Dorsal sepal elliptic, 18–23 × 6–10 mm, abaxially sparsely puberulent, 5–7-veined, apex acute; lateral sepals oblong, 20–28 × 6–9 mm, abaxially sparsely puberulent, 5–7-veined, apex acute and shortly caudate. Petals obovate or broadly oblong, 15–20 × 9–12 mm, 5-veined, apex obtuse or subacute; lip adnate to entire length of column wings, 11–17 × 6–14 mm, 3-lobed; lateral lobes falcate-lanceolate, ca. 5 × 1.5–2 mm, attenuate toward apex; mid-lobe flabellate or reniform, 10–14 mm wide, base shortly clawed, apex emarginate or shallowly 2-lobed; disk with 3 rows of small, yellow, crested warts at base; spur cylindrical, 25–50 mm, outside sparsely puberulent, apex obtuse. Column ca. 5 mm, dilated at apex, nearly glabrous; rostellum 2-lobed; lobes ca. 0.7 mm; pollinia narrowly obovoid, equal in size, ca. 2 mm; viscidium suboblong, small. Fl. Apr–Sep.  $2n = 20, 40, 42, 52$ .

Forests, damp places on riversides, along valleys; 800–2000 m. Guangdong, N and SE Guangxi, Hunan, Taiwan, SE Xizang, S and SE Yunnan [Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; Africa, Madagascar].

**22. *Calanthe ×dominyi*** Lindley, Gard. Chron. 1858: 4. 1858 [“*dominii*”].

白花长距虾脊兰 bai hua chang ju xia ji lan

*Calanthe albolongicalcarata* S. S. Ying; *C. matsumurana* Schlechter.

Plants ca. 50 cm tall. Pseudobulbs very small, completely enclosed in leaf sheaths. Leaves 5–8, well developed and spreading at anthesis, not deciduous; blade 15–25 × 5–8 cm, glabrous or sometimes with hairs on veins, apex acute or acuminate; petiole-like base 3–9 cm. Scape arising from leaf axil, 35–45 cm, 3–4 mm in diam., puberulent, with 2 sterile bracts; rachis 5–10 cm, subdensely 10–20-flowered; floral bracts persistent, lanceolate, 12–18 mm, glabrous, apex acuminate. Flowers white, flushed purple on outer surfaces, with pinkish purple lip; pedicel and ovary 20–25 mm, puberulent. Sepals similar, elliptic, 10–15 × 7–8 mm, abaxially sparsely puberulent, apex acute and shortly caudate. Petals obovate or obovate-lanceolate, 10–13 × 4–6 mm, glabrous, apex acute; lip adnate to entire length of column wings, ca. 15 × 12–18 mm, 3-lobed; lateral lobes narrowly elliptic, 4–7 × 4–5 mm, apex obtuse; mid-lobe broadly orbicular, 8–10 × 7–9 mm, apex divided by a deep sinus into 2 lobules, apiculate in sinus; lobules divergent, narrowly elliptic, ca. 10 × 5 mm, margin undulate, apex obtuse; disk with a cluster of wartlike yellow calli at base; spur 2–3 × 1–1.5 mm. Column ca. 2 mm; rostellum 2-lobed. Fl. Jun.

- Forests; 500–1300 m. Taiwan.

*Calanthe ×dominyi* was first named from an artificial hybrid between *C. masuca* (a synonym of *C. sylvatica* in the present treatment) and *C. triplicata* but subsequently has been found as a naturally occurring hybrid.

**23. *Calanthe odora*** Griffith, Not. Pl. Asiat. 3: 365. 1851.

香花虾脊兰 xiang hua xia ji lan

*Alismorkis angusta* (Lindley) Kuntze; *A. odora* (Griffith) Kuntze; *Calanthe angusta* Lindley; *C. angusta* var. *laeta* Handel-Mazzetti; *C. shweliensis* W. W. Smith.

Plants 25–50 cm tall. Pseudobulbs subconic, ca. 5 mm in diam., with 2 or 3 sheaths. Leaves 2 or 3, not well developed at anthesis, not deciduous; blade elliptic or elliptic-lanceolate, (9–)12–14(–22) × (2.5–)3–4(–5) cm, apex acuminate; petiole-like base short, often forming a pseudostem ca. 5 cm. Scape arising from previous year's leafless pseudobulb, erect, puberulent; rachis 2–5 cm, densely few to many flowered; floral bracts persistent, ovate-lanceolate, ca. 8 mm, abaxially puberulent. Flowers white; pedicel and ovary 10–14 mm, puberulent. Sepals similar, ovate-elliptic, 9–11 × 4–5(–7) mm, abaxially puberulent, 5-veined, apex acute. Petals subspatulate, 9–11 × 3–5 mm, glabrous, 3-veined, apex truncate and slightly mucronate; lip adnate to entire length of column wings, 8–10 × 6–8 mm, deeply 3-lobed; lateral lobes suboblong or obliquely ovate; mid-lobe subreniform, divided by a deep triangular sinus into 2 lobules, apiculate in sinus; lobules divergent, subobovate; disk with a semicircular cluster of many tuberous, wartlike calli at base; spur straight, cylindrical, 7–8 mm, outside sparsely puberulent. Column ca. 3 mm, dilated toward apex, sparsely puberulent; rostellum 2-lobed, lobes ca. 1.2 mm; pollinia subclavate, ca. 1.5 mm; viscidium suborbicular, small. Fl. May–Jul.

Broad-leaved forests, shaded and damp places on grassy slopes; 700–1300 m. NW and W Guangxi, Guizhou, Yunnan [Bangladesh, Bhutan, Cambodia, NE India, Laos, N Thailand, Vietnam].

**24. *Calanthe davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 10: 85. 1888 [“*davidii*”].

剑叶虾脊兰 jian ye xia ji lan

*Alismorkis pachystalix* (H. G. Reichenbach ex J. D. Hooker) Kuntze; *Calanthe bungenana* Ohwi; *C. davidii* var. *bungenana* (Ohwi) T. Hashimoto; *C. ensifolia* Rolfe; *C. furcata* Bateman ex Lindley f. *matsudae* (Hayata) M. Hiroe; *C. matsudae* Hayata; *C. pachystalix* H. G. Reichenbach ex J. D. Hooker.

Plants usually clustered, 32–70 cm tall, without distinct rhizome. Pseudobulbs often enclosed in leaf sheaths. Leaves 3 or 4, well developed and spreading at anthesis, not deciduous; blade ensiform or lorate, 18–65 × 0.8–2(–5) cm, glabrous, with 3 main veins, apex acute; petiole-like base inconspicuous or sometimes forming a pseudostem 4–10 cm. Scape arising from leaf axil, erect, 30–120 cm, stout, densely puberulent; rachis 8–20(–30) cm, subdensely many flowered; floral bracts persistent, reflexed, narrowly lanceolate, 10–15 mm, abaxially puberulent. Flowers yellowish green or white, sometimes tinged purple. Sepals similar, reflexed, subelliptic, 6–9 × ca. 4 mm, abaxially nearly glabrous or densely puberulent, 5-veined, apex acute or obtuse. Petals reflexed, narrowly oblong-ob lanceolate, 6–9 × 1.8–2.2 mm, glabrous, 3-veined, base clawed, apex obtuse or acute; lip adnate to entire length of column wings, broadly triangular, 6–9 × 4–9 mm, 3-lobed; lateral lobes oblong, falcate-oblong, or ovate-triangular, ca. 9 mm across their apices, apex obliquely truncate and obtuse; mid-lobe divided by a deep sinus into 2 lobules; lobules divergent, suboblong, narrower than lateral lobes; disk with 3 clusters of wartlike calli extending almost to sinus of mid-lobe; spur curved, cylindrical, 5–12 mm, outside sparsely puberulent, inside densely puberulent. Column ca. 3 mm, thick, dilated toward apex, nearly glabrous or sparsely puberulent; rostellum 2-lobed; lobes ca. 1 mm; pollinia nearly pear-shaped or obovoid, equal in size, ca. 1 mm, with short caudicles; viscidium small. Capsule ovoid, ca. 13 × 7 mm. Fl. Jun–Jul, fr. Sep–Oct.  $2n = 40, 44$ .

Forests, shaded places along valleys; 500–3300 m. S Gansu, Guizhou, Hubei, NW Hunan, S Shaanxi, Sichuan, Taiwan, SE Xizang, SE and W Yunnan [N India, Japan, Nepal, Vietnam].

**25. *Calanthe herbacea*** Lindley, Fol. Orchid. 6–7(Calanthe): 10. 1855.

西南虾脊兰 xi nan xia ji lan

*Alismorkis herbacea* (Lindley) Kuntze; *Calanthe brevicolumna* Hayata.

Plants 30–70 cm tall. Rhizome inconspicuous. Pseudobulbs nearly narrowly ovoid or cylindrical, very small, 1–2.5 cm × 5–15 mm, with 2 sheaths. Leaves 3 or 4, well developed and spreading at anthesis, not deciduous; blade elliptic or elliptic-lanceolate, 15–30 × ca. 9 cm, abaxially puberulent, 3- or 4-veined, apex acute or acuminate; petiole-like base 10–20 cm, slender. Scape arising from leaf axil, erect, to 70 cm, puberulent; rachis 8–15 cm, laxly ca. 10-flowered; floral bracts persistent, lanceolate, ca. 10 mm, abaxially puberulent. Flowers yellowish green; pedicel and ovary ca. 30 mm, puberulent. Dorsal sepal reflexed, obovate-lanceolate, ca. 15 × 7 mm, abaxially

puberulent, 5-veined, apex obtuse and mucronate; lateral sepals reflexed, elliptic, oblique, ca.  $15 \times 6$  mm, abaxially puberulent, 5-veined, base clawed, apex acute. Petals reflexed, subspatulate, ca.  $12 \times 2$ – $2.5$  mm, glabrous, apex obtuse; lip adnate to entire length of column wings, deeply 3-lobed; lateral lobes ovate,  $6$ – $7 \times$  ca.  $5$  mm, apex obliquely truncate; mid-lobe divided by a deep sinus into 2 lobules, apiculate in sinus; lobules divergent, ca. as large as lateral lobes; disk with a cluster of yellow wartlike calli at base; spur slightly arcuate, yellowish green,  $20$ – $30$  mm, slender, outside puberulent, apex obtuse. Column white, ca.  $7$  mm, dilated at apex, subglabrous; rostellum 2-lobed; anther cap white; pollinia clavate, subequal in size, ca.  $2$  mm; viscidium subsquare, ca.  $1$  mm. Fl. Jun–Aug.  $2n = 40$ ,  $40 + 2B$ ,  $42$ .

Humid places in dense forests, along valleys;  $1500$ – $2100$  m. S Guangxi, SE Xizang, S and SE Yunnan [India (Sikkim), Vietnam].

**26. *Calanthe argenteostriata*** C. Z. Tang & S. J. Cheng, *Orchid Rev.* 89: 144. 1981 [*“argenteo-striata”*].

银带虾脊兰 yin dai xia ji lan

Plants to ca.  $65$  cm tall, without conspicuous rhizome. Pseudobulbs subconic, small, ca.  $1.5$  cm in diam., with 2 or 3 sheaths. Leaves 3–7, well developed at anthesis, not deciduous; blade deep green, with 5 or 6 silver-gray bands adaxially, elliptic or ovate-lanceolate,  $18$ – $27 \times 5$ – $11$  cm, glabrous or abaxially slightly puberulent, apex acute; petiole-like base  $3$ – $4$  cm. Scape arising from leaf axil, to  $60$  cm, densely puberulent, with 3 or 4 tubular sheaths; rachis  $7$ – $11$  cm, subdensely more than 10-flowered; floral bracts persistent, broadly ovate, ca.  $15$  mm, abaxially puberulent. Flowers yellowish green; pedicel and ovary  $25$ – $30$  mm, puberulent. Sepals and petals  $\pm$  yellowish green; dorsal sepal reflexed, elliptic, ca.  $10 \times 4.5$  mm, abaxially puberulent, 5-veined, apex obtuse and shortly aristate; lateral sepals reflexed, broadly ovate-elliptic, ca.  $10 \times 5.5$  mm, abaxially puberulent, 5-veined, apex obtuse and shortly aristate. Petals  $\pm$  reflexed, subspatulate or obovate, slightly smaller than sepals, glabrous, 3-veined, apex subtruncate and mucronate; lip adnate to entire length of column wings at base, white, ca.  $16 \times 16$  mm, 3-lobed; lateral lobes flabellate, ca.  $7 \times 7$  mm, apex rounded; mid-lobe divided by a deep sinus into 2 lobules, apiculate in sinus; lobules obovate, ca. as large as lateral lobes, margin slightly erose, apex truncate; disk with 3 rows of small, golden yellow, wartlike calli at base; spur yellowish green, cylindrical,  $15$ – $19$  mm, outside sparsely puberulent, attenuate toward apex. Column white, ca.  $5$  mm; rostellum horn-shaped, 2-lobed; anther cap white, beaked; pollinia narrowly obovoid or narrowly clavate, subequal in size, ca.  $2$  mm, with short caudicles; viscidium subsquare. Capsule ca.  $30$  mm. Fl. Apr–May.  $2n = 45^*$ .

Forests;  $500$ – $1200$  m. N Guangdong, SW Guangxi, SW Guizhou, SE Yunnan [Vietnam].

**27. *Calanthe alismatifolia*** Lindley, *Fol. Orchid.* 6–7(*Calanthe*): 8. 1855 [*“alismatifolia”*].

泽泻虾脊兰 ze xie xia ji lan

*Alismorkis alismatifolia* (Lindley) Kuntze; *A. japonica* (Blume ex Miquel) Kuntze; *Calanthe austrokiusiuensis* Ohwi;

*C. fauriei* Schlechter; *C. furcata* Bateman ex Lindley var. *alismatifolia* (Lindley) M. Hiroe; *C. furcata* f. *fauriei* (Schlechter) M. Hiroe; *C. japonica* Blume ex Miquel; *C. nigropunctulata* Fukuyama.

Plants  $20$ – $45$  cm tall. Rhizome inconspicuous. Pseudobulbs cylindrical,  $1$ – $3$  cm  $\times$   $3$ – $5$  mm. Leaves 3–6, basal, well developed and spreading at anthesis, not deciduous; blade elliptic to ovate-elliptic,  $10$ – $23 \times 4$ – $12$  cm, glabrous or abaxially sometimes with short hairs, apex acute; petiole-like base  $6$ – $20$  cm, slender. Scapes 1 or 2, arising from leaf axils, erect,  $10$ – $28$  cm, slender, densely puberulent; rachis  $3$ – $4$  cm, subdensely to densely 3- to more than 10-flowered; floral bracts persistent, slightly recurved, broadly ovate-lanceolate,  $5$ – $10$  mm, abaxially sparsely puberulent. Flowers white, sometimes tinged purplish violet; pedicel and ovary  $10$ – $20$  mm, puberulent. Sepals similar, subobovate, ca.  $10 \times 6$  mm, abaxially pilose, 5-veined. Petals subrhombic, ca.  $8 \times 4$  mm, glabrous, 3-veined, apex obtuse; lip adnate to entire length of column wings, spreading, deeply 3-lobed; lateral lobes linear or narrowly oblong, ca.  $8 \times 2$  mm, apex rounded; mid-lobe flabellate, ca.  $17 \times 12$  mm, base clawed, apex subtruncate, divided by a deep sinus into 2 lobules; lobules subrhombic, much larger than lateral lobes,  $5$ – $6$  mm wide, margin entire or erose, apex truncate-obtuse; disk with several yellow, wartlike calli at base; spur straight, cylindrical, ca.  $10$  mm, slender, glabrous. Column ca.  $3$  mm, slightly dilated at apex, glabrous; rostellum 2-lobed; lobes ca.  $1.2$  mm; pollinia ovoid, subequal in size, ca.  $2$  mm. Capsule ca.  $20 \times 6$  mm. Fl. Jun–Jul.  $2n = 40$ ,  $44$ .

Evergreen broad-leaved forests;  $700$ – $2100$  m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Taiwan, SE Xizang, SE and W Yunnan, Zhejiang [Bhutan, NE India, Japan, Vietnam].

**28. *Calanthe triplicata*** (Willemet) Ames, *Philipp. J. Sci.*, C, 2: 326. 1907 [*“triplicatis”*].

三褶虾脊兰 san zhe xia ji lan

*Orchis triplicata* Willemet, *Ann. Bot. (Usteri)* 18: 52. 1796; *Alismorkis furcata* (Bateman ex Lindley) Kuntze; *A. veratrifolia* Kuntze, nom. illeg. superfl.; *Amblyglottis veratrifolia* Blume, nom. illeg. superfl.; *Calanthe furcata* Bateman ex Lindley; *C. rubicallosa* Masamune; *C. triplicata* f. *purpureo-flora* S. S. Ying; *C. veratrifolia* Ker Gawler, nom. illeg. superfl.; *Limodorum veratrifolium* Willdenow, nom. illeg. superfl.

Plants  $40$ – $100$  cm tall. Rhizome inconspicuous. Pseudobulbs ovoid-cylindrical,  $1$ – $3 \times 1$ – $2$  cm, with 2 or 3 sheaths. Leaves 3 or 4, well developed and spreading at anthesis, not deciduous; blade elliptic or elliptic-lanceolate,  $20$ – $60 \times 5$ – $12$  cm, glabrous or sometimes puberulent abaxially, apex acute; petiole-like base  $10$ – $18$  cm. Scape arising from leaf axil, erect,  $30$ – $70$  cm, puberulent; rachis  $5$ – $20$  cm, densely many flowered; floral bracts persistent, ovate-lanceolate,  $10$ – $20$  mm, puberulent or sometimes nearly glabrous. Flowers white, occasionally purplish red, later turning orange, turning black when dried; pedicel and ovary  $30$ – $40$  mm, puberulent. Dorsal sepal recurved, subelliptic,  $10$ – $12 \times 4.5$ – $5.5$  mm, abaxially puberulent, 5-veined, apex acute or apiculate; lateral sepals recurved, obovate-lanceolate, slightly oblique,  $10$ – $13 \times 5$ – $6$  mm, abaxially puberulent, 5-veined. Petals recurved, obovate-lanceolate,  $8$ – $10$

× 3–4.5 mm, abaxially puberulent, 3-veined, base clawed; lip adnate to entire length of column wings, 12–18 × ca. 14 mm, deeply 3-lobed; lateral lobes oblong to narrowly obovate-cuneate, ca. 7 × 3 mm, apex obtuse; mid-lobe divided by a deep sinus into 2 lobules, shortly apiculate in sinus; lobules divergent, linear-oblong, ca. as large as lateral lobes, ca. 3 mm wide; disk with 3 or 4 rows of small, golden or orange-red, wartlike calli at base; spur straight, white, cylindrical, (6–)12–15 mm, slender, outside sparsely puberulent, apex obtuse. Column ca. 5 mm, dilated at apex, sparsely puberulent; rostellum 2-lobed; lobes suboblong, ca. 2 mm, apex subtruncate; pollinia clavate, unequal in size, 2–4 mm, with conspicuous caudicles; viscidium subelliptic, small. Fl. Apr–May.  $2n = 18, 20, 40, 42$ .

Evergreen broad-leaved forests; 700–2400 m. S Fujian, Guangdong, Guangxi, Hainan, Taiwan, N and SE Yunnan [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Philippines, Sri Lanka, Vietnam; Australia, Madagascar, SW Pacific islands].

**29. *Calanthe yuana*** Tang & F. T. Wang, Bull. Fan Mem. Inst. Biol. Bot. 7: 7. 1936.

峨边虾脊兰 e bian xia ji lan

Plants to 70 cm tall, without distinct rhizome. Pseudobulbs conic, small, ca. 1 cm in diam., with 3 sheaths. Leaves 4, well developed and spreading at anthesis, not deciduous; blade elliptic, 18–21 × 4–6.5 cm, abaxially puberulent, apex shortly acuminate; petiole-like base sheathing, 7–10 cm, usually forming a pseudostem ca. 10 cm. Scape arising from leaf axil, erect, densely puberulent; rachis ca. 29 cm, laxly 14-flowered; floral bracts persistent, lanceolate, 4–6.5 mm, glabrous, apex acuminate. Flowers yellowish, with a white lip; pedicel and ovary 16–20 mm, densely puberulent. Dorsal sepal elliptic, ca. 15 × 7 mm, glabrous, 5-veined, apex acute; lateral sepals oblong-elliptic, ca. 17 × 5 mm, glabrous, 5-veined, apex mucronate. Petals ligulate, oblique, ca. 15 × 5.5 mm, 3-veined, apex obtuse and slightly mucronate; lip adnate to entire length of column wings at base, orbicular-rhombic, ca. 18 × 8 mm, 3-lobed; lateral lobes falcate-oblong, ca. 6 × 4.5 mm, apex obtuse; mid-lobe obovate, ca. 8.5 × 8 mm, base cuneate, apex rounded and emarginate; disk without lamellae or other appendages; spur straight or slightly arcuate, cylindrical, ca. 8 mm, glabrous, apex obtuse. Column ca. 6 mm, dilated at apex, glabrous; rostellum 2-lobed; lobes ca. 1.2 mm; pollinia obovoid, equal in size, ca. 2 mm; viscidium suboblong, small. Fl. May.

• Evergreen broad-leaved forests; ca. 1800 m. W Hubei, SW Sichuan.

**30. *Calanthe limprichtii*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 349. 1922.

开唇虾脊兰 kai chun xia ji lan

Plants to 80 cm tall. Rhizome inconspicuous. Pseudobulbs subconic, very small, ca. 0.8 cm in diam., with 2 or 3 sheaths. Leaves 2 or 3, well developed and spreading at anthesis, not deciduous; blade elliptic, 30–35 × ca. 11 cm, glabrous, apex acuminate; petiole-like base ca. 15 cm. Scape erect, arising from leaf axil, puberulent; rachis laxly many flowered; floral bracts persistent, lanceolate or elliptic-lanceolate, shorter than ovary, puberulent, apex acuminate. Flowers white, with green

lip; pedicel and ovary 15–17 mm, puberulent. Sepals similar, narrowly elliptic-oblong, ca. 20 × 6 mm, abaxially sparsely puberulent, 7-veined, apex acuminate; lateral sepals slightly narrower than dorsal sepal. Petals narrowly elliptic, ca. 20 × 4 mm, glabrous, 3-veined, apex acuminate; lip adnate to entire length of column wings at base, ca. 12 mm, 3-lobed; lateral lobes oblong, ca. 6 × 3 mm, apex obliquely truncate; mid-lobe oblong-ligulate, ca. 6 × 2 mm, apex acute; disk without lamellae or other appendages; spur arcuate, ca. 10 mm, slender, puberulent. Column ca. 7 mm, dilated toward apex, glabrous; rostellum 2-lobed; pollinia obovoid, equal in size.

• Forests; ca. 1500 m. C Sichuan.

**31. *Calanthe mannii*** J. D. Hooker, Fl. Brit. India 5: 850. 1890.

细花虾脊兰 xi hua xia ji lan

*Alismorkis mannii* (J. D. Hooker) Kuntze; *Calanthe brachychila* Gagnepain; *C. pusilla* Finet.

Plants 30–45 cm tall. Rhizome inconspicuous. Pseudobulbs conic, ca. 1 cm in diam., with 2 or 3 sheaths. Leaves 3–5, not well developed at anthesis, not deciduous; blade oblanceolate or oblong, 18–35 × 3–4.5 cm, plicate, abaxially puberulent, base sessile or attenuate into a petiole-like stalk, apex acute; petiole-like base 5–10 cm, usually forming a pseudostem 5–7 cm. Scape arising from leaf axil, erect, to 51 cm, densely puberulent; rachis 4–10 cm, 10- or more flowered; floral bracts persistent, lanceolate, 2–4 mm, glabrous. Flowers small, dark brown, with golden yellow lip; pedicel and ovary 5–7 mm, densely puberulent. Sepals similar, ovate-lanceolate or oblong, concave, 7–9 × 2.5–4.5 mm, abaxially densely puberulent, 3–5-veined, apex acute; lateral sepals ± oblique. Petals obovate-lanceolate or oblong, 6–7 × 1.2–2 mm, glabrous, 1–3-veined, apex acute; lip adnate to entire length of column wings, 3–4.5 × 2.5–3 mm, 3-lobed; lateral lobes ovate, oblique, 1.5–2 × 1–1.5 mm, apex obtuse-rounded; mid-lobe transversely oblong or nearly reniform, 1.5–2 × 2.5–3 mm, margin slightly undulate, apex emarginate and mucronate in sinus; disk with 3 lamellae or ridges; lamellae extending from base of lip to apex of mid-lobe, expanding to semilunate swellings on mid-lobe; spur straight, 1–3 × ca. 1 mm, outside puberulent. Column white, ca. 3 mm, dilated at apex, ventrally puberulent; rostellum small, 2-lobed; pollinia narrowly ovoid, subequal in size, ca. 0.8 mm; viscidium suborbicular, small. Fl. May.  $2n = 40$ .

Forests; 1300–2400 m. E Guangdong, NE Guangxi, SW Guizhou, SW Hubei, N Jiangxi, Sichuan, S and SE Xizang, NE Yunnan [Bhutan, India, Myanmar, Nepal, Vietnam].

**32. *Calanthe brevicornu*** Lindley, Gen. Sp. Orchid. Pl. 251. 1833.

肾唇虾脊兰 shen chun xia ji lan

*Alismorkis brevicornu* (Lindley) Kuntze; *Calanthe lamellosa* Rolfe; *C. scaposa* Z. H. Tsi & K. Y. Lang; *C. yunnanensis* Rolfe.

Plants 30–45 cm tall. Rhizome usually inconspicuous. Pseudobulbs conic, short, ca. 2 cm in diam., with 3 or 4 sheaths. Leaves 3 or 4, not well developed at anthesis, not deciduous; blade elliptic or obovate-lanceolate, 18–30 × 5–11.5 cm, apex

acute; petiole-like base sheathing, 3–10 cm, usually forming a stout pseudostem 5–8 cm long and 1–2 cm in diam. Scape arising from leaf axil, 25–40 cm, densely puberulent; rachis to 30 cm, laxly 5–13-flowered; floral bracts persistent, lanceolate, 5–13 mm, nearly glabrous. Flowers yellowish green, with pinkish red striations; pedicel and ovary 16–23 mm, puberulent. Sepals similar, oblong, 12–23 × (3–)4–6(–8) mm, abaxially puberulent, 5-veined, apex acute. Petals oblong-lanceolate, 11–20 × 4–5 mm, glabrous, 3-veined, apex acute; lip adnate to base of column wings, 11–20 × 6–10 mm, base shortly clawed, 3-lobed; lateral lobes falcate-oblong, ca. 15 × 12.5 mm, apex obliquely truncate; mid-lobe nearly reniform or orbicular, ca. 6 × 8 mm, base clawed, apex usually emarginate and mucronate in sinus; disk pinkish red, with 3 tall yellow lamellae; spur very short, ca. 2 mm, outside puberulent, attenuate toward apex. Column ca. 4 mm, slightly dilated toward apex, ventrally villous; rostellum 2-lobed; lobes ca. 1 mm; anther cap beaked; pollinia narrowly obovoid, subequal in size, ca. 1.5 mm. Fl. May–Jun.  $2n = 38, 40, 48$ .

Dense forests; 1600–3100 m. N Guangxi, Hubei, Sichuan, SE Xizang, SE and W Yunnan [Bhutan, N India, Myanmar, Nepal].

**33. *Calanthe hancockii*** Rolfe, Bull. Misc. Inform. Kew 1896: 197. 1896.

叉唇虾脊兰 cha chun xia ji lan

Plants 32–85 cm tall. Rhizome inconspicuous. Pseudobulbs conic, ca. 15 mm in diam., with 3 or 4 sheaths. Leaves 3, not well developed at anthesis, not deciduous; blade elliptic or elliptic-lanceolate, 20–40 × 5–12 cm, abaxially puberulent, margin undulate, apex acute; petiole-like base 5–20 cm, usually forming a stout pseudostem to ca. 25 cm long and 1–2 cm in diam. Scape arising from leaf axil, 22–80 cm, densely puberulent; rachis to 30 cm, laxly 7–20-flowered; floral bracts persistent, narrowly lanceolate, 7–10 mm, glabrous. Flowers with unpleasant smell, slightly nodding, yellowish brown, large; pedicel and ovary 15–20 mm, puberulent. Sepals similar, oblong-lanceolate, 25–35 × 6–10 mm, abaxially puberulent, 5–7-veined, apex acute or acuminate; lateral sepals slightly narrower than dorsal sepal. Petals subelliptic, ca. 23 × 6 mm, 3-veined, apex acuminate; lip adnate to entire length of column wings, lemon-yellow, 18–24 × 14–15 mm, base shortly clawed, 3-lobed; lateral lobes falcate-oblong, ca. 8 × 4 mm, apex obliquely truncate; mid-lobe narrowly obovate-oblong, ca. 10 × 5 mm, apex acute or rounded and mucronate; disk with 3 undulate lamellae, central one almost reaching apex of mid-lobe; spur yellowish, 2–3 mm, slender, outside puberulent, white pilose around mouth. Column ca. 5 mm, dilated toward apex, sparsely puberulent; rostellum 2-lobed; lobes ca. 1.7 mm; anther cap beaked; pollinia narrowly ovoid, ca. 2 mm; viscidium suborbicular. Fl. Apr–May.  $2n = 40^*$ .

• Evergreen broad-leaved forests, shaded places along valleys; 1000–3600 m. N Guangxi, SW Sichuan, NW and SE Yunnan.

**34. *Calanthe fugongensis*** X. H. Jin & S. C. Chen, Nordic J. Bot. 25: 20. 2008.

福贡虾脊兰 fu gong xia ji lan

Plants 50–60 cm tall. Rhizome inconspicuous. Pseudo-

bulbs conic, ca. 4 × 2 cm. Leaves 3 or 4, not well developed at anthesis, not deciduous; blade elliptic-lanceolate to oblong-lanceolate, 20–30 × 5–10 cm, glabrous, margin slightly undulate, apex acuminate; petiole-like base 3–10 cm, slender, usually involute and forming a pseudostem 9–20 cm. Scape terminal, erect, to 50 cm, finely puberulent; rachis to 30 cm, laxly to 20-flowered; floral bracts persistent, lanceolate, 9–10 mm, membranous, glabrous, apex acute. Flowers yellow; pedicel and ovary 20–26 mm, finely puberulent. Dorsal sepal narrowly elliptic, ca. 20 × 10 mm, 7-veined, apex acuminate; lateral sepals lanceolate, slightly oblique, ca. 20 × 8 mm, 5-veined, apex acute. Petals oblanceolate, 15–16 × ca. 6 mm, 3-veined, apex acuminate; lip attached to length of column, 13–14 × 13–14 mm, base shortly clawed, 3-lobed; lateral lobes narrowly oblong-hamate, oblique, ca. 5 × 8 mm, apex obtuse; mid-lobe spatulate, ca. 10 × 10 mm, base clawed, apical margin ± undulate-dentate, apex emarginate and mucronate in sinus; disk with 3 erect, fleshy, subquadrate lamellae on mid-lobe; spur adnate to ovary, cylindrical, 4.5–6 mm, outside and inside puberulent, apex obtuse. Column ca. 10 mm, dilated toward apex, glabrous, with triangular wings; rostellum 2-lobed; lobes ca. 1 mm; anther cap ca. 4 mm, beaked; pollinia clavate, subequal in size, ca. 2 mm; viscidium suboblong, ca. 0.8 mm. Fl. May–Jun.

• Montane evergreen forests; 2400–3000 m. W Yunnan.

**35. *Calanthe griffithii*** Lindley in Lindley & Paxton, Paxt. Fl. Gard. 3: 37. 1852.

通麦虾脊兰 tong mai xia ji lan

*Calanthe anjanii* Lucksom; *C. tangmaiensis* K. Y. Lang & Y. Tateishi.

Plants 30–60 cm tall. Pseudobulbs subconic, small, ca. 2 cm in diam., with 2–4 sheaths. Leaves 3 or 4, well developed and spreading at anthesis, not deciduous; blade oblong or oblong-lanceolate, 29–34 × 5–7 cm, apex acute; base contracted and cuneate, forming a pseudostem to 16 cm. Scape arising from leaf axil, erect, to 75 cm, densely puberulent; rachis ca. 19 cm, laxly many flowered; floral bracts persistent, ovate-lanceolate, 4–5 mm, abaxially sparsely puberulent, apex acuminate. Flowers greenish brown to yellowish green with brownish lip; pedicel and ovary ca. 25 mm, densely puberulent. Sepals similar, oblong, ca. 20 × 10 mm, abaxially puberulent, 5- or 6-veined, apex acute; lateral sepals slightly narrower than dorsal sepal. Petals suboblanceolate, ca. 17 × 6 mm, glabrous, 3-veined, apex acute; lip adnate to base of column wings, shorter than sepals, 3-lobed; lateral lobes oblong, ca. 8 × 4 mm, apex obliquely truncate; mid-lobe brown, subcordate or flabellate-elliptic, ca. 9 × 12 mm, margin undulate, apex emarginate and apiculate in sinus; disk with a single subtriangular lamella centrally; spur straight, cylindrical, ca. 6 mm, outside sparsely puberulent, apex obtuse. Column brown, ca. 8 mm, nearly glabrous; rostellum 2-lobed; pollinia obovoid, ca. 1.5 mm. Fl. May.

Evergreen broad-leaved forests; ca. 2000 m. SE Xizang [Bhutan, NE India, Myanmar].

**36. *Calanthe emeishanica*** K. Y. Lang & Z. H. Tsi, Acta Phytotax. Sin. 20: 186. 1982.

峨眉虾脊兰 e mei xia ji lan

Plants ca. 25 cm tall. Pseudobulbs very small, ca. 7 mm in diam., with 2 sheaths. Leaves 3 or 4, basal, well developed at anthesis, not deciduous; blade elliptic or oblong, 8–11 × 2.5–3.5 cm, apex shortly acuminate; petiole-like base ca. 1 cm, usually forming a pseudostem ca. 3 cm. Scape arising from leaf axil, ca. 24 cm, puberulent, usually with 2 tubular sheaths; rachis ca. 4 cm, laxly few flowered; floral bracts persistent, ovate-lanceolate, ca. 10 mm, apex acuminate. Flowers yellowish, with purplish red striations; pedicel and ovary ca. 20 mm. Sepals similar, ovate-lanceolate, ca. 17 × 5 mm, 5-veined, apex acuminate; lateral sepals oblique, 3–5-veined. Petals linear, slightly oblique, ca. 13 × 2 mm, 2- or 3-veined, apex acuminate; lip adnate to entire length of column wings, white, ca. 10 × 9 mm, 3-lobed near base; lateral lobes elliptic, slightly oblique, margin slightly dentate, apex obtuse; mid-lobe nearly reniform or transversely oblong, margin undulate, apex subtruncate and emarginate; disk with 7 crested lamellae, central 3 extending to apex of mid-lobe; spur straight, 2–3 mm, outside puberulent, apex obtuse. Column ca. 3 mm; anther cap ± beaked; pollinia obovoid, with very short caudicles; rostellum 2-lobed. Fl. Jul.

- Broad-leaved forests; ca. 2000 m. SC Sichuan (Emei Shan).

**37. *Calanthe arcuata*** Rolfe, Bull. Misc. Inform. Kew 1896: 196. 1896.

弧距虾脊兰 hu ju xia ji lan

*Calanthe arcuata* var. *brevifolia* Z. H. Tsi; *C. caudatilabella* Hayata; *C. caudatilabella* var. *latiloba* F. Maekawa ex Yamamoto.

Plants 18–45 cm tall. Rhizome inconspicuous. Pseudobulbs conic, small, ca. 1 cm in diam., with 2 or 3 sheaths. Leaves 3 or 4, basal, well developed at anthesis, not deciduous; blade narrowly elliptic-lanceolate or narrowly lanceolate, 15–28 × 0.7–3 cm, apex acute or acuminate; petiole-like base sheathing, often forming a pseudostem 2–3 cm. Scapes 1 or 2, arising from leaf axil, erect, 30–50 cm, densely puberulent or glabrous; rachis 10–25 cm, laxly ca. 10-flowered; floral bracts persistent, herbaceous, narrowly lanceolate, 10–18 mm, glabrous. Flowers white to yellowish green, flushed reddish brown on outer surfaces; pedicel and ovary arcuate, 14–20 mm, densely puberulent. Sepals similar, narrowly lanceolate, 17–22 × ca. 4 mm, glabrous, 5-veined, apex acuminate. Petals linear, 17–22 × 2–3 mm, 3-veined, apex acuminate; lip adnate to entire length of column wings, white, tinged purple at apex, usually turning yellow later, 11–18 × 4–6 mm, 3-lobed or rarely almost unlobed; lateral lobes ovate-triangular or suboblong, oblique, ca. 7 mm across their apices, apical margin sometimes toothed, apex acute; mid-lobe elliptic-rhombic, 8–10 × 6–7 mm, base usually clawed, margin undulate and irregularly toothed, apex aristate; disk with 3–5 ridges; spur cylindrical, slender, ca. 5 mm, glabrous or sparsely puberulent, apex obtuse. Column 4–5 mm, thick, dilated toward apex, glabrous or sometimes sparsely puberulent; column wings triangular, dilated at apex and embracing stigma; rostellum furcately 2-lobed; lobes ca. 1.2 mm; anther relatively small; pollinia narrowly ovoid, equal in size, ca. 1.2 mm; viscidium suboblong, small. Capsule subellipsoid, ca. 20 × 8 mm. Fl. May–Sep.  $2n = 38^*$ ,  $40^*$ .

• Forests, soil-covered rocks along valleys; 1400–3100 m. S Gansu, Guizhou, W Hubei, Hunan, S Shaanxi, W Sichuan, Taiwan, NW and W Yunnan.

**38. *Calanthe nipponica*** Makino, Bot. Mag. (Tokyo) 13: 128. 1899.

戟形虾脊兰 ji xing xia ji lan

*Calanthe trulliformis* King & Pantling var. *hastata* Finet.

Plants 25–38 cm tall. Rhizome inconspicuous. Pseudobulbs very small, with 3 or 4 sheaths. Leaves 4, well developed and spreading at anthesis, not deciduous, subsessile; blade narrowly lanceolate or narrowly elliptic, 12–16 × 1.5–2 cm, apex acuminate. Scape arising from leaf axil, erect, 24–34 cm, puberulent; rachis 6–12 cm, laxly 3–7-flowered; floral bracts persistent, ovate-lanceolate, 13–15 mm, abaxially slightly puberulent. Flowers nodding, pale yellow and green; pedicel and ovary 15–20 mm, densely puberulent. Dorsal sepal elliptic-lanceolate, ca. 14 × 5 mm, abaxially puberulent, 5-veined, apex acuminate; lateral sepals ovate-lanceolate, oblique, ca. 14 × 4.5 mm, abaxially puberulent, 5-veined, apex acuminate. Petals linear, ca. 12 × 2 mm, glabrous, 3-veined, apex acuminate; lip adnate to entire length of column wings, yellow, orange-brown at base, subovate-triangular, 3-lobed; lateral lobes ovate, ca. 5.5 × 4 mm, ca. 8 mm across their apices, apex obtuse; mid-lobe suboblong, ca. 6 × 4.5 mm, apex acute; disk with 3 lamellae, central one extending almost to apex of mid-lobe; spur cylindrical, 4–5 mm, outside puberulent, apex obtuse. Column ca. 5 mm, thick, dilated toward apex; rostellum 2-lobed; lobes ca. 1.2 mm; pollinia narrowly obovoid, ca. 14 mm; viscidium suborbicular. Fl. Jun.  $2n = 38, 40$ .

Forests; ca. 2600 m. SE Xizang [Japan].

**39. *Calanthe trifida*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 87. 1951.

裂距虾脊兰 lie ju xia ji lan

Plants ca. 75 cm tall, without distinct rhizome. Pseudobulbs subconic, short, 1–2 cm in diam., with 2 or 3 sheaths. Leaves 3, well developed and spreading at anthesis, not deciduous; blade elliptic, ca. 22 × 10 cm, papery, 5-veined, apex acuminate; petiole-like base 30–37 cm, usually forming a pseudostem to 23 cm. Scape arising from leaf axil, upper part densely puberulent; rachis ca. 30 cm, laxly many flowered; floral bracts persistent, lanceolate, ca. 5 mm, apex acute. Flowers pink; pedicel and ovary ca. 20 mm, puberulent. Sepals similar, elliptic, ca. 10 × 4 mm, abaxially puberulent, 5-veined, apex shortly acuminate; lateral sepals oblique, usually slightly shorter than dorsal sepal. Petals narrowly elliptic, ca. 7 × 2.2 mm, abaxially puberulent, 3-veined, apex obtuse; lip adnate to entire length of column wings, flabellate, ca. 5.5 mm, 3-lobed; lateral lobes broadly oblong, shorter and broader than mid-lobe, ca. 7 mm across their apices, apex subtruncate and ± incurved; mid-lobe suboblong, ca. 3.5 × 2 mm, apex acute; disk with 3 ridges, central one thicker and extending to apex of mid-lobe; spur cylindrical, ca. 6 mm, outside puberulent, apex obtuse and slightly 2-lobed. Column ca. 4 mm, ventrally sparsely puberulent, wings decurrent to lip; rostellum 2-lobed; lobes ca. 1 mm; anther cap

beaked; pollinia narrowly ovoid, equal in size, ca. 1.5 mm. Fl. Feb–Mar.

Evergreen broad-leaved forests; ca. 1700 m. SW Yunnan [Myanmar].

**40. *Calanthe discolor*** Lindley, Sert. Orchid. ad t. 9. 1838.

虾脊兰 xia ji lan

*Alismorkis discolor* (Lindley) Kuntze; *Calanthe cheniana* Handel-Mazzetti; *C. esquirolei* Schlechter.

Plants 40–65 cm tall. Rhizome inconspicuous. Pseudobulbs subconic, small, ca. 1 cm in diam., with 3 or 4 sheaths. Leaves 3, not well developed at anthesis, not deciduous; blade obovate-oblong to elliptic-oblong, 13–25 × 3–9 cm, abaxially densely puberulent, apex acute; petiole-like base 3–9 cm, usually forming a pseudostem 6–10 cm long and ca. 2 cm in diam. Scapes 1 or 2, arising from leaf axil, 18–30 cm, densely puberulent; rachis 6–8 cm, laxly 6–10-flowered; floral bracts persistent, ovate-lanceolate, 4–7 mm, nearly glabrous. Flowers brownish purple, with white lip; pedicel and ovary 6–13 mm, densely puberulent. Sepals similar, elliptic, slightly oblique, 11–13 × 6–7 mm, abaxially puberulent below middle, 5-veined, apex acute. Petals suboblong or oblanceolate, 11–12 × 3.5–5 mm, glabrous, 3-veined, apex slightly obtuse; lip adnate to entire length of column wings, flabellate in outline, 10–13 × ca. 18 mm, deeply 3-lobed; lateral lobes falcate-obovate or cuneate-obovate, 9–10 × 6–9 mm, larger than mid-lobe, apex truncate-obtuse and incurved toward mid-lobe; mid-lobe obovate-cuneate, 7–8 × ca. 6 mm, apical margin sometimes irregularly dentate, apex emarginate; disk with 3 membranous, triangular lamellae extending to middle of mid-lobe; spur cylindrical, 5–10 mm, outside sparsely puberulent, attenuate toward apex. Column ca. 4 mm, dilated at apex, wings decurrent to base of lip; rostellum 2-lobed; lobes ca. 0.6 mm; pollinia clavate, ca. 1.8 mm. Fl. Apr–May.  $2n = 40$ .

Evergreen broad-leaved forests; 800–1500 m. Anhui, N Fujian, Guangdong, S Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang [Japan, Korea].

**41. *Calanthe alleizettei*** Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 508. 1950.

长柄虾脊兰 chang bing xia ji lan

Plants to 100 cm tall, with many long roots at base; sheaths at base becoming fibrous. Pseudobulbs obscure, conic, ca. 1 × 1 cm. Leaves 2–4, fully developed at anthesis; blade oblanceolate to lanceolate, 15–35 × 4–6.5 cm, apex acute to acuminate; petiole-like base 10–25 cm, 5-veined. Scape arising from within clasping base of leaves, generally longer than leaves; peduncle 20–30 cm; rachis to 11 cm, ca. 10-flowered; floral bracts persistent, narrowly lanceolate, 5–7 × ca. 1.5 mm, apex acuminate. Flowers showy, pale violet to white with a lilac lip, ca. 3 cm wide across lateral sepals when flattened. Dorsal sepal ovate-oblong, ca. 12 × 5 mm, 5-veined, apex ± acute; lateral sepals ovate-oblong, ca. 14 × 6.5 mm, 5-veined, apex ± acuminate. Petals ovate-oblong, ca. 10 × 3.5 mm, 5-veined, apex ± acute; lip adnate to column, 3-lobed; lateral lobes reniform, ca. 3 × 8.5 mm, margin a little uneven, apex rounded; mid-lobe much smaller, ca. 3.5 × 3.5 mm, margin

very uneven, apex apiculate; disk with 3 keels running along lip and terminating on mid-lobe, middle keel longer; spur terete, curved, slightly more than 2 cm, pubescent. Column short and thick, ca. 7 mm.

Terrestrial in montane forests in limestone areas; 1600–1700 m. SE Yunnan (Malipo) [Vietnam].

This species was first recorded from China by X. H. Jin and S. C. Chen (Acta Bot. Yunnan. 29: 169–170. 2007).

**42. *Calanthe plantaginea*** Lindley, Gen. Sp. Orchid. Pl. 252. 1833.

车前虾脊兰 che qian xia ji lan

Plants 40–65 cm tall. Rhizome inconspicuous. Pseudobulbs broadly conic, 1.5–2 cm in diam., with 4 sheaths. Leaves 2–4, basal, not well developed at anthesis, not deciduous; blade elliptic, 25–28 × 8–12 cm, apex acute; petiole-like base ca. 20 cm, usually forming a pseudostem ca. 16 cm. Scape arising from leaf axil, 30–40 cm, puberulent; rachis 13–22 cm, laxly to subdensely 12- to more than 20-flowered; floral bracts persistent, lanceolate, 5–10 mm, glabrous. Flowers scented, pendulous, pinkish, white, or yellow; pedicel and ovary 14–24 cm, puberulent. Sepals similar, ovate-lanceolate, 15–17 × 6–7 mm, abaxially sparsely puberulent, 5-veined, apex acuminate; lateral sepals slightly smaller than dorsal sepal. Petals oblong or elliptic, 14–15 × 4–7 mm, glabrous, 3-veined, apex acute; lip adnate to entire length of column wings, subflabellate, 10–12 × 8–13 mm, 3-lobed; lateral lobes ovate-cuneate, oblique, ca. 4 × 5–7 mm, apex obtuse and incurved; mid-lobe transversely dilated, suboblong to orbicular, ca. 5 × 7 mm, apex apiculate; disk with 3 inconspicuous ridges, central one often lamellate; spur slightly arcuate, cylindrical, 5–20 mm, slender, outside puberulent. Column ca. 7 mm, dilated at apex, nearly glabrous, wings decurrent to lip and connecting to ridges on disk; rostellum 2-lobed; lobes ca. 1 mm; pollinia narrowly ovoid, ca. 1.7 mm. Fl. Mar–Apr.  $2n = 40$ .

Evergreen broad-leaved forests; 1800–2500 m. S and SE Xizang, SW and W Yunnan [Bhutan, India, Kashmir, Nepal].

- 1a. Flowers pinkish or white; petals oblong, narrower than lateral sepals; spur 17–20 mm ..... 42a. var. *plantaginea*
- 1b. Flowers yellow; petals elliptic, broader than lateral sepals; spur ca. 5 mm ..... 42b. var. *lushuiensis*

**42a. *Calanthe plantaginea* var. *plantaginea***

车前虾脊兰(原变种) che qian xia ji lan (yuan bian zhong)

*Alismorkis plantaginea* (Lindley) Kuntze.

Flowers pinkish or white. Petals oblong, 4–5 mm wide, narrower than lateral sepals; spur 17–20 mm.

Evergreen broad-leaved forests; 1800–2200 m. S and SE Xizang, SW Yunnan [Bhutan, India, Kashmir, Nepal].

**42b. *Calanthe plantaginea* var. *lushuiensis*** K. Y. Lang & Z. H. Tsi, Acta Phytotax. Sin. 25: 404. 1987.

泸水车前虾脊兰 lu shui che qian xia ji lan

Flowers yellow. Petals elliptic, 5–7 mm wide, wider than lateral sepals; spur short, ca. 5 mm.

- Evergreen broad-leaved forests; ca. 2500 m. W Yunnan.

**43. *Calanthe graciliflora*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 329. 1911.

钩距虾脊兰 *gou ju xia ji lan*

Plants to 70 cm tall. Rhizome inconspicuous. Pseudobulbs subovoid, short, ca. 2 cm in diam., with 3 or 4 sheaths. Leaves 3 or 4, well developed and spreading completely at anthesis, not deciduous; blade elliptic or elliptic-lanceolate, ca. 33 × 5.5–10 cm, apex acute; petiole-like base ca. 10 cm, usually forming a pseudostem 5–18 cm long and ca. 1.5 cm in diam. Scape arising from leaf axil, to 70 cm, densely puberulent; rachis to 32 cm, laxly many flowered; floral bracts persistent, lanceolate, 7–10 mm, glabrous. Flowers yellowish brown, with white lip; pedicel and ovary 15–20 mm, densely puberulent. Sepals reflexed, similar, subelliptic, 12–13 × 5–6 mm, glabrous, (3 or) 4- or 5-veined, apex acute; lateral sepals slightly narrower than dorsal sepal. Petals obovate-lanceolate, 9–13 × 3–4 mm, glabrous, 3- or 4-veined, base shortly clawed, apex acute; lip adnate to entire length of column wings, ca. 10 × 10 mm, 3-lobed; lateral lobes obovate-cuneate, slightly oblique, ca. 4 mm, apex obtuse-rounded or obliquely truncate; mid-lobe subsquare, obovate, or transversely oblong, ca. 4 × 3 mm, apex dilated, emarginate and mucronate in sinus; disk with 4 brown spots and 3 parallel ridges; ridges fleshy, extending to middle of mid-lobe, triangular, becoming taller toward their apices; spur curved or straight, cylindrical, 10–18 mm, outside sparsely puberulent, inside densely puberulent, apex attenuate. Column ca. 4 mm, glabrous, wings decurrent to lip and connecting to ridges on disk; rostellum 2-lobed, lobes ca. 1 mm; anther cap beaked; pollinia clavate, equal in size, ca. 2 mm, with conspicuous caudicles; viscidium suboblong, ca. 1 mm.  $2n = 40^*$ .

- Shaded and damp places in forests, streamsides, along valleys; 600–2400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, SW Sichuan, Taiwan, SE Yunnan, Zhejiang.

- 1a. Mid-lobe of lip subsquare or obovate;  
spur 10–13 mm, curved ..... 43a. var. *graciliflora*  
1b. Mid-lobe of lip transversely oblong;  
spur ca. 18 mm, straight ..... 43b. var. *xuefengensis*

**43a. *Calanthe graciliflora* var. *graciliflora***

钩距虾脊兰(原变种) *gou ju xia ji lan* (yuan bian zhong)

*Calanthe hamata* Handel-Mazzetti.

Lip with subsquare or obovate mid-lobe; spur curved, 10–13 mm, much shorter than pedicel and ovary. Fl. Mar–May.

- Shaded and damp places in forests, streamsides, along valleys; 600–2400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, SW Sichuan, Taiwan, SE Yunnan, Zhejiang.

**43b. *Calanthe graciliflora* var. *xuefengensis*** Z. H. Tsi, Acta Phytotax. Sin. 19: 510. 1981.

雪峰虾脊兰 *xue feng xia ji lan*

Mid-lobe of lip dilated at apex and transversely oblong;

spur straight, ca. 18 mm, subequal in length to pedicel and ovary.

- W Hunan.

**44. *Calanthe henryi*** Rolfe, Bull. Misc. Inform. Kew 1896: 197. 1896.

疏花虾脊兰 *shu hua xia ji lan*

Plants 35–70 cm tall. Rhizome inconspicuous. Pseudobulbs conic, ca. 1 cm in diam., with 2 or 3 sheaths. Leaves 2 or 3, basal, not well developed at anthesis, not deciduous; blade elliptic or obovate-lanceolate, 18–24 × ca. 8.5 cm, abaxially densely puberulent, 3-veined, apex acute; petiole-like base usually forming a pseudostem ca. 6 cm. Scape arising from leaf axil, erect, to 55 cm, densely puberulent; rachis to 28 cm, laxly 9–18-flowered; floral bracts persistent, lanceolate, 4–7 mm, glabrous, apex acuminate. Flowers yellow or yellowish green; pedicel and ovary ca. 20 mm, densely puberulent. Dorsal sepal oblong, 15–17 × 5–6 mm, abaxially puberulent, 4–6-veined, apex acute; lateral sepals oblong, slightly oblique, 15–17 × 4–5 mm, abaxially puberulent, 4- or 5-veined, apex acute. Petals subelliptic, 13–14 × ca. 4 mm, abaxially often puberulent at base, 3–5-veined, apex acute; lip adnate to entire length of column wings, ca. 10 × 12 mm, 3-lobed; lateral lobes oblong, ca. 6 × 3–6 mm, apex obliquely truncate; mid-lobe ca. 6 × 3 mm, base clawed, apex dilated, emarginate and mucronate in sinus; disk with 2 tall conspicuous ridges, central one thickened, lamellate and usually extending almost to apex of mid-lobe; spur straight or slightly arcuate, cylindrical, 11–15 mm, slender, outside sparsely puberulent. Column wings decurrent to lip and connecting to ridges on disk; rostellum 2-lobed; lobes ca. 1 mm; pollinia nearly ovoid, nearly equal in size, ca. 1 mm. Fl. May.

- Evergreen broad-leaved forests; 1600–2100 m. W Hubei, Sichuan.

**45. *Calanthe aristulifera*** H. G. Reichenbach, Bot. Zeitung (Berlin) 36: 74. 1878.

翘距虾脊兰 *qiao ju xia ji lan*

*Alismorkis aristulifera* (H. G. Reichenbach) Kuntze; *Calanthe amamiana* Fukuyama; *C. aristulifera* var. *amamiana* (Fukuyama) Hatusima; *C. elliptica* Hayata; *C. furcata* Bateman ex Lindley f. *raishaensis* (Hayata) M. Hiroe; *C. kirishimensis* Yatabe; *C. raishaensis* Hayata; *C. tokunoshimensis* Hatusima & Ida.

Plants 28–55 cm tall. Rhizome elongate, thick. Pseudobulbs subglobose, ca. 1 cm in diam., with 3 sheaths. Leaves 2–4, basal, not well developed at anthesis, not deciduous; blade obovate-elliptic or elliptic, 15–30 × 4–8 cm, papery, abaxially densely puberulent, apex acute; petiole-like base (6–)27–30 cm, usually forming a pseudostem 13–20 cm. Scapes 1 or 2, arising from leaf axils, 25–60 cm, densely puberulent; rachis 6–25 cm, laxly to subdensely 8–20-flowered; floral bracts persistent, narrowly lanceolate, ca. 5 mm, glabrous, apex acute. Flowers white or pink, occasionally flushed purple; pedicel and ovary 15–20 mm, puberulent. Dorsal sepal oblong-lanceolate, 12–17

× 5–8 mm, abaxially puberulent, 5-veined, apex acuminate; lateral sepals oblong, oblique, 12–17 × 4–7 mm, abaxially puberulent, 5-veined, apex acute. Petals narrowly obovate or elliptic, 11–15 × 2.5–4.5 mm, glabrous, 3-veined, apex subacute; lip adnate to entire length of column wings, flabellate, 8–16 × 8–12 mm, 3-lobed above middle; lateral lobes subsquare to suborbicular, falcate, 5–6 × 4–6 mm, apex obtuse-rounded; mid-lobe subsquare to oblate, 3–4 × 4–5 mm, margin slightly undulate, apex emarginate and apiculate in sinus; disk with 3–5(–7) ridges; ridges fleshy, extending almost to apex of mid-lobe, apices raised and triangular; spur cylindrical, 20–32 mm, outside puberulent, inside villous. Column ca. 6 mm, dilated at apex, ventrally puberulent, wings decurrent to lip and connecting to ridges on disk; rostellum 2-lobed; anther cap beaked; pollinia clavate, unequal in size, 1.5–2 mm, with short caudicles; viscidium subelliptic, ca. 0.5 mm. Fl. Feb–May.  $2n = 40$ .

Damp places along valleys, dense forests; 1500–2500 m. N Fujian, Guangdong, N Guangxi, E and N Taiwan [Japan].

**46. *Calanthe arisanensis*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 327. 1911.

台湾虾脊兰 tai wan xia ji lan

*Calanthe sasakii* Hayata.

Plants 30–50 cm tall. Rhizome thick. Pseudobulbs subovoid, 1–1.5 cm, with 3 or 4 sheaths. Leaves 2 or 3, well developed and spreading at anthesis, not deciduous; blade elliptic-oblancoate, 30–50 × 4–7 cm, papery, base cuneate, apex acute; petiole-like base 5–10 cm, usually forming a pseudostem more than 10 cm. Scape arising from leaf axil, 40–50 cm, puberulent; rachis 5–10 cm, laxly 5–10-flowered; floral bracts persistent, lanceolate, 10–18 mm, glabrous, apex acuminate. Flowers white, sometimes tinged pinkish purple; pedicel and ovary 20–40 mm, glabrous; ovary with 6 longitudinal winglike ridges. Dorsal sepal ovate-lanceolate, 20–25 × 9–11 mm, base slightly contracted, apex acuminate; lateral sepals ovate-lanceolate, oblique, 25–27 × ca. 10 mm, base contracted, apex acute. Petals narrowly lanceolate, 18–20 × ca. 4 mm, apex acute; lip adnate to entire length of column wings, broadly ovate or orbicular in outline, 13–20 × 18–25 mm, 3-lobed; lateral lobes subfalcate-ovate, 7–11 × 9–12 mm, apex rounded-obtuse; mid-lobe orbicular, ca. 9 × 11 mm, margin erose, apex aristate; disk with 3 shallow and inconspicuous ridges extending midway along mid-lobe; spur curved, cylindrical, 10–15 mm, inside densely puberulent. Column 7–9 mm, ventrally puberulent; rostellum 2-lobed; anther cap beaked; pollinia clavate, with caudicles; viscidium subelliptic. Capsule 30–50 × ca. 15 mm, with 6 winglike ridges. Fl. Dec–Mar.  $2n = 40^*$ .

• Forests; 1000–2000 m. Taiwan.

**47. *Calanthe metoensis*** Z. H. Tsi & K. Y. Lang, Acta Phytotax. Sin. 16(4): 129. 1978.

墨脱虾脊兰 mo tuo xia ji lan

Plants 30–50 cm tall. Rhizome inconspicuous. Pseudobulbs conic, small, ca. 1.5 cm in diam., enclosed in leaf sheaths. Leaves 3, well developed and spreading at anthesis, not deciduous; blade narrowly elliptic, 25–30 × 3.5–9.5 cm, with 5 main

veins, apex acute; petiole-like base sheathing, usually forming a pseudostem to ca. 9 cm long and ca. 1 cm in diam. Scapes 1 or 2, arising from leaf axils, erect, 30–50 cm, densely puberulent; rachis to 12 cm, laxly 2–10-flowered; floral bracts persistent, lanceolate, 7–20 mm, glabrous. Flowers pink; pedicel and ovary 15–30 mm, puberulent. Dorsal sepal elliptic, ca. 15 × 7 mm, sparsely puberulent, 5-veined, apex apiculate; lateral sepals ovate, oblique, ca. 15 × 6–8 mm, sparsely puberulent, 5-veined, apex apiculate. Petals linear, ca. 14 × 2 mm, glabrous, 3-veined, apex acute; lip adnate to entire length of column wings, ca. 12 × 10 mm, 3-lobed; lateral lobes ovate-triangular, ca. 8 mm across their apices, margin sometimes sparsely toothed, apex subacute; mid-lobe obovate-cuneate, ca. 6 × 6 mm, margin fimbriate, apex rounded and apiculate; disk with 3 ridges; spur cylindrical, ca. 15 × 2 mm, outside sparsely puberulent, attenuate toward apex, apex obtuse. Column ca. 5 mm, thick, wings dilated and triangular, embracing stigma; rostellum 2-lobed; lobes falcate-triangular, ca. 1.2 mm; pollinia clavate, unequal in size, larger ones ca. 2 mm, ± arcuate, smaller ones straight. Fl. Apr–Aug.

• Forests; 2200–2300 m. SE Xizang, W Yunnan.

**48. *Calanthe lechangensis*** Z. H. Tsi & Tang, Acta Phytotax. Sin. 19: 506. 1981.

乐昌虾脊兰 le chang xia ji lan

Plants to ca. 40 cm tall. Rhizome inconspicuous. Pseudobulbs conic, small, ca. 1 cm in diam., often with 3 sheaths. Leaf solitary, not well developed at anthesis, not deciduous; blade broadly elliptic, 20–30 × 8–11 cm, glabrous, margin slightly undulate, apex acute; petiole-like base 14–32 cm, slender, usually involute and forming a pseudostem 9–20 cm. Scape arising from leaf axil, erect, to 35 cm, puberulent; rachis 3–4 cm, laxly 4- or 5-flowered; floral bracts persistent, ovate-lanceolate, 4–5 mm, membranous, glabrous, apex aristate. Flowers pale red; pedicel and ovary ca. 12 mm, densely puberulent. Dorsal sepal ovate-lanceolate, 17–18 × 6–7 mm, abaxially densely puberulent, 5-veined, apex acute; lateral sepals oblong, slightly oblique, 17–18 × 5–6 mm, abaxially densely puberulent, 5-veined, apex ± hooked and aristate. Petals oblong-lanceolate, 15–16 × 4.5–5 mm, abaxially puberulent, 3-veined; lip adnate to entire length of column wings, obovate-orbicular, base clawed, 3-lobed; lateral lobes tooth-shaped, very small, 1–3 × 0.8–1.2 mm, apex obtuse; mid-lobe broadly ovate-cuneate, ca. 10 × 10 mm, base clawed, margin slightly erose, apex emarginate and mucronate in sinus; disk with 3 lamellae; spur straight, cylindrical, ca. 9 × 1.5 mm, outside and inside puberulent, apex obtuse. Column ca. 6 mm, dilated toward apex, glabrous, with triangular wings; rostellum 2-lobed; lobes ca. 1 mm; anther cap ca. 4 mm, beaked; pollinia clavate, subequal in size, ca. 2 mm; viscidium suboblong, ca. 0.8 mm. Fl. Mar–Apr.

• N Guangdong.

**49. *Calanthe nankunensis*** Z. H. Tsi, Acta Phytotax. Sin. 19: 507. 1981.

南昆虾脊兰 nan kun xia ji lan

Plants ca. 50 cm tall. Pseudobulbs subglobose, small, ca. 1 cm in diam., with 3 sheaths. Leaves 2, not well developed at

anthesis, not deciduous; blade elliptic, 21–25 × ca. 10 cm, abaxially densely puberulent, apex acuminate or acute; petiole-like base ca. 20 cm, usually forming a pseudostem ca. 10 cm. Scape arising from leaf axil, to 55 cm, densely puberulent; rachis ca. 10 cm, laxly 6- or 7-flowered; floral bracts persistent, narrowly lanceolate, 4–5 mm, sparsely puberulent. Flowers white; pedicel and ovary ca. 16 mm, puberulent. Dorsal sepal oblong, 15–18 × ca. 6 mm, abaxially puberulent, 5-veined, apex aristate; lateral sepals oblong, slightly oblique, 15–18 × ca. 6 mm, abaxially puberulent, 5-veined, apex acuminate and aristate. Petals narrowly oblong, 14–16 × 3.2–4 mm, glabrous, 3-veined, apex acuminate and aristate; lip adnate to entire length of column wings, ca. 11 × 9 mm, 3-lobed; lateral lobes subfalcate-oblong, ca. 3.5 × 2 mm, 6–7 mm across their apices, apex obliquely truncate; mid-lobe obovate, ca. 7 × 8 mm, base clawed, margin slightly erose, apex emarginate and apiculate in sinus; disk with 3 ridges and with a fleshy triangular appendage near mouth of spur; central ridge extending to apex of mid-lobe; spur strongly curved near apex, 8–9 mm, outside sparsely puberulent. Column ca. 5 mm, dilated at apex, puberulent, wings decurrent to lip; rostellum 2-lobed; lobes ca. 1 mm; anther cap beaked; pollinia narrowly ovoid, ca. 1.5 mm; viscidium narrowly oblong, ca. 1 mm. Fl. Apr.

- Shaded places along valleys. S Guangdong.

**50. *Calanthe sieboldii*** Decaisne ex Regel, Index Seminum [St. Petersburg] 1868: 80. 1868.

大黄花虾脊兰 da huang hua xia ji lan

*Calanthe discolor* Lindley f. *sieboldii* (Decaisne ex Regel) Ohwi; *C. discolor* var. *sieboldii* (Decaisne ex Regel) Maximowicz; *C. kawakamii* Hayata; *C. striata* (Swartz) R. Brown f. *sieboldii* (Decaisne ex Regel) Ohwi; *C. striata* var. *sieboldii* (Decaisne ex Regel) Maximowicz; *C. takeoi* Hayata.

Plants 30–55 cm tall. Rhizome elongate, thick. Pseudobulbs small, with 5–7 sheaths. Leaves 2 or 3, well developed at anthesis, not deciduous; blade broadly elliptic, 20–60 × 7.5–15 cm, apex acute or mucronate; petiole-like base 6–18 cm, usually forming a pseudostem 4–14 cm long and ca. 1.5 cm in diam. Scape 40–50 cm, sparsely puberulent; rachis 6–15 cm, laxly to subdensely 6–13-flowered; floral bracts persistent, lanceolate, ca. 10 mm, glabrous, apex acuminate. Flowers bright yellow, large, slightly fleshy; pedicel and ovary 10–15 mm, sparsely puberulent. Dorsal sepal elliptic, 22–30 × 10–15 mm, apex acute; lateral sepals ovate-oblong, oblique, 18–28 × 8–14 mm, apex acute. Petals narrowly elliptic, 19–24 × 7–9.5 mm, base narrowed, apex acute; lip adnate to entire length of column

wings, spreading horizontally, yellow, mottled red at base, deeply 3-lobed; lateral lobes ovate or falcate-obovate, oblique, 10–15 × 5–8 mm, apex obtuse-rounded; mid-lobe nearly elliptic, 9–13 × 5–9 mm, apex mucronate; disk with 5 ridges and 2 rows of white short hairs at base; lateral 2 ridges fleshy, central 3 extending almost to apex of mid-lobe; spur ca. 8 mm, inside puberulent. Column ca. 5 mm, thick; rostellum 2-lobed; pollinia with short caudicles, attached to an elliptic viscidium. Fl. Feb–Mar.  $2n = 40$ .

Forests; 1200–1500 m. Hunan, SW Taiwan [Japan (Ryukyu Islands), Korea].

**51. *Calanthe labrosa*** (H. G. Reichenbach) H. G. Reichenbach, Gard. Chron., n.s., 19: 44. 1883.

葫芦茎虾脊兰 hu lu jing xia ji lan

*Limatodis labrosa* H. G. Reichenbach, Gard. Chron., n.s., 11: 202. 1879; *Alismorkis labrosa* (H. G. Reichenbach) Kuntze; *Calantheidium labrosum* (H. G. Reichenbach) Pfitzer.

Plants ca. 30 cm tall, without a distinct rhizome. Pseudobulbs ± clustered, stemlike, ovoid or ovoid-conic, often contracted at middle, 3–8 × ca. 4 cm, with 2 or 3 sheaths. Leaves 2 or 3, fully spreading at anthesis, deciduous in dry season; blade elliptic, ca. 30 × 9 cm, base contracted and articulate, apex acuminate. Scape arising from base of pseudobulb, erect, to 28 cm, densely villous, with 2 brownish tubular sheaths below middle; rachis 8–10 cm, laxly 3–10-flowered; floral bracts persistent, ovate, ca. 20 mm, abaxially villous, apex acuminate. Flowers white, flushed pink, opening fully; pedicel and ovary ca. 35 mm, densely villous. Dorsal sepal ± reflexed, ovate, ca. 12 × 5 mm, abaxially densely villous, 3-veined, apex acute; lateral sepals ± reflexed, ovate, oblique, ca. 14 × 14 mm, abaxially densely villous, apex acute. Petals ± reflexed, ovate-oblong, ca. 15 × 5.5 mm, apex acute; lip adnate to column foot, broadly ovate, ca. 14 × 20 mm, ± 3-lobed; lateral lobes embracing column, white, with many purplish red spots and pale pink stripes, margin ± crisped; mid-lobe suborbicular, margin crisped; disk white, with 3 ridges at base; central ridge extending to apex of mid-lobe; spur yellowish, slender, ca. 25 × 1.5 mm, outside densely villous. Column purplish red, ca. 5 mm, thick, with a whitish column foot ca. 3 mm; rostellum 2-lobed; pollinia obovoid, equal in size, ca. 1 mm, with short caudicles; viscidium narrowly triangular. Fl. Nov–Dec.

Evergreen broad-leaved forests; 800–1200 m. S Yunnan [Myanmar, Thailand].

## 102. ACANTHEPHIPIUM Blume, Bijdr. 353. 1825 [*“Acanthophippium”*].

坛花兰属 tan hua lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale, Phillip J. Cribb

Herbs, terrestrial. Rhizome short, inconspicuous. Pseudobulbs ovoid, ovoid-cylindric, or clavate, fleshy, with a few internodes, usually covered with several membranous scalelike sheaths, with several stout, fleshy roots at base and 1–4 leaves at apex. Leaves ovate, elliptic, or obovate, large, convolute, plicate, base contracted and sheathing, articulate. New shoot arising from base of pseudobulb. Inflorescence borne laterally from a new shoot or from a lower node on pseudobulb, erect, short, unbranched, fleshy; peduncle usually enclosed by several large imbricate sheaths; rachis few flowered; floral bracts large, foliaceous. Flowers resupinate, large, fleshy; pedicel and ovary ellipsoid, sometimes sparsely pubescent, thickening after anthesis. Sepals connate at base and forming gib-

bous, urceolate tube, free at apex; dorsal sepal oblong to obovate, concave; lateral sepals oblong, oblique and broad at base, adnate to column foot at base and forming an urceolate mentum. Petals enclosed within sepaline tube, elliptic to spatulate, base shortly decurrent along column foot; lip small, articulate at apex of column foot, 3-lobed; lateral lobes erect; mid-lobe reflexed, triangular or oblong, short; disk with a series of lamellae or keels that run longitudinally between lateral lobes. Column elongate, dilated toward apex, sometimes winged, with a column foot at base; column foot very long, inflexed at middle, recurved toward apex; anther subglobose to ovoid, 2-locular; pollinia 8, in 2 groups of 4, subobovoid, unequal in size, waxy, each group attached to a sticky viscidium by a broad caudicle; rostellum broadly ovate; stigma broadly obovoid, entire. Capsule erect, ellipsoid, ridged.

Eleven species: from S and NE India and Bangladesh, throughout SE Asia, to S Japan, New Guinea, and the SW Pacific islands; three species in China.

Sprague (Bull. Misc. Inform. Kew 1928: 341. 1928) explained that the spelling in the protologue, "*Acanthophippium*," was an orthographical error and that *Acanthephippium* was the correct spelling. Garay and Sweet (Orchids S. Ryukyu Islands, 129. 1974) endorsed Sprague's view.

- 1a. Leaf usually solitary, rarely 2; lip membranous; disk with a solitary ridge; mentum conic and spurlike, tapering toward apex ..... 1. *A. striatum*  
 1b. Leaves 2–4; lip fleshy; disk with 3–5 lamellae or ridges; mentum saccate, with an obtuse-rounded apex.  
 2a. Disk with 3–5 toothed lamellae; column foot ca. 40 mm ..... 2. *A. sylhetense*  
 2b. Disk with 3 low ridges; column foot 18–20 mm ..... 3. *A. gougahense*

**1. *Acanthephippium striatum*** Lindley, Edwards's Bot. Reg. 24(Misc.): 41. 1838.

锥囊坛花兰 *zhui nang tan hua lan*

*Acanthephippium simplex* Averyanov; *A. sinense* Rolfe; *A. unguiculatum* (Hayata) Fukuyama; *Tainia unguiculata* Hayata.

Plants to 50 cm tall. Roots densely pubescent. Pseudobulb narrowly ovoid, 6–10 × 1–3 cm, 3- or 4-noded, with several membranous sheaths, 1- or rarely 2-leaved. Leaf elliptic to oblong, 20–30 × 7–14.5 cm, usually 5-veined, apex acute; petiole-like base ca. 3 cm and sheathing. Inflorescence 10–13 cm, with several scalelike membranous sheaths; rachis densely 4–6-flowered; floral bracts ovate-oblong, cymbiform, 3–3.5 cm, apex acute. Flowers creamy white with parallel red venation, tubular, 35–45 mm; pedicel and ovary 30–35 mm, sparsely pubescent or glabrate. Dorsal sepal elliptic, 20–25 × 10–13 mm, 7-veined, apex obtuse; lateral sepals oblong-triangular, slightly oblique, 26–35 × 15–20 mm, 5–7-veined, base adnate to column foot, apex subacute and recurved. Petals oblong-obovate, 20–25 × 10–12 mm, fleshy, 7-veined, apex obtuse or acute; lip adnate to apex of column foot, 20–25 mm, membranous, 3-lobed; lateral lobes erect, falcate-triangular, 10–12 mm; mid-lobe with red spots or blotches, ovate-triangular, small, ca. 8 mm, margin slightly undulate, apex acute, recurved; disk with a solitary broad yellow ridge; mentum formed by bases of lateral sepals and column foot, conic and spurlike, tapering toward apex, longer than column. Column 10–15 mm; column foot 30–40 mm, inflexed at its mid-point through an angle of 30–40°, adnate to base of lateral sepals for ca. 1/2 of its length, slightly recurved toward apex; anther ca. 3 mm; larger pollinia to ca. 2.2 mm, smaller pollinia ca. 1.5 mm; rostellum flaplike, triangular, entire; stigma broadly obovoid. Capsule 40–60 mm. Fl. Apr–Jun.

Shaded and humid places in dense forests, banks of streams, along valleys; 400–1500 m. S Fujian, SW Guangxi, Taiwan, S and SE Yunnan [NE India, Indonesia, Malaysia, Nepal, Thailand, Vietnam].

**2. *Acanthephippium sylhetense*** Lindley, Gen. Sp. Orchid. Pl. 177. 1833.

坛花兰 *tan hua lan*

*Acanthephippium curtisii* H. G. Reichenbach var. *albidum* Linden; *A. pictum* Fukuyama; *A. ringiflorum* Griffith; *A. sylhetense* var. *pictum* (Fukuyama) Hashimoto; *A. yamamotoi* Hayata.

Plants to 50 cm tall. Roots elongate. Pseudobulb ovoid-cylindric, 7–15 × 1.5–4 cm, 2–4-noded, with several large scalelike sheaths, 2–4-leaved. Leaves elliptic to oblong-elliptic, 30–40 × 8–11 cm, 5-veined, apex acuminate; petiole-like base ca. 2 cm, sheathing. Inflorescence 15–20 cm, fleshy, with several broadly ovate-lanceolate sheaths at base; rachis densely 3–5-flowered; floral bracts deep purple, ovate to oblong, concave, 2–2.5 cm, apex acute. Flowers white or yellow with purplish brown spots, campanulate-tubular, 40–45 mm; pedicel and ovary pale purple, 30–40 mm, sparsely pubescent. Sepals connate at base and connivent above, forming an urceolate tube with apices free; dorsal sepal subelliptic, 20–30 × 10–15 mm, 7-veined, apex obtuse; lateral sepals triangular to oblong, oblique, ca. 40 × 17–20 mm, 7-veined, base adnate to column foot, apex obtuse. Petals elliptic-obovate, 20–25 × 10–14 mm, fleshy, 5-veined, apex obtuse; lip adnate to apex of column foot, ca. 15 mm, fleshy, 3-lobed; lateral lobes erect, white, falcate, embracing column, ca. 8 mm; mid-lobe lemon-yellow, ligulate, 6–8 mm, apex obtuse, strongly recurved; disk white with purplish brown spots, fleshy, with 3–5 toothed lamellae; mentum formed by bases of lateral sepals and column foot, yellow with yellowish brown stripes, saccate, short, apex obtuse-rounded. Column white, ca. 15 mm; column foot white, tinged with purple, ca. 40 mm, inflexed at its mid-point through an angle of 30–40°, adnate to base of lateral sepals for ca. 1/2 of its length, slightly recurved toward apex; anther ca. 3 mm; larger pollinia ca. 2 mm, smaller pollinia ca. 1 mm; rostellum truncate; stigma broadly obovoid. Capsule to 60 mm. Fl. Apr–Jul.

Damp places in dense forests, along valleys; 500–800 m. Taiwan, S Yunnan [Bangladesh, NE India, Japan, Laos, Malaysia, Myanmar, Thailand].

**3. *Acanthephippium gougahense*** (Guillaumin) Seidenfaden, Contr. Revis. Orchid Fl. Cambodia, Laos & Vietnam, 4. 1975.

中华坛花兰 *zhong hua tan hua lan*

*Calanthe gougahensis* Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 26: 537. 1954; *Acanthephippium odoratum* Averyanov; *A. thailandicum* Seidenfaden.

Plants to 50 cm tall. Roots short. Pseudobulb ovoid-cylindrical, 5–7 × ca. 1 cm, 4-noded, with several large membranous sheaths, 2–4-leaved. Leaves broadly obovate-elliptic, 22–24 × ca. 7 cm, 3-veined, apex acuminate or acute; petiole-like base 2–10 cm, sheathing. Inflorescence 10–15 cm, fleshy, with several scalelike sheaths at base; rachis densely 2–5-flowered; floral bracts oblong-lanceolate, 2.5–3 cm, apex acuminate. Flowers creamy white with faint red striations on outer surface, campanulate-tubular, ca. 30 mm; pedicel and ovary 13–15 mm. Sepals connate at base and connivent above, forming an urceolate tube with apices free; dorsal sepal broadly elliptic-oblong, 18–20 × 8–9 mm, 3–5-veined, apex obtuse; lateral sepals ovate, oblique, 18–20 × 12–13 mm, 5-veined, base adnate to column foot, apex subobtuse. Petals narrowly ovate-oblong, ca. 20 × 7

mm, fleshy, 5-veined, apex subacuminate; lip adnate to apex of column foot, creamy white, ca. 10 mm, fleshy, 3-lobed; lateral lobes erect, creamy white with brownish purple markings, hatchet-shaped, 5–8 mm, margins slightly incurved; mid-lobe yellow, rhombic-triangular, 5–8 × 4–7 mm, apex acute, recurved; disk papillose, fleshy between 2 lateral lobes, with 3 low, rounded ridges; mentum formed by bases of lateral sepals and column foot, saccate, apex obtuse-rounded. Column white, ca. 13 mm; column foot 18–20 mm, inflexed at its mid-point through an angle of 60°, adnate to base of lateral sepals for ca. 1/2 of its length, slightly recurved toward apex; anther ca. 4 mm; larger pollinia ca. 1.5 mm, smaller pollinia ca. 0.8 mm; rostellum truncate with an apiculate tip; stigma broadly obovoid. Fl. Apr–May.

Forests; ca. 300 m. Guangdong [Thailand, S Vietnam].

The name *Acanthephippium sinense* (a synonym of *A. striatum*) has been misapplied to material of this species by some authors.

### 103. ANTHOGONIUM Wallich ex Lindley, Gen. Sp. Orchid. Pl. 425. 1840.

筒瓣兰属 tong ban lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, terrestrial or occasionally lithophytic. Stems mostly buried in soil, globose corms or elongate, small canes, of many nodes, decaying within several months after new corms produced. Leaves 2 or 3, rarely to 5, deciduous, linear-lanceolate, plicate, sheathing. Inflorescences several, emerging above leaves; rachis whitish or tan to pale green, branched or unbranched, with several tightly appressed brownish bracts; floral bracts loosely appressed, pinkish fading to brown. Flowers numerous, not resupinate, basally gibbous, perianth reflexed downward, pink to nearly white; ovary suberect. Sepals spreading, oblanceolate, basally connate forming a tube, apically free. Petals spreading or strongly reflexed, elongate, spatulate, obtuse, connate basally, free apically; lip basally adnate to column, apically expanded and 3-lobed, with longitudinal red to purple lines and spots. Column whitish to pink, apex dilated and abruptly incurved, lacking wings and a foot; anther cap pale yellow, 2-locular; pollinia 4, soft, without caudicle and viscidium. Capsule fusiform.

One species: Bangladesh, Bhutan, Cambodia, China, N India, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam.

**1. Anthogonium gracile** Lindley, Gen. Sp. Orchid. Pl. 426. 1840.

筒瓣兰 tong ban lan

*Anthogonium corydaloides* Schlechter; *A. griffithii* H. G. Reichenbach.

Plants to 55 cm tall. Pseudobulbs usually partly buried in soil, 1–2 cm in diam., with 2 or 3 nodes, with 2–5 leaves. Leaf blade narrowly elliptic or narrowly lanceolate, 7–45 × 1–2(–3.5) cm, papery, base petiolate, apex acuminate; petioles and sheaths forming a slender pseudostem 3–22 cm. Inflorescence erect; peduncle slender, glabrous, with several tubular sheaths; rachis 4–10(–25) cm, laxly 4–8-flowered; floral bracts ovate-

lanceolate, small, ca. 4 mm, apex acute. Flowers often slightly nodding, lip rose-pink or white and tinged with red; pedicel and ovary 1.5–2 cm. Sepals connate in basal half forming a tube 7–8 mm, with apical half free; dorsal sepal oblong-lanceolate, ca. 16 × 2 mm, apex obtuse; lateral sepals falcate-spatulate, ca. 16 × 4.5 mm, apex acute. Petals narrowly oblong-spatulate, ca. 16 × 2 mm, apex obtuse; lip ca. 1.6 cm, cuneate-clawed at base, apical part 3-lobed; lateral lobes ovate-triangular, apex obtuse; mid-lobe subovate, nearly as large as lateral lobes, apex obtuse. Column ca. 1.6 cm. Fl. Jul–Nov.  $2n = 38, 40, 42, 54$ .

Grassy slopes or thickets; 1200–2300 m. W Guangxi, SW Guizhou, SE Xizang, W to SE Yunnan [Bangladesh, Bhutan, Cambodia, N India, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

### 104. COLLABIUM Blume, Bijdr. 357. 1825.

吻兰属 wen lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Collabiopsis* S. S. Ying.

Herbs, terrestrial, rarely epiphytic, glabrous except for minute hairs on bracts. Rhizome creeping, scales tubular, soon caducous, rarely persistent; roots filiform, not branching, villous. Pseudobulbs alternating, 1–6 with a leaf and 1 with an inflorescence, articulate at junction with petiole or scape, scales 1 per pseudobulb, tubular, generally soon caducous. Leaf 1 per pseudobulb, convolute,

petiolate. Inflorescence an erect raceme, unbranched, both scape and rachis elongating during anthesis. Flowers resupinate, turned to all sides, opening widely. Lateral sepals inserted on column foot. Lip immovable, narrowly attached to column foot, usually 3-lobed, without spur (but column foot with a spur); hypochile basal portion clawlike with parallel margins, front part usually with lateral lobes, lateral keels 2, from base elevating into an entire lobe or into an oblique structure hollow in front, from there continuing to front, median keel absent or present, simple; epichile recurved. Column suborbicular in section, with a seam in front laterally on either side, foot with a spur; anther 2-locular; pollinia 2, hard, waxy, without appendages, obliquely conic with an obtuse top and a hollow base. Capsule fusiform, column and back wall of column foot persistent when mature, with an irregular row of unicellular hairs inside along margins. Seeds fusiform.

Eleven species: SE Asia, from the Himalayas to SE China, Malaysia, Indonesia, and the Philippines, to New Guinea and the Pacific islands; three species (one endemic) in China.

The genus *Collabium* has been monographed by van der Burgh and de Vogel (Orchid Monogr. 8: 135–174. 1997).

- 1a. Each keel between lateral lobes of lip elevated into an oblique pyramid hollow in front; pseudobulb and petiole together more than 2.5 cm; lip lateral lobes 1.5–3 × 4–5 mm, broadly sessile, broader than long, subovate; column 5–7 mm, together with spur 9–16 mm ..... 3. *C. chinense*
- 1b. Each keel between lateral lobes of lip elevated into a solid, simple lobe; otherwise without above combination of characters.
- 2a. Floral bracts 4–6 × ca. 2.5 mm; flowers with yellowish segments marked or tipped reddish purple, lip whitish, red stippled apically and below; lip epichile cuneate-subquadrate; keels on epichile ± distinct, ca. 0.4 mm high ..... 1. *C. formosanum*
- 2b. Floral bracts 6–11 × 2–5.5 mm, ovate-oblong; flowers with white segments tipped violet or yellowish with red lines, or purple; lip epichile transversely elliptic; keels on epichile prominent, ca. 0.7 mm high ..... 2. *C. delavayi*

**1. *Collabium formosanum*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 319. 1911.

台湾吻兰 tai wan wen lan

*Collabiopsis formosana* (Hayata) S. S. Ying.

Rhizome slender, 2–3 mm in diam., internodes ca. 4 cm. Pseudobulbs widely spaced along rhizome, cylindrical, 1.5–3.5 cm × 2–4 mm, petiole-like, enclosed by sheaths. Leaf blade ovate-lanceolate or oblong-lanceolate, 7–22 × 3–8 cm, papery, base subrounded or sometimes slightly cuneate, margin undulate, apex acuminate; petiole 1–2 cm. Peduncle to 38 cm, with several sheaths below; rachis laxly 4–9-flowered; floral bracts narrowly lanceolate, 4–6 × ca. 2.5 mm, acuminate. Flowers: sepals and petals green, adaxial apex with red spots, lip white with red spots and stripes; pedicel and ovary 1–1.5 cm. Dorsal sepal narrowly oblong-lanceolate, 15–17 × 2.2–2.5 mm, 3-veined, acuminate; lateral sepals falcate-oblong-lanceolate, slightly shorter and wider than dorsal sepal, 3-veined, base adnate to column foot, apex acuminate; mentum spurlike, ca. 4 mm. Petals similar to sepals, ca. 16 × 2 mm, 3-veined, acuminate; lip suborbicular, 10–14 mm, claw ca. 5 mm, 3-lobed at middle; lateral lobes obliquely ovate, ca. 8 mm wide (flattened), acute, apical margin irregularly serrate; mid-lobe obovate, ca. 5 mm wide, rounded and slightly concave, margin irregularly serrate; disk with 2 lamellae from base running to mid-lobe. Column ca. 1 cm, base dilated, foot ca. 4 mm, with wings dilated on upper part and rounded-auriculate. Fl. May–Sep.

Dense forests or on rocks along valleys; 1000–2000 m. E and N Taiwan [Vietnam].

**2. *Collabium delavayi*** (Gagnepain) Seidenfaden, Opera Bot. 72: 26. 1984.

南方吻兰 nan fang wen lan

*Tainia delavayi* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 708. 1932; *Chrysoglossum delavayi* (Gagnepain) Tang & F. T. Wang; *Collabiopsis delavayi* (Gagnepain) S. S. Ying.

Rhizome to 30 cm, 1.5–2 mm in diam., not branching. Pseudobulbs: leaf-bearing ones borne 6.5–8 cm apart, 1.5–2 × ca. 0.2 cm, rather angular in section; inflorescence-bearing ones 1.5–2 cm from leaf-bearing ones, smaller, cylindrical. Leaf blade ovate-oblong, 5.5–12 × 2.5–4.3 cm, acute to acuminate; petiole 0.4–1.1 cm. Peduncle 13–17 cm; rachis to 8 cm, 4–7-flowered; floral bracts ovate-oblong, 0.6–1.1 cm × 2–5.5 mm, acute. Flowers recorded as white, with violet tips to sepals, yellowish with red lines, or purple; pedicel and ovary 12–13 cm. Dorsal sepal obovate to linear-lanceolate, 16–18 × 2–4 mm, 3-veined, acute to acuminate; lateral sepals unequal in size and shape, one more falcate than other, obovate to linear-lanceolate, 13–16.5 × 2–3 mm, 3-veined, acuminate. Petals similar to sepals, slightly falcate, 12–16.5 × 2–2.5 mm, 3-veined, acute to acuminate; lip 13–15.5 mm, 3-lobed; hypochile 7–10 × 9–10 mm; claw 4.5–5.5 mm; lateral lobes erect, subovate, somewhat falcate, 6–7.5 × 2.5–4 mm, distally obtuse to acute and irregularly toothed to lacerate; epichile broadly obovate to transversely elliptic, 5.5–6 × 7–8 mm, margin toothed to lacerate, apex truncate to somewhat emarginate, somewhat recurved; lateral keels 2, between lateral lobes turning into an erect, incurved ligulate lobe with a rounded top, each keel continuing as an entire, thin crest, ending halfway or on top of epichile; median keel commencing from fleshy part between elevation of keels as a low, fleshy, entire ridge ending on basal half or top half of epichile. Column 9–10 mm, top part truncate, acutely tipped; column foot spur saccate, cylindrical, 5–6.5 mm. Fl. Jun, Nov.

• Primary forests, along streams, ravines, on rocks; 400–2400 m. Guangdong, N Guangxi, NE Guizhou, W Hubei, S Hunan, SE Yunnan.

**3. *Collabium chinense*** (Rolfe) Tang & F. T. Wang, Fl. Hainan. 4: 217. 1977.

吻兰 wen lan

*Nephelephyllum chinense* Rolfe, Bull. Misc. Inform. Kew 1896: 194. 1896; *Chrysoglossum robinsonii* Ridley; *Collabiopsis chinensis* (Rolfe) S. S. Ying; *C. uraiensis* (Fukuyama) S. S.

Ying; *Collabium uraiense* Fukuyama; *Tainia chinensis* (Rolfe) Gagnepain.

Rhizome terete, 3–4 mm in diam. Pseudobulbs cylindrical, usually ca. 4 cm × 2–4 mm, petiolate base slightly dilated and ± prostrate to rhizome, ± covered with sheaths. Leaf blade 7–15(–21) × (2–)4–7(–9) cm, papery, base subrounded, acute; petiole 1–2 cm. Peduncle 14–18 cm, glabrous, with 2–4 membranous tubular sheaths; rachis 4–7 cm, laxly 4–7-flowered; floral bracts ovate-lanceolate, 1.1–1.6 cm, acuminate. Flowers medium-sized, sepals and petals green, lip white, column yellow; pedicel and ovary 1–1.4 cm. Dorsal sepal oblong-lanceolate, ca. 10 × 2.5 mm, 5-veined, acuminate; lateral sepals ± falcate-ob-

long, ca. 10 × 3 mm, 5-veined, base adnate to column foot, apex acuminate; mentum spurlike, cylindrical, ca. 6 × 2.5 mm. Petals oblong, ca. 10 × 2 mm, acuminate; lip obovate, ca. 9 mm, clawed at base, 3-lobed; lateral lobes broadly sessile, subovate, 1.5–3 × 4–5 mm, obtuse; mid-lobe nearly oblate to subsquare, ca. 9 mm wide, rounded, apical margin slightly denticulate; disk with 2 lunar lamellae running to basal claw. Column 5–7 mm, together with spur 9–16 mm; wings slightly dilated into triangular teeth on both sides near apex. Fl. Jul–Nov.

Damp rocky places in dense forests or along valleys; 600–1000 m. S Fujian, S Guangdong, S Guangxi, Hainan, N Taiwan, SE Xizang, SE Yunnan [Thailand, Vietnam].

## 105. CHRYSOGLOSSUM Blume, Bijdr. 337. 1825.

金唇兰属 jin chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, terrestrial, rarely epiphytic, glabrous except for minute hairs in lip or bracts or both. Rhizome creeping, not branching, with scales; roots filiform, not branching. Pseudobulb consisting of 1 internode, alternating 1–6 with a leaf and 1 with an inflorescence, ascending, clearly articulate with petiole or scape, scales tubular, membranous, soon disintegrating. Leaf 1 per pseudobulb, not deciduous, convolute, not sheathing at base, plicate; petiole channeled. Inflorescence an erect raceme on a leafless pseudobulb, both scape and rachis elongating during anthesis, scape with few internodes, scales tubular, persistent; floral bracts persistent during anthesis. Flowers resupinate, turned to all sides, widely spaced, most open simultaneously, opening widely, spreading. Sepals free; lateral sepals inserted on column foot. Petals equal in size and shape; lip movable, narrowly attached to column foot, 3-lobed, without a spur (but column foot provided with a spur), fleshy; hypochile with claw on either side strongly pleated, front part on either side with an erect lateral lobe, keels 3, conspicuous, median one shorter; epichile recurved, concave, lateral margins incurved or inrolled, on base with 2 or 3 keels continued from hypochile. Column straight to curved forward, with 2 small, rounded lobes on front of column foot and 2 lateral, fleshy keels that continue upward on column, where they fuse and end below stigma, margins on either side at or below middle with a seam drawn out into a flat, triangular or suborbicular wing that continues upward as a narrow seam, foot with a saccate spur; anther 2-locular; pollinia 2, hard, without caudicles, stipe, or viscidium. Capsule with persistent remnants of perianth.

Four species: tropical Asia to New Guinea and the Pacific islands; two species in China.

The genus *Chrysoglossum* has been monographed by van der Burgh and de Vogel (Orchid Monogr. 8: 135–174. 1997).

- 1a. Leaf blade 4.5–7.5 cm wide; lateral sepals 10–16 mm; margin of claw of lip with 1 pleat, and shallow wave sometimes absent, glabrous; column foot spur short and wide, 0.5–2.5 mm, less than 1.5 × as long as broad; stigma margin entire ..... 1. *C. ornatum*
- 1b. Leaf blade 5–12.5 cm wide; lateral sepals 14–18 mm; margin of claw of lip with 2 shallow pleats and once folded downward, very minutely papillose; column foot spur slender, 2.5–3.3 mm, more than 2 × as long as broad; base of stigma margin laterally on either side with a distinct protruding point ..... 2. *C. assamicum*

### 1. *Chrysoglossum ornatum* Blume, Bijdr. 338. 1825.

金唇兰 jin chun lan

*Ania maculata* Thwaites; *Chrysoglossum erraticum* J. D. Hooker; *C. formosanum* Hayata; *C. maculatum* (Thwaites) J. D. Hooker; *Tainia maculata* (Thwaites) Trimen.

Pseudobulbs borne 1–2 cm apart on rhizome, cylindrical-conic, 5–7 cm × 8–20 mm, 1-leaved. Leaf blade narrowly elliptic, strongly plicate, 20–34 × 4.5–7.5 cm, papery, 5-veined, base cuneate, apex shortly acuminate; petiole ca. 10 cm. Peduncle to 50 cm, glabrous, with 4 or 5 sheaths; rachis laxly ca. 10-flowered; floral bracts lanceolate, 1–1.3 cm, acuminate. Flowers green with reddish brown spots, lip white or yellowish spotted with purple, column white; pedicel and ovary to 2 cm. Dorsal sepal oblong, 12–14 × ca. 3 mm, 5-veined, subobtusely; lateral sepals falcate-oblong, 10–16 × ca. 3.5 mm, 5-veined, apex subobtusely; mentum conic, ca. 2 mm. Petals falcate, 12–14 × 4–5 mm; lip 8–10 mm, base with 2 small auricles, 3-lobed

near middle; lateral lobes erect, ovate-triangular, rounded; mid-lobe broadly elliptic or orbicular, concave; disk with 3 lamellae, lateral 2 incurved at middle, median shorter. Column 6–8 mm, winged, near middle with 2 auricles, base dilated, foot ca. 3 mm; pollinia pyriform. Fl. Apr–Jun.  $2n = 36$ .

Shaded and humid places in forests; 700–1700 m. Guangxi, Hainan, Taiwan, S and SW Yunnan [Bhutan, Cambodia, India, Indonesia, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

### 2. *Chrysoglossum assamicum* J. D. Hooker, Fl. Brit. India 5: 784. 1890.

锚钩金唇兰 mao gou jin chun lan

*Chrysoglossum sinense* Mansfeld; *Collabiopsis assamica* (J. D. Hooker) S. S. Ying; *Collabium assamicum* (J. D. Hooker) Seidenfaden.

Rhizome stout, ca. 5 mm in diam., internodes 5–7 mm. Pseudobulbs borne 1–2 cm apart on rhizome, cylindrical-conic,

4–6 cm × 7–12 mm, base slightly dilated, covered with membranous tubular sheaths. Leaf blade elliptic, 20–36 × 5–12.5 cm, papery, apex shortly acuminate; petiole 9–10 cm. Inflorescence erect; peduncle to more than 1 m, glabrous, covered with 4 or 5 sheaths 3–5 cm; rachis to 21 cm, laxly 8–12-flowered; floral bracts narrowly lanceolate, 1.2–1.5 cm. Flowers white; pedicel and ovary 2–2.5 cm, slender. Dorsal sepal narrowly oblong, 14–18 × ca. 3 mm, with inconspicuous veins, apex slightly obtuse; lateral sepals falcate-oblong, 14–18 × 3–4 mm, with 3 inconspicuous veins, apex obtuse, base adnate to

apex of column foot; mentum spurlike, ca. 4 mm. Petals similar to lateral sepals, 13–17 × ca. 2 mm; lip obovate-cuneate, ca. 1 cm, 3-lobed; lateral lobes subovate, ca. 1 cm wide (flattened), apex obtuse; mid-lobe broadly obovate, 4–6 × 5–7 mm, concave, apex subtruncate; disk with 3 lamellae, median shorter. Column ca. 1 cm, winged, with conspicuous foot; wings with 1 decurved toothlike arm on either side of middle part. Fl. Apr.

Damp rocky places along valleys or in forests; ca. 1600 m. E Guangxi, SE Xizang [NE India, Vietnam].

### 106. DIGLYPHOSA Blume, Bijdr. 336. 1825.

密花兰属 mi hua lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood, Stephan W. Gale

*Diglyphis* Blume.

Herbs, terrestrial. Rhizome creeping, with long, fibrous roots. Pseudobulb persistent, narrowly conic or cylindric, with either a solitary terminal leaf at apex or an inflorescence at base. Leaf solitary, large, plicate, papery, contracted into a long petiole-like stalk at base. Inflorescence arising from base of pseudobulb, erect, terminal, racemose, occasionally branching in larger plants, glabrous, with several scattered tubular sheaths; rachis densely many flowered; floral bracts reflexed, narrow. Flowers medium-sized, resupinate. Sepals usually spreading; dorsal sepal longer than lateral sepals; lateral sepals adnate to column foot and forming a mentum. Petals similar to but slightly wider than lateral sepals; lip slightly fleshy, hinged to apex of column foot, entire to 3-lobed, reflexed above middle, margin suberect below middle, without a spur; disk with 2 fleshy, converging lamellae or keels. Column erect, arcuate, slender, winged, with a simple column foot at base; anther terminal; anther cap cordate, apex conic-convex, 2-locular; rostellum short and broad, not lobed; pollinia 2, waxy, nearly triangular, without caudicles.

Two species: tropical parts of NE India and Vietnam, through SE Asia to New Guinea; one species in China.

#### 1. *Diglyphosa latifolia* Blume, Bijdr. 336. 1825.

密花兰 mi hua lan

*Chrysoglossum latifolium* (Blume) Benth & J. D. Hooker; *C. macrophyllum* King & Pantling; *Diglyphis latifolia* (Blume) Miquel; *Diglyphosa macrophylla* (King & Pantling) King & Pantling.

Plants 25–40 cm tall. Rhizome fleshy. Pseudobulb cylindric, somewhat angular in cross section, 9–14 × 0.8–1 cm, with caducous scales. Leaf blade broadly elliptic, plicate, 25–37 × 11–17 cm, veins prominent abaxially, margin undulate, apex acuminate or acute; petiole-like stalk 10–20 cm. Inflorescence deep purple, 22–40 cm, with 3 or 4 scattered tubular sheaths; rachis 13–20 cm, densely many flowered; floral bracts reflexed, deep purple, narrowly ovate-lanceolate, 6–12 mm, apex acumi-

nate. Flowers fleshy, mostly opening simultaneously, orange-red, spotted with purple, omitting an unpleasant smell; pedicel and ovary 10–14 mm, slender. Dorsal sepal narrowly oblong-ovate, 10–13 × 2.5–3.5 mm, 3-veined, apex acuminate; lateral sepals oblong-ovate, falcate, 7–11 × ca. 3 mm, 3-veined, base adnate to column foot and forming an inconspicuous mentum, apex acuminate. Petals similar to lateral sepals, 9–13 × 3–5 mm, base adnate to column foot; lip mobile, oblong-obovate, ca. 5 × 3 mm, fleshy, slightly constricted near middle, concave below constriction and reflexed above, apex acute; disk with 2 fleshy lamellae extending from base of lip almost to apex, converging into a single ridge toward base and apex. Column ca. 5 mm; column foot ca. 2 mm; rostellum subsquare, thick. Fl. Jun.

Damp places in forests, along valleys; ca. 1200 m. SE Yunnan [NE India, Indonesia, Malaysia, New Guinea, Philippines].

### 107. ARUNDINA Blume, Bijdr. 401. 1825.

竹叶兰属 zhu ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Stephan W. Gale

Herbs, terrestrial. Rhizome ovoid, stout; roots many, filiform, slender, fibrous. Stem erect, tufted at base, reedlike, unbranched or occasionally branched when older, leafy. Leaves ± distichous, linear-lanceolate, conduplicate and sheathing at base, apex acute. Inflorescence terminal, unbranched or occasionally shortly branched, few to many flowered; floral bracts persistent, triangular, small. Flowers resupinate, opening one at a time, large; pedicel and ovary elongate, slender. Sepals similar, elliptic or lanceolate, apex acute; lateral sepals usually connivent below lip. Petals spreading, ovate-elliptic or obovate, apex acute; lip adnate to base of column, obovate, not spurred, 3-lobed; disk with 3 longitudinal pubescent lamellae; lateral lobes erect, embracing column, rounded; mid-lobe spreading, apex divided. Column long, straight, dilated and narrowly winged toward apex; anther terminal, incumbent; pollinia 8, in 2 groups, ± waxy, with short caudicles, attached to sticky viscidia; stigma transversely oblong, broad. Capsule cylindric-fusiform, large, ridged.

One highly variable species: from Nepal, NE and S India, and Bhutan, through S China, to SE Asia and S Japan, introduced and naturalized in the Pacific islands and the Neotropics.

**1. *Arundina graminifolia*** (D. Don) Hochreutiner, Bull. New York Bot. Gard. 6: 270. 1910.

竹叶兰 zhu ye lan

*Bletia graminifolia* D. Don, Prodr. Fl. Nepal. 29. 1825; *Arundina bambusifolia* Lindley; *A. chinensis* Blume; *A. chinensis* var. *major* S. Y. Hu; *A. graminifolia* var. *chinensis* (Blume) S. S. Ying; *A. stenopetala* Gagnepain.

Plants 40–100(–150) cm tall. Stem rigid, enclosed by leaf sheaths. Leaves numerous, 8–20 × 1–2 cm, leathery or papery, apex acuminate; sheaths 2–4 cm. Inflorescence 2–20 cm, racemose or 1- or 2-branched at base and paniculate, 2–10-flowered, flowers opening in succession; floral bracts broadly ovate-triangular, 3–5 mm, sheathing at base. Flowers white or pink, sometimes slightly tinged with purple; pedicel and ovary 1.5–3 cm. Sepals narrowly elliptic to narrowly elliptic-lanceolate, 25–

40 × 7–9 mm. Petals ovate-elliptic, 25–40 × 13–15 mm; lip 25–40 × 12–24 mm, apical margin undulate; lateral lobes incurved, embracing column, rounded; mid-lobe subsquare, 8–16 × 10–16 mm, apex shallowly divided; disk with 3 (rarely 5) lamellae. Column slightly arcuate, 20–25 mm. Capsule 28–35 × 8–15 mm. Fl. and fr. Jun–Nov, sometimes Jan–Apr.  $2n = 32, 38, 40, 42$ .

Grassy slopes, streamsides, thickets, forests; 400–2800 m. N Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Hunan, Jiangxi, S Sichuan, Taiwan, SE Xizang, W to SE Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

Reviewer L. Averyanov notes that *Arundina caespitosa* Averyanov (Taiwania 52: 289. 2007), described from Vietnam, is a distinct species and occurs in S China. However, the present authors prefer to treat all Chinese *Arundina* under a broad delimitation of *A. graminifolia*.

## 108. THUNIA H. G. Reichenbach, Bot. Zeitung (Berlin) 10: 764. 1852.

笋兰属 sun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, terrestrial or epiphytic, usually rather large and tall, lacking pseudobulbs. Rhizome short, thick. Stems fasciculate, erect, biennial, simple, sheathed below and leafy above. Leaves distichous, sessile below, often thinly textured. Inflorescence terminal, borne on young leafy shoots, racemose, arching or pendulous, several flowered; floral bracts persistent, spathe-like, large. Flowers short-lived, large, showy. Sepals and petals subsimilar, free. Petals often slightly narrower and smaller than sepals; lip entire, embracing column, spurred, fringed on front margin; disk with 5–7 lamellae or fringes; spur short, obtuse. Column slender, subterete at apex, 2-winged, footless; rostellum ± 3-lobed; stigma concave; anther cap terminal, incumbent; pollinia 4, 2-lobed, without a conspicuous caudicle, commonly attached to sticky substance.

About six species: SE Asia and Bhutan, China, India, and Nepal; one species in China.

**1. *Thunia alba*** (Lindley) H. G. Reichenbach, Bot. Zeitung (Berlin) 10: 764. 1852.

笋兰 sun lan

*Phaius albus* Lindley in Wallich, Pl. Asiat. Rar. 2: 85. 1831; *P. marshallianus* (H. G. Reichenbach) N. E. Brown; *Thunia marshalliana* H. G. Reichenbach.

Plants, terrestrial or epiphytic. Stem erect, terete, 30–100 cm tall, somewhat stout, usually with ca. 10 leaves, base with several amplexicaul sheaths, completely enclosed in leaf sheaths. Leaf blade narrowly elliptic or narrowly elliptic-lanceolate, 10–20 × 2.5–5 cm, papery or herbaceous, apex acuminate or long acuminate, with amplexicaul sheaths at base, articulate; sheaths persistent, tubular, 2–4 cm, becoming scarious. Rachis 4–10 cm, 2–7-flowered; floral bracts persistent, broadly elliptic to elliptic, cymbiform, large, 3–5 cm, papery.

Flowers large, white, lip yellow [or white] and with orange or chestnut spots and stripes; pedicel and ovary 2.5–3 cm. Sepals narrowly oblong, 4–5 × ca. 1.5 cm, apex acuminate. Petals similar to sepals in size, slightly narrower; lip broadly ovate-oblong or broadly oblong-pandurate, 4–5 × 2.5–3 cm, irregularly fimbriate or erose, simple, apical margin crisped; disk with 5–9 shortly dentate-fimbriate ridges; spur cylindrical, ca. 1 cm × 3–3.5 mm, apex obtuse. Column ca. 2 cm. Capsule ellipsoid, ca. 4 × 2 cm. Fl. Jun.  $2n = 36, 38, 40, 42, 44, 80$ .

Lithophytic on rocks or epiphytic on lower branches of trees in forests or in shaded and rocky places; 1200–2300 m. SW Sichuan, SE Xizang, S, SE, and W Yunnan [Bhutan, NE India, Indonesia, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

The Chinese material belongs to *Thunia alba* var. *alba*; *T. alba* var. *bracteata* (Roxburgh) N. Pearce & P. J. Cribb, from Bhutan, NE India, and Nepal, is distinguished by the lack of a yellow patch on the lip.

## 109. COELOGYNE Lindley, Coll. Bot. ad t. 33. 1821 [“*Caelogyne*”].

贝母兰属 bei mu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Dudley Clayton

Herbs, epiphytic. Rhizome creeping or ± pendulous, usually with rather dense nodes. Pseudobulbs distant or close, ovoid to cylindrical, usually covered with leathery sheaths, usually with 2 leaves at apex but sometimes with only 1 leaf. Leaf blade often ob-

long to elliptic, usually thickly textured, usually petiolate at base. Inflorescence either terminal or lateral to mature pseudobulbs and either heterantherous, proterantherous, or synantherous with partially to entirely developed leaves, or hysterantherous with fully developed pseudobulb and leaves, inflorescence erect or pendulous, with or without distichous-equant, persistent sheaths at base or imbricate, sterile, convolute sheathing bracts at interface between peduncle and rachis, sometimes its apex enclosed in a large bract or several bracts, usually several flowered, rarely more than 20-flowered or reduced to a solitary flower; floral bracts caducous, often large. Flowers opening successively or simultaneously, large or medium-sized, sometimes heterantherous. Sepals similar, often concave. Petals often linear, much narrower than sepals; lip often concave at base, 3-lobed or rarely unlobed; lateral lobes  $\pm$  erect and embracing column; callus with longitudinal lamellae. Column rather long, winged on both sides and around top, without column foot; anther terminal, incumbent; pollinia 4, in 2 pairs, waxy, attached to 1 sticky substance; stigma concave; rostellum rather large. Capsule medium-sized, often ribbed or narrowly winged.

About 200 species: tropical and subtropical Asia to Oceania; 31 species (six endemic) in China.

*Coelogyne venusta* Rolfe (Gard. Chron., ser. 3, 35: 259. 1904) was described based on cultivated material. It is excluded from the present treatment because the cited locality "Yunnan" is incorrect and most probably resulted from the habit of early collectors to record false information; the species is only known from Borneo (Sarawak, Brunei, and Sabah).

1a. Inflorescence with imbricate sterile bracts.

2a. Inflorescence with imbricate sterile bracts mainly at base of peduncle; lip with 3 lamellae, margin of mid-lobe fimbriate.

3a. Petals ovate-lanceolate, nearly as wide as sepals, lip not 3-lobed ..... 1. *C. leungiana*

3b. Petals filiform to linear, much narrower than sepals, lip 3-lobed.

4a. Lip mid-lobe ovate, callus with 3 lamellae, median lamella indistinct, lateral lamellae terminating near tip of mid-lobe, undulate ..... 2. *C. ovalis*

4b. Lip mid-lobe orbicular, fimbriate, callus with 3 lamellae, median lamella virtually a brown vein, lateral lamellae terminating at tip of mid-lobe, initially diverging then converging at tip of mid-lobe ..... 3. *C. fimbriata*

2b. Inflorescence with imbricate sterile bracts at junction of peduncle and rachis.

5a. Rachis extending with new imbricate bracts to produce further annual sets of flowers.

6a. Pseudobulbs cylindric or narrowly ovoid.

7a. Lip mid-lobe oblong-obcordate, 3–4 mm, callus with 3 lamellae, median lamella short, lateral lamellae parallel, extending from base of lip to 2/3 onto mid-lobe, low initially, then rising, abruptly terminating ..... 4. *C. raizadae*

7b. Lip mid-lobe broadly oblong or subelliptic, ca. 6 mm, callus with 2 narrow longitudinal lamellae extending from base of lip to near middle of mid-lobe, prominent on mid-lobe only ..... 5. *C. longipes*

6b. Pseudobulbs ovoid or ellipsoid.

8a. Lip with no callus; flowers red with a partly black apex to mid-lobe ..... 6. *C. tsii*

8b. Lip with a callus with 2 lamellae.

9a. Lip mid-lobe nearly broadly oblong, 2 lamellae faint near base of lip, elevated and prominent on mid-lobe ..... 7. *C. schultesii*

9b. Lip mid-lobe nearly elliptic, 2 lamellae terminating 2/3 onto mid-lobe ..... 8. *C. prolifera*

5b. Rachis producing single set of flowers.

10a. Lip with 5 lamellae.

11a. Lip with prominent lamellae, outer lamellae broader ..... 9. *C. griffithii*

11b. Lip with median keel fleshy on mid-lobe ..... 10. *C. zhenkangensis*

10b. Lip with 2 or 3 lamellae.

12a. Dorsal sepal more than 1.5 cm.

13a. Lip with crenulate lamellae, mid-lobe suborbicular or cordate, margin erose, 2 crenulate lamellae terminating at base of mid-lobe ..... 11. *C. stricta*

13b. Lip with fimbriate lamellae.

14a. Dorsal sepal ca. 4 cm; lip mid-lobe triangular with fimbriate margin and 3 fimbriate lamellae terminating at tip of mid-lobe ..... 12. *C. barbata*

14b. Dorsal sepal nearly 3 cm; lip mid-lobe quadrangular with fimbriate margin and 2 fimbriate lamellae terminating at middle of mid-lobe, lamellae becoming a warty projection toward tip ..... 13. *C. calcicola*

12b. Dorsal sepal less than 1.5 cm.

15a. Pseudobulbs less than 4 cm; lip mid-lobe nearly orbicular, bilobed, with 3 simple, straight lamellae; flowers white with some yellow ..... 14. *C. leucantha*

15b. Pseudobulbs more than 5 cm.

16a. Inflorescence slender and arching; lip mid-lobe suborbicular, 3 crenulate or fimbriate lamellae terminating at base of mid-lobe, median keel shorter ..... 15. *C. rigida*

- 16b. Inflorescence erect; lip with fimbriate or crenulate lamellae.
- 17a. Lip with 3 crenulate and fleshy lamellae terminating at base of mid-lobe, median keel shorter ..... 16. *C. pulchella*
- 17b. Lip with 3 fimbriate lamellae ..... 17. *C. sanderae*
- 1b. Inflorescence bare to first flower, or rarely with 1 or a few sterile bracts; flowers opening simultaneously.
- 18a. Pseudobulb with 1 leaf; flowers fleshy; lip  $\pm$  entire without distinct lateral lobes, and 3 smooth lamellae ..... 18. *C. malipoensis*
- 18b. Pseudobulbs with 2 leaves; flowers membranous; lip with distinct lateral lobes, basal part not embracing column, lip lacking transverse fold at base.
- 19a. Inflorescence heteranthous; lip mid-lobe suborbicular, callus with 4 or 5 fimbriate lamellae ..... 19. *C. cristata*
- 19b. Sepals, petals, and lip margins not undulate; lamellae not fimbriate, deeply serrate, deeply crenulate, or lacinate but entire or erose, papillate or verrucose, dentate or crenulate to irregularly cristate.
- 20a. Dorsal sepal forming a hood over column, larger than lateral sepals and petals; lateral sepals and petals not widespread away from column.
- 21a. Lip with mid-lobe orbicular, callus with 3 lamellae, but median lamella shorter ..... 20. *C. assamica*
- 21b. Lip with lateral lobes rounded in front, mid-lobe broadly ovate to cordate, callus with 3 fleshy, undulate lamellae ..... 21. *C. fuscescens*
- 20b. Dorsal sepal erect, away from column; lateral sepals and petals widespread away from column; sepals and petals of ca. equal length.
- 22a. Dorsal sepal and lateral sepals of ca. equal width, petals narrower.
- 23a. Lip with mid-lobe large in relation to overall size of flower, sometimes clawed; lip with margin tending toward being membranous.
- 24a. Lip mid-lobe ovate, margin membranous, callus with 3 lamellae terminating at tip of mid-lobe, median keel ca. 1/2 as long ..... 22. *C. taronensis*
- 24b. Lip mid-lobe oblong-ovate, callus with 5 lamellae, 3 crenate lamellae terminating at base of mid-lobe, 2 further lamellae continue to tip of mid-lobe ..... 23. *C. suaveolens*
- 23b. Lip with mid-lobe not large relative to overall size of flower; lip without evident claw; lip with margin tending toward being fleshy.
- 25a. Inflorescence heteranthous, with arching peduncle and rachis; lip mid-lobe ovate-lanceolate, crenate at sinuses, callus with 3 undulate lamellae terminating at base of mid-lobe ..... 24. *C. flaccida*
- 25b. Inflorescence proteranthous; lip mid-lobe initially with parallel sides then expanding, callus with 3 crenate lamellae terminating at ca. 1/3 way on mid-lobe ..... 25. *C. viscosa*
- 22b. Dorsal sepal, lateral sepals, and petals of ca. equal width; sepals, petals, and lip tending toward being fleshy.
- 26a. Inflorescence hysteroanthous.
- 27a. Inflorescence peduncle enclosed with bracts to rachis, lower flowers concealed by bracts; lip with 3 lamellae, median keel short, lateral lamellae terminating on mid-lobe, crenate, thickened ..... 26. *C. occultata*
- 27b. Inflorescence bare; lip with 3 dentate lamellae converging toward base of mid-lobe then diverging and disappearing on mid-lobe, further dentate, curled lamellae appearing on outside of existing lamellae ..... 27. *C. punctulata*
- 26b. Inflorescence proteranthous or synanthous.
- 28a. Inflorescence proteranthous.
- 29a. Inflorescence 3–8-flowered; flowers white; lip with continuous golden yellow eyes on lateral lobes, 2 yellow patches bordered with red on mid-lobe, 3 lamellae terminating at base of mid-lobe ..... 28. *C. nitida*
- 29b. Inflorescence 2- or 3-flowered; flowers creamy yellow; lip with 3 white, crested lamellae terminating at middle of mid-lobe ..... 29. *C. weixiensis*
- 28b. Inflorescence synanthous.
- 30a. Sepals lanceolate; petals narrowly lanceolate; flowers white, 4 large yellow eyes bordered with orange-red on lip; lip with 3 low lamellae terminating at base of mid-lobe, crenulate ..... 30. *C. corymbosa*
- 30b. Sepals subelliptic; petals subrhombic-elliptic; flowers cream-colored with brown veins on lateral lobes and deep yellow lamellae ..... 31. *C. gongshanensis*

**1. *Coelogyne leungiana*** S. Y. Hu, Quart. J. Taiwan Mus. 25: 223. 1972.

单唇贝母兰 dan chun bei mu lan

Rhizome creeping, 2–3 mm in diam., densely covered with scales. Pseudobulbs oblong-ellipsoid, slightly compressed trigonous, 2–4 × 0.8–1.5 cm, with 2 leaves at apex and several sheaths at base; sheaths nearly ovate, 1–2 cm. Leaf blade oblong-elliptic, 5–8 × 1.3–2.3 cm, leathery, apex acute; petiole 6–8 cm. Inflorescence heteranthous, with several equitant cylindrical sheaths at base; sheaths tightly embracing lower half of inflorescence; rachis with 1 or 2 flowers opening successively, apex of rachis enclosed in several white bracts; floral bracts caducous, to 2 cm, papery; pedicel and ovary 6–8 mm. Flowers creamy yellow. Sepals and petals similar, ovate-lanceolate, ca. 20 × 6 mm; lip entire, ovate-lanceolate, ca. 20 × 7 mm, slightly fleshy; callus with 3 longitudinal lamellae extending from base to above middle, median lamella inconspicuous; lamellae purplish red, irregularly dentate. Column slightly arcuate, ca. 14 mm, both sides with narrow wings, ca. 4 mm wide; anther ovoid, ca. 3 mm wide. Fl. Dec.

• Dry and sunny rocks in mountainous areas. Hong Kong.

**2. *Coelogyne ovalis*** Lindley, Edwards's Bot. Reg. 24(Misc.): 91. 1838.

长鳞贝母兰 chang lin bei mu lan

*Coelogyne decora* Wallich ex Voigt; *C. pilosissima* Planchon.

Rhizome creeping, relatively long, ca. 3 mm in diam., internodes 1–2.4 cm. Pseudobulbs 8–13 cm apart on rhizome, not lucid when dried, nearly cylindrical, 3–6 cm × 6–8 mm, with 2 leaves at apex and 2 sheaths at base; sheaths ca. 3 cm, membranous, deciduous when old. Leaf blade lanceolate, oblong-lanceolate, or ovate-lanceolate, 6–12 × 2–3.7 cm, papery, apex acuminate or obtuse; petiole 5–10 cm. Inflorescence heteranthous; peduncle 5–8 cm, base covered with several equitant tubular sheaths; rachis often with 1 or 2 or rarely to 3 or 4 flowers opening successively, apex of rachis enclosed in several white bracts; floral bracts caducous; pedicel and ovary 6–10 mm. Flowers greenish yellow, with purplish red stripes on lip. Sepals oblong-lanceolate, ca. 20 × 5–6 mm. Petals filiform or narrowly linear, nearly as long as sepals, ca. 1 mm wide; lip suboblong-ovate, ca. 20 × 15 mm, 3-lobed; lateral lobes erect, subovate; mid-lobe elliptic, ca. 10 × 9 mm, fimbriate at margin; callus with 3 longitudinal lamellae, of which purple inner 2 extending from its middle or near apex to base of disk, median lamella indistinct, sometimes a further 2 much shorter lamellae outside others on mid-lobe. Column slightly arching, ca. 13 mm, both sides with wings; wings widened toward column apex, apex obtuse; anther ca. 2.5 mm; rostellum ca. 2 mm. Capsule subobovoid, ca. 2.5 × 1.2 cm; fruiting pedicel ca. 5 mm. Fl. Aug–Nov, fr. next Sep.  $2n = 40, 80$ .

On trees or rocks along rivers or valleys; 1200–3200 m. SE Xizang, W Yunnan [Bhutan, NE India, Myanmar, Nepal, Vietnam].

**3. *Coelogyne fimbriata*** Lindley, Bot. Reg. 11: ad t. 868. 1825.

流苏贝母兰 liu su bei mu lan

*Broughtonia linearis* Wallich ex Lindley; *Coelogyne arunachalensis* H. J. Chowdhery & G. D. Pal; *C. chrysotropis* Schlechter; *C. fimbriata* var. *annamica* Finet ex Gagnepain; *C. fuliginosa* Loddiges ex Hooker; *C. laotica* Gagnepain; *C. longiciliata* Teijsmann & Binnendijk; *C. padangensis* J. J. Smith & Schlechter; *C. pallens* Ridley; *C. primulina* Barretto; *C. xerophyta* Handel-Mazzetti; *Pleione chinensis* Kuntze; *P. fimbriata* (Lindley) Kuntze; *P. fuliginosa* (Loddiges ex Hooker) Kuntze.

Rhizome creeping, slender, 1.5–2.5 mm in diam., internodes 3–7 mm. Pseudobulbs 2–4.5(–8) cm apart on rhizome, not lucid when dried, narrowly ovoid to nearly cylindrical, 2–3(–4.5) cm × 5–15 mm, with 2 leaves at apex and 2 or 3 sheaths at base; sheaths ovate, 1–2 cm, deciduous when old. Leaf blade oblong or oblong-lanceolate, 4–10 × 1–2 cm, papery, apex acute; petiole 1–1.5(–2) cm. Inflorescence heteranthous; peduncle 5–10 cm, base covered with several tubular sheaths; sheaths equitant, closely embracing inflorescence; rachis often with 1 or 2 flowers opening successively, apex of rachis enclosed in several white bracts; floral bracts caducous; pedicel and ovary 1–1.2 cm. Flowers pale yellow or nearly white, only with red stripes on lip. Sepals oblong-lanceolate, 16–20 × 4–7 mm. Petals filiform or narrowly linear, 16–20 × 0.7–1 mm; lip ovate, 13–18 mm, 3-lobed; lateral lobes erect, subovate; mid-lobe nearly elliptic, 5–7 × 5–6 mm, margin fimbriate, apex obtuse; callus with 2 irregularly undulate lamellae extending from base to near apex of mid-lobe and between them at base of callus with 1 short lamella, sometimes a further 2 much shorter lamellae outside others on mid-lobe. Column slightly arcuate, 10–13 mm, both sides with wings; wings widened toward column apex, one side 1–1.3 mm wide, apex irregularly incised or dentate. Capsule obovoid, 1.8–2 × ca. 1 cm; fruiting pedicel 6–7 mm. Fl. Aug–Oct, fr. next Apr–Aug.  $2n = 40, 40 + 2f$ .

On tree trunks or rocks along streamsides, in forests, or at forest margins; 500–2300 m. N Fujian, Guangdong, Guangxi, Hainan, S Jiangxi, SE Xizang, Yunnan [Bhutan, Cambodia, NE India, Indonesia, Laos, NE Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**4. *Coelogyne raizadae*** S. K. Jain & S. Das, Proc. Indian Acad. Sci., B, 87(5): 119. 1978.

三褶贝母兰 san zhe bei mu lan

Pseudobulbs 2–8 cm apart on ascending, stout rhizome, cylindrical or narrowly oblong, tapering above to narrowly ovoid, 3–9.5 × 0.6–1.2 cm, slightly ridged when old, with 2 leaves at apex, sheathed with large bracts at base. Leaf blade narrowly elliptic-oblong, 6–11 × 1.6–2.5 cm, with 5–7 veins, midvein prominent, base narrowing gradually into grooved petiole 1.3–5 cm, margin entire, apex acute-acuminate. Inflorescence heteranthous; peduncle erect, greenish, 3–15 cm, slender, smooth, with imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis; rachis slightly zigzag, 2–6-flowered, continuing to develop and producing a further set of sterile bracts at interface between peduncle and rachis and flowers annually. Flowers small, 1–1.2 cm in diam., sepals and petals white or cream-colored, lip white or cream-colored, sometimes tinged with light yellow or light brown at front of lateral lobes, lamellae yellow. Dorsal sepal oblong-lanceolate, 12–15 × 3–5 mm, with 3–5 veins, midvein prominent, apex acute; lateral

sepals oblong-lanceolate, 12–15 × 3–4 mm, with 3–5 veins, midvein prominent, somewhat acute. Petals reflexed, filiform, 1-veined, entire, acute; lip 11–15 × 6–7 mm, smooth, grooved at base, 3-lobed; lateral lobes clasping column, narrowly oblong, 8–11 × 2–3 mm, straight on sides, entire, obtuse or somewhat acute; mid-lobe oblong-obcordate, 3–4 mm, margin undulate, crenulate, apex retuse; callus with 3 lamellae, median lamella short, lateral lamellae parallel, extending from base of lip to 2/3 onto mid-lobe, low initially, then rising, abruptly terminating. Column slightly arcuate, 9–13 mm, narrowly winged at tip, entire. Fl. Mar–Jun.

On trees and rocks in lower montane forests; 1800–2200 m. SE Xizang, SW Yunnan [Bhutan, NE India, Laos, Nepal].

**5. *Coelogyne longipes*** Lindley, *Fol. Orchid.* 5(Coelogyne): 10. 1854.

长柄贝母兰 *chang bing bei mu lan*

*Pleione longipes* (Lindley) Kuntze.

Rhizome stout, 5–7 mm in diam., with dense, nearly leathery scaly sheaths, with rather short internodes. Pseudobulbs 3–4 cm apart on rhizome, lucid when dried, nearly cylindrical, slightly narrowed toward both ends, 3–7.5 cm × 8–12(–15) mm, with 2 leaves at apex and with several sheaths at base; sheaths bright yellow, lucid. Leaf blade oblong-ob lanceolate or suboblong-lanceolate, (10–)15–23 × (1–)1.8–3 cm, base cuneate, apex acuminate; petiole 2.5–6 cm. Inflorescence hysteroanthous; peduncle bare, 7–15 cm, slender, with imbricate, convolute, sheathing, sterile bracts at interface between peduncle and rachis, 5–7-flowered; rachis thickened in lower part; floral bracts almost deciduous at anthesis, ca. 1.8 cm; pedicel and ovary 7–10 mm; rachis continuing to develop and producing a further set of imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis and flowers annually. Flowers white or pale yellow. Sepals ovate-oblong, ca. 10 × 5–6 mm, 5-veined, apex shortly acuminate. Petals narrowly linear or filiform, ca. 10 × 0.3 mm, attenuate toward apex; lip nearly broadly ovate, ca. 10 × 8–9 mm, 3-lobed; lateral lobes subovate, margins entire; mid-lobe broadly oblong or subelliptic, ca. 6 × 5 mm, margin ± crisped, apex truncate and emarginate; callus with 2 narrow longitudinal lamellae extending from base of lip to near middle of mid-lobe, prominent on mid-lobe only. Column slightly arcuate, 5–6 mm, both sides with broad wings surrounding its apex, to 4 mm wide. Capsule narrowly obovoid-oblong, ca. 2 × 0.6 cm. Fl. Jun, fr. next Mar.  $2n = 40$ .

On trees in forests; 1000–2600 m. SE Xizang, W to SE Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand].

**6. *Coelogyne tsii*** X. H. Jin & H. Li, *Ann. Bot. Fenn.* 43: 295. 2006.

吉氏贝母兰 *ji shi bei mu lan*

Rhizome creeping, ca. 3 mm in diam. Pseudobulbs 2–3 cm apart along rhizomes, conic to ovoid, 3–5 × 2–3 cm, when young covered with sheaths. Leaves 2 per pseudobulb, terminal, convolute, oblong, 14–16 × 4–5 cm, leathery, with 5–7 main veins. Inflorescence hysteroanthous, to 50 cm, with imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis; rachis 7–10-flowered; flowers open simul-

taneously; floral bracts caducous, lanceolate, ca. 2 cm; pedicel and ovary ca. 15 mm; rachis continuing to develop and producing a further set of sterile bracts at interface between peduncle and rachis and flowers annually. Flowers fully open, red with partly black tip on mid-lobe. Dorsal sepal narrowly ovate, ca. 14 × 7 mm, 9-veined, apex acuminate; lateral sepals elliptic, ca. 14 × 6 mm, 5-veined, acuminate. Petals linear, ca. 14 × 3 mm, 3-veined, acuminate; lip attached to column, white, ca. 15 × 9 mm, 3-lobed, without lamellae; lateral lobes erect, suborbicular, entire, edges slightly reflexed outward; claw to mid-lobe ca. 2 × 2 mm; mid-lobe black, rotund, ca. 3 × 6 mm, entire. Column red, ca. 8 mm, winged; pollinia 4, suborbicular. Capsule ca. 2 × 0.8 cm. Fl. Mar.

• On tree trunks in subtropical evergreen forests; ca. 2600 m. W Yunnan.

**7. *Coelogyne schultesii*** S. K. Jain & S. Das, *Proc. Indian Acad. Sci., B*, 87(5): 121. 1978.

疣鞘贝母兰 *you qiao bei mu lan*

*Coelogyne longipes* Lindley var. *verruculata* S. C. Chen.

Rhizome 5–7 mm in diam., with dense leathery scaly sheaths; sheaths surrounding young pseudobulb usually with small warts on abaxial surface. Pseudobulbs ovoid to narrowly ovoid, 2.5–6 × 1.5–2 cm, thinly wrinkled when dried, sheathing at base, with 2 leaves at apex. Leaf blade narrowly elliptic or narrowly oblong, 10–16 × 1.3–2.7 cm, leathery, narrowed toward both ends, apex acuminate; petiole 3–7.5 cm. Inflorescence hysteroanthous, 12–45 cm, with imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis; rachis 3–6-flowered, slightly flexuose; floral bracts caducous; pedicel and ovary 1–1.2 cm; rachis continuing to develop and producing a further set of sterile bracts at interface between peduncle and rachis and flowers annually. Flowers dark green-yellow, with brown lip. Sepals narrowly ovate-oblong, 13–15 × ca. 5 mm, 5–7-veined, apex acute. Petals linear or linear-lanceolate, 10–11 × ca. 1 mm, 1-veined, attenuate from base to apex; lip nearly ovate-oblong, 10–13 mm, near middle 3-lobed; lateral lobes subovate; mid-lobe nearly broadly oblong, apex undulate and emarginate; callus with 2 longitudinal lamellae 2–2.5 mm. Column arcuate, ca. 11 mm, upper part with suborbicular wings; wings 4–5 mm, ca. 1.5 mm wide on one side. Fl. Jul.  $2n = 40$ .

On trees in forests; ca. 1700 m. S and W Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

**8. *Coelogyne prolifera*** Lindley, *Gen. Sp. Orchid. Pl.* 40. 1830.

黄绿贝母兰 *huang lü bei mu lan*

*Coelogyne flavida* J. D. Hooker ex Lindley; *Pleione flavida* (J. D. Hooker ex Lindley) Kuntze; *P. prolifera* (Lindley) Kuntze.

Rhizome slightly rigid, 5–6 mm in diam., densely covered with leathery scaly sheaths, with rather short internodes. Pseudobulbs 2.5–4 cm apart on rhizome, somewhat lucid when dried, narrowly ovoid-oblong, 2.2–3.7 × 1–1.2 cm, with 2 leaves at apex and several sheaths at base. Leaf blade oblong-lanceolate or suboblong, 8–13 × 1.6–2.1 cm, apex acuminate;

petiole 2–2.5 cm. Inflorescence hysteroanthous, 10–15 cm and elongated at fruiting, with imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis; rachis 4–6-flowered, lower part often slightly thickened; floral bracts almost deciduous at anthesis, ca. 1.2 cm; pedicel and ovary 8–10 mm; rachis continuing to develop and producing a further set of sterile bracts at interface between peduncle and rachis and flowers annually. Flowers green or yellowish green, ca. 10 mm in diam. Dorsal sepal oblong, 6–7 × ca. 2.8 mm, 3-veined, apex obtuse; lateral sepals ovate-oblong, similar to dorsal sepal in size. Petals linear, slightly narrowed toward base, 5–6 × ca. 0.6 mm, 1-veined; lip subovate, 6–7 × ca. 5 mm, base concave and shallowly saccate, 3-lobed; lateral lobes erect, ovate; mid-lobe nearly elliptic, ca. 4 × 3 mm, margin crisped, apex emarginate; callus with 2 inconspicuous longitudinal lamellae extending from base of mid-lobe and then diminishing. Column almost erect, subclavate, ca. 5 mm, apex narrowly winged and irregularly notched. Capsule oblong, 1.2–1.4 × 0.5–0.6 cm. Fl. Jun.

On trees or rocks in forests; 1100–2200 m. S, SE, and W Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**9. *Coelogyne griffithii*** J. D. Hooker, Fl. Brit. India 5: 838. 1890.

格力贝母兰 ge li bei mu lan

Rhizome stout, rigid, 4.5–13 cm. Pseudobulbs compressed, linear-oblong, 4–10 × 1.4–3 cm, sulcate, with 2 leaves at apex and several sheaths at base. Leaf blade elliptic-lanceolate, 10–26 × 5–8 cm, leathery, acuminate; petiole ca. 5 cm. Inflorescence hysteroanthous; peduncle green, 5–15 cm, slender, glabrous; rachis zigzag, 10–20 cm; flowers 6–18, opening in succession; imbricate sterile bracts at interface between peduncle and rachis. Flowers light brownish, ca. 2.5 cm in diam. Sepals broadly oblong, 10–13 × ca. 6 mm, glabrous, 3-veined, acuminate. Petals 10–13 × ca. 1 mm, very slender, glabrous, 1-veined, obtuse; lip 3-lobed; lateral lobes rounded with broad crenulations; mid-lobe narrowly truncate at base, entire, undulate, recurved; callus with 5 prominent, short lamellae, outer ones broader. Column ca. 5 mm, hood narrowly winged with wings serrate. Capsule ellipsoid, ca. 3.5 × 1.5 cm. Fl. Apr, Jun–Aug.

On trees, moss-covered rocks; 1300–1600 m. SE Yunnan [NE India, Myanmar].

**10. *Coelogyne zhenkangensis*** S. C. Chen & K. Y. Lang, Acta Phytotax. Sin. 21: 345. 1983.

镇康贝母兰 zhen kang bei mu lan

Rhizome slightly rigid, 3–5 mm in diam., with scaly sheaths. Pseudobulbs 3–5.5 cm apart on rhizome, cylindrical, 5–7 cm × 5–8 mm, attenuate toward apex, with 2 leaves at apex and several sheaths at base; sheaths oblong-lanceolate to nearly ovate, 2–4.5 cm, abaxially ± covered with small wartlike outgrowths. Leaf blade narrowly oblong-lanceolate or oblong-lanceolate, 8–11 × 2–3.2 cm, base cuneate, apex acuminate; petiole 1.4–2.5 cm. Inflorescence hysteroanthous, nearly as long as leaves, with 6 or 7 imbricate sterile bracts at interface between peduncle and rachis forming a tube 1.5–2 cm; rachis 3- or 4-flowered, slightly flexuose; floral bracts caducous. Sepals line-

ar, ca. 11 × 2 mm, abaxially carinate, 5-veined, apex acuminate. Petals subfiliform or narrowly linear, ca. 11 × 0.7 mm, 3-veined; lip slightly anchor-shaped, ca. 11 mm, concave at base, 3-lobed; lateral lobes on basal sides of lip, oblong, ca. 2 × 1.2 mm, auriculate, irregularly dentate at apex; mid-lobe oblong-oblongate, ca. 9 × 2.3 mm, apex subacute; callus with 5 lamellae, median lamella a thickened ridge extending to tip of mid-lobe, 4 lateral lamellae thick veins terminating at base of mid-lobe. Fl. Mar.

• On tree trunks; ca. 2500 m. SW Yunnan (Zhenkang).

**11. *Coelogyne stricta*** (D. Don) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 184. 1919.

双褶贝母兰 shuang zhe bei mu lan

*Cymbidium strictum* D. Don, Prodr. Fl. Nepal. 35. 1825; *Coelogyne elata* Lindley.

Pseudobulbs sparse, 3–5 cm apart on rhizome, oblong or narrowly ovoid, 7–13 × 2.5–5 cm, with 2 leaves at apex. Leaf blade suboblong, 14–27 × 4–5 cm, leathery; petiole 3–6.5 cm. Inflorescence hysteroanthous, 15–21 cm, with imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis; raceme 7–12 cm, several to 10-flowered; floral bracts caducous. Flowers white, lip with yellow spots, lamellae tinged with red in apical part. Sepals oblong, 15–25 × 4–10 mm, acute; lateral sepals carinate abaxially. Petals narrowly oblong, 14–23 × 4–10 mm, acute; lip nearly ovate-oblong, ca. 22 mm, 3-lobed; mid-lobe irregularly undulate-dentate on margin; callus with 2 longitudinal lamellae extending from base to mid-lobe; lamellae crisped and slightly crenulate. Column slightly arcuate, ca. 14 mm, slightly expanded into a hood with small wings, notched at sides, front 3-lobed and margin irregular. Fl. Apr–Jun.  $2n = 40, 44$ .

On trees along steep riverbanks in lower and upper montane forests; 1100–2000 m. SE Xizang, Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Vietnam].

**12. *Coelogyne barbata*** Lindley ex Griffith, Itin. Pl. Khasiyah Mts. 72. 1848.

髯毛贝母兰 ran mao bei mu lan

Rhizome stout, 1–1.3 cm in diam., rigid, densely covered with scaly sheaths, with rather short internodes. Pseudobulbs sparse, usually narrowly ovoid-oblong, 7–11.5 × 1–2.5 cm, with 2 leaves at apex and several sheaths at base; sheaths ovate-lanceolate, 6–9 cm, often fibrously lacerate when old. Leaf blade oblanceolate-oblong or suboblong, 22–28 × 4–6 cm, 5-veined, apex acuminate or shortly cuspidate; petiole (4.5–)6–14 cm. Inflorescence hysteroanthous, 20–26 cm; imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis forming a tube 4–5 cm × 7–8 mm; rachis 9–12-flowered, slightly flexuose; floral bracts deciduous when all flowers opened, broadly ovate-rhombic, slightly conduplicate and cymbiform, 2.5–3 × ca. 2 cm. Flowers white, with brown spots on lip. Sepals narrowly ovate-oblong or suboblong, 33–36 × 8–10 mm, 7–9-veined, acute; lateral sepals often slightly narrower than dorsal sepal. Petals linear-lanceolate, ca. 34 × 2.5 mm, 3-veined; lip subovate, 25–30 × 24–28 mm, 3-lobed; lateral lobes

erect, nearly suborbicular; mid-lobe ovate to suboblong, ca. 10 × 7–8 mm, margin long fimbriate; callus with 3 lacerate-fimbriate lamellae extending to middle or near apex of mid-lobe; fimbriate hairs to 2 mm. Column arcuate, 19–22 mm, both sides winged; wings widened from base to apex, upper part 2.5–3 mm wide on one side, apex irregularly finely toothed. Capsule obovoid, ca. 4 × 1.5 cm, slightly 3-ridged. Fl. Sep–Oct.  $2n = 40$ .

On trees in forests or on cliffs; 1100–2900 m. SW Sichuan, SE Xizang, W to SE Yunnan [Bhutan, NE India, Nepal].

**13. *Coelogyne calcicola*** Kerr, J. Siam Soc., Nat. Hist. Suppl. 9: 233. 1933.

滇西贝母兰 dian xi bei mu lan

Pseudobulbs 3–4 cm apart on a stout, creeping, sheathed rhizome, ovoid, 5–10 cm, angled, with 2 leaves, enclosed with persistent bracts at base. Leaf blade oblong-lanceolate or oblong-obovate, 13–20 × 4–5.5 cm, abaxially minutely verrucose, many veined, prominent abaxially, somewhat acute; petiole 3.8–6 cm, narrow. Inflorescence hysteroanthous, erect, rigid; peduncle bare, 7–15 cm, with 6 or 7 densely imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis; rachis 5–7 cm; flowers up to 6, opening simultaneously. Flowers spreading, sepals and petals creamy white. Dorsal sepal oblong-lanceolate, ca. 28 × 14 mm, 7–9-veined, somewhat acute; lateral sepals oblong-lanceolate, ca. 27 × 9 mm, 7–9-veined, somewhat acute. Petals linear, ca. 26 × 3.5 mm, 3-veined, obtuse; lip ca. 27 × 25 mm, 3-lobed; lateral lobes small compared with remainder of lip, rounded, front margin fimbriate; mid-lobe quadrangular, ca. 13 × 14 mm, margin long fimbriate except around tip; callus with 2 lamellae extending from base of lip and reaching middle of mid-lobe, fimbriate, toward tip keels broadening into a warty protrusion. Column slightly arched, ca. 17 mm, hood winged. Fl. Apr–May.

On trees; 900–1500 m. SW Yunnan [Laos, Myanmar, Thailand, Vietnam].

This plant was first reported from Yunnan by Seidenfaden (Dansk Bot. Ark. 29(4): 71. 1975), based on *Forrest 18715* (K). It is similar to *Coelogyne sanderae* in having a fimbriate-margined lip and three fimbriate-hairy lamellae. But in the specimen collected from Yunnan, the central lamella is very short (3–4 mm), and the lateral two lamellae are almost not fimbriate when extending to mid-lobe.

**14. *Coelogyne leucantha*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 198. 1921.

白花贝母兰 bai hua bei mu lan

*Coelogyne leucantha* var. *heterophylla* Tang & F. T. Wang.

Rhizome rigid, 5–7 mm in diam., densely covered with lucid, scaly sheaths, with rather short internodes. Pseudobulbs 1–2 cm apart from each other, ovoid-oblong, 1.5–3(–5) cm × 8–15 mm, with 2 leaves at apex and several sheaths at base; sheaths ovate to lanceolate, 2.5–6.5 cm, lucid. Leaf blade oblanceolate to oblong-lanceolate, (5–)10–15 × 1.1–3 cm, base cuneate, apex subacuminate; petiole (1.5–)4–9.5 cm. Inflorescence hysteroanthous, 15–20 cm, with imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis forming a tube 1.5–3 cm; rachis 3–11-flowered, thickened in lower part;

floral bracts caducous; pedicel and ovary ca. 10 mm. Flowers white, slightly spotted with yellow on lip. Sepals suboblong, 13–18(–25) × 3.5–4.5 mm, 5-veined, apex acuminate. Petals filiform, nearly as long as sepals, ca. 0.7 mm wide, 1-veined, apex acute; lip nearly ovate-oblong, 13–17(–24) × 7–11 mm, 3-lobed; lateral lobes erect, obtuse; mid-lobe nearly elliptic, 6–10 × 4–7 mm, margin irregularly dentate; callus with 3 longitudinal lamellae extending from base to ca. middle of mid-lobe, median lamella shorter; lamellae straight, crisped-crenate. Column suberect, 10–14(–21) mm, both sides winged; wings very narrow in lower part, widened toward upper part, ca. 0.7 mm wide on one side. Capsule obovoid-oblong, trigonous, 1.6–1.8 × 0.7–0.9 cm. Fl. May–Jul, fr. Sep–Dec.

On tree trunks in forests or rocks along valleys; 1500–2600 m. SW Sichuan, NW, S, and W Yunnan [N Myanmar].

**15. *Coelogyne rigida*** E. C. Parish & H. G. Reichenbach, Trans. Linn. Soc. London 30. 146. 1874.

挺茎贝母兰 ting jing bei mu lan

Pseudobulbs on stout, creeping, heavily sheathed rhizome, 3–5 cm apart, suboblong or oblong-cylindric, to 9 × ca. 1.3 cm, somewhat attenuate toward apex, with 2 leaves at apex. Leaf blade suboblong-oblong-lanceolate, 27–30 × 4.6–5 cm, leathery, base cuneate, apex acuminate; petiole 4–6 cm. Inflorescence hysteroanthous, ca. 20 cm, with 10 imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis forming a tube 3.5–4 cm; rachis 8-flowered, slightly flexuose; floral bracts not completely deciduous at anthesis, ovate-lanceolate, 1.8–1.9 cm; pedicel and ovary 7–8 mm. Flowers small. Dorsal sepal suboblong-elliptic, 8–10 × 4–5 mm, 3-veined; lateral sepals suboblong, 9–11 mm, slightly narrower than dorsal sepal, 3-veined. Petals linear, ca. 9 × 1 mm, 1-veined; lip subovate, 8–10 mm, 3-lobed; lateral lobes erect; mid-lobe nearly elliptic, 3–4 mm, margin somewhat undulate, apex emarginate; callus with 3 longitudinal lamellae; lamellae conspicuously crisped, extending to mid-lobe, median lamella shorter. Column slightly arcuate, 5–6 mm, both sides winged; wings below middle very narrow, upper part slightly wider, ca. 0.5 mm wide on one side. Fl. Jun–Jul.

On trees in forests in limestone areas; 700–800 m. S Yunnan [NE India, Myanmar, Thailand, Vietnam].

**16. *Coelogyne pulchella*** Rolfe, Bull. Misc. Inform. Kew 1898: 194. 1898.

美丽贝母兰 mei li bei mu lan

Rhizome stout, creeping, sheathed. Pseudobulbs 2–3 cm apart on rhizome, dark green, ovoid to ovoid-oblong, 4–7 × 2–3 cm, rather drawn out in upper part with several obscure angles becoming pronounced with age, with 2 leaves at apex. Leaves oblong-lanceolate or elliptic, 13–17 × 2.5–5 cm, subleathery, with 7 veins prominent abaxially, apex acute; petiole ca. 4 cm, grooved. Inflorescence hysteroanthous; peduncle bare, erect, stiff, 10–11 cm, with imbricate bracts at interface of peduncle and rachis; rachis 14–15 cm, slender, 4–12-flowered; flowers closely spaced, opening simultaneously; floral bracts deciduous. Flowers 2.5–3 cm in diam., pure white with large yellowish brown blotch on disk that becomes darker on lamellae

and a smaller blotch at extreme base of lip. Sepals ovate, 12.5–15 × ca. 7.5 mm, acute. Petals linear, 12.5–15 × 2–3 mm, subacute; lip 12.5–15 mm, 3-lobed; lateral lobes erect, subovate, rounded at tip, front margin nearly 5 mm wide; mid-lobe much larger with 2 rounded, crenulate, undulate lobes at apex; callus with 3 fleshy crenulate lamellae, extending from base of lip to base of mid-lobe, median keel short. Column incurved, flattened on front, less than 5 mm, tip denticulate. Fl. Mar, Sep–Oct.

On trees. Yunnan [Myanmar].

**17. *Coelogyne sanderae*** O'Brien, Gard. Chron., ser. 3, 13: 360. 1893.

撕裂贝母兰 si lie bei mu lan

*Coelogyne darlacensis* Gagnepain; *C. ridleyi* Gagnepain.

Rhizome stout, 6–8 mm in diam., covered with scaly sheaths, with rather short internodes. Pseudobulbs 1.5–3 cm apart on rhizome, yellowish when dried, lucid, usually narrowly ovoid to narrowly ovoid-oblong, 3–8 × 1–2 cm, with 2 leaves at apex and several sheaths at base. Leaf blade oblong to oblong-lanceolate, 9–20 × 2.8–4.6 cm, apex acuminate; petiole 1.5–4 cm. Inflorescence hysteranthous, 20–25 cm, somewhat stout, with 10 imbricate, convolute, sheathing sterile bracts at interface between peduncle and rachis forming a tube 2.5–4.5 × 0.6–0.8 cm; rachis 4–6-flowered; floral bracts caducous; pedicel and ovary 15–20 mm. Flowers white, with yellow spots on lip. Sepals oblong or oblong-lanceolate, 26–30 × 8–10 mm, apex acuminate. Petals linear, ca. 28 × 2 mm; lip subovate, 25–29 × 20–24 mm, 3-lobed; lateral lobes erect, nearly suborbicular, margins ± dentate or shortly fimbriate; mid-lobe nearly broadly ovate or oblong, 10–13 × 9–11 mm, margin irregularly dentate or shortly fimbriate; callus with 3 lacerate-fimbriate brownish lamellae extending to mid-lobe, median lamella slightly shorter. Column arcuate, ca. 17 mm, both sides winged; wings widened from base to apex, upper part ca. 1.5 mm wide on one side, apex obtuse. Capsule nearly narrowly obovoid, trigonous, 3.3–3.6 × ca. 1.5 cm. Fl. Mar–Apr, fr. Jun.

On tree trunks or rocks at forest margins; 1000–2300 m. S Yunnan [Myanmar, Vietnam].

**18. *Coelogyne malipoensis*** Z. H. Tsi, Bull. Bot. Res., Harbin 15: 43. 1995.

麻栗坡贝母兰 ma li po bei mu lan

Rhizome stout, 5–6 mm in diam., rigid, with dense, brown, scaly sheaths. Pseudobulbs 1.2–1.8 cm apart on rhizome, not lucid, narrowly oblong, slightly narrowed toward apex, 3.5–4 cm × 8–11 mm, longitudinally channeled when dried, with 1 leaf at apex, sheathing at base; sheaths 3–3.5 cm, later deciduous. Leaf blade elliptic, 9–15 × 4–5.2 cm, thickly leathery, apex shortly acuminate; petiole 2–8 cm. Inflorescence initially synanthous becoming hysteranthous, pseudobulb and inflorescence basally embraced by sheaths at anthesis, but leaves completely stretching out, 15–22 cm; rachis 4.5–10.5 cm, 3- or 4-flowered, base with 1 amplexicaul sterile bract; floral bracts deciduous, narrowly oblong, ± cymbiform, 1.5–1.7 cm, papery; pedicel and ovary 10–15 mm. Flowers ca. 2.5 cm

in diam., with sepals and petals white, lip white with yellow on mid-lobe. Sepals narrowly ovate or subovate-lanceolate, 18–20 × 6–7 mm, 5-veined, apex acuminate. Petals ovate, 14–15 × 5–6 mm; lip suboblong-obovate, 18–20 × ca. 9 mm, apex subtruncate or obtuse-rounded; callus with 3 longitudinal lamellae extending from base of lip to above middle. Column 8–10 mm, both sides winged; wings dilated at apex, to 5 mm wide, apex truncate. Fl. Nov–Dec.

Rocky slopes in limestone areas; ca. 1400 m. SE Yunnan [Vietnam].

**19. *Coelogyne cristata*** Lindley, Coll. Bot. ad t. 33. 1821.

贝母兰 bei mu lan

*Cymbidium speciosissimum* D. Don.

Rhizome somewhat rigid, 4–6 mm in diam., branched, with dense, lucid, leathery, scaly sheaths. Pseudobulbs 1.5–3 cm apart on rhizome, oblong or ovoid, (1–)2.5–6 × (0.5–)1–1.7 cm, corrugate and deeply channeled when dried, with 2 leaves at apex and several sheaths at base; sheaths ovate or ovate-lanceolate, 2–6 cm, leathery. Leaf blade linear-lanceolate, (5–)10–17 × (0.4–)0.7–1.9 cm, papery, base attenuate to inconspicuous petiole, apex long acuminate. Inflorescence heteranthous, 8–12 cm, basal half embraced in sheaths; raceme 5–7 cm, 2–10-flowered; floral bracts not deciduous at anthesis, ovate-lanceolate, ± cymbiform, 2.5–3.5 cm, papery; pedicel and ovary 20–25 mm. Flowers white, rather large. Sepals lanceolate or oblong-lanceolate, 30–40 × 10–15 mm, abaxially ± carinate, apex acute. Petals similar to sepals, 9–11 mm wide; lip ovate, concave, nearly as long as sepals, 3-lobed; lateral lobes erect, subovate, nearly entire; mid-lobe broadly obovate or suboblate, 12–15 mm, margin nearly entire, apex obtuse or emarginate; callus with 5 fimbriate lamellae extending from base of lip to base of mid-lobe, 2 inner lateral lamellae continuing to apex of mid-lobe, elevated, plate-like, and crenulate, median lamella continuing as a prominent vein. Column slightly arcuate, 20–30 mm, both sides winged; wings widened from base to apex, ca. 1.5 mm wide on one side in upper part, apex emarginate or subtruncate. Fl. May.  $2n = 40$ .

On large rocks along forest margins; 1700–1800 m. S Xizang [Bhutan, NE India, Nepal].

**20. *Coelogyne assamica*** Linden & H. G. Reichenbach, Berliner Allg. Gartenzeitung 25: 403. 1857.

云南贝母兰 yun nan bei mu lan

*Coelogyne annamensis* Rolfe; *C. dalatensis* Gagnepain; *C. fuscescens* Lindley var. *assamica* (Linden & H. G. Reichenbach) Pfitzer & Kraenzlin; *C. saigonensis* Gagnepain; *C. siamensis* Rolfe; *Cymbidium evrardii* Guillaumin.

Pseudobulbs close together on a sturdy rhizome, spindle-shaped, 6–7 cm, 1.5–2 cm in diam. at middle, with 2 leaves. Leaf blade elliptic-lanceolate, 16–25 × 3.5–6 cm, with 3–5 veins, prominent abaxially, with petiole ca. 3 cm, barely attenuate, acute. Inflorescence proteranthous; peduncle enclosed with convolute bracts at base, 10–12 cm; rachis arching, slightly zigzag, 19–25 cm, thickened, becoming slender; flowers usually 8, opening simultaneously; floral bracts deciduous. Flowers pale yellow, more than 7 cm in diam., lip darker yellow with intricate brown veins on lateral lobes, veins on mid-lobe orange-

brown. Dorsal sepal oblong, ca.  $32 \times 9$  mm, with 7–9 branched veins, acuminate to slightly acute; lateral sepals linear, falcate, ca.  $28 \times 6$  mm, with branched veins, acute. Petals narrowly linear, ca.  $30 \times 2.5$  mm, with 3 branched veins; lip obovate with deep recess on each side, ca.  $26 \times 12$  mm, conspicuously veined, 3-lobed; lateral lobes not spreading, triangular; mid-lobe somewhat orbicular, ca.  $12 \times 13$  mm, shortly clawed, acute or subacute; callus with 3 lamellae but median lamella shorter. Column arcuate, clavate, ca. 20 mm, tip ca. 6 mm in diam., acuminate. Fl. Jan.

On trees in riverine forests; ca. 700 m. NW Yunnan [Bhutan, NE India, Laos, Myanmar, Thailand, Vietnam].

**21. *Coelogyne fuscescens*** Lindley, Gen. Sp. Orchid. Pl. 41. 1830.

褐唇贝母兰 he chun bei mu lan

*Coelogyne brunnea* Lindley; *C. cynoches* E. C. Parish & H. G. Reichenbach.

Rhizome slightly stout, 5–6 mm in diam., with dense brown sheaths. Pseudobulbs rather clustered on rhizome, 6–7 mm apart, not lucid when dried, suboblong, slightly narrowed toward both ends,  $2-3 \text{ cm} \times 5-7 \text{ mm}$ , with 2 leaves at apex, sheathing at base; sheaths brown, 1.5–2 cm. Leaf blade oblong-ob lanceolate,  $11.5-13.5 \times 1.3-2 \text{ cm}$ , leathery, contracted at base into a petiole 1–2 cm, apex obtuse or acute. Inflorescence proteranthous, rarely synanthous, 12–14 cm, initially enclosed in sheaths at base; rachis 4–6 cm, usually 2-flowered; floral bracts often embracing pedicel and ovary, oblong-lanceolate,  $\pm$  cymbiform, 2–2.5 cm, membranous; pedicel and ovary 2–2.5 cm. Flowers ca. 4 cm in diam. Sepals suboblong,  $25-28 \times 7-9 \text{ mm}$ , 5-veined, apex acuminate or shortly cuspidate. Petals linear,  $22-24 \times 2.5-3 \text{ mm}$ ; lip ovate, 25–28 mm, concave at base, 3-lobed; lateral lobes subovate, nearly entire; mid-lobe ovate,  $10-13 \times 6-7 \text{ mm}$ ; callus with 3 fleshy, undulate longitudinal lamellae extending to base of mid-lobe, then continuing as branched veins converging at tip of lip. Column ca. 20 mm, both sides with narrow wings. Fl. Jun.  $2n = 40$ .

On rocks; ca. 1300 m. S Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**22. *Coelogyne taronensis*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 59: 254. 1922.

高山贝母兰 gao shan bei mu lan

Pseudobulbs close together on short, creeping rhizome, 2–4 cm, longitudinally wrinkled, rounded at base, base enclosed with bracts that become fibrous but not adherent, with 2 leaves at apex. Leaf blade linear-lanceolate,  $7-18 \times 1.2-3.3 \text{ cm}$ , with 7 major veins and further 4–7 minor veins, base with short indistinct petiole, apex acute or obtuse. Inflorescence synanthous; peduncle to 7 cm, enclosed in 3 or 4 straw-colored bracts; rachis to 10 cm; flowers 1–3, opening in succession; floral bracts deciduous. Flowers mainly yellow but spotted in form of brown holes or slits. Dorsal sepal oblong-lanceolate,  $35-40 \times 10-13 \text{ mm}$ , 11-veined, acute; lateral sepals oblique, oblong-lanceolate,  $35-40 \times 10-13 \text{ mm}$ , 11-veined, acute. Petals oblique, lanceolate, ca.  $35 \times 5-6 \text{ mm}$ , base saccate; lip 3-lobed; lateral lobes

narrow, front rounded; mid-lobe ovate, margin membranous, veined, apex acute; callus with 3 lamellae extending from base of lip, lateral lamellae extending to tip of mid-lobe, median lamella ca. 1/2 as long. Column slightly arcuate, middle section thickened, expanding to form winged hood, tip rounded, denticulate. Fl. Jul.

• On trees in montane forests; 2400–3500 m. W Yunnan.

**23. *Coelogyne suaveolens*** (Lindley) J. D. Hooker, Fl. Brit. India 5: 832. 1890.

疏茎贝母兰 shu jing bei mu lan

*Pholidota suaveolens* Lindley, Gard. Chron. 1856: 372. 1856; *Pleione suaveolens* (Lindley) Kuntze.

Rhizome stout, to 1 cm in diam., with dense, brown, scaly sheaths. Pseudobulbs ca. 6 cm apart on rhizome, somewhat lucid when dried, narrowly ovoid or linear-ovoid,  $5.7-7 \times \text{ca. } 1.5 \text{ cm}$ , embraced by large sheaths (deciduous when old), with 2 leaves at apex. Leaf blade oblanceolate or oblong-ob lanceolate,  $30-38 \times 5.5-6 \text{ cm}$ , thickly papery, base contracted into a petiole 9–11 cm, apex acuminate. Inflorescence synanthous, ca. 20 cm, enclosed in sheaths initially except flowering part; rachis flexuous, ca. 10 cm, usually more than 10-flowered; floral bracts deciduous, oblong-ovate,  $\pm$  cymbiform, ca. 2 cm, papery; pedicel and ovary 15–17 mm. Flowers white, with yellow spots on lip. Sepals suboblong, ca.  $12 \times 4-4.5 \text{ mm}$ , 5-veined, apex acuminate. Petals oblong-lanceolate or narrowly ovate-oblong, ca.  $12 \times 3.5 \text{ mm}$ ; lip suboblong, ca. 1 cm, near or above middle contracted into hypochile and epichile or slightly 3-lobed; lateral lobes very small or inconspicuous; mid-lobe oblong-ovate; callus with 4 or 5 longitudinal lamellae, 3 lamellae extending from base of lip to base of mid-lobe, further 2 crenate lamellae on outside of existing lamellae extending from base of mid-lobe to tip of mid-lobe. Column 5–6 mm, both sides narrowly winged. Fl. May.

On rocks in evergreen broad-leaved forests; ca. 600 m. S Yunnan [NE India, Thailand].

**24. *Coelogyne flaccida*** Lindley, Gen. Sp. Orchid. Pl. 39. 1830.

栗鳞贝母兰 li lin bei mu lan

*Coelogyne esquirolii* Schlechter; *C. lactea* H. G. Reichenbach; *Pleione flaccida* (Lindley) Kuntze.

Rhizome stout, 7–8 mm in diam., rigid, with dense, purplish brown, leathery sheaths. Pseudobulbs often 2–3 cm apart on rhizome, bright yellow when dried, oblong or nearly cylindrical,  $6-12.5 \times 1.5-3.2 \text{ cm}$ , somewhat attenuate toward apex, with 2 leaves at apex and several sheaths at base; sheaths  $5-8 \times 2.5-3 \text{ cm}$ , leathery, abaxially mottled with purplish brown particularly in central part and basal half. Leaf blade oblong-lanceolate to elliptic-lanceolate,  $13-19 \times 3-4.5 \text{ cm}$ , leathery, apex subacuminate or shortly cuspidate; petiole 4.5–8 cm. Inflorescence heteranthous, 16–32 cm, basal half enclosed in sheaths; rachis 11–21 cm, sparsely 8–10-flowered; floral bracts caducous, obovate-elliptic, ca. 2.5 cm; pedicel and ovary 17–20 mm. Flowers pale yellow to white, with yellow and pale reddish brown spots on lip. Dorsal sepal oblong or oblong-lanceolate,  $21-24 \times 6-7 \text{ mm}$ ; lateral sepals slightly narrower,

abaxially ± carinate. Petals linear-lanceolate, 20–22 × 2–3 mm; lip subovate, 16–20 × ca. 15 mm, 3-lobed; lateral lobes erect, subovate, apex obtuse; mid-lobe suboblong, 6–7 × ca. 4 mm, margin ± crisped; callus with 3 crisped-incised lamellae extending from base of lip to basal half of mid-lobe. Column slightly arcuate, ca. 13 mm, both sides with wings; wings widened toward column apex, ca. 1.5 mm wide on one side in upper part. Fl. Mar.  $2n = 40$ .

On trees in forests; 1600–1700 m. NW Guangxi, S Guizhou, S and W Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**25. *Coelogyne viscosa*** H. G. Reichenbach, Allg. Gartenzeitung 24: 218. 1856.

禾叶贝母兰 he ye bei mu lan

*Coelogyne graminifolia* E. C. Parish & H. G. Reichenbach; *Pleione graminifolia* (E. C. Parish & H. G. Reichenbach) Kuntze; *P. viscosa* (H. G. Reichenbach) Kuntze.

Rhizome stout, 6–8 mm in diam., with dense, leathery, shiny sheaths. Pseudobulbs 1–1.5 cm apart on rhizome, often bright yellow when dried, ovoid or terete-ovoid, 5–6 × 1–3.5 cm, vernicose, with 2 leaves at apex and several sheaths at base; sheaths abaxially mottled with purplish brown, 4–7 cm, leathery. Leaf blade linear, grasslike, 30–40 × 0.8–1.2 cm, leathery, base slightly contracted, without distinct petiole, apex obtuse. Inflorescence proteranthous, compressed cylindrical, relatively short, basal 2/3 embraced by sheaths; rachis 2–4-flowered; floral bracts caducous; pedicel and ovary ca. 15 mm. Flowers white, tinged with brown and with yellow spots on lip. Dorsal sepal oblong, ca. 23 × 7 mm, apex obtuse; lateral sepals slightly narrower, ca. 5 mm wide, abaxially slightly keeled. Petals similar to lateral sepals; lip ovate, ca. 20 × 15 mm, 3-lobed; lateral lobes erect, nearly subovate, apex obtuse; mid-lobe subovate, 7–8 × ca. 5 mm, apex acuminate; callus with 3 crisped-incised, longitudinal lamellae, extending from base of lip to ca. 1/3 way on mid-lobe, median lamella slightly shorter. Column slightly arching, ca. 12 mm, winged on both sides; wings widened toward column apex, ca. 1.5 mm wide on one side in upper part. Capsule suboblong-ovoid or narrowly obovoid-oblong, 3.2–3.8 × 0.7–1.1 cm; fruiting pedicel 9–12 mm. Fl. Sep–Nov.  $2n = 40$ .

On rocks in forests; 700–2000 m. S and SW Yunnan [NE India, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**26. *Coelogyne occultata*** J. D. Hooker, Fl. Brit. India 5: 832. 1890.

卵叶贝母兰 luan ye bei mu lan

*Pleione occultata* (J. D. Hooker) Kuntze.

Rhizome stout, 4–5 mm in diam., with dense, brown, scaly sheaths. Pseudobulbs 2–5 cm apart on rhizome, obliquely attached or almost parallel to rhizome, dark brown and grooved when dried, slightly lucid, suboblong-obovoid or subrhombic, 1.5–5 cm × 8–15 mm, with 2 leaves at apex and 1 or 2 ovate sheaths at base. Leaf blade ovate or ovate-elliptic, (1.5–)3–6 × 1–2.5 cm, leathery, base broadly truncate or subrounded, apex acute or obtuse; petiole 4–9 mm, stout. Inflorescence hysteroanthous, usually rather short, 3–6 cm, embraced by sheaths at

anthesis except inflorescence; rachis often 2- or 3-flowered, rarely a solitary flower; floral bracts caducous, linear-lanceolate, 2–3 cm; pedicel and ovary ca. 15 mm. Flowers white, with purple veins and 2 brownish yellow eyelike blotches. Sepals lanceolate or oblong-lanceolate, 30–33 × 6–10 mm; lateral sepals slightly shorter and narrower than dorsal sepal. Petals sublinear-oblong-ovate or narrowly elliptic-oblong-ovate, 30–33 × 3.5–4 mm; lip ovate, 20–25 × 14–16 mm, 3-lobed; lateral lobes erect, nearly suborbicular; mid-lobe ovate, ca. 10 × 6–7 mm, apex acuminate; callus with 2(or 3) irregularly crenulate lamellae extending from base of lip to mid-lobe. Column slightly arcuate, 15–18 mm, both sides winged; wings widened from base to apex, upper part ca. 2 mm wide on one side. Capsule suboblong, ca. 2 × 0.7–0.8 cm, ± 3-ridged. Fl. Jun–Jul, fr. Nov.  $2n = 38, 40, 76$ .

On tree trunks in forests or rocks along valleys; 1300–3000 m. S and SE Xizang, W Yunnan [Bhutan, NE India, Myanmar].

**27. *Coelogyne punctulata*** Lindley, Coll. Bot. ad t. 33. 1821.

狭瓣贝母兰 xia ban bei mu lan

*Coelogyne brevifolia* Lindley; *C. goweri* H. G. Reichenbach; *C. nitida* J. D. Hooker (1890), not (Wallich ex D. Don) Lindley (1830); *C. ocellata* Lindley; *C. ocellata* var. *boddaertiana* H. G. Reichenbach; *C. ocellata* var. *maxima* H. G. Reichenbach; *C. punctulata* var. *hysterantha* Tang & F. T. Wang; *Cymbidium nitidum* Roxburgh (1832), not Wallich ex D. Don (1825); *Pleione goweri* (H. G. Reichenbach) Kuntze; *P. nitida* Kuntze.

Rhizome rigid, stout, 5–7 mm in diam., with brown scaly sheaths. Pseudobulbs rather contiguous, less than 1 cm apart on rhizome, bright yellow when dried, oblong or narrowly ovoid-oblong, 2.5–4 cm × 7–13 mm, with 2 leaves at apex and several sheaths at base; sheaths ovate-oblong, 2–5 cm, papery. Leaf blade lanceolate or narrowly oblong-lanceolate, 8–14 × 1.3–2.5 cm, adaxially often with dense raised transverse veinlets, apex acuminate; petiole 2–4 cm. Inflorescence hysteroanthous, slightly recurved, 8–15 cm; rachis 2–4-flowered; floral bracts caducous, suboblong-lanceolate, 2–3.5 cm; pedicel and ovary 13–17 mm. Flowers white, with deep-colored eyelike blotches on lip. Sepals lanceolate or oblong-lanceolate, 18–20 × 4–5 mm, apex acute. Petals linear, 18–20 × ca. 1.5 mm; lip ovate, 16–18 × ca. 10 mm, 3-lobed; lateral lobes erect, nearly suborbicular, apex rounded; mid-lobe ovate-lanceolate, ca. 7 × 5–6 mm, with 2 longitudinal, dentate lamellae extending from base of lip to mid-lobe and a short median lamella between them. Column slightly arcuate, ca. 12 mm, both sides winged; wings widened from base to apex, upper part 1.5–2 mm wide on one side, apex subtruncate or obtuse. Capsule obovoid-oblong, ca. 2.2 × 0.8–0.9 cm. Fl. Nov, fr. next Apr.  $2n = 38$ .

On trees or rocks in forests; 1300–2900 m. S and SE Xizang, W Yunnan [Bhutan, NE India, Myanmar, Nepal].

**28. *Coelogyne nitida*** (Wallich ex D. Don) Lindley, Gen. Sp. Orchid Pl. 40. 1830.

密茎贝母兰 mi jing bei mu lan

*Cymbidium nitidum* Wallich ex D. Don, Prodr. Fl. Nepal. 35. 1825; *Coelogyne ochracea* Lindley; *C. ochracea* subsp. *conferta* E. C. Parish & H. G. Reichenbach; *C. punctulata* Lindley var. *conferta* (E. C. Parish & H. G. Reichenbach) Tang

& F. T. Wang; *Pleione ochracea* (Lindley) Kuntze.

Rhizome stout, rigid, with scaly sheaths. Pseudobulbs contiguous, yellowish brown and strongly wrinkled when dried, lucid, oblong-ellipsoid, 1.5–3 × 1–1.5 cm, deeply sulcate, sheathing at base, with 2 leaves at apex. Leaf blade narrowly elliptic, ca. 7 × 1.5 cm, leathery, base attenuate into petiole ca. 2 cm, apex acuminate. Inflorescence proteranthous, ca. 6 cm, lower part enclosed in leathery sheaths; rachis 2- or 3-flowered; floral bracts caducous; pedicel and ovary ca. 16 mm. Flowers white or slightly tinged yellowish, lip with 2 eyelike colored blotches. Sepals oblong, 17–19 × 4–5 mm, apex acuminate. Petals nearly broadly linear or narrowly oblong, ca. 15 × 2–3 mm; lip ovate, ca. 15 × 10 mm, 3-lobed; lateral lobes erect, subobovate; mid-lobe nearly elliptic, ca. 5 × 4 mm, with 3 longitudinal inconspicuous lamellae extending from base of lip, lateral lamellae thick, median lamella inconspicuous. Column slightly arcuate, ca. 12 mm, both sides winged; wings widened from base to apex, upper side ca. 1 mm wide on one side. Fl. Mar.  $2n = 40$ .

On trees in forests in limestone areas; ca. 3100 m. NW, S, and W Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**29. *Coelogyne weixiensis*** X. H. Jin, Ann. Bot. Fenn. 42: 135. 2005.

维西贝母兰 *wei xi bei mu lan*

Rhizome short, ca. 2 mm in diam. Pseudobulbs close together, less than 15 mm apart along rhizomes, conic to cylindrical, when young covered by sheaths, 3–5 × 1–1.5 cm. Leaves 2 per pseudobulb, terminal, convolute, oblanceolate, 20–30 × 2.5–3 cm, leathery. Inflorescence proteranthous, erect, ca. 15 cm, 2- or 3-flowered; floral bracts caducous, linear, ca. 2 cm. Flowers opening simultaneously, spreading, creamy yellow; pedicel and ovary ca. 2 cm. Dorsal sepal elliptic, ca. 35 × 17 mm, 7-veined, apex acute; lateral sepals tinged with deep yellow, lanceolate, ca. 35 × 12 mm, 7-veined, base oblique, apex acuminate, mucronate. Petals linear, ca. 35 × 6 mm, 5-veined, apex acuminate; lip firmly attached to column, 3-lobed; lateral lobes erect, suborbicular, dentate, veins brown, sometimes with 2 eyelike blots at base; 3 crested lamellae extending from base of lip with lateral lamellae terminating at middle of mid-lobe and median lamella extending toward tip of mid-lobe. Column ca. 20 mm, with 2 yellow wings; pollinia 4, suborbicular. Capsule not seen. Fl. May–Jun.

• On tree trunks in subtropical evergreen forests; 2600–3000 m. W Yunnan.

**30. *Coelogyne corymbosa*** Lindley, Fol. Orchid. 5(Coelogyne): 7. 1854.

眼斑贝母兰 *yan ban bei mu lan*

*Pleione corymbosa* (Lindley) Kuntze.

Rhizome somewhat rigid, 3–4 mm in diam., with dense, brown, scaly sheaths. Pseudobulbs rather dense, less than 1 cm apart from each other, bright yellow or brownish yellow and strongly wrinkled when dried, oblong-ovoid or nearly rhombic-oblong, (1–)2–4.5 cm × 6–13 mm, with 2 leaves at apex and several sheaths at base; sheaths lucid, ovate, 1.5–2.5 cm, papery. Leaf blade oblong-oblancheolate to obovate-oblong, 4.5–15 × 1–3 cm, subleathery, adaxially with raised transverse veinlets, apex often acuminate; petiole 1–2 cm. Inflorescence proteranthous to synanthous, 7–15 cm (elongated when fruiting), embraced by sheaths below middle; raceme 2- or 3(or 4)-flowered; floral bracts caducous. Flowers white or slightly tinged with yellowish green, with 4 yellow eyelike blotches surrounded by reddish orange. Sepals oblong-lanceolate, 18–22(–35) × 7–8 mm, apex acute or obtuse; lateral sepals somewhat narrower than dorsal sepal. Petals linear-lanceolate, 18–22 × 2.5–4 mm; lip subovate, 16–28 × 12–25 mm, 3-lobed; lateral lobes erect, suborbicular or nearly subovate; mid-lobe ovate or ovate-lanceolate, 6–9 mm; 2 or 3 low lamellae extending from base to mid-lobe. Column slightly arcuate, 10–20 mm, both sides winged; wings widened from base to apex, upper side ca. 1.7 mm wide on one side, apex obtuse. Capsule subobovoid, slightly trigonous, 2.2–5 × 0.9–1.3 cm. Fl. May–Jul, fr. next Jul–Nov.  $2n = 38, 40$ .

On trees at forest margins or on humid cliffs; 1300–3500 m. S and SE Xizang, S and W Yunnan [Bhutan, NE India, Myanmar, Nepal].

**31. *Coelogyne gongshanensis*** H. Li ex S. C. Chen, Fl. Reipubl. Popularis Sin. 18: 412. 1999.

贡山贝母兰 *gong shan bei mu lan*

Rhizome short, stout, densely covered with broken brown sheaths. Pseudobulbs nearly tufted, subobovoid-globose to subellipsoid, 1.3–1.8 cm × 7–9 mm, ± narrowed at base, grooved or wrinkled when dried, sheathing at base, with 2 leaves at apex. Leaf blade narrowly obovate-lanceolate, oblong-lanceolate, or occasionally subelliptic, (4–)7–13 × 1–2(–3) cm, leathery, base contracted into a short petiole, apex acuminate. Inflorescence synanthous, 8–12.5 cm, lower part enclosed in scaly sheaths; rachis 2–4-flowered; floral bracts caducous; pedicel and ovary 12–22 mm. Flowers creamy yellow. Sepals subelliptic, 32–35 × ca. 15 mm, apex acute; lateral sepals slightly narrower than dorsal sepal. Petals subrhombic-elliptic, 32–35 × ca. 17 mm; lip ca. 22 mm, 3-lobed; lateral lobes nearly suborbicular, entire, with brown veins; mid-lobe ovate, ca. 8 × 6 mm; callus with 3 deep yellow lamellae, lateral lamellae extending to middle of mid-lobe, median keel shorter. Column ca. 13 mm, both sides winged; wings ca. 1.5 mm wide on one side in upper part. Fl. May.

• On branches in thickets or *Picea* forests, on snow not melted at flowering time; 2800–3200 m. NW Yunnan.

## 110. PLEIONE D. Don, Prodr. Fl. Nepal. 36. 1825.

独蒜兰属 *du suan lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Phillip J. Cribb, Stephan W. Gale

Herbs epiphytic, lithophytic, or terrestrial. Pseudobulbs annual, often clustered, ovoid, conic, pyriform, or turbinate, gradually narrowed toward apex to form a distinct neck, sometimes abruptly contracted into a very short neck, 1- or 2-leaved at apex. Leaves

usually papery, plicate, usually contracted at base into a short petiole-like stalk, usually deciduous or falling in winter. Inflorescences 1 or 2, arising from base of an old pseudobulb, erect, appearing either before or after leaves, 1- or 2-flowered; floral bracts often colorful, persistent. Flowers large, usually showy, opening widely, sometimes fragrant. Sepals usually free, similar. Petals similar to but usually slightly narrower than sepals; lip conspicuously larger than sepals, entire or obscurely 3-lobed, sometimes basally adnate to column base, apical margin erose or lacerate; disk with a callus consisting of 2 to several lamellae or rows of papillae extending along central veins. Column slightly arcuate, slender, winged above, apex usually erose; pollinia 4, in 2 pairs, waxy, often obovoid and bilaterally flattened. Capsule fusiform, with 3 longitudinal ribs.

About 26 species: from Nepal, across C, S, and E China and Bhutan, south to Laos, Myanmar, Thailand, and Vietnam; 23 species (12 endemic) in China.

- 1a. Pseudobulb 2-leaved.
- 2a. Plants spring-flowering; leaves developing at flowering.
- 3a. Lip much broader than long, apex obtuse or emarginate; callus on disk composed of 5–9 lacerate lamellae ..... 5. *P. scopulorum*
- 3b. Lip ca. as broad as long, apex subacute; callus on disk composed of 5–9 rows of papillae that grade into lacerate lamellae midway along mid-lobe ..... 6. *P. kaatia*
- 2b. Plants autumn-flowering; leaves deciduous or withered at flowering.
- 4a. Sheaths on pseudobulb warty; pseudobulb green, mottled purplish brown; column 35–45 mm ..... 3. *P. praecox*
- 4b. Sheaths on pseudobulb smooth; pseudobulb green; column 14–20 mm.
- 5a. Pseudobulb turbinate to pyriform, usually with a short, indistinct neck; lip 3-lobed at or below middle; apical margin of lip erose; column 17–20 mm ..... 1. *P. maculata*
- 5b. Pseudobulb ovoid-conic or flask-shaped, apex contracted into an elongate neck; lip 3-lobed above middle; apical margin of lip emarginate and undulate, not erose; column 14–17 mm ..... 2. *P. autumnalis*
- 1b. Pseudobulb 1-leaved.
- 6a. Plants autumn-flowering; pseudobulb turbinate, dorsiventrally flattened, much thicker than tall; sepals fused in basal half and forming a tube ..... 4. *P. saxicola*
- 6b. Plants spring-flowering; pseudobulb ovoid to conic, taller than thick; sepals free to base.
- 7a. Callus on lip composed of rows of individual papillae.
- 8a. Sepals and petals white.
- 9a. Lip base saccate and with a short spur 1–2 mm ..... 10. *P. albiflora*
- 9b. Lip base neither saccate nor spurred ..... 11. *P. humilis*
- 8b. Sepals and petals pink, rose-purple, pale purplish red, or purple.
- 10a. Sepals 39–50 mm; petals strongly reflexed ..... 9. *P. aurita*
- 10b. Sepals 20–35(–45) mm; petals spreading, not reflexed.
- 11a. Lip with 7 rows of papillae; plants often stoloniferous ..... 7. *P. hookeriana*
- 11b. Lip with 6 rows of papillae; plants not stoloniferous ..... 8. *P. chunii*
- 7b. Callus on lip composed of entire, erose, lacerate, or denticulate lamellae.
- 12a. Flowers orange-yellow, yellow, or yellowish white, sometimes with red, crimson, or brown marks on lip, and sometimes overlaid with purple on sepals and petals.
- 13a. Lamellae on lip entire ..... 13. *P. forrestii*
- 13b. Lamellae on lip slightly erose or erose-lacerate.
- 14a. Sepals and petals yellow, not overlaid with purple ..... 14. *P. ×confusa*
- 14b. Sepals and petals yellow, overlaid with purple ..... 15. *P. ×christianii*
- 12b. Flower white, red, or purple, never tinged with yellow.
- 15a. Floral bract shorter than ovary.
- 16a. Lip purplish, pink, or sometimes white, with purple or deep red spots on lip; lamellae on lip entire or slightly erose ..... 16. *P. yunnanensis*
- 16b. Lip purplish pink, sometimes tinged white, with bold broad purple stripes on apical margin; lamellae on lip ragged ..... 17. *P. ×taliensis*
- 15b. Floral bract ca. as long as or exceeding ovary.
- 17a. Sepals and petals pure white.
- 18a. Dorsal sepal 30–40 mm; lamellae on lip entire ..... 13. *P. forrestii*
- 18b. Dorsal sepal 50–55 mm; lamellae on lip lacerate ..... 18. *P. grandiflora*
- 17b. Sepals and petals bright rose-purple, purplish violet, pink, rose-pink, pale purple, purplish red, or white tinged pink (occasionally pure white in *P. formosana*).
- 19a. Lamellae on lip lacerate ..... 12. *P. ×kohlsii*
- 19b. Lamellae on lip entire, erose, or denticulate.
- 20a. Pseudobulb geniculate-curved; leaf 0.2–1.1 cm wide ..... 23. *P. microphylla*
- 20b. Pseudobulb not curved; leaf 2–7 cm wide.

- 21a. Sepals 28–35 mm; lip 25–40 mm; column 25–30 mm ..... 22. *P. limprichtii*  
 21b. Sepals 35–65 mm; lip 35–55 mm; column 27–45 mm.  
 22a. Lip strongly deflexed at apical 1/3, lacking marks on lateral lobes; disk with 2 or 4 denticulate lamellae ..... 21. *P. pleionoides*  
 22b. Lip not strongly deflexed, with reddish, brownish, or dark purple marks on lateral lobes; disk with 2–5 entire or erose lamellae.  
 23a. Lip usually same color as sepals and petals; disk with 4 or 5 erose, uninterrupted lamellae ..... 19. *P. bulbocodioides*  
 23b. Lip usually different in color from sepals and petals; disk with 2–5 entire or erose, usually interrupted lamellae ..... 20. *P. formosana*

**1. *Pleione maculata*** (Lindley) Lindley & Paxton, Paxt. Fl. Gard. 2: [5]. 1851.

秋花独蒜兰 qiu hua du suan lan

*Coelogyne maculata* Lindley, Gen. Sp. Orchid. Pl. 43. 1830; *C. arthuriana* H. G. Reichenbach; *C. diphylla* (Lindley & Paxton) Lindley; *Pleione diphylla* Lindley & Paxton; *P. maculata* var. *arthuriana* (H. G. Reichenbach) Rolfe ex Kraenzlin; *P. maculata* var. *virginia* H. G. Reichenbach.

Herbs, epiphytic. Pseudobulb green, turbinate to pyriform, 1–3 × 1–1.5 cm, usually with a short, indistinct neck, often enclosed in persistent, smooth sheaths, 2-leaved. Leaves elliptic-lanceolate to oblanceolate, 10–20 × 1.5–3.5 cm, papery, apex acute. Inflorescence appearing after leaves have fallen, erect; peduncle completely enclosed in several membranous sheaths, 5–6 cm; floral bract cucullate, broadly obovate or suborbicular when flattened, 17–30 mm, exceeding ovary, apex obtuse. Flower solitary, suberect or spreading horizontally, fragrant, white or occasionally tinged purplish red, lip with a yellow center and purple blotches on apical margin. Dorsal sepal oblong-lanceolate, 30–40 × 7–9 mm, apex obtuse; lateral sepals broadly lanceolate, falcate, slightly oblique, 30–40 × 8–10 mm, apex acute. Petals oblanceolate, ± falcate, 30–42 × 7–8 mm, apex acute; lip ovate-oblong, 25–35 × 20–25 mm, conspicuously 3-lobed at or below middle; lateral lobes small; mid-lobe 10–13 mm, margin erose, apex emarginate; disk with 5–7 papillate-toothed lamellae; central 2 or 3 lamellae arising at base of lip, all extending almost to apex of lip. Column ± arcuate, 17–20 mm, apex irregularly erose-toothed. Fl. Oct–Nov.  $2n = 40$ .

On tree trunks and mossy rocks in broad-leaved forests; 600–1600 m. W Yunnan [Bhutan, India, Myanmar, Nepal, N Thailand].

In the wild, *Pleione maculata* occasionally crosses with *P. praecox* to produce the hybrid *P. ×lagenaria* Lindley & Paxton, the presence of which in China has not yet been confirmed.

**2. *Pleione autumnalis*** S. C. Chen & G. H. Zhu, Harvard Pap. Bot. 4: 429. 1999.

长颈独蒜兰 chang jing du suan lan

Herbs, lithophytic. Pseudobulb green, ovoid-conic or flask-shaped, 2.5–4 × 1–1.4 cm, apex contracted into an elongate neck ca. 7 mm, 2-leaved. Leaves falling prior to flowering. Inflorescence erect; peduncle partly or nearly completely enclosed in sheaths, 2–4 cm; floral bract oblong-obovate, 18–22 × 10–13 mm, apical margin usually crisped-erose, apex obtuse. Flower solitary, white; pedicel and ovary 1.5–2 cm. Dorsal se-

pal oblong-obovate, 33–37 × 9–10 mm, 5–7-veined, apex subacute; lateral sepals slightly oblique. Petals oblong-lanceolate, slightly oblique toward apex, 32–36 × 8–9 mm, 5–7-veined, apex acute; lip broadly ovate or suborbicular when flattened, 23–37 × 24–28 mm, 3-lobed above middle; lateral lobes erect, orbicular, margin undulate, apex rounded; mid-lobe subsquare-ovate or subsquare-orbicular, 10–12 × 12–14 mm, margin undulate, apex emarginate; disk with 2 or 3 broad stripes and densely warty on lateral lobes, and with 7 rows of sparse papillae along central veins, 5 of them extending from near base of lip. Column arcuate, subclavate, 14–17 mm; column wings dilated. Capsule oblanceolate-oblong, ca. 25 × 7–8 mm. Fl. Nov.

• On rocks. SW Yunnan.

**3. *Pleione praecox*** (Smith) D. Don, Prodr. Fl. Nepal. 37. 1825.

疣鞘独蒜兰 you qiao du suan lan

*Epidendrum praecox* Smith, Exot. Bot. 2: 73. 1806; *Coelogyne birmanica* H. G. Reichenbach; *C. praecox* (Smith) Lindley; *C. reichenbachiana* T. Moore & Veitch; *C. wallichiana* Lindley; *Cymbidium praecox* (Smith) Lindley; *Dendrobium praecox* (Smith) Smith; *Pleione birmanica* (H. G. Reichenbach) B. S. Williams; *P. concolor* B. S. Williams; *P. praecox* var. *birmanica* (H. G. Reichenbach) Grant; *P. praecox* var. *reichenbachiana* (T. Moore & Veitch) Torelli & Riccaboni; *P. praecox* var. *wallichiana* (Lindley) E. W. Cooper; *P. reichenbachiana* (T. Moore & Veitch) Kuntze; *P. wallichiana* (Lindley) Lindley & Paxton.

Herbs, epiphytic. Pseudobulb green, mottled purplish brown, usually turbinate, 1.5–4 × 1–2.3 cm, apex abruptly contracted into a conspicuous neck, outer sheaths warty, 2- or rarely 1-leaved. Leaves elliptic-obovate to elliptic, 9–20 × 1.7–6.7 cm, papery, base attenuate into a petiole-like stalk 2–6.5 cm, apex acuminate. Inflorescence appearing after leaves have fallen or withered, erect; peduncle 5–10 cm, with 3 papillate sheaths; floral bract oblong-obovate, 25–30 × 15–20 mm, exceeding ovary, apex acute. Flower solitary or rarely 2, large, pink to purplish red, rarely white, with a yellow callus and occasionally with purple spots on lip. Dorsal sepal suboblong-lanceolate, 55–60 × 7–8 mm, apex acute; lateral sepals slightly oblique, slightly wider at base than dorsal sepal, apex acute. Petals linear-lanceolate, slightly falcate, 50–70 × 4–6 mm, apex acute; lip obovate-elliptic or elliptic, 40–50 × ca. 30 mm, obscurely 3-lobed; lateral lobes inconspicuous; mid-lobe lacerate on apical margin, apex emarginate; disk with 3–5 rows of papil-

lae extending from base of lip to midway along mid-lobe. Column  $\pm$  arcuate, 35–45 mm, apex irregularly toothed. Fl. Sep–Oct.  $2n = 40$ .

On tree trunks and mossy rocks in forests, cliffs; 1200–2500(–3400) m. SE Xizang, SE and SW Yunnan [Bangladesh, Bhutan, NE India, Laos, Myanmar, Nepal, N Thailand, N Vietnam].

**4. *Pleione saxicola*** Tang & F. T. Wang ex S. C. Chen, *Acta Phytotax. Sin.* 25: 473. 1987.

岩生独蒜兰 yan sheng du suan lan

Herbs, epiphytic or terrestrial. Pseudobulb dark green, turbinate, dorsiventrally flattened, 0.7–1.1  $\times$  1–2 cm, apex abruptly contracted into a conspicuous neck, outer sheaths slightly warty, 1-leaved. Leaf developing at flowering, suboblong-lanceolate to oblanceolate, 10–18  $\times$  1.7–3.7 cm, papery, base attenuate into a petiole-like stalk 3–7 cm, apex acute. Inflorescence erect; peduncle 7–10 cm, with 2 or 3 membranous sheaths at base; floral bract oblanceolate, 20–30  $\times$  ca. 10 mm, exceeding ovary, apex acute. Flower solitary, large, to 10 cm in diam., rose-red with a white base and a yellow or white callus on lip. Sepals fused in basal half and forming a tube; dorsal sepal oblanceolate, ca. 63  $\times$  8 mm, apex acute; lateral sepals slightly oblique, slightly wider at base than dorsal sepal, apex acute. Petals oblanceolate, slightly shorter and narrower than sepals, apex acute; lip broadly elliptic, ca. 55  $\times$  22–25 mm, base cuneate and with a claw ca. 13 mm, distinctly 3-lobed above middle; lateral lobes broadly ovate, 3–4  $\times$  4–5 mm, margin undulate-crenate; mid-lobe suborbicular, ca. 8  $\times$  15 mm, apex rounded and slightly irregularly crenulate; disk with 3 entire or slightly undulate lamellae extending from base of lip to midway along disk. Column  $\pm$  arcuate, 40–46 mm, apex irregularly toothed. Fl. Sep.

Cliffs along streams; 2400–2500 m. SE Xizang, NW Yunnan [Bhutan].

**5. *Pleione scopulorum*** W. W. Smith, *Notes Roy. Bot. Gard. Edinburgh* 13: 218. 1921.

二叶独蒜兰 er ye du suan lan

*Bletilla scopulorum* (W. W. Smith) Schlechter; *Jimensia scopulorum* (W. W. Smith) Garay & R. E. Schultes.

Herbs, terrestrial. Pseudobulb green, usually ovoid, slightly oblique, 1–2.5  $\times$  0.6–1.5 cm, tapering at apex into a conspicuous long neck, 2-leaved. Leaves developing at flowering, lanceolate, oblanceolate, or narrowly elliptic, 4–13  $\times$  1–2.3 cm, papery, base attenuate into a petiole-like stalk enclosed in tubular sheaths, apex acute. Inflorescence erect; peduncle 12–18 cm, lacking sheaths; floral bract oblanceolate, 18–27 mm, shorter than or almost as long as ovary, apex obtuse to acute. Flowers solitary or rarely 2 or 3, rose-purple or rarely white and tinged pale purplish blue, usually with a yellow center and dark purple spots on lip, sepals and petals rarely yellow. Dorsal sepal elliptic-lanceolate or narrowly ovate, 25–32  $\times$  7–9 mm, apex acuminate; lateral sepals obliquely elliptic, 21–30  $\times$  8–10 mm, apex apiculate. Petals oblanceolate or narrowly ovate-oblong, 25–32  $\times$  7–9 mm, apex subacute or obtuse; lip transversely elliptic or suboblate, 20–25  $\times$  25–30 mm, much broader than long, obscurely 3-lobed, apical margin denticulate, apex obtuse and sometimes emarginate; disk with 5–9 lacerate lamellae ex-

tending from base of lip to midway along mid-lobe; lamellae 1–1.5 mm tall. Column  $\pm$  arcuate, 15–20 mm; column wings very narrow below middle, dilated above, to 5 mm tall at apex, apex irregularly dentate. Capsule fusiform-oblong, 20–30 mm. Fl. May–Jul, fr. Oct.  $2n = 40$ .

Rocky grasslands in coniferous forests, mossy rocks along streams, subalpine scrubby meadows; 2800–4200 m. SE Xizang, NW and SW Yunnan [NE India, Myanmar].

**6. *Pleione kaatiae*** P. H. Peeters, *Richardiana* 3: 132. 2003.

卡氏独蒜兰 ka shi du suan lan

Herbs, terrestrial. Pseudobulb green, ovoid or conic, slightly oblique, 1–2  $\times$  1.5–1.8 cm, 2-leaved. Leaves developing at flowering, lanceolate, oblanceolate, or narrowly elliptic, 4–10  $\times$  1–2 cm, papery, base attenuate into a petiole-like stalk enclosed in tubular sheaths, apex acute. Inflorescence erect; peduncle 10–13 cm, lacking sheaths; floral bract lanceolate, 18–22 mm, shorter than or almost as long as ovary, apex obtuse to acute. Flower solitary, rose-purple, tinged pale purplish blue, usually with a yellow center and dark purple spots on lip. Dorsal sepal elliptic-lanceolate, 30–32  $\times$  7–9 mm, apex acuminate; lateral sepals obliquely elliptic, 28–30  $\times$  8–10 mm, apex apiculate. Petals narrowly oblanceolate, 30–32  $\times$  ca. 7 mm, apex acute; lip broadly ovate, 20–25  $\times$  25–30 mm, usually ca. as broad as long, obscurely 3-lobed, apical margin erose, apex subacute; disk with 5–9 rows of papillae extending from base of lip and grading into lacerate lamellae midway along mid-lobe; papillae 1–1.5 mm tall. Column  $\pm$  arcuate, 18–20 mm; column wings very narrow below middle, dilated above, to 5 mm tall at apex, apex irregularly dentate. Capsule fusiform-oblong, 14–20 mm. Fl. Jun–Jul, fr. Oct.

• Rocky grasslands in coniferous forests, mossy rocks along streams, subalpine scrubby meadows. W Sichuan.

This species is very closely allied to *Pleione scopulorum* but differs in having a distinctive ovoid pseudobulb, smaller flowers with narrower, falcate petals, and a narrower lip with a subacute apex and a predominantly papillose rather than lamellate callus.

**7. *Pleione hookeriana*** (Lindley) Rollisson, *Gen. Cat., Orchids*, 43. 1876–1878.

毛唇独蒜兰 mao chun du suan lan

*Coelogyne hookeriana* Lindley, *Fol. Orchid.* 5(Coelogyne): 14. 1854; *C. hookeriana* var. *brachyglossa* H. G. Reichenbach; *Pleione hookeriana* var. *brachyglossa* (H. G. Reichenbach) Rolfe; *P. laotica* Kerr.

Herbs, epiphytic. Pseudobulb green or purple, ovoid to conic, 1–2  $\times$  0.5–1 cm, base sometimes attached to a slender rhizome, 1-leaved. Leaf still immature or not developing at flowering, elliptic-lanceolate or suboblong, 6–10  $\times$  2–2.8 cm, papery, base attenuate into a petiole-like stalk 2–3 cm, apex acute. Inflorescence erect; peduncle 6–10 cm, with several membranous sheaths below middle; floral bract suboblong, 10–17  $\times$  4–5 mm, apex obtuse. Flower solitary, small; sepals and petals pale purplish red to nearly white, lip white with a yellow center and purple or yellowish brown spots; pedicel and ovary 10–20 mm. Dorsal sepal suboblong or oblanceolate, 20–35(–45)  $\times$  6–10 mm, apex acute; lateral sepals lanceolate, fal-

cate, slightly oblique, usually as wide as but slightly shorter than dorsal sepal, apex acute. Petals oblanceolate, 20–35 × 5–7 mm, apex acute; lip oblate or subcordate, 25–40 × 27–45 mm, obscurely 3-lobed, apical margin irregularly denticulate or almost entire, apex emarginate; disk with 7 rows of papillae extending along central veins from near base of lip almost to apex of mid-lobe; hairs to ca. 2 mm tall. Column ± arcuate, 15–26(–30) mm; column wings very narrow below middle, dilated above, to 6–10 mm tall at apex, apex usually slightly denticulate. Capsule suboblong, 10–25 mm. Fl. Apr–Jun, fr. Sep.  $2n = 40$ .

On tree trunks, mossy rocks and cliffs at thicket margins; 1600–3100 m. N Guangdong, N and W Guangxi, SE Guizhou, S Xizang, SE Yunnan [Bhutan, NE India, N Laos, Myanmar, Nepal, ?Thailand].

**8. *Pleione chunii*** C. L. Tso, Sunyatsenia 1: 148. 1933.

陈氏独蒜兰 *chen shi du suan lan*

*Pleione hookeriana* (Lindley) Rollisson var. *sinensis* G. Kleinhaus ex Torelli & Riccaboni; *P. milanii* Braem.

Herbs, terrestrial or lithophytic. Pseudobulbs usually clustered in large colonies, green or pale green, pyriform to conic, 2.5–4.5 × ca. 1.2 cm, tapering at apex into a conspicuous neck, 1-leaved. Leaf elliptic-lanceolate or narrowly elliptic, 6–20 × 2–3(–4.6) cm, apex acute. Inflorescence appearing with young leaf, erect; peduncle 5–7 cm, enclosed in tubular sheaths at base; floral bracts green, narrowly elliptic-oblanceolate, ca. 25 × 10–15 mm. Flowers solitary or rarely 2, large, pale pink to rose-purple, often paler toward base, lip white with a longitudinal yellow or orange-yellow stripe at center and brown-red spotted toward apex; pedicel and ovary 16–20 mm. Dorsal sepal narrowly elliptic or oblong-elliptic, 24–35 × 7–10 mm, apex subacute; lateral sepals obliquely elliptic, slightly shorter and wider than dorsal sepal, apex subacute. Petals spreading, oblanceolate or spatulate, 24–33 × 5–9 mm, apex rounded or obtuse; lip broadly flabellate when flattened, 20–25 × 25–30 mm, obscurely 3-lobed above middle, lateral margins erect and embracing column, apical margin dentate or irregularly erose, apex emarginate; disk with 6 rows of long papillae extending from base of lip almost to apex of mid-lobe. Column 20–23 mm; column wings very narrow below middle, dilated above, apex irregularly denticulate. Fl. Apr–May.

• Forests; 1400–2800 m. N Guangdong, Guangxi, Guizhou, Hubei, W Yunnan.

This species is treated by some authorities as a variety of *Pleione hookeriana*. Indeed, it is very similar in its lip shape and flower color. However, *P. chunii* has distinct pseudobulbs and larger flowers with a callus on the lip composed of six rows of papillae. It has been confused with *P. aurita*, but that species has a distinct floral morphology and bright rose-purple flowers.

**9. *Pleione aurita*** P. J. Cribb & H. Pfennig, Orchidee (Hamburg) 39: 111. 1988.

艳花独蒜兰 *yan hua du suan lan*

Herbs, epiphytic. Pseudobulb green or pale green, conic, somewhat angular in cross section, 2–4 × 1–2 cm, 1-leaved. Leaf erect, oblanceolate, 8–18 × 2–4 cm, apex acute. Inflorescence erect; peduncle 5–7 cm; floral bract pale pink with darker

veins, narrowly elliptic-oblanceolate, cucullate, ca. 25 × 10–15 mm, apex acute or subacute. Flower solitary, showy, pale pink, rose-pink, or purple, paler toward base of floral segments, lip with a yellow or orange-yellow stripe at center; pedicel and ovary green, arcuate, 16–20 mm, 6-ribbed. Dorsal sepal hooded over column, narrowly elliptic or oblong-elliptic, 39–50 × 11–15 mm, apex subacute; lateral sepals porrect or spreading weakly, obliquely elliptic, 39–43 × 14–16 mm, apex subacute. Petals strongly reflexed, oblanceolate or spatulate, 39–43 × 14–19 mm, apex obtuse or rounded; lip broadly flabellate when flattened, deeply cucullate, 39–40 × 50–60 mm, obscurely 3-lobed toward apex, apical margin undulate and irregularly erose, apex emarginate; disk with 4 or 5 rows of long papillae extending from base of lip to ca. 5 mm from apex of mid-lobe. Column clavate, 25–30 mm, apex irregularly dentate; column wings narrow. Fl. Apr–May.

• Montane forests; 1400–2800 m. W Yunnan.

**10. *Pleione albiflora*** P. J. Cribb & C. Z. Tang, Bot. Mag. 184: 117. 1983.

白花独蒜兰 *bai hua du suan lan*

Herbs, epiphytic or lithophytic. Pseudobulb ovoid-conic, 3–4.5 × 0.8–1.8 cm, with an elongated neck, 1-leaved. Leaf immature at anthesis, lanceolate, falcate, apex acute. Inflorescence erect; peduncle 3–13 cm, covered by 3 or 4 membranous sheaths except at apex; floral bracts erect, obovate, 20–35 mm, apex rounded or truncate. Flower solitary, nodding, fragrant, white, rarely with pale mauve lines on sepals and petals, lip with bold crimson, brown, or brownish yellow central stripes or tinged purple at apex; pedicel and ovary 20–30 mm. Sepals narrowly elliptic, 44–55 × 8–10 mm, apex obtuse. Petals oblanceolate, 45–55 × 8–9 mm, apex obtuse or subrounded; lip broadly ovate, 45–57 × 30–40 mm, obscurely 3-lobed, apical margin lacerate, base saccate and forming a short spur 1–2 mm; lateral lobes incurved; disk with 5 rows of long papillae in apical half of lip. Column slightly arcuate, 33–40 mm, apex without teeth. Fl. Apr–May.

On tree trunks or mossy rocks and cliffs in shaded places; 2400–3300 m. NW Yunnan [N Myanmar].

**11. *Pleione humilis*** (Smith) D. Don, Prodr. Fl. Nepal. 37. 1825.

矮小独蒜兰 *ai xiao du suan lan*

*Epidendrum humile* Smith, Exot. Bot. 2: 75. 1806; *Coelogyne humilis* (Smith) Lindley; *C. humilis* var. *albata* H. G. Reichenbach; *C. humilis* var. *tricolor* H. G. Reichenbach; *Pleione diantha* Schlechter; *P. humilis* var. *adnata* Pfitzer; *P. humilis* var. *pulchella* E. W. Cooper; *P. humilis* var. *purpurascens* Pfitzer.

Herbs, epiphytic or lithophytic. Pseudobulb olive-green, flask-shaped with a long neck, 2–6 × 0.8–2 cm, apex with 1 leaf. Leaf oblanceolate to elliptic, 18–25 × 2.8–3.5 cm, apex acute. Inflorescence produced before leaf, 1- or 2-flowered; peduncle clothed in scarious sheaths; floral bract obovate, 20–32 × 8–12 mm, apex subacute to obtuse. Flowers spreading to nodding; sepals and petals white, lip white, spotted and streaked with crimson or yellow-brown with a central pale yellow zone;

pedicel and ovary 2–3 cm. Dorsal sepal linear-oblongate, 34–47 × 6–7 mm, apex subacute; lateral sepals obliquely oblanceolate, 40–53 × 70–90 mm, apex subacute. Petals obliquely linear-oblongate, 31–42 × 5–7 mm, apex rounded; lip oblong-elliptic, obscurely 3-lobed in front, 34–44 × 25–31 mm, base saccate, margin lacerate in apical half, apex emarginate; lateral lobes erect-incurved, callus consisting of 5–7 barbate lamellae. Column 26–28 mm, broadly winged, apex irregularly dentate.

Epiphytic in moss, on *Rhododendron* and other tree species, plants often forming rings or collars around trunks or branches; 1800–3200 m. SE Xizang [Bhutan, NE India (Assam, Manipur, Sikkim), Myanmar, Nepal].

*Pleione humilis* is known from NE India, and almost certainly grows in adjacent parts of SE Xizang (indeed, it was noted from there by Press et al., Annot. Checkl. Fl. Pl. Nepal, 224. 2000). However, the present authors found no relevant specimens and therefore could not substantiate the occurrence of this species in China.

**12. *Pleione ×kohlsii*** Braem, Schlechteriana 2: 168. 1991.

春花独蒜兰 chun hua du suan lan

Herbs, terrestrial or possibly epiphytic. Pseudobulb green, pyriform, 3–4.5 × 1–1.7 cm, 1-leaved. Leaf erect, green, 10–20 × 2–5 cm. Inflorescence appearing with young leaf, erect; peduncle ca. 7 cm; floral bracts narrowly elliptic to oblanceolate, 24–28 × ca. 4 mm, exceeding ovary. Flower solitary, purplish violet or pink, lip tinged pale yellow with a yellow throat and with reddish brown spots and stripes. Dorsal sepal narrowly elliptic, 40–45 × 10–14 mm, apex obtuse; lateral sepals narrowly suboblong-elliptic, 40–45 × 12–14 mm, apex obtuse. Petals falcate, oblanceolate, 40–45 × 8–10 mm, narrower than sepals, apex obtuse or subacute; lip orbicular when flattened, obscurely 3-lobed, lateral margins erect and embracing column, apical margin lacerate, apex emarginate; lateral lobes narrowly subelliptic, margin minutely erose; disk with 5 lacerate lamellae. Column clavate, 25–28 mm.

- Forests; 2400–2800 m. W Yunnan.

This entity is thought to be a natural hybrid between *Pleione forrestii* and *P. aurita*.

**13. *Pleione forrestii*** Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 106. 1912.

黄花独蒜兰 huang hua du suan lan

Herbs, epiphytic or lithophytic. Pseudobulb green, conic or ovoid-conic, 1.5–3 × 0.6–1.8 cm, 1-leaved. Leaf appearing after flowering, subelliptic to narrowly elliptic-lanceolate, 10–15 × 3–7 cm, papery, base attenuate into a petiole-like stalk 2–3 cm, apex acute or obtuse. Inflorescence erect; peduncle usually 4–9 cm, nearly completely enclosed in 3 or 4 scarious sheaths; floral bracts oblong-lanceolate or lanceolate, 27–33 × 5–7 mm, conspicuously longer than ovary, apex obtuse or subacute. Flower solitary, orange-yellow, pale yellow, or yellowish white, rarely pure white, with brown or crimson spots and marks on lip; pedicel and ovary 9–15 mm. Dorsal sepal oblanceolate, 30–40 × 7–8 mm, apex acute; lateral sepals oblong-oblanceolate, oblique, 30–40 × 8–9 mm, apex obtuse. Petals oblanceolate, falcate, 36–42 × 7–8 mm, apex subacute; lip broadly obovate-elliptic or nearly broadly rhombic, 32–40 × 28–32 mm, base

contracted into a short claw, 3-lobed; lateral lobes erect and embracing column, apex rounded; mid-lobe subquadrate, apical margin lacerate, apex emarginate; disk with 5–7 entire but usually slightly undulate lamellae extending from base of lip to midway along mid-lobe. Column arcuate, 25–30 mm; column wings obscure. Fl. Mar–May.  $2n = 38^*$ ,  $39^*$ ,  $40^*$ ,  $42^*$ ,  $44^*$ .

- On humus-covered rocks and tree trunks in open forests and at forest margins; 2200–3200 m. N and NW Yunnan.

Reviewer L. Averyanov notes that *Pleione forrestii* also occurs in N Vietnam. However, the present authors could not substantiate this record because they found no relevant specimens.

1a. Sepals and petals orange-yellow to pale yellow ..... 13a. var. *forrestii*

1b. Sepals and petals pure white ..... 13b. var. *alba*

**13a. *Pleione forrestii* var. *forrestii***

黄花独蒜兰(原变种) huang hua du suan lan (yuan bian zhong)

Flower orange-yellow to pale yellow with brown or crimson spots and marks on lip. Fl. Apr–May.

- On humus-covered rocks and tree trunks in open forests and at forest margins; 2200–3200 m. NW Yunnan.

**13b. *Pleione forrestii* var. *alba*** (H. Li & G. H. Feng) P. J. Cribb in P. J. Cribb & Butterfield, Gen. *Pleione*, ed. 2, 88. 1999.

白瓣独蒜兰 bai ban du suan lan

*Pleione alba* H. Li & G. H. Feng, Acta Bot. Yunnan. 6: 193. 1984; *P. forrestii* f. *alba* (H. Li & G. H. Feng) Torelli & Riccaboni.

Flower pure white, with crimson marks on apical part of lip. Fl. Mar–Apr.

- Mixed forests; 2700–3100 m. N Yunnan (Dayao).

**14. *Pleione ×confusa*** P. J. Cribb & C. Z. Tang, Bot. Mag. 184: 126. 1983.

芳香独蒜兰 fang xiang du suan lan

Herbs, terrestrial or lithophytic. Pseudobulb green or dark olive-green, conic-ovoid, 2–2.5 × 2–2.5 cm, 1-leaved. Leaf not developing at flowering, elliptic-lanceolate to oblanceolate, 10–15 × 3–4 cm, apex acuminate. Inflorescence erect or suberect; peduncle reddish, 2–5 cm; floral bract pale maroon with deeper venation, oblanceolate, ca. 25 × 10–15 mm, apex acute. Flower solitary, primrose-yellow to pale yellow, with red marks on lip, fragrant. Sepals elliptic-lanceolate, 37–42 × 7–12 mm, apex acute; lateral sepals slightly oblique, slightly wider than dorsal sepal. Petals oblanceolate, 38–42 × 7–9 mm, apex acute; lip ovate-orbicular, 25–32 × 30–35 mm, obscurely 3-lobed, apical margin lacerate, apex emarginate; disk with 4–6 erose-lacerate lamellae. Column 35–40 mm; column wings obscure. Fl. Apr–May.  $2n = 40$ .

NW Yunnan [N Myanmar].

This entity is thought to be a natural hybrid between the yellow-flowered *Pleione forrestii* and the white-flowered *P. albiflora*. Its flower

is pale yellow, very similar in color to, but a little paler than, that of *P. forrestii*. The lamellae on the lip are lacerate, not entire as in *P. forrestii* or fimbriate as in *P. albiflora*.

**15. *Pleione ×christianii*** H. Perner, *Orchidee Beih.*, Deutsch. Orchid. Ges. 6: 12. 1999.

滇西独蒜兰 dian xi du suan lan

Pseudobulb 1-leaved at apex. Flower solitary, yellow overlaid with purple on sepals and petals, boldly striped with red on apical half of lip; lip 3-lobed; disk with 5 slightly erose lamellae. Fl. Apr–May.

• W Yunnan.

This entity is thought to be a natural hybrid between *Pleione forrestii* and *P. yunnanensis*. It can be distinguished easily from the two by the color of the flower.

**16. *Pleione yunnanensis*** (Rolfe) Rolfe, *Orchid Rev.* 11: 292. 1903.

云南独蒜兰 yun nan du suan lan

*Coelogyne yunnanensis* Rolfe, *J. Linn. Soc., Bot.* 36: 23. 1903; *Pleione chiwuana* Tang & F. T. Wang; *P. yunnanensis* var. *chiwuana* (Tang & F. T. Wang) G. Kleinhaus ex Torelli & Riccaboni.

Herbs, terrestrial or lithophytic. Pseudobulb green, ovoid, narrowly ovoid, or conic, 1.5–3 × 1–2 cm in diam., 1-leaved. Leaf very immature or undeveloped at anthesis, lanceolate to narrowly elliptic, 6.5–25 × 1–3.5 cm, papery, base attenuate into a petiole-like stalk 1–6 cm, apex acuminate or subacute. Inflorescence erect; peduncle 10–20 cm, with several sheaths below middle; floral bracts obovate to obovate-oblong, 20–30 × 5–8 mm, shorter than ovary, apex obtuse. Flowers solitary or rarely 2, purplish, pink, or sometimes white, with purple or deep red spots on lip; pedicel and ovary 30–45 mm, usually deep red. Dorsal sepal oblong-oblancoate, 35–40 × 6–8 mm, apex obtuse; lateral sepals oblong-lanceolate or elliptic-lanceolate, slightly oblique, 35–40 × 6–10 mm, usually slightly wider than dorsal sepal, apex obtuse. Petals oblancoate, 35–40 × 5–7 mm, base cuneate, apex obtuse; lip broadly obovate, 30–40 × 25–30 mm, 3-lobed; lateral lobes erect and loosely embracing column, broad, apex rounded; mid-lobe subquadrate, apical margin irregularly erose-lacerate, apex emarginate; disk with 3–5 entire or slightly erose lamellae extending from base of lip to base of mid-lobe. Column ± arcuate, 18–23 mm; column wings very narrow below middle, dilated above, apex 5–6 mm tall and irregularly dentate at apex. Capsule fusiform-cylindric, 25–30 × ca. 12 mm. Fl. Apr–May, fr. Sep–Oct.  $2n = 40, 120$ .

On mossy rocks in forests and at forest margins, shaded and rocky places on grassy slopes and under ericaceous shrubs; 1100–3500 m. N and W Guizhou, SW Sichuan, SE Xizang, NW and SE Yunnan [N Myanmar].

**17. *Pleione ×taliensis*** P. J. Cribb & Butterfield, *Gen. Pleione*, ed. 2, 123. 1999.

大理独蒜兰 da li du suan lan

Pseudobulb 1-leaved. Leaf not fully developed at flowering. Floral bract shorter than ovary. Flower purplish pink,

sometimes tinged white, with bold broad purple stripes on apical margin of lip; disk with 4 or 5 ragged lamellae. Fl. Apr–May.

• Grassy and shrubby banks, under ericaceous shrubs and trees, under *Pinus yunnanensis*; 2400–2700 m. NW Yunnan.

This entity is thought to be a natural hybrid of *Pleione yunnanensis* and *P. bulbocodioides*. It is similar to *P. yunnanensis* by having an elongate pedicel and ovary, but it differs by having a purplish pink flower, ragged lamellae on the lip, and broad purple stripes on the apical margin of the lip.

**18. *Pleione grandiflora*** (Rolfe) Rolfe, *Orchid Rev.* 11: 291. 1903.

大花独蒜兰 da hua du suan lan

*Coelogyne grandiflora* Rolfe, *J. Linn. Soc., Bot.* 36: 22. 1903; *Pleione barbarae* Braem; *P. braemii* Pinkepank; *P. harbordii* Braem; *P. moelleri* Braem; *P. mohrii* Braem; *P. pinkepankii* Braem & H. Mohr.

Herbs, lithophytic. Pseudobulb green, subconic, 3–4.5 × 1.2–1.5 cm, enclosed by fibrous remains of basal sheaths, 1-leaved. Leaf very immature at anthesis, lanceolate, papery, base attenuate into a petiole-like stalk, apex acute. Inflorescence erect; peduncle 10–15 cm, covered by 3 or 4 membranous sheaths in lower 2/3; floral bracts narrowly elliptic, 23–40 mm, exceeding ovary, apex obtuse. Flower solitary, large, white, sometimes with dark purplish red or brown spots and streaks on lip. Dorsal sepal oblanceolate, 50–55 × 10–15 mm, apex rounded; lateral sepals narrowly elliptic, slightly oblique, 48–55 × 10–15 mm, usually slightly shorter but wider than dorsal sepal, apex obtuse. Petals oblanceolate, falcate, 50–55 × 8–10 mm, apex rounded; lip broadly ovate-elliptic to flabellate, 50–55 × 30–40 mm, obscurely 3-lobed, base narrowed into a claw ca. 10 mm, upper part of lateral margins and apical margin coarsely lacerate, apex emarginate; disk with 4 or 5(–7) irregularly lacerate lamellae. Column arcuate, 38–40 mm, apex not toothed; column wings very narrow. Fl. May.

On rocks in forests; 2600–2900 m. SE and SW Yunnan [N Vietnam].

**19. *Pleione bulbocodioides*** (Franchet) Rolfe, *Orchid Rev.* 11: 291. 1903.

独蒜兰 du suan lan

*Coelogyne bulbocodioides* Franchet, *Nouv. Arch. Mus. Hist. Nat.*, sér. 2, 10: 84. 1888; *C. delavayi* Rolfe; *C. henryi* Rolfe; *C. pogonioides* Rolfe; *Pleione communis* Gagnepain; *P. communis* var. *subobtusa* Gagnepain; *P. delavayi* (Rolfe) Rolfe; *P. fargesii* Gagnepain; *P. ganchuenensis* Gagnepain; *P. henryi* (Rolfe) Schlechter; *P. mairei* Schlechter; *P. rhombilabia* Handel-Mazzetti; *P. smithii* Schlechter.

Herbs, terrestrial or lithophytic. Pseudobulb ovoid to ovoid-conic, with a conspicuous neck, 1–2.5 × 1–2 cm, 1-leaved. Leaf immature at anthesis, developing after flowering, narrowly elliptic-lanceolate or suboblancoate, 10–25 × 2–5.8 cm, papery, base attenuate into a petiole-like stalk 2–6.5 cm, apex acute or acuminate. Inflorescence erect; peduncle 7–20 cm, covered by 3 tubular sheaths below middle; floral bracts

linear-oblong, (20–)30–40 mm, apex obtuse. Flowers solitary or rarely 2, pink to pale purple, with dark purple marks on lip; pedicel and ovary 10–25 mm. Dorsal sepal lanceolate to oblanceolate, 35–50 × 7–9 mm, apex acute or obtuse; lateral sepals narrowly elliptic or oblong-oblanceolate, slightly oblique, 35–50 × 8–10 mm, apex subacute or obtuse. Petals oblanceolate, slightly oblique, 35–50 × 4–7 mm, apex acute; lip obovate or broadly obovate when flattened, 35–45 × 30–40 mm, base cuneate and adnate to column, obscurely 3-lobed, apical margin lacerate; mid-lobe subquadrate, apex emarginate; disk with 4 or 5 rose lamellae 1–1.5 mm tall; central lamella (when present) usually shorter but taller than others. Column ± arcuate, 27–40 mm; column wings very narrow below middle, dilated above, 6–7 mm tall at apex, irregularly dentate. Capsule suboblong, 27–35 mm. Fl. Apr–Jun.  $2n = 40^*$ ,  $120^*$ .

• Humus-covered soil, on mossy rocks in evergreen broad-leaved forests and at thicket margins; 900–3600 m. Anhui, N Fujian, S Gansu, N Guangdong, N Guangxi, Guizhou, Hubei, Hunan, S Shaanxi, Sichuan, SE Xizang, C and NW Yunnan.

**20. *Pleione formosana*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 326. 1911.

台湾独蒜兰 tai wan du suan lan

*Pleione bulbocodioides* (Franchet) Rolfe var. *nivea* (Fukuyama) S. S. Ying; *P. formosana* f. *alba* Torelli & Riccaboni; *P. formosana* f. *nivea* Fukuyama; *P. formosana* var. *nivea* (Fukuyama) Masamune; *P. hookeriana* (Lindley) Rollisson f. *nivea* (Fukuyama) M. Hiroe; *P. hui* Schlechter; *P. pricei* Rolfe.

Herbs, lithophytic, epiphytic, or terrestrial. Pseudobulb green or dark purple, compressed ovoid or ovoid, 1.3–4 × 1.7–3.7 cm, 1-leaved. Leaf immature or developing at anthesis, elliptic or oblanceolate, 10–30 × 3–7 cm, papery, base attenuate into a petiole-like stalk 3–4 cm, apex acute or obtuse. Inflorescence erect; peduncle 7–16 cm, with 2 or 3 membranous sheaths at base; floral bracts linear-lanceolate to narrowly elliptic, 22–40 mm, apex acute. Flowers solitary or rarely 2, sometimes slightly fragrant, rose-pink or occasionally white, lip often yellowish with reddish or brownish marks; pedicel and ovary 15–27 mm. Dorsal sepal narrowly elliptic-oblanceolate or spatulate-oblanceolate, 42–57 × 9–15 mm, apex acute; lateral sepals narrowly elliptic-oblanceolate, slightly oblique, 40–55 × 10–15 mm, apex acute or subacute. Petals linear-oblanceolate, 42–60 × 10–15 mm, apex subacute; lip broadly ovate-elliptic to orbicular when flattened, 40–55 × 30–46 mm, obscurely 3-lobed, apical margin lacerate, apex emarginate; disk with 2–5 entire or erose lamellae; lamellae usually interrupted along their length, central one (when present) shorter than others. Column 28–42 mm, apex obscurely toothed. Capsule dark brown, fusiform, ca. 40 mm. Fl. Mar–Apr.  $2n = 38^*$ ,  $40^*$ ,  $40 + 2B^*$ ,  $42^*$ .

• Humus-covered soil, on rocks in montane forests and at forest margins; 600–1500 m (1500–2500 m in Taiwan). N and W Fujian, SE Jiangxi, Taiwan, S Zhejiang.

**21. *Pleione pleionoides*** (Kraenzlin) Braem & H. Mohr, Orchis 65–66: 124. 1989.

美丽独蒜兰 mei li du suan lan

*Pogonia pleionoides* Kraenzlin, Bot. Jahrb. Syst. 29: 267. 1901; *Pleione amoena* Schlechter; *P. hubeiensis* Torelli & Riccaboni; *P. speciosa* Ames & Schlechter; *P. votolinii* Torelli & Riccaboni.

Herbs, terrestrial or lithophytic. Pseudobulb conic, 2.5–3 × ca. 1.5 cm, surface rough, 1-leaved. Leaf immature at anthesis, elliptic-lanceolate, 14–20 × ca. 2.5 cm, papery, apex acute. Inflorescence erect; peduncle 8–18 cm; floral bracts linear-lanceolate, 25–31 mm, exceeding ovary, apex acute. Flowers solitary or rarely 2, bright rose-purple, with yellow or white lamellae on lip. Dorsal sepal narrowly elliptic, 40–65 × 6–13 mm, apex acute; lateral sepals slightly oblique, 40–65 × 7–14 mm, slightly wider than dorsal sepal, apex acute. Petals oblanceolate, ± falcate, 42–64 × 5–10 mm, apex acute; lip subrhombic to obovate when flattened, 42–55 × 35–42 mm, strongly deflexed at apical 1/3, very obscurely 3-lobed, apical margin denticulate; disk with 2 or 4 denticulate lamellae. Column 35–45 mm. Fl. Jun.  $2n = 40^*$ ,  $80^*$ .

• On humus-covered or mossy rocks, cliffs in forests; 1700–2300 m. Chongqing, Guizhou, W Hubei.

**22. *Pleione limprichtii*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 346. 1922.

四川独蒜兰 si chuan du suan lan

*Pleione bulbocodioides* (Franchet) Rolfe var. *limprichtii* (Schlechter) P. J. Cribb.

Herbs, terrestrial or lithophytic. Pseudobulb green or purple, conic-ovoid, 3–4 × 2–2.5 cm, with an elongated neck, 1-leaved. Leaf immature at anthesis, lanceolate, ca. 13 × 4 cm, papery, apex acute. Inflorescence erect; peduncle 10–12 cm, covered by several sheaths below middle; floral bracts pale purplish red, oblanceolate, 22–25 × 6–8 mm, exceeding ovary, apex acute. Flowers solitary or rarely 2, purplish red to rose-pink, lip with brick-red spots and white lamellae. Dorsal sepal narrowly elliptic, 30–35 × 5–9 mm, apex acute; lateral sepals narrowly elliptic, slightly oblique, 28–35 × 6–10 mm, slightly wider but shorter than dorsal sepal, apex acute. Petals oblanceolate, falcate, 30–35 × 4–5 mm, apex acute; lip suborbicular, 25–40 × 25–35 mm, obscurely 3-lobed toward apex, apical margin lacerate, apex emarginate; disk with 4 irregularly denticulate or erose lamellae. Column ± arcuate, 25–30 mm; column wings very narrow below middle, dilated above. Fl. Apr–May.  $2n = 40$ ,  $80$ .

On humus-covered or mossy rocks, cliffs; 2000–2500 m. SW Sichuan, Yunnan [N Myanmar].

**23. *Pleione microphylla*** S. C. Chen & Z. H. Tsi, Acta Phytotax. Sin. 38: 182. 2000.

小叶独蒜兰 xiao ye du suan lan

Herbs, epiphytic. Pseudobulb ovoid-cylindric, 0.7–1.5 × 0.3–0.5 cm, geniculate-curved, 1-leaved; new pseudobulb arising directly from middle of old one. Leaf not fully developed at flowering, narrowly oblong or oblong-lanceolate, 2–6 × 0.2–1.1 cm, base contracted into a slender petiole-like stalk 1.5–2.8 cm. Inflorescence erect; peduncle 1.7–2 cm; floral bract oblong-lanceolate, 15–22 mm. Flower solitary, white with yellow streaks on lip, petals tinged pale pink toward apex; pedicel

and ovary 7–8 mm. Dorsal sepal oblong-lanceolate, 33–36 × 6–7 mm; lateral sepals oblique. Petals oblanceolate, 31–34 × 4–6 mm; lip orbicular-rhombic, ca. 30 × 28 mm, base narrowed into a distinct claw 7–8 mm, obscurely 3-lobed; margins of lateral lobes slightly undulate and erose; mid-lobe broadly ovate, ca. 12 × 12 mm, apical margin erose, apex emarginate; disk with 2 entire lamellae extending from midway along lip to base of

mid-lobe, interrupted for ca. 2 mm halfway along. Column ca. 32 mm, slender. Fl. Apr.

• S Guangdong.

Like many similar species, the leaf of *Pleione microphylla* begins to emerge at flowering but continues to develop after anthesis. The first hint of the leaf often can be seen in flowering plants in cultivation.

## 111. PANISEA (Lindley) Lindley, Fol. Orchid. 5(Panisea): 1. 1854, nom. cons.

曲唇兰属 qu chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Coelogyne* sect. *Panisea* Lindley, Gen. Sp. Orchid. Pl. 44. 1830; *Androgyne* Griffith; *Sigmatogyne* Pfitzer; *Zetagyne* Ridley.

Herbs, epiphytic or lithophytic. Rhizome creeping. Pseudobulbs close together, cylindrical to ovoid-globose, sometimes prostrate basally, 1- or 2-leaved. Leaves conduplicate, petiolate to subsessile, linear-lanceolate, thinly leathery, acute. Inflorescence synanthous, proteranthous, or heteranthous, 1–8-flowered, erect to decurved; floral bracts persistent, shorter than ovary. Flowers resupinate, variously colored. Sepals free, similar, lateral sepals often oblique or slightly narrower and longer. Petals similar to sepals, often shorter and narrower; lip entire or 3-lobed; lateral lobes small, not clasping column, sometimes basally sigmoid, often with short keels or lamellae. Column ca. as long as or much shorter than lip, with or without stelidia, foot abbreviated or almost absent; anther overhanging; pollinia 4, obliquely obovoid, with caudicles; stigma cup-shaped; rostellum large. Capsule ellipsoid.

Seven species: Bhutan, Cambodia, China, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam; five species (one endemic) in China.

*Panisea albiflora* (Ridley) Seidenfaden (Contr. Revis. Orchid Fl. Cambodia, Laos & Vietnam, 87. 1975; *Zetagyne albiflora* Ridley, J. Nat. Hist. Soc. Siam 4: 118. 1921), described from Vietnam, was recorded from Hainan (Changjiang, 1300–1400 m) by X. Q. Song, Q. W. Meng and Y. B. Luo (Acta Bot. Yunnan. 31: 32. 2009). The present authors could not confirm this because they have not seen the specimen (*X. Q. Song 08003*, PE).

- 1a. Lip with very small lateral lobes ..... 3. *P. uniflora*  
 1b. Lip entire.  
 2a. Lip ecallose.  
 3a. Inflorescences 5–8-flowered ..... 5. *P. demissa*  
 3b. Inflorescences 1- or 2-flowered ..... 4. *P. yunnanensis*  
 2b. Lip with lamellae or callus on disk.  
 4a. Pseudobulbs suberect, borne at some distance from each other on creeping rhizome ..... 1. *P. tricallosa*  
 4b. Pseudobulbs prostrate in lower part, connected to each other by many separate short rhizomes ..... 2. *P. cavaleriei*

1. *Panisea tricallosa* Rolfe, Bull. Misc. Inform. Kew 1901: 148. 1901.

曲唇兰 qu chun lan

*Panisea bia* (Kerr) Tang & F. T. Wang; *P. pantlingii* (Pfitzer) Schlechter; *P. unifolia* S. C. Chen; *Sigmatogyne bia* Kerr; *S. pantlingii* Pfitzer; *S. tricallosa* (Rolfe) Pfitzer.

Rhizome 2–3 mm in diam., branched, rooting on nodes, with membranous sheaths. Pseudobulbs rather dense, often tufted, erect or suberect, brown when dry, narrowly ovoid or subellipsoid, 7–20 × 4–10 mm, wrinkled when dry, base conspicuously contracted, apex 1- or 2-leaved. Leaf blade narrowly elliptic or suboblong, 3–6 × (0.5–)0.8–2.3 cm, acute or obtuse; petiole 4–13 cm. Inflorescence proteranthous, 1-flowered; peduncle 2–3 cm; floral bracts ovate, 3–5 mm, scarious. Flowers pale yellow or greenish, 2–2.5 cm in diam., lip with 3 small spots at base, calli on disk orange, column pale yellow; pedicel and ovary ca. 1 cm. Sepals narrowly ovate, oblong-ovate, or broadly lanceolate, 12–19 × ca. 5 mm, dorsally carinate, 5-veined, acuminate; lateral sepals slightly oblique. Petals ovate-oblong or nearly broadly lanceolate, 13–18 × ca. 4 mm, 3-veined, acute to acuminate; lip obovate-oblong to spatulate, 10–20 × 6–7 mm, sigmoid at base, entire, inconspicuously undu-

late, truncate, apiculate, or subrounded; disk with 2 or 3 short longitudinal lamellae. Column 5–7 mm, both sides winged; wings very narrow in lower part, upper part 1–1.5 mm wide on one side, apex surrounding column and irregularly incised; foot inconspicuous. Capsule subobovoid-ellipsoid, hexagonal, ca. 2 × 1–1.3 cm, each ridge with a wing ca. 1.5 mm wide. Fl. Dec, fr. next May–Jun.  $2n = 40$ .

Epiphytic on tree trunks in forests; below 2100 m. Hainan, S and SW Yunnan [Bhutan, NE India, Laos, Nepal, Thailand, Vietnam].

2. *Panisea cavaleriei* Schlechter, Repert. Spec. Nov. Regni Veg. 20: 383. 1924.

平卧曲唇兰 ping wo qu chun lan

Pseudobulbs connected to one another by many separate short rhizomes, prostrate below middle, upper part curved upward, narrowly oblong or ovate-oblong, 1–2 cm × 7–8 mm, apex 1-leaved. Leaf blade narrowly elliptic to elliptic, 2.6–5 × 1.2–1.6 cm, papery, apex acute or obtuse; petiole 6–12 cm. Inflorescence 1.5–2.5 cm; floral bracts ovate, very small, scarious. Flowers yellowish white; pedicel and ovary 1.2–1.8 cm, slender. Sepals subovate-lanceolate, 13–16(–20) × 5–6 mm, slightly dorsally carinate, 5-veined; lateral sepals oblique, base dilated. Petals shorter and narrower than sepals, thinly textured;

lip obovate-oblong, 16–22 × 7–12 mm, narrowed into a claw from middle to base, concave or shallowly saccate at base, entire, upper margin often irregularly denticulate or ± crisped, apex subtruncate and apiculate, upper part with 2 short longitudinal lamellae; lamellae ca. 1.5 mm, ca. 1 mm high. Column 5–7 mm, winged; wings very narrow in lower part, upper part wider, 1.5–2 mm wide on one side, apex surrounding column and slightly 3-lobed and irregularly denticulate. Fl. Dec–Apr.

• Forests, lithophytic on shaded rocks along rivers; 1700–2100 m. SW Guangxi, SW Guizhou, C and SE Yunnan.

**3. *Panisea uniflora*** (Lindley) Lindley, Fol. Orchid. 5(Panisea): 2. 1854.

单花曲唇兰 dan hua qu chun lan

*Coelogyne uniflora* Lindley, Gen. Sp. Orchid. Pl. 42. 1830; *Chelonistele biflora* (E. C. Parish & H. G. Reichenbach) Pfitzer; *Coelogyne biflora* E. C. Parish & H. G. Reichenbach; *C. falcata* T. Anderson ex J. D. Hooker; *C. thuniana* H. G. Reichenbach; *Pleione thuniana* (H. G. Reichenbach) Kuntze; *P. uniflora* (Lindley) Kuntze.

Rhizome 3–4 mm in diam., rigid, densely covered with brown sheaths. Pseudobulbs tufted, borne 5–15 mm apart, often ± appressed to rhizome, narrowly ovoid to flask-shaped, 1.5–4 cm × 7–13 mm, base contracted, apex 2-leaved. Leaf blade linear-oblong, (5.5–)10–21.5 × 0.8–1.2 cm, acuminate; petiole 1–2 cm. Inflorescence proteranthous or heteranthous, erect, 1-flowered; peduncle 2–4 cm, lower part enclosed in sheaths; floral bracts ovate, 4–6 mm, scarious. Flowers pale apricot to yellowish, lip with 3–7 orange spots on lateral lobes; pedicel and ovary 1.1–1.3 cm. Sepals narrowly ovate-oblong, 19–22 × 5.5–6.5 mm, 5-veined, acuminate or acute. Petals oblong-elliptic or narrowly elliptic, 17–20 × ca. 7 mm, 5-veined, obtuse; lip obovate-elliptic, 1.8–2.2 × 1–1.2 cm, base contracted and shortly clawed, rounded, lower sides with 2 very small lateral lobes; lateral lobes oblong-lanceolate, sometimes slightly falcate, ca. 3 × 1 mm, weakly saccate at base; disk with 2 or 3 obscure keels. Column curved, 8–10 mm, broadly winged; foot ca. 2 mm. Capsule obovoid to ellipsoid, 1.7–2.2 × 1–1.2 cm. Fl. Oct–Mar.  $2n = 40$ .

Epiphytic on trees or lithophytic on rocks in forests; 800–2400 m. S Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**4. *Panisea yunnanensis*** S. C. Chen & Z. H. Tsi, Acta Bot. Yunnan. 2: 301. 1980.

云南曲唇兰 yun nan qu chun lan

Rhizome 2–3 mm in diam., densely covered with brown sheaths. Pseudobulbs tufted, borne 3–6 mm apart, dark green to brown when dry, narrowly ovoid to ovoid, 1.2–2 cm × 4–7 mm, thinly wrinkled, base conspicuously contracted, apex 2-leaved. Leaf blade narrowly oblong or oblong-lanceolate, 25–45 × 4–8 mm, papery, acute or obtuse; petiole 2–4 mm. Inflorescence 2–3 cm, 1- or 2-flowered, base embraced by several scarious sheaths; floral bracts ovate, 3–4 mm, scarious. Flowers white; pedicel and ovary 1.2–1.4 cm. Dorsal sepal narrowly ovate, 11–14 × 3.5–4.5 mm, 5-veined, acuminate; lateral sepals oblong-lanceolate, 11–14 × 2–2.5 mm, dorsally carinate, 3-veined. Petals similar to lateral sepals, but not carinate; lip oblong-spatulate, 11–14 × 3–4 mm, sometimes with slightly thickened veins, attenuate toward base, clawed at base, entire, margin slightly crisped, apex rounded, without lamellae and other appendages. Column 5–7 mm, winged. Fl. Nov–Dec.

Epiphytic on trees or lithophytic on rocks in forests; 1200–1800 m. SE Yunnan [N Vietnam].

**5. *Panisea demissa*** (D. Don) Pfitzer in Engler, Pflanzenr. 32(IV. 50. II. B. 7): 141. 1907.

矮曲唇兰 ai qu chun lan

*Dendrobium demissum* D. Don, Prodr. Fl. Nepal. 34. 1825; *Coelogyne parviflora* Lindley; *Panisea parviflora* (Lindley) Lindley.

Pseudobulbs clustered, narrowly ovoid to ovoid, 1.5–4 × ca. 0.6 cm. Leaves 1 or 2; blade lanceolate or elliptic-lanceolate, 3–8 × 0.7–1.5 cm, acute; petiole 4–8 mm. Inflorescence proteranthous, decurved, laxly 5–8-flowered; peduncle slender, sheathed at base, 1–2 cm; rachis 2–3.5 cm; floral bracts ovate, 6–7 × 1–1.8 mm, acute, membranous, persistent. Flowers 1–1.2 cm in diam., white; pedicel and ovary slender, 6–9 mm. Sepals similar, oblong-lanceolate, weakly saccate at base, dorsally keeled, 8–12 × ca. 3 mm. Lip simple, oblong, 8–12 × ca. 2 mm, subacute, sigmoidally bent, 3-veined, narrow at base, ecallose. Column winged, ca. 8 mm. Fl. Apr.

Epiphytic on trees. SC China (without precise locality) [NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

## 112. *DENDROCHILUM* Blume, Bijdr. 398. 1825.

足柱兰属 zu zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Acoridium* Nees & Meyen; *Platyclinis* Benth.

Herbs, epiphytic, lithophytic, rarely terrestrial. Rhizome short or long. Pseudobulbs tufted, fusiform or ovoid, narrow, 1-leaved. Leaf blade linear to narrowly elliptic, leathery, usually petiolate. Inflorescence lateral, suberect to pendulous, slender, spicate or racemose, usually densely many flowered, synanthous (in *Dendrochilum* subg. *Platyclinis* (Benth.) Pfitzer) and heteranthous (in *D.* subg. *Dendrochilum*). Flowers usually resupinate, small, thinly textured. Sepals free, subequal, spreading; lateral sepals adnate to base of column. Petals smaller than sepals, often erose; lip 3-lobed or entire, usually with small lateral lobes and a large mid-lobe; disk 2- or 3-keeled. Column usually short, curved, foot absent or short (rarely long), with narrow or broad lateral arms (stelidia) and an often toothed apical wing around anther; pollinia 4, in 2 pairs, waxy, each pair with 1 slender caudicle; viscidium very small; stigma concave; rostellum ligulate, usually entire, spreading horizontally or ascending.

About 270 species: mainland Asia east to the Philippines and New Guinea, particularly well represented in the montane areas of Sumatra and Borneo; one species in China.

**1. *Dendrochilum uncatum*** H. G. Reichenbach, Bonplandia 3: 222. 1855.

足柱兰 zu zhu lan

*Dendrochilum formosanum* (Schlechter) Schlechter; *D. uncatum* var. *formosanum* (Schlechter) T. Hashimoto; *Platyclinis formosana* Schlechter.

Pseudobulbs ± clustered, narrowly ellipsoid or narrowly ovoid, 2–4 × 1–1.5 cm, usually shiny. Leaf blade narrowly elliptic to linear-oblong, 8–15 × 1.5–3 cm, base cuneate, apex acuminate or acute; petiole 1–4 cm. Inflorescence 10–15 cm,

together with young pseudobulb and leaf, arising from rhizome near base of last pseudobulb, arching or nodding, slender; rachis often slightly flexuose, 20–30-flowered; floral bracts ovate, 3–4 mm. Flowers distichous, yellowish; pedicel and ovary ca. 3 mm. Sepals narrowly elliptic or oblong, 6–7 × 2–4 mm. Petals oblong or elliptic, 5–6 × 2–3 mm; lip lyrate, ca. 5 × 3 mm, shortly clawed at base, 3-lobed; lateral lobes lunate, very small; mid-lobe obovate, ca. 3.3 × 2.5 mm; disk with 2 short longitudinal ridges near base. Column ca. 2 mm, steldia arising from middle. Capsule globose, less than 1 cm in diam.  $2n = 30$ .

Epiphytic on trees in broad-leaved forests or thickets; 500–1000 m. S Taiwan [Philippines].

### 113. PHOLIDOTA Lindley ex Hooker, Exot. Fl. 2: ad t. 138. 1825.

石仙桃属 shi xian tao shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic, pendulous or erect. Pseudobulbs contiguous or well spaced on creeping rhizomes, ovoid to sub-cylindric, rarely connected to each other at both ends and stemlike or each connected at base by a short rhizome to middle part of another pseudobulb, apex 1- or 2-leaved. Leaves narrowly elliptic, ovate, or oblong, leathery, shortly petiolate. Inflorescence terminal, emerging from apex of pseudobulb, distichous, pendulous, slender, racemose, laxly or densely many flowered; rachis often slightly flexuose; floral bracts persistent or deciduous, distichous, large, concave. Flowers resupinate, often not opening widely, white, small, fleshy. Dorsal sepal concave or convex, broadly ovate to elliptic; lateral sepals ovate to ovate-oblong, concave or convex, often carinate. Petals ovate to linear, often smaller than sepals; lip sessile, with a saccate basal hypochile and subentire or 3- or 4-lobed; epichile deflexed; disk sometimes with thick veins or lamellae. Column short, upper part winged or hooded, foot absent; anther incumbent; pollinia 4, waxy, subequal in size, in 2 pairs, connected by inconspicuous caudicles to sticky material; rostellum rather large. Capsule relatively small, often ribbed.

Thirty species: mainland and SE Asia, Australia, New Guinea, and the Pacific islands; 12 species (two endemic) in China.

The genus *Pholidota* was monographed by de Vogel (Orchid Monogr. 3. 1988).

The following species were described or recorded from China but could not be treated here because no specimens were seen by the present authors:

*Pholidota niana* Y. T. Liu, R. Li & C. L. Long (Ann. Bot. Fenn. 39: 227. 2002), described from SE Yunnan (Xichou, 1300–1400 m).

*Pholidota recurva* Lindley (Gen. Sp. Orchid. Pl. 37. 1830), recorded from S Yunnan (Mengla, ca. 1500 m) by X. H. Jin, H. Li and D. Z. Li (Acta Bot. Yunnan. 29: 394. 2007).

- 1a. Each new young shoot developing from near apex of last developed pseudobulb: stems consisting of superposed pseudobulbs (*P. sect. Articulatae* (H. G. Reichenbach) Pfitzer) ..... 1. *P. articulata*
- 1b. Each new young shoot sprouting from base of a pseudobulb (usually last developed one): pseudobulbs arranged along a usually short to very short rhizome.
- 2a. Rhizome pendulous, only at base attached to substratum by roots; aerial roots often present on pendulous part of rhizome; pseudobulbs turned to all sides of rhizome; inflorescences generally hysteranthous, each borne on a shoot not developing into a leaf-bearing pseudobulb after anthesis (*P. sect. Crinonia* (Blume) Butzin) ..... 2. *P. protracta*
- 2b. Rhizome creeping, along most of its length attached to substratum by roots; aerial roots absent; pseudobulbs turned to one side of rhizome; inflorescences synanthous or proteranthous.
- 3a. Pseudobulbs 1-leaved (*P. sect. Pholidota*).
- 4a. Mature leaves thick, leathery; floral bracts with numerous dense fine veins; lateral sepals free at base ..... 3. *P. imbricata*
- 4b. Mature leaves thin, herbaceous; floral bracts with less than 25 relatively coarse veins; lateral sepals connate at base ..... 4. *P. pallida*
- 3b. Pseudobulbs 2-leaved.
- 5a. Pseudobulbs crowded to ca. 2.5 cm apart on rhizome; floral bracts persistent at anthesis (caducous in *P. leveilleana*); keels on lip hypochile absent or low and swollen; keels on epichile, if present, at most 2 (*P. sect. Chinenses* (H. G. Reichenbach) de Vogel).
- 6a. Petals ca. equally wide as or only slightly narrower than dorsal sepal.

- 7a. Floral bracts persistent during anthesis; pseudobulbs very slender, fusiform; petals more than 7.5 mm ..... 5. *P. roseans*
- 7b. Floral bracts caducous at anthesis; pseudobulbs swollen, ovoid; petals less than 5.5 mm ..... 6. *P. leveilleana*
- 6b. Petals less than 1/2 as wide as dorsal sepal (see note under *P. chinensis*).
- 8a. Pseudobulbs usually 1.6–8 × 0.5–2.3 cm, narrowly ovoid-oblong, contracted into a short stalk at base; lip hypochile with 3 basal swollen veins, epichile usually unornamented; leaves ± turning black when dry ..... 7. *P. chinensis*
- 8b. Pseudobulbs 4–11.5 × 0.3–0.4 cm, subcylindric, not narrowed into a short stalk at base; lip hypochile with 2 basal lamellae, epichile 3-ridged; leaves not turning black when dry ..... 8. *P. longipes*
- 5b. Pseudobulbs rather widely spaced along rhizome; floral bracts caducous at anthesis, usually falling off but sometimes remaining clasped around flower; base of lip hypochile smooth (*P. sect. Repentes* de Vogel).
- 9a. Lip almost entirely saccate, with a small lateral depression on each side at base; epichile very small.
- 10a. Plants sturdy; flowers opening widely; hypochile with 3 keels at back which are fused at base; column apical hood relatively large, with a rounded top; anther cap inserted ca. halfway between stigma and hood margin; epichile consisting of 2 small lobes that are bent over front opening of hypochile, rarely lobes reduced or absent ..... 9. *P. convallariae*
- 10b. Plants rather small; flowers not opening widely; keels absent; column apical hood abruptly truncate; anther cap inserted on top margin; epichile consisting of a triangular to narrowly triangular concave point ..... 10. *P. cantonensis*
- 9b. Lip consisting of a broad saccate hypochile without lateral depressions and a broad epichile suborbicular in outline when flattened.
- 11a. Roots rather sturdy, “woody,” stiff, 1.5–2 mm in diam.; epichile abruptly recurved giving lip a distinctly sigmoid appearance, ecallose, 2.8–4 mm ..... 11. *P. yunnanensis*
- 11b. Roots rather slender and flexuous, herbaceous, 0.5–1 mm in diam.; lip not distinctly curved; hypochile with 3 short keels at back; epichile 1–2 mm ..... 12. *P. missionariorum*

**1. *Pholidota articulata*** Lindley, Gen. Sp. Orchid. Pl. 38. 1830.

节茎石仙桃 jie jing shi xian tao

*Coelogyne articulata* (Lindley) H. G. Reichenbach; *C. khasyana* (H. G. Reichenbach) H. G. Reichenbach; *Pholidota articulata* var. *griffithii* (J. D. Hooker) King & Pantling; *P. articulata* var. *obovata* (J. D. Hooker) Tang & F. T. Wang; *P. griffithii* J. D. Hooker; *P. khasyana* H. G. Reichenbach; *P. lugardii* Rolfe; *P. obovata* J. D. Hooker.

Pseudobulbs connected to each other at both ends and stemlike, subcylindric, (2–)4–12 cm × 5–10(–25) mm, sometimes slightly narrowed, branching or not, sometimes with very short rhizomes between them and producing a few roots. Leaves 2, at apex of new pseudobulb; leaf blade obovate-elliptic, oblong, or narrowly elliptic, 7–17.5 × 2.7–6.2 cm, veins plicate, subacute or obtuse; petiole 1–1.5 cm. Inflorescence at apex of new pseudobulb, 6–18 cm; rachis 10- or more flowered, ± flexuous; floral bracts deciduous during flowering, narrowly ovate-oblong, 1.5–2.5 × 0.5–0.7 cm. Flowers greenish white or white and slightly tinged with reddish; pedicel and ovary 6–7 mm. Dorsal sepal oblong or elliptic, concave, 9–10 × 4–5 mm, dorsally carinate, 5-veined; lateral sepals ovate, oblique, slightly wider than dorsal sepal. Petals oblong-lanceolate or suboblanceolate, ca. 7 × 2–2.5 mm, 5-veined; lip broadly oblong in outline, contracted at apical 1/4–1/3 into epichile and hypochile; hypochile cymbiform, slightly wider than epichile, with 5 longitudinal lamellae near base; epichile transversely elliptic, 3–4 mm wide, margin crisped. Column 2.5–3 mm, ca. 1 mm wide, stout, apex winged; rostellum broadly ovate, 1.4–1.8 mm. Capsule ellipsoid to obovoid-ellipsoid, 1.8–2 cm, slightly 3-ridged; fruiting pedicel ca. 2.5 mm. Fl. Jun–Aug, fr. Oct–Dec.  $2n = 38, 38 + 2B, 40, 40 + 2-6B$ .

Epiphytic on trees in forests, lithophytic on shaded rocks; 800–2500 m. SW Guizhou, SW Sichuan, SE Xizang, NW to SE Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**2. *Pholidota protracta*** J. D. Hooker, Hooker’s Icon. Pl. 19: ad t. 1877. 1889.

尾尖石仙桃 wei jian shi xian tao

Rhizome subcylindric, 2.5–3.5 mm in diam., slender, usually with long internodes, apex producing a pseudobulb and with a new rhizome at its base. Pseudobulbs borne 2–4 cm apart from each other, subcylindric, 1.7–4.5 cm × 2.5–5 mm, attenuate toward apex, ± curved, apex 2-leaved. Leaf blade narrowly elliptic-lanceolate, 7.3–12.5 × 1.3–2.3 cm, papery, base broadly cuneate, apex acuminate or nearly caudate; petiole 3–12 cm. Inflorescence arising from rhizome near base of last pseudobulb, 1.5–3 cm; rachis 3–7-flowered; floral bracts persistent at least at end of flowering, broadly ovate, ca. 3 mm. Flowers pale yellow, small; pedicel and ovary 5–7 mm. Sepals ovate-oblong, ca. 4 × 2.5 mm, 3-veined; lateral sepals slightly oblique. Petals narrowly obovate, ca. 3 × 1.8 mm; lip subovate-oblong in outline, ca. 4 × 3 mm, shallowly cupular at base, slightly 3-lobed, apex emarginate, without appendages inside. Column ca. 3.5 mm, both sides winged; wings widened toward column apex; rostellum ca. 1.3 mm wide. Capsule obovoid-ellipsoid, ca. 1 cm × 6 mm, 3-ridged; fruiting pedicel 4–5 mm. Fl. Oct.  $2n = 40$ .

Epiphytic on trees in broad-leaved evergreen forests or on cliffs along valleys; 1800–2700 m. SE Xizang, NW Yunnan [Bhutan, NE India, Myanmar, Nepal].

**3. *Pholidota imbricata*** Hooker, Exot. Fl. 2: ad t. 138. 1825.

宿苞石仙桃 su bao shi xian tao

*Coelogyne imbricata* (Hooker) H. G. Reichenbach; *Cymbidium imbricatum* (Hooker) Roxburgh; *Pholidota bracteata* (D. Don) Seidenfaden; *P. henryi* Kraenzlin; *P. imbricata* var. *henryi* (Kraenzlin) Tang & F. T. Wang; *Ptilocnema bracteata* D. Don.

Rhizome creeping, rather robust, 5–7 mm in diam., with many nodes, densely covered with scaly sheaths, with many roots. Pseudobulbs contiguous, suboblong, (2.5–)4–8 × 1–1.5 cm, obscurely obtusely 4-ridged, apex 1-leaved. Leaf blade oblong-oblancheolate, oblong, or nearly broadly oblancheolate, 7–25(–35) × 2–8.5 cm, thinly leathery, base cuneate, apex shortly acuminate or acute; petiole 1.5–5 cm. Inflorescence arising from young pseudobulbs with nearly mature leaf at anthesis, usually 25–50 cm; rachis nodding, 5–30 cm, densely many flowered; floral bracts persistent, often conduplicate, broadly ovate, 4–7 × 4–8 mm, with many dense veins, ± concave. Flowers white or slightly tinged with red; pedicel and ovary 4–5 mm. Dorsal sepal orbicular or broadly elliptic, cymbiform, 3–4.5 × 3–4.5 mm, 5-veined, midvein slightly raised; lateral sepals free, ovate, cymbiform, 4–6 × 3.5–4 mm, dorsally strongly carinate. Petals sublinear-lanceolate, 3–4.5 × 1–1.5 mm, 1-veined; lip saccate, 4–6 mm, slightly 3-lobed; lateral lobes embracing column, erect, nearly broadly oblong, 2.5–3 × ca. 2 mm; mid-lobe suboblong, 3–4 mm wide, margin slightly undulate, apex emarginate; disk with 2 or 3 longitudinal lamellae or thickened veins near base. Column nearly orbicular in ventral view, 3–4 mm, thick, both sides with wings; rostellum broad. Capsule obovoid-ellipsoid, 1–1.3 cm × 6–7 mm; fruiting pedicel 2–4 mm. Fl. Jul–Sep, fr. Oct–Jan.  $2n = 40$ .

Epiphytic on trees or lithophytic on rocks in forests; 800–2700 m. SW Sichuan, SE Xizang, S and W Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Sri Lanka, Thailand, Vietnam; Australia, SW Pacific islands].

**4. *Pholidota pallida*** Lindley, Edwards's Bot. Reg. 21: ad t. 1777. 1835.

粗脉石仙桃 cu mai shi xian tao

*Coelogyne pallida* (Lindley) H. G. Reichenbach; *Pholidota schlechteri* Gagnepain; *P. tixieri* Guillaumin; *P. yunnanensis* Schlechter (1924), not Rolfe (1903); *P. yunpeensis* Hu.

Rhizome short, 5–6 mm in diam., densely covered with scaly sheaths, with many roots. Pseudobulbs contiguous, nearly narrowly oblong, 1.8–6 cm × 6–11 mm, slightly obtusely 4-ridged, apex 1-leaved. Leaf blade narrowly elliptic-oblancheolate to narrowly oblong-oblancheolate, 10–23 × 2.3–5.5 cm, papery, apex acute or acuminate and mucronate; petiole 1–4 cm. Inflorescence arising from young pseudobulbs, with nearly mature or immature leaf at anthesis, 10–25 cm; rachis nodding, densely many flowered; floral bracts broadly ovate-sagittate, conduplicate, concave, 3–5 mm, pubescent on margin, with many somewhat loosely arranged veins, acute to obtuse. Flowers white, slightly tinged with reddish; pedicel and ovary 3–4 mm. Dorsal sepal broadly elliptic, concave, 4–5 × 2.5–3 mm, dorsally carinate, apex acute; lateral sepals broadly ovate-oblong, oblique, 5–6 × 3–3.5 mm, dorsally carinate, ± connate at base. Petals ovate-elliptic, ca. 4 × 2–2.5 mm; lip shallowly saccate, 4–6 mm, 3-lobed; lateral lobes ovate, 1.5–2 mm; mid-lobe transversely oblong, ca. 3 × 4 mm, apex emarginate; saccate disk with 2 or 3

thick veins near base. Column ca. 3 mm, both sides with wings; wings above middle broader and nearly orbicular in ventral view. Capsule subobovoid, ca. 1 cm × 6 mm; fruiting pedicel 2–3 mm. Fl. Jun–Jul, fr. Oct.  $2n = 40$ .

Epiphytic on tree trunks in forests; 800–2700 m. S and SW Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**5. *Pholidota roseans*** Schlechter, Repert. Spec. Nov. Regni Veg. 12: 107. 1913.

贵州石仙桃 gui zhou shi xian tao

Rhizome 2–4 mm in diam., ± covered with scaly membranous sheaths. Pseudobulbs cylindric, 5–7 cm × ca. 4 mm, narrowed toward apex, apex 1-leaved. Leaf blade narrowly elliptic-lanceolate or narrowly oblong-lanceolate, 10–12 × 1.6–1.8 cm, papery, apex acuminate; petiole 2–2.5 cm. Inflorescence arising from young pseudobulbs with an immature leaf enclosed by sheaths, 10–15 cm; rachis 7–10 cm, laxly many flowered; floral bracts persistent, elliptic, concave, 3–4 mm. Flowers pale rose; pedicel and ovary 5–6(–15) mm. Dorsal sepal elliptic, concave, 8–10 × 3.5–4.5 mm, dorsally slightly carinate, apex mucronate; lateral sepals ovate, slightly oblique, nearly as large as dorsal sepal, dorsally carinate. Petals obliquely elliptic, slightly smaller than dorsal sepal; lip 9–11 mm, shallowly cupular near middle, base broadly cuneate; apical part broadly ovate, 5–6 mm, 3-lobed; lateral lobes nearly orbicular, 1–1.5 mm; mid-lobe subquadrate, apex emarginate and mucronate, adaxially with 3 longitudinal lamellae; lamellae somewhat crested, median short, lateral longer, extending downward into thickened veins. Column ca. 5 mm, upper part with broad wings; rostellum broadly ligulate. Fl. Mar.

Lithophytic on rocks in thickets; 800–1200 m. S Guizhou [N Vietnam].

**6. *Pholidota leveilleana*** Schlechter, Repert. Spec. Nov. Regni Veg. 12: 107. 1913.

单叶石仙桃 dan ye shi xian tao

*Pholidota wenshanica* S. C. Chen & Z. H. Tsi.

Rhizome short, stout, 8–10 mm in diam., with scaly sheaths. Pseudobulbs borne close together, narrowly ovoid, oblong, or subcylindric, 2.5–8 cm × 6–12 mm, apex 1- or 2-leaved. Leaf blade narrowly elliptic, narrowly elliptic-lanceolate, or oblong-lanceolate, 15–30 × 2–3.5 cm, apex acuminate; petiole 3.5–8 cm. Inflorescence arising from young pseudobulbs, with nearly mature leaf at anthesis, often ± pendulous, 13–25 cm or longer; sheaths 1.5–3 cm; rachis straight, laxly 12–35-flowered; floral bracts deciduous, elliptic or broadly ovate-rhombic, ± conduplicate, membranous. Flowers white and slightly tinged with pink, or yellowish brown, ca. 5 mm in diam., lip white, tinged with pale brown or with yellow blotches, stigma red; pedicel and ovary 3–4 mm. Sepals broadly ovate-elliptic, 5–7 × 3–6 mm, 7-veined, acute; lateral sepals dorsally carinate. Petals ovate-elliptic, 4–5 × 2.5–3 mm, 3–5-veined, obtuse; lip broadly oblong or subovate in outline, 5–6 × 3–3.5 mm, contracted into epichile and hypochile at apical 3/5; hypochile ca. 1 mm wide, shallowly cupular in center, margin spreading horizontally, with 3 or 4 thickened veins extending

from base to above middle; epichile transversely oblong or elliptic, 4–5 mm wide, margin slightly undulate, apex emarginate. Column 2.2–3 mm, apex broadly winged. Capsule narrowly obovoid, ca. 2 cm × 5–6 mm; fruiting pedicel 2–3 mm. Fl. May, Dec.

Sparse forests, shaded rocks; 500–1600 m. N and W Guangxi, S Guizhou, SE Yunnan [Vietnam].

De Vogel (Orchid Monogr. 3: 116. 1988) stated in an addendum to his monograph of *Pholidota* that although he had not seen the holotype of *P. wenshanica*, “the description and the line drawings do agree so very well with *Pholidota leveilleana* Schltr. that I am convinced that it is conspecific with that species.”

**7. *Pholidota chinensis*** Lindley, J. Hort. Soc. London 2: 308. 1847.

石仙桃 shi xian tao

*Coelogyne chinensis* (Lindley) H. G. Reichenbach; *C. pho-las* H. G. Reichenbach; *Pholidota chinensis* var. *cylindracea* Tang & F. T. Wang.

Rhizome creeping, 3–8 mm in diam. or thicker, with rather dense nodes and many roots. Pseudobulbs borne (3–)5–15 cm apart on rhizome, narrowly ovoid-oblong, variable in size, usually 1.6–8 cm × 5–23 mm; petiole 0.5–2 cm, apex 2-leaved. Leaf blade turning blackish when dried, obovate-elliptic, oblanceolate-elliptic, or suboblong, 5–22 × 2–6 cm, with 3 rather conspicuous veins, apex acuminate, acute, or shortly caudate; petiole 1–5 cm. Inflorescence arising with young pseudobulb and young leaves from base of last pseudobulb, 12–38 cm; rachis often ± arching, several to 20-flowered, slightly flexuous; floral bracts persistent at least at end of flowering, oblong to broadly ovate, often ± conduplicate, 1–1.7 × 0.6–0.8 cm. Flowers white or tinged yellowish; pedicel and ovary 4–8 mm. Dorsal sepal elliptic or ovate-elliptic, cymbiform, 7–10 × 4.5–6 mm, dorsally slightly carinate; lateral sepals ovate-lanceolate, slightly narrower than dorsal sepal, conspicuously carinate. Petals lanceolate, 9–10 × 1–2.5 mm (see note below); lip ± broadly ovate in outline, slightly 3-lobed, basal half saccate and with 2 suborbicular lateral lobes on both sides; mid-lobe ovate, 4–5 × 4–5 mm, mucronate. Column 4–5 mm, winged above middle; rostellum broadly ligulate. Capsule obovoid-ellipsoid, 1.5–3 × 1–1.6 cm, 6-ridged, with narrow wings on 3 ridges; fruiting pedicel 4–6 mm. Fl. Apr–May, fr. Sep–Jan.  $2n = 38, 40$ .

Epiphytic on trees or lithophytic on rocks in forests or at forest margins, shaded places on cliffs; 900–2100 m. N Fujian, Guangdong, Guangxi, SW Guizhou, Hainan, SE Xizang, W to SE Yunnan, S Zhe-jiang [Myanmar, Vietnam].

De Vogel (Orchid Monogr. 3: 45. 1988) noted that one specimen from Hainan, *Lau 28054*, has unusually broad petals, ca. 4 mm wide, but in all other aspects fits in the description of *Pholidota chinensis*.

**8. *Pholidota longipes*** S. C. Chen & Z. H. Tsi, Acta Phytotax. Sin. 21: 346. 1983.

长足石仙桃 chang zu shi xian tao

Rhizome 4–8 mm in diam., stout, with scaly sheaths. Pseudobulbs rather dense, cylindrical, 4–11.5 cm × 3–4 mm, attenuate toward apex, apex 2-leaved. Leaf blade narrowly ellip-

tic-lanceolate, 8–16 × 1.5–3 cm, papery, with many veins, long acuminate; petiole 1–3 cm. Inflorescence arising with young pseudobulb and young leaves from base of last pseudobulb, 6–10 cm; rachis 4–5 cm, 7–9-flowered; floral bracts persistent at least at end of flowering, ovate, concave, 5–6 × 2.5–3 mm. Flowers fragrant, white, ca. 1.2 cm in diam.; pedicel and ovary 1–1.2 cm. Sepals ovate, cymbiform, 11–12 × ca. 5 mm, 5-veined, obtuse or mucronate, dorsally carinate. Petals ovate-elliptic, slightly shorter than sepals, obtuse; lip ca. 1 cm, contracted at middle to form epichile and hypochile; hypochile saccate, ca. 5 × 2.5 mm, with 2 longitudinal lamellae near base; epichile oblong, ca. 5 × 3 mm, mucronate, base with 3 thickened ridges ca. 1 mm. Column ca. 3 mm, winged on both sides; rostellum broadly ligulate, ca. 1 mm. Capsule obovoid, ca. 1.8 × 1 cm, 3-ridged, ridges narrowly winged; fruiting pedicel 5–10 mm. Fl. Jan.

• Lithophytic on humid rocks in evergreen broad-leaved forests along limestone valleys; 1000–1400 m. SE Yunnan.

Curiously, this species was omitted from de Vogel’s monograph of *Pholidota* (Orchid Monogr. 3. 1988). In FRPS 18 (394–397. 1999), this species was placed in the 2-leaved *P.* sect. *Chinenses* (H. G. Reichenbach) de Vogel).

**9. *Pholidota convallariae*** (E. C. Parish & H. G. Reichenbach) J. D. Hooker, Hooker’s Icon. Pl. 19: ad t. 1880. 1889.

凹唇石仙桃 ao chun shi xian tao

*Coelogyne convallariae* E. C. Parish & H. G. Reichenbach, Flora 55: 277. 1872.

Rhizome creeping, covered with scaly sheaths. Pseudobulbs narrowly ovoid, 2.5–5 × ca. 1.5 cm, apex 2-leaved. Leaf blade narrowly elliptic, 15–20 × 2–2.5 cm, obtuse or shortly acuminate; petiole 1–2 cm. Inflorescence arising with young pseudobulb and young leaves from base of last pseudobulb, 15–20 cm; rachis 10- or more flowered; floral bracts caducous, linear, 1–1.5 cm. Flowers fragrant, white or creamy white, sometimes with a pale green center, 5–6 mm in diam.; pedicel and ovary ca. 5 mm. Dorsal sepal suboblong or elliptic, ca. 5 × 2–2.5 mm, obtuse; lateral sepals obliquely ovate, slightly wider than dorsal sepal. Petals ovate-elliptic, 4–4.5 × ca. 2.5 mm, obtuse; lip shallowly saccate, ca. 4 mm, apex emarginate, base with 3 longitudinal lamellae ca. 1 mm. Column ca. 1.7 mm, stout, apex with a broad wing ca. 1.4 mm high; rostellum nearly transversely oblong, ca. 1.5 mm wide. Fl. unknown.

Epiphytic on trees in forests; ca. 1500 m. SW Yunnan [NE India, Myanmar, Thailand, Vietnam].

*Pholidota convallariae* is represented in China by var. *convallariae*; *P. convallariae* var. *breviscapa* Deori & J. Joseph, from India, is distinguished by an up to 7-flowered inflorescence, floral bracts ca. 7 × 7 mm, and five keels on the lip.

**10. *Pholidota cantonensis*** Rolfe, Bull. Misc. Inform. Kew 1896: 196. 1896.

细叶石仙桃 xi ye shi xian tao

*Pholidota uraiensis* Hayata.

Rhizome creeping, 2.5–3.5 mm in diam., branching, densely covered with scaly sheaths, nodes sparsely rooting.

Pseudobulbs borne 1–3 cm apart on rhizome, narrowly ovoid to ovoid-oblong, 1–2 cm × 5–8 mm, embraced by leathery sheaths when young, apex 2-leaved. Leaf blade linear or linear-lanceolate, 2–8 × 0.5–0.7 cm, papery, margin often ± recurved, apex shortly acuminate or subacute; petiole 2–7 cm. Inflorescence arising with young pseudobulb and young leaves from base of last pseudobulb, 3–5 cm; rachis 10- or more flowered, straight; floral bracts caducous, ovate-oblong. Flowers white or yellowish, ca. 4 mm in diam.; pedicel and ovary 2–3 mm. Dorsal sepal ovate-oblong, ± cymbiform, 3–4 × ca. 2 mm, dorsally slightly carinate, apex obtuse; lateral sepals ovate, oblique, slightly wider than dorsal sepal. Petals broadly ovate-rhombic or broadly ovate, 2.8–3.3 × 2.8–3.2 mm; lip broadly elliptic, cymbiform, ca. 3 × 4–5 mm, subtruncate or obtuse; disk without appendages. Column ca. 2 mm, thick, winged on both apical sides; rostellum small. Capsule obovoid, 6–8 × 4–5 mm; fruiting pedicel 2–3 mm. Fl. Apr, fr. Aug–Sep.

• Lithophytic on rocks in forests or shaded places; 200–900 m. N Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Taiwan, Zhejiang.

**11. *Pholidota yunnanensis*** Rolfe, J. Linn. Soc., Bot. 36: 24. 1903.

云南石仙桃 yun nan shi xian tao

*Pholidota kouytcheensis* Gagnepain.

Rhizomes creeping, 4–6 mm in diam., branched, densely covered by leathery sheaths; roots 1.5–2 mm in diam. Pseudobulbs usually spaced 1–3 cm on rhizome, subcylindric, (1.5–)2–5 cm × 6–8 mm, somewhat attenuate toward apex, embraced by leathery sheaths when young, apex 2-leaved. Leaves shortly petiolate, lanceolate, 6–15 × 0.7–1.8(–2.5) cm, papery, veins plicate, subobtuse. Inflorescence arising with young leaves from rhizome near base of last pseudobulb, 7–9(–12) cm; rachis 15–20-flowered, sometimes slightly flexuous toward base; floral bracts deciduous during flowering, ovate-rhombic, 6–8 × 4.5–5.5 mm. Flowers white or pale flesh-colored, 3–4 mm in diam.; pedicel and ovary 3.5–5 mm. Dorsal sepal broadly ovate-elliptic or ovate-oblong, slightly concave, 3.2–3.8 × 2–2.5 mm, dorsally slightly carinate; lateral sepals broadly ovate-lanceolate, slightly narrower than dorsal sepal, concave, dorsally conspicuously carinate. Petals similar to dorsal sepal, neither concave nor carinate; lip sigmoid, oblong-obovate in outline, ca. 4 × 3 mm, apex subtruncate or obtuse and often inconspicuously

emarginate, slightly contracted and concave near base, forming a cupular or subglobose sac, ecallose; epichile 2.8–4 mm, abruptly recurved. Column 2–2.5 mm, apex winged and with 2 small teeth on both sides; rostellum broadly ligulate. Capsule obovoid-ellipsoid, ca. 1 cm × 6 mm, 3-ridged; fruiting pedicel 2–4 mm. Fl. May, fr. Sep–Oct.

Epiphytic on trees in forests or lithophytic on rocks along valleys; 1200–1700 m. Guangxi, Guizhou, W Hubei, W Hunan, NE to S Sichuan, S Yunnan [N Vietnam].

**12. *Pholidota missionariorum*** Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 3: 146. 1931.

尖叶石仙桃 jian ye shi xian tao

*Pholidota rupestris* Handel-Mazzetti.

Rhizomes creeping, often branched, 2–3 mm in diam., densely covered with scaly sheaths, nodes sparsely rooting; roots 0.5–1 mm in diam. Pseudobulbs usually 5–10 mm apart on rhizome, bright yellowish when dried, ovoid to subcylindric, 1–3 cm × 5–12 mm, base embraced by leathery sheaths, apex 2-leaved. Leaf blade linear-oblong, nearly broadly linear, or lanceolate, 2–8 × 0.6–1 cm, thickly leathery, midvein concave and 2 lateral veins obviously convex adaxially, all 3 veins raised abaxially, margin slightly recurved, apex subacute to long acuminate; petiole 3–10 cm. Inflorescence arising with young leaves from rhizome near base of last pseudobulb, 3–8 cm; rachis straight, 3–9-flowered; floral bracts gradually falling off during flowering, ovate, 6–7 mm. Flowers white, tinged with green or reddish, 5–7 mm in diam.; pedicel and ovary 2–5 mm. Sepals ovate or broadly ovate, 3–5 × 2–2.5 mm, 1-veined; lateral sepals cymbiform, slightly oblique, narrower than dorsal sepal. Petals obovate-orbicular or elliptic, 2.5–3 × ca. 1.8 mm, 3-veined; lip nearly broadly oblong or obovate, ca. 4 × 3 mm, base slightly concave, margin crisped, apex obtusely mucronate or broadly emarginate; hypochile with 3 short keels at back; epichile 1–2 mm. Column 1.2–1.5 mm, thick, apex winged, slightly irregularly toothed; rostellum suberect, suborbicular. Capsule obovoid-ellipsoid, ca. 1 cm × 5 mm, slightly 3-ribbed; fruiting pedicel 1–2 mm. Fl. Jun, Oct–Nov, fr. Nov.

Epiphytic on trees in forests, lithophytic on shaded rocks; 1100–2600 m. C and SW Guizhou, SE Xizang, NW and SE Yunnan [Bhutan, Myanmar, N Vietnam].

## 114. *OTOCHILUS* Lindley, Gen. Sp. Orchid. Pl. 35. 1830.

耳唇兰属 er chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Tetrapeltis* Wallich ex Lindley.

Herbs, epiphytic. Rhizome erect or pendulous. Pseudobulbs superposed, i.e., each pseudobulb arising near apex of previous pseudobulb, subcylindric, 2-leaved. Leaves petiolate, plicate, linear to elliptic, papery, acute. Inflorescence proteranthous or synanthous, pendulous, racemose, many flowered; rachis straight or weakly zigzag; floral bracts caducous at or after anthesis. Flowers resupinate, often white, with or without brown markings, or flesh-colored, small. Sepals free, narrowly lanceolate to linear-lanceolate. Petals linear-lanceolate to linear; lip with a saccate, bilobed hypochile and a much longer, narrow epichile, ecallose; lateral lobes of hypochile clasping base of column. Column incurved and dilated apically, without stielidia, foot absent; pollinia 4, with caudicles; stigma cup-shaped; rostellum large. Capsule ellipsoid, rostrate.

Four species: Bhutan, China, NE India, Myanmar, Nepal, Thailand, and Indochina; four species in China.

- 1a. Flowers small, dorsal sepal less than 10 mm; anther cap and rostellum with a broad triangular front; floral bracts broadly obtuse.
- 2a. Leaves linear-lanceolate; hypochile lateral lobes longer than broad, edges somewhat erose, surface smooth, united by a transverse callus or ridge at distal side of their base, nearly closing access to hypochile sac; epichile attached well below transverse ridge; sac without internal keels; column uniformly slender, cylindrical .... 1. *O. fuscus*
- 2b. Leaves ovate-lanceolate; hypochile lateral lobes not much longer than broad, outside finely papillose, transverse ridge absent; interior of sac with a thickened longitudinal ridge; column ventrally flattened throughout most of its length ..... 2. *O. albus*
- 1b. Flowers larger, dorsal sepal 12–20 mm; floral bracts ovate-lanceolate, apex triangular.
- 3a. Lip epichile ovate-lanceolate, less than 1.5–3 × as long as broad; rostellum and anther cap rostrate; disk with 3 laminate keels extending from base of hypochile to base of epichile, 2 additional short keels on base of epichile; lateral lobes acute or obliquely truncate, slightly erose ..... 3. *O. porrectus*
- 3b. Lip epichile narrowly lanceolate, 3–4 × as long as broad; rostellum and anther cap broadly triangular, obtuse; disk with 3 keels extending from base of hypochile which terminate ca. halfway up toward base of epichile; lateral lobes obtuse ..... 4. *O. lancilabius*

**1. *Otochilus fuscus* Lindley, Gen. Sp. Orchid. Pl. 35. 1830.**

狭叶耳唇兰 xia ye er chun lan

*Broughtonia fusca* (Lindley) Wallich ex J. D. Hooker; *Coelogyne fusca* (Lindley) H. G. Reichenbach; *Otochilus lancifolius* Griffith.

Pseudobulbs pendulous, greenish yellow or slightly tinged with brown when dry, cylindrical-fusiform, 2.5–10 × 0.6–1.3 cm, rugose, covered with fibrous sheaths. Leaf blade linear-lanceolate or nearly linear, 10–20 × 0.7–1.1 cm, acuminate; petiole 1.5–3 cm. Inflorescence proteranthous, suberect; peduncle ± arching, usually 12–17 cm; rachis 6–8 cm, laxly 10- to many flowered; floral bracts persistent, narrowly obovate-linear, 8–11 × 2.5–3 mm, papery, acute. Flowers fragrant, white or tinged with pale yellow, 1.4–1.6 cm in diam.; pedicel and ovary 4–7 mm, slender. Dorsal sepal oblong or nearly narrowly ovate-oblong, 7–8 × ca. 2 mm, abaxially carinate, 5-veined, obtuse; lateral sepals slightly narrower and ± oblique. Petals ca. 6.5 × 1.5 mm, 3–5-veined, midvein slightly thickened abaxially; lip 3-lobed; lateral lobes erose at apex, at distal side of their bases united by a transverse appendage, nearly closing access between mid-lobe and sac; mid-lobe narrowly elliptic to suboblong, 4.5–5.5 × ca. 1.7 mm, base contracted and slightly clawed, apex acuminate; sac subglobose, ca. 1 mm in diam., without appendages inside. Column ca. 5 mm, slender, base slightly exerted, upper part winged. Capsule obovoid-ellipsoid, 7–10 × 5–6 mm. Fl. Mar, fr. Oct.  $2n = 40$ .

Epiphytic on trees in forests; 1200–2100 m. Yunnan [Bhutan, Cambodia, NE India, Myanmar, Nepal, Thailand, Vietnam].

**2. *Otochilus albus* Lindley, Gen. Sp. Orchid. Pl. 35. 1830.**

白花耳唇兰 bai hua er chun lan

*Coelogyne alba* (Lindley) H. G. Reichenbach.

Pseudobulbs enclosed in tubular sheaths when young, brownish yellow when dried, subcylindrical, 3.5–4.5 cm × 6–7 mm, grooved, usually with roots at joint. Leaf blade narrowly oblong or narrowly elliptic, 5–16 × 1.3–1.7 cm, acuminate; petiole 1–2 cm. Inflorescence synanthous; peduncle 3–7.5 cm, sheathed; rachis ca. 7 cm, slender, weakly zigzag, laxly 8- or 9-flowered; floral bracts caducous, ovate-lanceolate, ca. 5 × 5

mm. Flowers uniformly white, 1–1.8 cm in diam.; pedicel and ovary 5–6 mm. Dorsal sepal narrowly oblong, 7–8 × 1.4–1.6 mm, 3-veined, acuminate; lateral sepals slightly oblique. Petals narrowly oblong-lanceolate, 6–7 × 1.2–1.5 mm, 3-veined, acute; lip 3-lobed; lateral lobes embracing column, reaching 1/5–1/4 of its length; mid-lobe oblong, ca. 6 mm, adaxially ± papillate, apex apiculate; sac with a thickened longitudinal ridge inside. Column 5–6 mm; rostellum broadly ligulate. Fl. Jun–Jul.

1300–1500 m. SE Xizang [NE India, Myanmar, Nepal, Thailand, Vietnam].

**3. *Otochilus porrectus* Lindley, Gen. Sp. Orchid. Pl. 36. 1830.**

耳唇兰 er chun lan

*Coelogyne porrecta* (Lindley) H. G. Reichenbach; *Otochilus forrestii* W. W. Smith; *O. fragrans* (Wallich ex Lindley) Nicholson; *O. latifolius* Griffith; *Tetrapeltis fragrans* Wallich ex Lindley.

Pseudobulbs greenish yellow when dry, cylindrical to fusiform, 2.5–11 cm × 7–13 mm, sparsely wrinkled. Leaf blade narrowly elliptic to narrowly elliptic-lanceolate, 7–20 × 2.1–4.1(–5.7) cm, acuminate or obtuse; petiole 1–2.5 cm. Inflorescence synanthous, ± arching, 15–20 cm; rachis 7–10 cm, laxly several flowered; floral bracts caducous. Flowers white, sometimes slightly tinged with yellowish on abaxial surface of sepals and lip; pedicel and ovary 5–8 mm. Dorsal sepal suboblong or oblong-oblong, 11–13 × ca. 2.5 mm, dorsally somewhat carinate, 5-veined, apex acute or obtuse; lateral sepals suboblong, similar in size to dorsal sepal. Petals sublinear, 11–13 × ca. 0.8 mm, 3-veined; lip 3-lobed; lateral lobes erect, embracing column, reaching 1/3–1/2 length of column, oblong, 3–4 × 1.5–2 mm; mid-lobe ovate-elliptic, 6–7 × 4–5 mm, base narrowed into a claw ca. 1 mm, apex acute; sac with 3 thickened and 2 shorter ridges extending nearly to base of mid-lobe. Column ca. 1 cm, upper part winged; anther with long beak to 2 mm; rostellum narrowly lanceolate, 1.5–2 mm. Capsule obovoid-ellipsoid, to 2 cm × ca. 9 mm. Fl. and fr. Oct–Dec.  $2n = 40$ .

Epiphytic on trees or lithophytic on rocks in forests; 1000–2100 m. NW to SE Yunnan [NE India, Myanmar, Nepal, Thailand, Vietnam].

**4. *Otochilus lancilabius* Seidenfaden, Opera Bot. 89: 94. 1986.**

宽叶耳唇兰 kuan ye er chun lan

Roots borne at internodes. Pseudobulbs greenish yellow when dry, subcylindric, narrowly fusiform to clavate, 4–10 cm × 6–20 mm, sheathed at base, sparsely wrinkled. Leaf blade elliptic-lanceolate to oblong-lanceolate, 12–19 × 2.5–4.2 cm, apex acuminate or shortly cuspidate; petiole 1.5–2.5 cm. Inflorescence proteranthous, decurved; peduncle sheathed when young; rachis laxly several flowered; floral bracts caducous, linear, acute. Flowers white, 1.5–2.2 cm; pedicel and ovary 1–1.2 cm. Dorsal sepal linear-oblong, cymbiform, 13–15 × ca. 2 mm, abaxially ± carinate, 5-veined, acute; lateral sepals some-

what oblique. Petals linear, ca. 14 × 0.7 mm, 3-veined, acute; lip 3-lobed; lateral lobes erect, embracing column, reaching ca. 1/4 length of column, triangular-ovate, 15–20 × ca. 0.5 mm; mid-lobe oblong-lanceolate, 10–12 × 2.5–3 mm, base shortly clawed, apex acuminate; sac with 3 or 4 short thickened ridges. Column subclavate, 1.3–1.4 cm, upper part winged; anther cap ellipsoid, ca. 1 mm; rostellum ligulate, ca. 0.7 mm. Capsule subobovoid-ellipsoid, 1.5–2 cm. Fl. Oct–Nov.

Epiphytic on trees in forests; 1500–2800 m. SE Xizang, SW Yunnan [Bhutan, NE India, Laos, Nepal, Vietnam].

## 115. NEOGYNA H. G. Reichenbach, Bot. Zeitung (Berlin) 10: 931. 1852.

新型兰属 xin xing lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic. Rhizome stout, with many fibrous roots. Pseudobulbs ± clustered, ovoid-cylindric to conic, rather long, sheathed, apex 2-leaved. Leaves petiolate, relatively large, papery. Inflorescence racemose, proteranthous or hysteranthous, pendulous; greater part of peduncle covered by sheaths at anthesis; floral bracts persistent, relatively large. Flowers resupinate, not opening widely, large; pedicel and ovary cylindrical, 3-ridged. Sepals similar, fleshy, campanulate (united and saccate at base). Petals shorter and narrower than sepals, base not saccate; lip oblong, funnel-shaped, 3-lobed near apex, spurless, lateral lobes erect, embracing column, base saccate and enclosed in basal sac of lateral sepals. Column curved, rather long, winged; anther cap incumbent, oblong; pollinia 4, in 2 pairs, waxy, oblong-pyriform, depressed, base with flat caudicles, attached to a sticky substance; stigma concave; rostellum triangular. Capsule with 6 longitudinal ridges, apex with persistent column.

One species: Bhutan, China, NE India, Laos, Myanmar, Nepal, Thailand, N Vietnam.

**1. Neogyna gardneriana** (Lindley) H. G. Reichenbach, Bot. Zeitung (Berlin) 10: 931. 1852.

新型兰 xin xing lan

*Coelogyne gardneriana* Lindley in Wallich, Pl. Asiat. Rar. 1: 33. 1830; *Neogyna gardneriana* var. *basiquinquellamellata* Tang & F. T. Wang; *N. gardneriana* var. *basitrilamellata* Tang & F. T. Wang; *Pleione gardneriana* (Lindley) Kuntze.

Rhizome ca. 8 mm in diam. Pseudobulbs borne 1–2 cm apart, dark brown when dried, narrowly ovoid to subcylindric, 9–15 × 1–2 cm, base slightly contracted. Leaves narrowly elliptic-oblancoate, 30–44 × 4–8 cm, acuminate; petiole 4–5 cm. Peduncle 10–20 cm, continuously elongating at fruiting; rachis straight or sometimes slightly flexuous, 7–13 cm, several to 10-flowered; floral bracts broadly ovate-elliptic to suborbicular, 2–

4 × 1.5–2.8 cm, thinly membranous, obtuse. Flowers white, keels yellow; pedicel and ovary 1.5–1.8 cm. Sepals suboblong, 40–45 × ca. 10 mm, abaxially carinate, basal sac ca. 4 mm deep; lateral sepals with deeper basal sac. Petals linear, 40–45 × 3–4 mm; lip obovate, 4–4.5 × ca. 2.5 cm, distally 3-lobed; lateral lobes subovate, obtuse-rounded; mid-lobe subreniform, margin ± erose; disk with 2 or rarely 3 longitudinal lamellae extending from base to base of mid-lobe, occasionally with 5 lamellae at base; basal sac 4–5 mm deep. Column ca. 3.5 mm. Capsule obovoid-ellipsoid, ca. 3.5 × 2 cm, wing-shaped ribs ca. 3 mm wide. Fl. Nov–Jan.

Epiphytic on trees in forests or lithophytic on shaded rocks along valleys; 600–2200 m. SE Xizang, S Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, N Vietnam].

## 116. BULLEYIA Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 108. 1912.

蜂腰兰属 feng yao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic. Rhizome creeping. Pseudobulbs close together, narrowly ovoid-ellipsoid, usually covered by many sheaths, apex 2-leaved. Leaves petiolate, linear-lanceolate to lanceolate, plicate, papery, acuminate. Inflorescence synanthous, pendulous, racemose, 10–20-flowered, flowers in apical part opening first; rachis zigzag; floral bracts caducous after anthesis, partly covering flowers, membranous. Flowers distichous, white, part of lip and column reddish brown, resupinate. Sepals free, ovate to ovate-lanceolate, lateral sepals oblique. Petals obliquely and narrowly oblong; lip spurred at base, curved, entire, ecallose, constricted near middle, apical part suborbicular-reniform; spur incurved, tubular. Column dilated apically, without stelidia, foot absent; pollinia 4, ellipsoid-obovoid, with caudicles. Capsule ellipsoid.

One species: Bhutan, China, NE India.

**1. Bulleyia yunnanensis** Schlechter, Notes Roy. Bot. Gard. Edinburgh 5: 108. 1912.

蜂腰兰 feng yao lan

Pseudobulbs golden yellow when dried, lucid, narrowly ovoid or narrowly ovoid-ellipsoid, 3.5–7 × 1–2 cm, rugose-grooved. Leaves 2, oblong-lanceolate or nearly lanceolate, 16–43 × 1.5–3 cm, papery, base cuneate, apex long acuminate; peti-

ole 5–12 cm, grooved. Inflorescence laxly 10–15-flowered; peduncle 30–66 cm; rachis 6–16 cm, glabrous; floral bracts pale reddish green, broadly ovate, 1.5–2 × 1.2–1.5 cm, papery, subacute. Flowers white, with pale brown lip and reddish brown anther cap; pedicel and ovary 6–7 mm, glabrous. Sepals subsimilar, 5-veined; dorsal sepal ovate-oblong, 12–14 × 4–5 mm, apiculate; lateral sepals nearly narrowly ovate-lanceolate, oblique, 15–18 × 5–6 mm, apiculate. Petals elliptic-oblong, 15–18 × 2–3 mm, 3-veined, oblique, acute to apiculate; lip 12–14 ×

5–6 mm, deeply constricted at middle, spurred, entire; hypochile ovate-elliptic, concave at base; epichile reniform, emarginate; disk with 3 thickened, keeled veins on mesochile; spur arising from between sepals, cylindrical, curved-porrect. Column 8–10 mm, upper wings 2–3 mm wide, glabrous. Capsule erect, ellipsoid, 1.5–2 cm × 8–10 mm. Fl. Jul–Aug, fr. Oct.

Epiphytic on tree trunks in forests or lithophytic on rocks along valleys; 700–2700 m. NW to SE Yunnan [Bhutan, NE India].

## 117. ISCHNOGYNE Schlechter, Repert. Spec. Nov. Regni Veg. 12: 106. 1913.

瘦房兰属 shou fang lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic. Rhizome creeping. Pseudobulbs borne close together, prostrate basally, cylindrical, 1-leaved. Leaf lanceolate-elliptic, obtuse, thinly leathery, petiolate. Inflorescence synanthous to proteranthous, 1-flowered, erect; floral bracts persistent, shorter than ovary. Flowers white, lip with 2 purple spots at base and with a yellow blotch at base of mid-lobe, resupinate. Sepals free, linear-lanceolate; lateral sepals abruptly pouchlike and basally dilated. Petals linear; lip basally spurred, 3-lobed, ecallose; spur concealed by bases of lateral sepals. Column dilated and flattened apically, without stelidia, foot absent; pollinia 4, broadly obovoid, caudiculate; stigma cup-shaped. Capsule ellipsoid.

• One species: China.

**1. *Ischnogyne mandarinorum*** (Kraenzlin) Schlechter, Repert. Spec. Nov. Regni Veg. 12: 107. 1913.

瘦房兰 shou fang lan

*Coelogyne mandarinorum* Kraenzlin, Bot. Jahrb. Syst. 29: 269. 1901; *Pleione mandarinorum* (Kraenzlin) Kraenzlin.

Pseudobulbs brown when dry, cylindrical, 1.5–3 cm × 2.5–3.5 mm, longitudinally wrinkled when dry, apically ± hook-shaped. Leaf suberect, lanceolate-elliptic, 4–7 × 1.2–1.5 cm, thinly leathery, obtuse; petiole 1–2 cm. Inflorescence 5–7 cm; floral bracts ovate, 5–7 mm, membranous. Flower solitary, white, lip with 2 purple spots at base and with a yellow blotch

at base of mid-lobe; pedicel and ovary 1–2 cm. Sepals linear-lanceolate, 28–32 × 3–3.5 mm; lateral sepals with basal pouch ca. 3 mm. Petals linear, ca. 30 × 2.5 mm; lip narrowly obovate, ca. 30 × 8 mm, attenuate toward base, base spurred, distally 3-lobed and slightly shoulderlike; lateral lobes small; mid-lobe subquadrate, slightly undulate, apex slightly emarginate and apiculate; spur ca. 3 × 1.5 mm. Column ca. 2.5 cm; wing ca. 2.5 mm wide on each apical side. Capsule ellipsoid, 1.6–2 cm × 7–9 mm. Fl. May–Jun, fr. Jul–Aug.

• Epiphytic on trees and lithophytic on rocks in forests or along valleys; 700–1500 m. Chongqing, S Gansu, W Guizhou, W Hubei, S Shaanxi, Sichuan.

## 118. POLYSTACHYA Hooker, Exot. Fl. 2: ad t. 103. 1824, nom. cons.

多穗兰属 duo sui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Dendroorkis* Thouars.

Herbs, epiphytic or lithophytic. Stem erect, often pseudobulbous or fusiform, simple or superposed, with 1 to several leaves. Leaves conduplicate, often narrowly oblong or oblong, sheathing and articulate at base. Inflorescences terminal, racemose or paniculate, few to many flowered; peduncle often enclosed in scarios sheaths. Flowers not resupinate, small or sometimes medium-sized. Sepals connivent or spreading; dorsal sepal free; lateral sepals adnate to column foot forming a mentum. Petals smaller, usually linear; lip superior, entire or 3-lobed, base articulate with column foot, spurless; disk often farinaceous (pseudopollen). Column short, with conspicuous column foot; pollinia 4 (unequal in size, in 2 pairs) or 2 (each deeply cleft), waxy, with a small stipe and a viscidium.

About 200 species: centered in Africa, some species in tropical America, and one pantropical species widespread in Asia from Sri Lanka and India eastward to Sulawesi and the Philippines, including China.

**1. *Polystachya concreta*** (Jacquin) Garay & H. R. Sweet, Orquideologia 9(3): 206. 1974.

多穗兰 duo sui lan

*Epidendrum concretum* Jacquin, Enum. Syst. Pl. 30. 1760; *Dendroorkis purpurea* (Wight) Kuntze; *Onychium flavescens*

Blume; *Polystachya flavescens* (Blume) J. J. Smith; *P. pleistantha* Kraenzlin; *P. purpurea* Wight; *P. purpurea* var. *lutescens* Gagnepain.

Plants 10–29 cm tall. Pseudobulbs usually slightly compressed, ovoid to conic, 1–2 × 0.5–1.5 cm, with 2 or 3 nodes.

Leaves 3–5, narrowly oblong or narrowly ovate-lanceolate, 7–18 × 1.2–3.4 cm, base narrowed into a petiole and then decurrent into a sheath, apex obtuse or unequally shallowly 2-lobed. Inflorescence terminal, 3–10 cm, usually 1–4-branched; rachis ± narrowly winged, racemose, branches 1–2 cm, 3–8-flowered; floral bracts narrowly lanceolate to nearly subulate, 2–5 mm. Flowers pale yellow, small; pedicel and ovary 8–12 mm. Dorsal sepal subovate, 3.5–4 × 1.5–2 mm, obtuse; lateral sepals broadly ovate-triangular, ca. 4 mm wide at base. Petals linear-oblongate or subcuneate, 2.5–3 × ca. 0.5 mm; lip 3.5–4 mm,

base contracted into a short claw, 3-lobed; lateral lobes incurved, ovate-oblong to narrowly oblong, small; mid-lobe orbicular, margin undulate and irregularly erose, apex emarginate, with a thickened central part. Column ca. 1 mm, foot short. Capsule ellipsoid, 1.2–1.4 cm × 5–6 mm. Fl. and fr. Aug–Sep.

Epiphytic on trees in dense forests or thickets; 600–1500 m. S Yunnan [Cambodia, India (including Nicobar Islands), Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Africa, subtropical and tropical America].

## 119. *ERIA* Lindley, Bot. Reg. 11: ad t. 904. 1825, nom. cons.

毛兰属 *mao lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*), Luo Yibo (罗毅波); Jeffrey J. Wood

*Trichosma* Lindley.

Herbs, epiphytic, lithophytic, or rarely terrestrial. Rhizome creeping. Stems pseudobulbous, of 1 distinctly enlarged internode, ovoid, faintly to distinctly angular in transverse section, with 2–4 leaves toward apex; base of pseudobulbs loosely covered by leaf sheaths. Leaves convolute in bud, elliptic to narrowly elliptic, leathery, articulate, tapering at base. Inflorescence axillary, erect, many flowered, pubescent; peduncle subtended by 2 or 3 imbricate sterile bracts arising from opposite leaf base; inflorescence axis covered by brown stellate hairs; floral bracts brown, narrowly ovate to triangular. Flowers opening widely, usually cream-colored to pale yellow and in some species with purple veins or purple markings on column, column foot, and lip, stellate or otherwise, large; ovary angular in cross section, sometimes winged. Sepals narrowly triangular with hairs abaxially; lateral sepals slightly ventrally broadened at base, recurved at apex; mentum distinct. Petals similar to sepals; lip simple or 3-lobed, callus absent or adorned with ridges. Column short, foot incurved; anther cap fleshy, with an obtuse apical median ridge, apex obtuse and covering erect, truncate rostellum; pollinia 8, in 2 groups of 4, each group contained within a distinct 4-chambered pouch at base of anther cap, each pollinium laterally compressed, ± deltoid in lateral view, equal in size, at base attached with white granular caudicles.

About 15 species: mainland Asia and the whole of the Malay Archipelago, east to New Guinea and Bougainville Island; seven species (one endemic) in China.

Lindley established *Eria* based on *E. stellata* (now *E. javanica*). The generic name is derived from the Greek *έρion* (*erion*, wool) and refers to the woolly hairs on the inflorescence and flowers. Lindley, in giving the name, was referring to *Eria pubescens*, now referred to *Dendrolirium lasiopetalum* (see p. 351). Densely woolly pubescence is indeed characteristic of *Dendrolirium* but not very evident in *Eria* s.s. In the same year, Blume (Bijdr. 340, 342, 343, 352. 1825) established the genera *Callostylis*, *Ceratium*, *Dendrolirium*, *Mycaranthes*, and *Trichotosia*. Lindley (Gen. Sp. Orchid. Pl. 65–70. 1830) included Blume's *Dendrolirium* and his own *Pinalia* in *Eria*, including 25 species in the genus. Seidenfaden, in his treatment of Thai *Eria* (Opera Bot. 62: 1–157. 1982), commented, “this genus as circumscribed by Lindley and as understood by later authors, has had so many heterogeneous elements included that considerations must be given to possible separations into more genera.”

*Eria* s.l. comprises ca. 370 species, with ca. 44 species recorded from China. Although no serious modern studies of *Eria* s.l. at the interspecific level have been undertaken over its entire range (apart from Seidenfaden, loc. cit.), conspecificity may be expected to be high, thereby reducing the number of described taxa.

Pridgeon et al. (Gen. Orchid. 4(1): 532. 2005) reported that the recent molecular and morphological phylogenetic analysis of the Eriinae by Ng (Phylogenetic relationships in tribe Podochileae (Orchidaceae: Epidendroideae): based on combined evidence from molecular and morphological data. Unpublished Ph.D. Thesis, University of London. 2002) provided further evidence suggesting that the large and unwieldy *Eria*, in the widely accepted sense, is polyphyletic. Combined ITS, *matK*, and *trnL-F* analysis shows the widely accepted Chinese genera *Ceratostylis* and *Trichotosia* to be nested within *Eria* s.l. Ng recommended the continuing recognition of these. However, former sections of *Eria* s.l. represented in China, viz. *Bryobium*, *Callostylis*, *Conchidium*, and a broadly defined *Pinalia*, are given generic rank. *Eria* sect. *Aeridostachya* J. D. Hooker, *E.* sect. *Cylindrolobus* (Blume) Lindley, and *E.* sect. *Dendrolirium* (Blume) Lindley form a clade and have been amalgamated into a very broadly defined *Callostylis* (Pridgeon et al., loc. cit.: 541–542. 2005). The constituent elements of *Callostylis* are, however, morphologically distinctive, and *Aeridostachya*, *Cylindrolobus*, and *Dendrolirium* are recognized as distinct genera in this account. Other changes affecting Chinese taxa include the inclusion of *Eria* sect. *Pellaianthus* J. D. Hooker into *Campanulorchis* (see p. 346) and *E.* sect. *Strongyleria* Pfitzer into *Mycaranthes* (see p. 348).

The genus *Pinalia*, established by Lindley in 1826, is newly circumscribed by Pridgeon et al. (loc. cit.: 569. 2005). It now comprises five former sections of *Eria* s.l., viz. *E.* sect. *Hymeneria* Lindley, *E.* sect. *Pinalia* (Buchanan-Hamilton ex D. Don) Lindley, *E.* sect. *Polyura* Schlechter, *E.* sect. *Secundae* Leavitt, and *E.* sect. *Urostachya* Lindley (see p. 352). This is significant because these taxa represent the majority of the former *Eria* s.l., altogether including approximately 160 species. The majority of taxa from China now belong within *Pinalia*.

*Eria* s.s. is represented by seven species in China. It is typified by the widespread *E. javanica* and comprises about half a dozen allied species mostly restricted to New Guinea, as well as the mainland Asian species formerly placed in *E.* sect. *Trichosma* (Lindley) Lindley, to which the remaining Chinese species belong and among which *E. coronaria* is the most widespread.

- 1a. Leaves plicate, venation convolute; flowers stellate ..... 1. *E. javanica*  
 1b. Leaves conduplicate; flowers not as above.  
 2a. Lip simple ..... 7. *E. vittata*  
 2b. Lip 3-lobed.  
 3a. Pseudobulbs ovoid or ovoid-oblong, less than 3 cm.  
 4a. Pseudobulbs borne mostly 3–6 cm apart on a slender creeping rhizome; disk of lip with 3 undulate-curved median keels running to apex of mid-lobe, with additional reduced keels mostly within mid-lobe; flowers greenish, keels brownish ..... 2. *E. clausa*  
 4b. Pseudobulbs borne close together; disk of lip with 3 undulate lamellae extending to base of mid-lobe; flowers greenish or yellowish white, mid-lobe of lip purple, lateral lobes with purple spots ..... 3. *E. corneri*  
 3b. Pseudobulbs narrowly cylindrical, short or elongate.  
 5a. Pseudobulbs 2–2.5 cm, much shorter than leaves; inflorescence much shorter than leaves; leaves 0.8–1.8 cm wide; lip distinctly clawed ..... 6. *E. yanshanensis*  
 5b. Pseudobulbs (5–)10–20 cm, longer than or ca. as long as leaves; inflorescence ca. as long as or longer than leaves; leaves 1–6 cm wide; lip not clawed.  
 6a. Inflorescence (1 or)2–4(–6)-flowered; sepals pale greenish yellow, sometimes with a purplish tint, without purple-red spots; lip disk with 3 entire or undulate lamellae running from base to mid-lobe and with 2–4 additional crenate or undulate lamellae on mid-lobe, lip lateral lobes with strong purplish red streaks and a yellow center; leaf apex acute; floral bracts 3–8 mm ..... 4. *E. coronaria*  
 6b. Inflorescence 7–12-flowered; sepals densely red spotted abaxially; lip disk with 2 diverging keels and 1 keel on mid-lobe, or with 2 entire lamellate keels below middle and 5 undulate lamellate keels above middle and central 3 of latter extending to mid-lobe, confluent, and reduced to a few teeth, lip lateral lobes without purplish red streaks; leaf apex acuminate; floral bracts 6–11 mm ..... 5. *E. gagnepainii*

**1. *Eria javanica*** (Swartz) Blume, Rumphia 2: 23. 1839.

香花毛兰 xiang hua mao lan

*Dendrobium javanicum* Swartz, Kongl. Vetensk. Acad. Nya Handl. 21: 247. 1800; *Eria fragrans* H. G. Reichenbach; *E. stellata* Lindley; *E. striolata* H. G. Reichenbach; *Octomeria stellata* (Lindley) Sprengel; *Pinalia fragrans* (H. G. Reichenbach) Kuntze; *P. stellata* (Lindley) Kuntze; *P. striolata* (H. G. Reichenbach) Kuntze; *Tainia stellata* (Lindley) Pfitzer.

Pseudobulbs cylindrical, 6–7 × 1.2–1.5 cm, with 3 sheaths, 2-leaved near apex. Leaf blade spatulate to obovate-lanceolate, 36–40 × 5–6 cm, with 7–10 main veins, base attenuate, apex acuminate. Inflorescences lateral or subterminal, 40–50 cm, many flowered, sheathing at base; rachis rusty pubescent; floral bracts deciduous, ovate-lanceolate, 1.2–1.5 cm. Flowers fragrant, white, sepals rusty pubescent abaxially; pedicel and ovary nearly as long as floral bracts, rusty pubescent. Dorsal sepal lanceolate, 15–20 × ca. 4 mm, long acuminate; lateral sepals falcate-lanceolate, 15–20 × 4–5 mm, long acuminate; mentum ca. 5 mm. Petals lanceolate, 15–20 × ca. 4 mm, long acuminate; lip ovate-lanceolate in outline, ca. 14 × 7–8 mm, 3-lobed; lateral lobes suberect, oblong, 6–7 mm, obtuse; mid-lobe oblong-lanceolate, 7–8 × ca. 3 mm, acuminate; disk with 3 or 5 lamellae extending to near apex of mid-lobe. Column ca. 5 mm (with anther cap), thickened, foot 5–6 mm. Fl. Aug–Oct. *2n* = 36.

Lithophytic in rocky places, sometimes in forests; 300–1000 m. C Taiwan, S Yunnan [NE India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand].

**2. *Eria clausa*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 121. 1896.

匍茎毛兰 pu jing mao lan

*Eria corneri* H. G. Reichenbach var. *clausa* (King & Pantling) A. N. Rao.

Rhizome creeping, slender. Pseudobulbs borne (1–)3–6 cm apart on rhizome, ovoid or ovoid-oblong, 1.5–3 × 0.6–1 cm, apex 1–3-leaved. Leaf blade elliptic or elliptic-oblong, 5–15 × 1.5–3 cm, with grayish white papillae on both surfaces when dry, with 5 or 6 main veins, acuminate or long acuminate; petiole 1–3 cm. Inflorescence 1, rarely 2, subterminal, 8–10 cm, shorter than leaves, sparsely 2–6-flowered; peduncle 2–2.5 cm, with 2 membranous basal sheaths; floral bracts ovate to triangular, 1–4 mm. Flowers yellowish green or pale green; pedicel and ovary 5–7 mm. Dorsal sepal oblong, 8–10 × 2–3 mm, obtuse; lateral sepals falcate-lanceolate, 7–10 × 3–3.5 mm, obtuse; mentum ca. 4 mm. Petals fusiform-oblong, 6–10 × 2–2.5 mm, obtuse; lip obovate in outline, ca. 7 × 5–7 mm, 3-lobed; lateral lobes ± obliquely oblong; mid-lobe broadly ovate, ca. 3 × 2–2.5 mm, obtuse; disk with 3 high median lamellae extending from base to apex of mid-lobe, undulate-curved distally, with additional shorter, sinuous outer lamellae mostly restricted to mid-lobe. Column ca. 4 mm (with anther cap), foot ca. 3 mm. Capsule ellipsoid, 1–1.5 cm × 6–8 mm; fruiting pedicel ca. 2 mm. Fl. Mar, fr. Apr–May.

Epiphytic on tree trunks or lithophytic on rocks in broad-leaved forests; 1000–1700 m. W Guangxi, SE Xizang, S and SE Yunnan [Bhutan, N India, Myanmar, Vietnam].

Averyanov (Opred. Orkhid. Vetnama, 227, 400. 1994) treated *Eria clausa* as a synonym of the related *E. corneri*. King & Pantling (Ann. Roy. Bot. Gard. Calcutta 8: 121. 1898) suggested that *E. clausa* might be a cleistogamous form of *E. vittata*, whereas Rao (J. Econ. Taxon. Bot. 20: 708. 1996) suggested that it was a cleistogamous form of *E. corneri*. They differ, however, in that *E. corneri* has clustered pseudobulbs, while *E. clausa* has well-spaced pseudobulbs.

**3. *Eria corneri*** H. G. Reichenbach, Gard. Chron., n.s., 10: 106. 1878.

半柱毛兰 ban zhu mao lan

*Eria goldschmidiana* Schlechter; *E. septemlamella* Hayata.

Pseudobulbs ± clustered, ovoid-oblong or ellipsoid, 2–5 × 1–2.5 cm, apex 2- or 3-leaved. Leaf blade elliptic-lanceolate or obovate-lanceolate, (15–)20–45 × 1.5–6 cm, both surfaces with grayish white papillae when dry, apex acuminate or long acuminate; petiole 2–3 cm. Inflorescence subterminal, 6–22 cm, more than 10-flowered (sometimes to 60-flowered); floral bracts deltoid, ca. 1 mm. Flowers white or slightly tinged with yellow, with white linear projections on sepals and petals; pedicel and ovary 7–8 mm. Dorsal sepal ovate-triangular, ca. 10 × 2 mm, acuminate; lateral sepals falcate-triangular, ca. 10 × 5 mm, obtuse-rounded and apiculate; mentum obtuse. Petals linear-lanceolate, slightly falcate, ca. 10 × 1.2 mm; lip ovate in outline, ca. 10 × 6 mm, 3-lobed; lateral lobes suberect, suborbicular, rounded; mid-lobe ovate-triangular, 3–3.5 × ca. 2 mm, obtuse, with ca. 7 crested or fimbriate lamellae; disk with 3 undulate lamellae extending to base of mid-lobe. Column subcylindric, ca. 3 mm, foot ca. 5 mm. Capsule obovoid-cylindric, ca. 1.5 cm × 5–6 mm; fruiting pedicel ca. 3 mm. Fl. Aug–Sep, fr. Oct–Dec.  $2n = 36$ .

Epiphytic on trees or lithophytic on rocks in forests; 500–1500 m. S Fujian, S and W Guangdong, S Guangxi, SW Guizhou, Hainan, Taiwan, SE Yunnan [Japan (Ryukyu Islands), Vietnam].

**4. *Eria coronaria*** (Lindley) H. G. Reichenbach, Ann. Bot. Syst. 6: 271. 1861.

足茎毛兰 zu jing mao lan

*Coelogyne coronaria* Lindley, Edwards's Bot. Reg. 27 (Misc.): 83. 1841; *Eria cylindropoda* Griffith; *E. medogensis* S. C. Chen & Z. H. Tsi; *E. suavis* (Lindley) Lindley; *Trichosma coronaria* (Lindley) Kuntze; *T. suavis* Lindley.

Plants glabrous, turning black when dried. Rhizome creeping, 4–5 mm in diam., often with funnel-shaped sheaths 6–7 mm. Pseudobulbs contiguous or 1–2 cm apart from each other, cylindrical, 5–15 cm × 3–6 mm. Leaves 2, subterminal, sessile, narrowly elliptic or obovate-elliptic, rarely ovate-lanceolate, 6–16 × 1–4 cm, acute or obtuse. Inflorescence arising between leaves, 10–30 cm, 2–6-flowered; floral bracts lanceolate or linear, rarely ovate-lanceolate, 5–8 mm. Flowers white, with purple stripes on lip; pedicel and ovary ca. 1.5 cm. Dorsal sepal elliptic-lanceolate, ca. 17 × 5 mm, obtuse; lateral sepals falcate-lanceolate, ca. 15 × 5 mm, obtuse; mentum conspicuous. Petals oblong-lanceolate, ca. 17 × 4.5 mm, obtuse; lip oblong in outline, 14–15 × 11–12 mm, 3-lobed; lateral lobes divaricate, suborbicular or suboblong; mid-lobe triangular or subsquare, ca. 5 × 4 mm, acute or subtruncate; disk with 3 entire or undulate lamellae running from base to mid-lobe and with 2–4 additional crenate or undulate lamellae on mid-lobe. Column ca. 5 mm, foot ca. 5 mm. Capsule obovoid-cylindric, ca. 2 cm; fruiting pedicel ca. 3 mm. Fl. May–Jun.  $2n = 34, 36, 38, 44, 52$ .

Epiphytic on tree trunks or lithophytic on rocks in forests; 1300–2100 m. Guangxi, Hainan, SE Xizang, NW and S Yunnan [Bhutan, India, Nepal, Thailand, Vietnam].

*Eria medogensis*, described from SE Xizang, represents a peloric form of *E. coronaria* in which the lip is undifferentiated and resembles the sepals and petals.

**5. *Eria gagnepainii*** A. D. Hawkes & A. H. Heller, Lloydia 20: 130. 1957 [“*gagnepainii*”].

香港毛兰 xiang gang mao lan

*Trichosma simondii* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 505. 1950; *Eria herklotsii* P. J. Cribb; *E. rubropunctata* Seidenfaden, nom. illeg. superfl.

Plants glabrous, turning black when dried. Rhizomes creeping, 4–5 mm in diam., with funnel-shaped sheaths 0.7–1.5 cm. Pseudobulbs contiguous or 1–3 cm apart from each other, cylindrical, slender, 5–23 cm × 3–6 mm, base with a long, fibrously lacerate sheath. Leaves 2, subterminal, sessile, narrowly elliptic, elliptic-lanceolate, oblong-lanceolate, or obovate-elliptic, 10–26 × 2.5–6 cm, with 5–9 main veins, acuminate. Inflorescence 1(or 2), arising between leaves, 6–40 cm, up to 12-flowered; floral bracts ovate-lanceolate to linear, 6–11 mm, acuminate. Flowers pure white at first, turning cream-colored and then yellow as they age, scented or unscented; pedicel and ovary 1–1.5 cm. Dorsal sepal narrowly elliptic or oblong-elliptic, 14–16 × 3–5 mm, acute or obtuse; lateral sepals falcate-elliptic or falcate-lanceolate, 12–16 × 5–8 mm, obtuse to acuminate; mentum ca. 5 mm, obtuse. Petals oblong-lanceolate, slightly curved, 11–13 × 1.5–3 mm, acute or obtuse; lip suborbicular or ovate-orbicular in outline, ca. 9 × 8 mm, 3-lobed; lateral lobes parallel to mid-lobe, suboblong or ovate-triangular, obtuse; mid-lobe 2–3 × ca. 2 mm, subtriangular or ovate-triangular, acute; disk with 2 diverging keels and 1 keel on mid-lobe, or with 2 entire lamellate keels below middle and 5 undulate lamellate keels above middle and central 3 of latter extending to mid-lobe, confluent, and reduced to a few teeth. Column ca. 5 mm, foot ca. 5 mm. Fl. Feb–Apr.

Epiphytic on trees or lithophytic on rocks in forests; 1500–2100 m. Hainan, Hong Kong, SE Xizang, NW to S Yunnan [Vietnam].

**6. *Eria yanshanensis*** S. C. Chen, Acta Phytotax. Sin. 26: 239. 1988.

砚山毛兰 yan shan mao lan

Plants turning black when dried. Rhizome flexuous, short, sparsely pubescent; pseudobulbs contiguous, cylindrical, 2–2.5 cm × 2–3 mm, with longitudinal stripes, apex 2-leaved. Leaf blade oblong-obovate, 9.5–13.8 × 0.8–1.8 cm, nearly leathery when dried, usually with 9 main veins, subacute. Inflorescence terminal, 15–19 cm, laxly 9- or 10-flowered; floral bracts lanceolate, 3–4(–7) mm. Flowers glabrous. Dorsal sepal lanceolate-oblong, ca. 8 × 2 mm, shortly acuminate; lateral sepals subovate, 6–7 × 2–2.5 mm, subacute. Petals slightly curved, narrowly oblong, ca. 6 × 1.5 mm, subacute; lip obovate-cuneate in outline, ca. 9 × 5–6 mm, with a basal claw 4–4.5 mm, distally 3-lobed; lateral lobes subovate, broadly obtuse; mid-lobe suborbicular, ca. 1.5 × 3 mm, margin irregularly crenate or undulate, apex mucronate; disk with a central, suborbicular lamella ca. 0.7 mm tall in basal half and 6 or 7 irregularly fimbriate lamellae above. Column ca. 1.5 mm (not including anther cap). Cap-

sule oblong-ellipsoid, ca. 1 cm × 5–6 mm; fruiting pedicel 5–6 mm. Fl. unknown, fr. Oct.

- Epiphytic in dense forests; ca. 1100 m. S and SE Yunnan.

**7. *Eria vittata*** Lindley, J. Proc. Linn. Soc., Bot. 3: 51. 1858.

条纹毛兰 tiao wen mao lan

*Pinalia vittata* (Lindley) Kuntze.

Plants glabrous. Rhizome slender, glabrous, with a funnel-shaped sheath on each node. Pseudobulbs 2–2.5 cm apart from each other, slightly curved, cylindrical, 6–7 cm × 6–8 mm, apex 2-leaved. Leaf blade elliptic or elliptic-lanceolate, 14–19 × 2–4 cm, with 8 or 9 main veins, acuminate. Inflorescence subter-

minal, usually pendulous, 14–18 cm, many flowered; floral bracts persistent, lanceolate to subulate, 1–4 mm. Flowers grayish green, with purplish brown stripes on sepals and petals, ca. 1 cm in diam.; pedicel and ovary ca. 1 cm. Dorsal sepal oblong, ca. 12 × 3 mm, obtuse; lateral sepals obliquely triangular-oblong, falcate, ca. 10 × 4 mm, acute; mentum ca. 5 mm. Petals lanceolate-oblong, ca. 12 × 5 mm, obtuse; lip oblong in outline, ca. 12 × 5 mm, base attenuate, margin entire, apex subtruncate and slightly mucronulate, with 5 undulate lamellae running nearly from base to apex. Column laterally compressed, nearly ca. 7 mm (with anther cap), slender, foot to 7 mm. Fl. unknown.

Lithophytic on rocks in forests along valleys; ca. 1600 m. SE Xizang [NE India, Myanmar, Thailand].

**120. CAMPANULORCHIS** Brieger in Brieger et al., Schlechter Orchideen 1(11–12): 750. 1981.

钟兰属 zhong lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

Herbs, epiphytic, small to medium-sized. Rhizome short or elongate, stout, internodes short or to ca. 4 cm, with pubescent roots. Stems pseudobulbous, pseudobulbs of 1 internode, short to ca. 13 cm, sometimes with several ferruginous reddish brown pubescent sheaths, distinctly or slightly swollen at base, then tapering distally, upper portion cylindrical, with 1–4 leaves at apex. Leaves erect or spreading, conduplicate or terete, ± linear-oblong or ligulate, leathery, articulate at base to a short, sometimes pubescent leaf base or to stem. Inflorescences 1- to few flowered, up to 3 per pseudobulb, emerging from an acute sheath, often densely ferruginous reddish brown pubescent; floral bracts often ferruginous pubescent. Flowers not resupinate or resupinate, opening widely, densely pubescent. Sepals and pedicel and ovary densely pubescent. Dorsal sepal free; lateral sepals connate with column foot forming a distinct shortly conic mentum. Petals free, smaller than sepals, glabrous; lip entire or 3-lobed in apical half; lateral lobes (when present) erect; mid-lobe with thickened margin; callus of 2 longitudinal central and 1 apical, somewhat verrucose ridges. Column short, somewhat clavate, sometimes pubescent, foot ca. as long as or longer than column proper, incurved; pollinia 8, compressed ovoid or clavate.

About five species: widespread in Indonesia, Laos, Malaysia, New Guinea, Thailand, and Vietnam, extending east to S China (Hainan); one species in China.

**1. *Campanulorchis thao*** (Gagnepain) S. C. Chen & J. J. Wood, **comb. nov.**

钟兰 zhong lan

Basionym: *Eria thao* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 503. 1950; *E. bulbophylloides* Tang & F. T. Wang (1974), not C. Schweinfurth (1936).

Rhizome well developed, slightly dilated at joint. Pseudobulbs borne 1–3 cm apart from each other, ovoid or globose, ca. 1.2 cm in diam., enclosed in 2 sheaths, apex 1-leaved. Leaf blade elliptic or oblong-elliptic, (3–)5–10 × (1–)1.5–2 cm, leathery, base attenuate into a petiole 1.5–2 cm, apex obtuse. Inflorescence terminal, ca. 2 cm, 1-flowered, with dense, reddish brown, cottony hairs; floral bracts broadly triangular, ca. 1 mm. Flowers yellow, lip yellowish red, tinged with purple; pedicel

and ovary ca. 5 mm, with dense, reddish brown, cottony hairs. Sepals with dense, reddish brown, cottony hairs abaxially; dorsal sepal lanceolate-oblong, ca. 17 × 6–8 mm, obtuse; lateral sepals triangular-ovate, ca. 20 × 6–9 mm, obtuse. Petals elliptic, ca. 15 × 5 mm, obtuse; lip obovate-rhombic in outline, nearly ca. 15 × 10 mm, 3-lobed; lateral lobes subtriangular-ovate, ca. 4 × 3 mm; mid-lobe suboblong, ca. 10 × 6 mm, margin conspicuously thickened; disk with 3 lamellae, central 1 inconspicuous, lateral 2 much higher. Column ca. 6 mm, apex dilated, shortly winged, foot ca. 8 mm. Capsule ellipsoid-cylindrical, ca. 3.1 × 1 cm, with sparse, reddish brown, cottony hairs. Fl. Aug–Oct, fr. Dec–Feb.  $2n = 42$ .

Epiphytic on trees or lithophytic on rocks in forests; 600–1200 m. S Hainan [Vietnam].

**121. CONCHIDIUM** Griffith, Not. Pl. Asiat. 3: 321. 1851.

蛤兰属 ge lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

Herbs, dwarf, caespitose, epiphytic or lithophytic, often forming mats on substrate. Rhizome creeping. Pseudobulb of 1 internode, globose, discoid, or oblong, strongly depressed, reticulate or not. Leaves 1–4, inserted at top of pseudobulbs, obovate-lanceolate, subsessile, petiole tapering, articulate. Inflorescence terminal, solitary, elongate, hysteroanthous, proteranthous, or synanthous, 1- or a few flowered; peduncle filiform; floral bracts hooded, membranous. Flower white, pale green, or yellow. Dorsal sepal triangular, acuminate; lateral sepals obliquely triangular or lanceolate, acuminate, forming a distinct mentum with column foot. Petals obovate-

lanceolate or oblong, acuminate or obtuse; lip entire or 3-lobed, with a claw, simple or adorned with ridges. Column with a curving foot; pollinia 8, compressed, ovoid; rostellum truncate, almost square in outline.

About ten species: Bhutan, S China, N India, S Japan, Laos, Myanmar, Nepal, Thailand, Vietnam; four species (one endemic) in China.

1a. Pseudobulbs contiguous.

- 2a. Pseudobulbs depressed globose, discoid, 5–6 × 4–6 mm, surrounded by reticulate sheaths, congested, 2- or 3-leaved; leaves 1–2 × 0.3–0.4 cm; flowers pale green; dorsal sepal ca. 4 mm, acuminate; disk with 2 basal calli ..... 1. *C. muscicola*  
 2b. Pseudobulbs narrowly ovoid, 10–15 × 3–4 mm, not surrounded by reticulate sheaths, 2-leaved; leaves 4–10 × 0.5–1.6 cm; flowers white; dorsal sepal ca. 8 mm, obtuse; disk with 3 lamellae ..... 4. *C. japonicum*

1b. Pseudobulbs borne 2–5 cm apart on rhizome.

- 3a. Pseudobulbs 3–6 mm, ± subglobose or compressed globose, covered by reticulate sheaths; leaves 0.5–1.6 × 0.2–0.4 cm; lip to ca. 5 mm, entire, lanceolate; flowers white or pale yellow ..... 2. *C. pusillum*  
 3b. Pseudobulbs 9–15 mm, oblong-cylindric, without reticulate sheaths; leaves 2–6 × 0.6–1.5 cm; sepals 11–18 mm; lip 10–17 mm, 3-lobed; flowers cream-colored and lavender or red ..... 3. *C. rhomboidale*

**1. *Conchidium muscicola*** (Lindley) Rauschert, Feddes Repert. 94: 444. 1983.

网鞘蛤兰 wang qiao ge lan

*Dendrobium muscicola* Lindley, Gen. Sp. Orchid. Pl. 75. 1830; *D. parviflorum* D. Don; *Eria muscicola* (Lindley) Lindley; *Pinalia muscicola* (Lindley) Kuntze.

Plants 3–4 cm tall, glabrous. Pseudobulbs congested, depressed globose, discoid, 5–6 × 4–6 mm, covered by reticulate membranous sheaths, apex 2- or 3-leaved. Leaf blade oblanceolate or spatulate, 10–20 × 3–4 mm, thinly papery, with 7 or 8 main veins, apex acute or rounded and apiculate; petiole 3–4 cm. Inflorescence (2–)5- or 6-flowered; floral bracts lanceolate, ca. 5 mm, acuminate. Flowers pale green, small; pedicel and ovary ca. 2 mm. Dorsal sepal lanceolate, ca. 4 × 1 mm, acuminate; lateral sepals ovate-lanceolate, slightly falcate, ca. 4 × 3 mm, acuminate; mentum small or indistinct, apex obtuse. Petals lanceolate, ca. 3.5 × 1 mm, acuminate; lip subelliptic, ca. 3 × 1 mm, entire, acuminate, contracted on both sides near middle, crenulate on apical margin; disk with 2 basal calli, central part with 3 veins running to near apex and lateral ones slightly thickened at base. Column less than 1 mm, foot ca. 2.5 mm. Capsule oblong-cylindric, ca. 4 × 2 mm; fruiting pedicel very short. Fl. Jul–Aug, fr. Oct.  $2n = 18, 36$ .

Epiphytic on trees or lithophytic on rocks in evergreen broad-leaved forests; 1800–2800 m. S Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, ?Sri Lanka, Thailand, Vietnam].

**2. *Conchidium pusillum*** Griffith, Not. Pl. Asiat. 3: 321. 1851.

蛤兰 ge lan

*Conchidium sinicum* Lindley; *Eria pusilla* (Griffith) Lindley; *E. sinica* (Lindley) Lindley; *Phreatia uniflora* Wight; *Pinalia pusilla* (Griffith) Kuntze; *P. sinica* (Lindley) Kuntze.

Plants 1–3 cm tall; rhizome long creeping, slender, with grayish white membranous sheaths. Pseudobulbs usually growing in pairs, each pair 2–5 cm apart on rhizome, nearly subglobose or compressed globose, 3–6 mm in diam., covered by reticulate membranous sheaths (sheaths deciduous when dry). Leaves 2 or 3, obovate-lanceolate, obovate, or subelliptic to orbicular, 5–16 × 2–4 mm, with 3–6 main veins, apex with

an awn 1–1.5 mm, or obtuse, rounded, or subtruncate, apiculate; petiole 2–3 mm, articulate. Inflorescence 1–5 cm, 1- or 2-flowered; floral bracts ovate, ca. 2 mm, shortly aristate or acuminate. Flowers white or pale yellow, small; pedicel and ovary ca. 1.5 mm. Dorsal sepal ovate or ovate-lanceolate, 4–6 × ca. 1.5 mm, obtuse or acuminate; lateral sepals triangular or ovate-triangular, slightly oblique, 4.5–6 × ca. 2 mm, acuminate; mentum long, incurved. Petals lanceolate, ca. 4 × 1 mm, acuminate; lip lanceolate or subelliptic, ca. 3.5 × 1.5 mm, base contracted, entire, margin thinly ciliate or irregularly denticulate, apex obtuse or acuminate; disk with 2 or 3 stripes, running from base to near middle. Column ca. 1 mm, foot ca. 2 mm, slightly curved. Fl. Oct–Nov.

Lithophytic on damp rocks or epiphytic on tree trunks in forests; 600–1500 m. S Fujian, S Guangdong, S Guangxi, Hainan, SE Xizang, SE Yunnan [NE India, Myanmar, Thailand, Vietnam].

**3. *Conchidium rhomboidale*** (Tang & F. T. Wang) S. C. Chen & J. J. Wood, **comb. nov.**

菱唇蛤兰 ling chun ge lan

Basionym: *Eria rhomboidalis* Tang & F. T. Wang, Acta Phytotax. Sin. 1: 86. 1951.

Rhizome slender, 1–2 mm in diam. Pseudobulbs borne 2–4 cm apart from each other, oblong-cylindric, 0.9–1.5 cm × 4–6 mm, apex 2-leaved. Leaves shortly petiolate, narrowly elliptic or ovate-elliptic, 2–6 × 0.6–1.5 cm, apex acute and apiculate. Inflorescence subterminal, on outer side of leaves, ca. 2.5 cm, 1-flowered, with 1 or 2 sheaths at base; floral bracts ovate, ca. 1 mm, acute. Flowers cream-colored and lavender or red; pedicel and ovary ca. 1 cm. Dorsal sepal elliptic, ca. 11 × 4 mm, obtuse; lateral sepals ovate-lanceolate or triangular, oblique, ca. 18 × 6–7 mm, obtuse; mentum ca. 6 mm. Petals slightly curved, oblong-lanceolate, ca. 10 × 3 mm, obtuse; lip subrhombic, 10–17 × 7–10 mm, base narrowed into a claw, apical quarter 3-lobed; lateral lobes oblong, margins slightly obtusely toothed or entire; mid-lobe trapezoid, ca. 4 × 5–6 mm, barbate on adaxial veins, margin irregularly dentate, subtruncate; disk with 2 lamellae extending from base to near base of mid-lobe. Column ca. 4 mm, foot ca. 8 mm. Fl. Apr–May.

● On rocks in forests; 700–1300 m. SW Guangxi, SW Guizhou, Hainan, SE Yunnan [?Vietnam].

**4. *Conchidium japonicum*** (Maximowicz) S. C. Chen & J. J. Wood, **comb. nov.**

高山蛤兰 gao shan ge lan

Basionym: *Eria japonica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 31: 103. 1887; *Aeridostachya reptans* (Kuntze) Rauschert; *Callista reptans* Kuntze; *Dendrobium reptans* Franchet & Savatier (1879), not Swartz (1805); *E. arisanensis* Hayata; *E. hosokawae* A. D. Hawkes & A. H. Heller; *E. matsudae* Hayata; *E. reptans* (Kuntze) Makino; *E. reptans* var. *matsudae* (Hayata) S. S. Ying.

Pseudobulbs contiguous, regularly arranged in a row on rhizome, narrowly ovoid, 1–1.5 cm × 3–4 mm, apex 2-leaved. Leaves shortly petiolate, oblong or linear, 4–10 × 0.5–1.6 cm, apex acuminate. Inflorescence subterminal, ca. 5 cm, slender,

hairy, 1–4-flowered; peduncle ca. 1 cm; floral bracts ovate, ca. 3 mm, acute. Flowers white; pedicel and ovary ca. 8 mm, hairy. Dorsal sepal narrowly elliptic, ca. 8 × 3 mm, obtuse; lateral sepals ovate, oblique, ca. 6 × 5 mm, acute. Petals elliptic-lanceolate, ca. 8 × 2 mm, obtuse-rounded; lip subobovate in outline, base narrowed into a claw, 3-lobed above middle; lateral lobes erect, deltoid, acute; mid-lobe nearly square, ca. 3 × 3 mm, fleshy, apex subtruncate and slightly emarginate; disk with 3 lamellae from base, central lamella extending to apex and lateral 2 to base of mid-lobe. Column ca. 3 mm, foot nearly 5 mm. Fl. Jun.  $2n = 38, 40$ .

Lithophytic on rocks or epiphytic on tree trunks in forests; 700–900 m (1500–2500 m in Taiwan). S Anhui, N and W Fujian, Guizhou, Taiwan, Zhejiang [S Japan].

**122. MYCARANTHES** Blume, Bijdr. 352. 1825.

拟毛兰属 ni mao lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

Herbs, epiphytic, lithophytic, or rarely terrestrial. Stem short or elongate, usually slender, cylindrical, of few to many internodes, lacking pseudobulbs, with leaves along whole length. Leaves alternate, in a biseriate arrangement on stem axis, conduplicate or rarely terete, usually long and narrow, articulate, base tightly enveloping stem, sometimes imbricate at base, sheaths persistent. Inflorescences subterminal or terminal, 1 or usually more than 1 together (as many as 12 in robust plants), with dense, short, stellate hairs, with numerous crowded small flowers; floral bracts triangular, usually small, broad at base and covered by short stellate hairs. Flowers spirally arranged, usually cream-colored or greenish yellow, sometimes adorned with small purple spots; pedicel, ovary, and abaxial surface of sepals tomentose, covered with similar hairs to inflorescence. Sepals and petals widely spreading. Dorsal sepal elliptic to triangular, acute; lateral sepals obliquely triangular, broadened at base, acute. Petals narrow, smaller than sepals; lip distinctly 3-lobed, or simple, rigid, perpendicular to long column foot; lateral lobes (when present) often erose; callus 2-partite, farinose, with a powdery median ridge that usually ends in a protruding globose callus at tip. Column erect, short, foot long; stigma almost circular or semicircular, large; anther cap hat-shaped, ventral side almost flat, usually not covering anther tightly, leaving pollinia fully exposed, hinged at base via a thin filament; pollinia 8, clavate, equal in size, with a common caudicle.

About 25 species: Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Singapore, Thailand, Vietnam; two species in China.

- 1a. Leaves terete; flowers 1–2 cm in diam. .... 1. *M. pannea*  
1b. Leaves dorsiventrally compressed; flowers 0.3–0.5 cm in diam. .... 2. *M. floribunda*

**1. *Mycarantes pannea*** (Lindley) S. C. Chen & J. J. Wood, **comb. nov.**

指叶拟毛兰 zhi ye ni mao lan

Basionym: *Eria pannea* Lindley, Edwards's Bot. Reg. 28 (Misc.): 64. 1842; *E. calamifolia* J. D. Hooker; *E. odoratissima* Teijsmann & Binnendijk; *E. teretifolia* Griffith; *Pinalia calamifolia* (J. D. Hooker) Kuntze; *P. pannea* (Lindley) Kuntze.

Plants small, densely white tomentose when young. Rhizome creeping, elongate, slender, noded. Stems borne 2–5 cm apart on rhizome, terete, 1–2 cm, 3–4 mm in diam., with 3 or 4 leaves near apex. Leaves terete, slightly laterally compressed, 4–20 × ca. 0.3 cm, fleshy, adaxially grooved and often with white hairs along margins of grooves, apex obtuse. Inflorescence arising from between leaves, 3–5 cm, 1–5-flowered; floral bracts ovate-triangular, ca. 6 × 4 mm, obtuse. Flowers vanilla-scented, pale yellow-green, lip dark purplish; pedicel and ovary 7–10 mm. Sepals densely hairy abaxially, yellowish brown (when dried) and sparsely hairy adaxially; dorsal sepal

oblong-elliptic, ca. 6 × 3 mm, obtuse; lateral sepals obliquely ovate-triangular, ca. 6 × 5 mm, obtuse. Petals oblong, ca. 5 × 2 mm, both surfaces sparsely white hairy, obtuse; lip subobovate-elliptic, ca. 7 × 4 mm, apical part slightly fleshy, both surfaces white tomentose, margin entire, apex obtuse-rounded, base narrowed and with a linear callus, apex with 1 conspicuous elongate-elliptic callus. Column ca. 1.5 mm, abaxially sparsely white hairy, foot ca. 4 mm. Fl. Apr–May.  $2n = 36, 38$ .

Epiphytic on trees or lithophytic on rocks in forests; 800–2200 m. Guangxi, SW Guizhou, SE Hainan, SE Xizang, SW Yunnan [Bhutan, Cambodia, NE India, Indonesia, Laos, Malaysia, Myanmar, Singapore, Thailand, Vietnam].

**2. *Mycarantes floribunda*** (D. Don) S. C. Chen & J. J. Wood, **comb. nov.**

拟毛兰 ni mao lan

Basionym: *Dendrobium floribundum* D. Don, Prodr. Fl. Nepal. 34. 1825; *Callista floribunda* (D. Don) Kuntze; *Eria paniculata* Lindley; *Pinalia paniculata* (Lindley) Kuntze.

Plants 20–60 cm tall. Stems nearly clustered, erect, terete, slightly swollen at base, cylindrical, 15–50 cm, 3–5(–8) mm in diam., many noded, with internodes enclosed in leaf sheaths. Leaves many, alternate along stem, sessile, linear or narrowly lanceolate, 10–20 × 0.3–0.6 cm, apex acuminate. Inflorescences 1 or 2, subterminal, 10–15 cm, many flowered, with dense grayish white cottony hairs; floral bracts ovate-lanceolate or subtriangular, 5–6 mm, abaxially (sometimes only at base) with grayish white cottony hairs, acuminate. Flowers yellowish green; pedicel and ovary 2–3 mm, densely grayish white cottony. Sepals densely grayish white cottony abaxially; dorsal sepal ovate-elliptic, ca. 3 × 1 mm, obtuse; lateral sepals ± obliquely triangular, ca. 3 × 2.5 mm, obtuse; mentum ca. 2 mm.

Petals oblong, ca. 3 × 1.5 mm, glabrous, broadly obtuse; lip subflabellate in outline, base shortly clawed, distally 3-lobed; lateral lobes subovate-triangular; mid-lobe ± reniform, ca. 1.5 × 2.5 mm; disk with a white, somewhat dumbbell-shaped projection from base to near apex and 2 smaller projections on both basal sides; dumbbell-shaped projections ca. 1 mm, globose proximally and ellipsoid-cuneate distally. Column less than 1 mm, foot ca. 2 mm. Capsule cylindrical, ca. 1 cm × nearly 1.5 mm, with grayish white cottony hairs. Fl. Apr–Jun.  $2n = 38 + 0-4B$ .

Epiphytic on trees in forests; ca. 800 m. S Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

### 123. CYLINDROLOBUS Blume, Fl. Javae Praef. vi. 1828.

柱兰属 zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

*Ceratium* Blume, Bijdr. 342. 1825, not Schrank (1793), nor Albertini & Schweinitz (1805).

Herbs, epiphytic or rarely terrestrial. Stems elongate, slender, usually not pseudobulbous, but in some species a few terminal internodes sometimes slightly swollen, with leaves along entire length, except for a few nodes at base where persistent leaf sheaths are found, or with only a few leaves toward apex. Leaves alternate, conduplicate, linear-oblongate, narrowly elliptic, or narrowly ovate, leathery, articulate to a sheathing leaf base tightly enveloping stem. Inflorescences lateral on many nodes or arising from terminal node of stem, usually short and slender, only 1- or a few flowered; peduncle usually very much reduced; floral bracts few, spirally arranged, in some species conspicuous, brightly colored, fleshy. Flowers mostly white or cream-colored, sometimes ochre-yellow, medium-sized, glabrous or sparsely stellate-hairy on abaxial surface of sepals; pedicel and ovary glabrous. Dorsal sepal free, often recurved; lateral sepals oblique at base, forming with column foot a blunt, oblique mentum. Petals free, smaller than sepals; lip 3-lobed, hinged to column foot, curved, adorned with a papillose, subglobose callus and papillose keels, or only with laminate keels; lateral lobes erect, enclosing column; mid-lobe in most species smaller than lateral lobes. Column short, foot shorter than or ca. as long as column proper; pollinia 8, rectangular, arranged in a series of pairs, 1 large and 1 small, posterior 4 much smaller.

About 30 species: SW China, Indochina, Indonesia, Malaysia, Myanmar, Philippines, Thailand; three species (one endemic) in China.

- 1a. Stems slender, terete, not fleshy, 1–2 mm in diam.; lip ca. 3.5 mm ..... 1. *C. tenuicaulis*  
 1b. Stems stout, clavate, fleshy, 2–6 mm in diam.; lip nearly 1 cm.  
 2a. Lip yellow ..... 2. *C. cristatus*  
 2b. Lip lateral lobes with purple edges, mid-lobe with lighter purple edges and patch ..... 3. *C. marginatus*

**1. *Cylindrolobus tenuicaulis*** (S. C. Chen & Z. H. Tsi) S. C. Chen & J. J. Wood, **comb. nov.**

细茎柱兰 xi jing zhu lan

Basionym: *Eria tenuicaulis* S. C. Chen & Z. H. Tsi, Guihaia 15: 109. 1995 [*“tenuicaulis”*]; *E. gracilicaulis* S. C. Chen & Z. H. Tsi (1988), not Kraenzlin (1910).

Rhizome often slightly flexuous. Stem ± flexuous, terete, 1–2 mm in diam., noded, usually with 3 or 4 leaves at apex. Leaves oblong or lanceolate-oblong, 4–5 × 0.6–1 cm, apex acuminate; petiole 2–4 cm, articulate. Inflorescence arising from axil of apical leaf or a lower node, 5–6 mm, 2- or rarely 1-flowered; floral bracts broadly elliptic, cuspidate-acuminate. Flowers small, 4–5 mm in diam., glabrous; pedicel and ovary ca. 3 mm, glabrous. Dorsal sepal oblong-ovate or suboblong, 3–3.5 × ca. 1.2 mm, acute; lateral sepals broadly triangular-ovate, oblique, ca. 4 × 2 mm, subacute. Petals subovate, slightly shorter than dorsal sepal, acute; lip subovate in outline, ca. 3.5 mm, base subcuneate, 3-lobed; lateral lobes ca. 1.5 mm, ovate; mid-lobe subquadrate, ca. 1 × 1 mm, crisped and apiculate, with a central suborbicular lamella ca. 0.5 mm high; disk with 2

suborbicular lamellae ca. 0.6 mm high. Column slightly arcuate, ca. 1.7 mm, apex slightly enlarged; foot ca. 1.5 mm. Fl. Apr.

• Epiphytic on tree trunks in evergreen forests; 1500–2200 m. SE Xizang.

**2. *Cylindrolobus cristatus*** (Rolfe) S. C. Chen & J. J. Wood, **comb. nov.**

鸡冠柱兰 ji guan zhu lan

Basionym: *Eria cristata* Rolfe, Bull. Misc. Inform. Kew 1892: 139. 1892.

Pseudobulbs terete, sometimes clavate at apex, 9–11 cm, 3–6 mm in diam. Leaves 3 or 4, lanceolate, 6–8.5 × 1–1.4 cm, acute. Inflorescences subterminal, 2-flowered; rachis white tomentose; floral bracts yellowish green, oblong-ovate, recurved, 1.2–1.3 × 0.8–0.9 cm, obtuse. Flowers white; lip yellow, somewhat darker on disk and margins of lateral lobes; pedicel and ovary ca. 1.5 cm, white tomentose. Dorsal sepal ovate-lanceolate, 13–14 × 6–7 mm, subacute; lateral sepals triangular-ovate, carinate, ca. 15 × 7–8 mm, base oblique. Petals

lanceolate, 11–13 × ca. 6 mm, subobtusely; lip 3-lobed, 8–9 mm, apex recurved; lateral lobes erect, oblong; mid-lobe obovate, apex slightly denticulate; disk hairy, with 3 obscure keels, lateral keels terminating in 2 truncate fleshy crests, in front of which are 2 concavities partitioned by a median hairy keel, and elevated plates covered with yellow hairs forming 3 crests at apex. Column 5–6 mm.

Epiphytic on tree trunks; 1400–1500 m. S Yunnan (Pu'er) [Myanmar, Thailand].

**3. *Cylindrolobus marginatus* (Rolfe) S. C. Chen & J. J. Wood, comb. nov.**

柱兰 zhu lan

Basionym: *Eria marginata* Rolfe, Gard. Chron., ser. 3, 5: 200. 1889; *Pinalia marginata* (Rolfe) Kuntze.

Plants 10–20 cm tall, without distinct rhizomes. Pseudobulbs tufted, clavate, 5–10 cm × 2–6 mm, above middle conspicuously dilated, apex 2- or 3- (or 4)-leaved. Leaves sessile, oblong-lanceolate or ovate-lanceolate, 5–11 × 1–2 cm, apex

acute. Inflorescences 1 or 2, subterminal, usually with 2 flowers on a short peduncle ca. 5 mm; floral bracts 2, opposite, oblong or ovate, 10–12 × 5–7 mm, acute. Flowers fragrant, white; lip lateral lobes with purple edges, mid-lobe with lighter purple edges and patch; pedicel and ovary ca. 1.3 cm, with dense white cottony hairs. Sepals with white cottony hairs abaxially; dorsal sepal ovate-lanceolate, ca. 15 × 5 mm, obtuse; lateral sepals falcate-lanceolate, nearly as long as dorsal sepal, ca. 6 mm wide, obtuse. Petals oblong-lanceolate, ca. 12 × 4 mm, obtuse, glabrous; lip obovate in outline, nearly 1 cm, 3-lobed; lateral lobes suberect, subovate, apex incurved and slightly covering mid-lobe; mid-lobe subrhombic-flabellate, ca. 5 × 5 mm, thickened and papillate except on margin, base with a suborbicular projection, apex emarginate; disk with a longitudinal thickened band running from base to mid-lobe and a central keel. Column ca. 3 mm; foot ca. 4 mm. Capsule obovoid-cylindric, ca. 3 cm × 5 mm. Fl. Feb–Mar, fr. May.

Epiphytic on tree trunks at forest margins; 1000–2000 m. S Yunnan [Myanmar, Thailand].

## 124. *DENDROLIRIUM* Blume, Bijdr. 343. 1825.

绒兰属 rong lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

Herbs, epiphytic, lithophytic, or rarely terrestrial. Rhizome stout, long and creeping, or short, with sheaths along its length. Stems usually pseudobulbous, with a few leaves toward apex, covered by persistent sheathing leaf bases. Leaves distichous, conduplicate, narrowly elliptic, leathery, leaf base tapering below to form a petiole before emerging with leaf sheath that tightly envelops stem. Inflorescences lateral or subterminal, erect, borne from base of pseudobulb or slender stem, with a few medium-sized flowers, peduncle glabrous to densely pubescent; base of inflorescence in some species covered by persistent leaf scales and never developing into a pseudobulb; floral bracts sometimes brightly colored orange or yellow and more conspicuous than flowers. Flowers rather dull in color, usually brownish or greenish yellow. Sepals glabrous, villous or densely stellate-pubescent abaxially; lateral sepals obliquely ovate, base attached to column foot to form an obliquely conic mentum. Petals free, lanceolate to oblanceolate, shorter and smaller than sepals; lip 3-lobed or obscurely 3-lobed, adorned with ridges or a thickened tissue at base of mid-lobe forming a somewhat globose wart. Column short, foot incurved, ca. as long as or shorter than column proper; pollinia 8, equal in size, laterally compressed, clavate, attached to lamellae of caudicles at base.

About 12 species: Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; two species in China.

*Eria lanigera* Seidenfaden (Opera Bot. 114: 177. 1992), described from Vietnam, was recently recorded from SW Yunnan (Menglian) by X. H. Jin and S. C. Chen (Acta Bot. Yunnan. 29: 170. 2007). J. J. Wood notes that this is in fact a species of *Dendrolirium*, although the relevant new combination has yet to be published.

- 1a. Pedicel and ovary and sepals light brown tomentose ..... 1. *D. tomentosum*  
 1b. Pedicel and ovary and sepals white or grayish yellowish tomentose ..... 2. *D. lasiopetalum*

**1. *Dendrolirium tomentosum* (J. Koenig) S. C. Chen & J. J. Wood, comb. nov.**

绒兰 rong lan

Basionym: *Epidendrum tomentosum* J. Koenig in Retzius, Observ. Bot. 6: 53. 1791; *Eria hainanensis* Rolfe; *E. tomentosa* (J. Koenig) J. D. Hooker; *Pinalia tomentosa* (J. Koenig) Kuntze.

Rhizome ca. 5 mm in diam., with 4 or 5 nodes and funnel-shaped sheaths between pseudobulbs. Pseudobulbs slightly compressed, ellipsoid, 2–7 × 1.5–2.5 cm, often with 2 or 3 nodes, distally 3- or 4-leaved. Leaf blade elliptic or oblong-lanceolate, 10–24 × 1–5 cm, relatively thick, sometimes fleshy,

base articulate, apex acute; petiole 1–1.5 cm. Inflorescence arising from near base of an old pseudobulb, 10–30 cm, stout, densely light brown tomentose, with 6 or 7 funnel-shaped basal sheaths, many flowered; floral bracts ovate or ovate-lanceolate, 1.2–2 cm, abaxially densely light brown tomentose, adaxially sparsely hairy, apex acuminate; pedicel and ovary 3–4 cm, densely light brown tomentose. Sepals densely light brown tomentose abaxially; dorsal sepal oblong-lanceolate, 10–15 × ca. 3 mm, shortly acuminate; lateral sepals obliquely ovate-lanceolate, 10–15 × 4–5 mm, acuminate. Petals linear-lanceolate, 9–13 × ca. 2 mm, acuminate; lip recurved, suboblong in outline, 10–13 × ca. 4 mm, 3-lobed; lateral lobes suberect, small; mid-lobe subobovate-oblong, 6–7 × 2–4 mm, margin strongly undu-

late, apex rounded and apiculate; disk with a broad and thick band ca. 7 mm from base to mid-lobe and often finely papillate around band. Column subcylindric, ca. 4 mm (not including anther cap), foot 3–4 mm. Capsule cylindrical, 3–3.5 cm, with persistent hairs; fruiting pedicel ca. 2.5 cm, sparsely hairy. Fl. Apr–May, fr. Aug–Sep.

Epiphytic on trees or lithophytic on rocks; 800–1500 m. SE Hainan, S Yunnan [NE India, Laos, Myanmar, Thailand, Vietnam].

**2. *Dendrolirium lasiopetalum*** (Willdenow) S. C. Chen & J. J. Wood, **comb. nov.**

白绵绒兰 bai mian rong lan

Basionym: *Aerides lasiopetalum* Willdenow, Sp. Pl. 4: 130. 1805; *Dendrobium albidotomentosum* Blume; *D. pubescens* Hooker; *Epidendrum lasiopetalum* (Willdenow) Poirlet; *Eria albidotomentosa* (Blume) Lindley; *E. flava* Lindley; *E. lasiopetalum* (Willdenow) Ormerod; *E. pubescens* (Hooker) Lindley ex Loudon; *Octomeria pubescens* (Hooker) Sprengel; *Pinalia albidotomentosa* (Blume) Kuntze; *P. pubescens* (Hooker) Kuntze.

Rhizome creeping, ca. 5 mm in diam. Pseudobulbs borne 1.5–5 cm apart on rhizome, fusiform, 3–7.5 × 1.5–3.5 cm, apex with 3–5 leaves. Leaf blade elliptic or oblong-lanceolate, 12–30 × 1.5–5 cm, with 8–14 main veins, apex acuminate. Inflorescences 1 or 2, arising from near base of an old pseudobulb, 10–20 cm, laxly flowered; rachis densely white or grayish yellowish cottony-hairy; floral bracts ovate-lanceolate, ca. 1 cm, abaxially with white or grayish yellowish cottony hairs, apex long acuminate; pedicel and ovary 2–3 cm, densely hairy. Sepals densely white or grayish yellowish cottony-hairy abaxially; dorsal sepal lanceolate, ca. 12 × 2 mm, obtuse; lateral sepals triangular-lanceolate, slightly oblique, ca. 13 × 5 mm. Petals linear, ca. 14 × 1 mm, acuminate; lip ovate in outline, ca. 11 × 5 mm, base contracted into a claw, 3-lobed; margins of lobes undulate; lateral lobes subobovate; mid-lobe suboblong; disk with an obovate-lanceolate thickened area extending from base to mid-lobe. Column ca. 4 mm, thick, foot ca. 4 mm, arcuate. Capsule cylindrical, 2.5–4 cm × ca. 4 mm, with white cottony hairs when young. Fl. Jan–Apr, fr. Aug.  $2n = 38, 40$ .

Epiphytic in shaded places in forests, epiphytic on trees along streams, lithophytic on rocks; 1200–1700 m. SE Hainan, Hong Kong [Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

## 125. *AERIDOSTACHYA* (J. D. Hooker) Brieger in Brieger et al., *Schlechter Orchideen* 1(11–12): 714. 1981.

气穗兰属 qi sui lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

*Eria* sect. *Aeridostachya* J. D. Hooker, Fl. Brit. India 5: 786. 1890 [*Acridostachya*].

Herbs, epiphytic or terrestrial. Stem well spaced on a stout rhizome, or clustered, short, stout, fleshy but noticeably swollen, base densely covered by imbricate sheaths. Leaves distichous, erect, conduplicate, narrowly oblanceolate or oblanceolate, leathery. Inflorescence arising from upper nodes of stem, erect and terminated by an arching, densely flowered, bottlebrush-like raceme, covered by short, dense, stellate hairs. Flowers small, not resupinate or ovary only slightly twisted, usually cream-colored or yellow, sometimes purplish, or appearing brownish due to brown stellate-hairy indumentum. Sepals densely brown stellate-hairy abaxially; dorsal sepal triangular; lateral sepals obliquely dilated at base, adnate to much elongated column foot forming a long, distinct conic mentum. Petals oblong, smaller than sepals, narrow; lip erect, entire, or obscurely 3-lobed, joined contiguously to column foot, closely pressed to column and column foot, often expanding at base or folded in such a way as to form a pouch. Column short, foot usually longer, often rather sigmoid; pollinia 8, ellipsoid or clavate, ± equal in shape and size.

Possibly 15 species: China (Taiwan), Indonesia, Malaysia, New Guinea, Pacific islands, Philippines, Thailand; one species in China.

**1. *Aeridostachya robusta*** (Blume) Brieger in *Schlechter, Orchideen*, ed. 3, 1A(11–12): 714. 1981.

气穗兰 qi sui lan

*Dendrolirium robustum* Blume, Bijdr. 347. 1825; *Aeridostachya purpureocentra* (J. J. Smith) Rauschert; *Eria aeridostachya* H. G. Reichenbach ex Lindley; *E. borneensis* Rolfe; *E. brunea* Ridley; *E. kinabaluensis* Rolfe; *E. linearifolia* Ridley; *E. lorifolia* Ridley; *E. purpureocentra* J. J. Smith; *E. robusta* (Blume) Lindley; *E. sawadae* Yamamoto; *E. uchiyamae* Tuyama; *Pinalia aeridostachya* (H. G. Reichenbach ex Lindley) Kuntze; *P. robusta* (Blume) Kuntze.

Pseudobulbs tufted, laterally compressed, cylindrical, 3–7 × ca. 1.5 cm, stout, distally 2–4-leaved. Leaves ± distichous, erect, sessile, linear-oblanceolate, 30–40 × 2–3.5 cm, leathery, base attenuate, apex acute. Inflorescence subterminal, 17–18 cm, slender, upper part slightly recurved, with stellate hairs,

densely many flowered; peduncle 12–13 cm, with a few sterile basal bracts; sterile bracts red, ovate, ca. 2 × 1 mm, densely stellate-pilose, acuminate; floral bracts inconspicuous. Flowers small, crowded, brownish; pedicel and ovary ca. 6 mm, densely stellate-pilose. Sepals with reddish hairs abaxially; dorsal sepal ovate-oblong, ca. 3 × 1.5 mm, often slightly thickened, base truncate, apex obtuse; lateral sepals obliquely ovate, ca. 2.5 × 3 mm, obtuse. Petals oblong, slightly oblique, ca. 3 × 1.5 mm, glabrous, base truncate, margin undulate, apex rounded; lip ± cymbiform, oblong in outline, ca. 4 × 1.5 mm, with 4 or 5 purple, branched veins, glabrous, base adnate to column foot, entire, margin conspicuously crenulate, apex recurved, bluntly rounded. Column erect, ca. 1 mm, base with a deep groove, foot ca. 3 mm. Fl. May.

Epiphytic on tree trunks in forests; ca. 1000 m. S Taiwan [Indonesia, Malaysia, New Guinea, Philippines, Thailand; Pacific islands (Fiji, New Caledonia, Samoa, Solomon Islands)].

**126. BRYOBIUM** Lindley, *Intr. Nat. Syst. Bot.*, ed. 2, 446. 1836.

蕨兰属 xian lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

*Alvisia* Lindley.

Epiphytes, medium-sized. Rhizome creeping, short, often stout, with slender branching roots. Pseudobulbs ovoid to fusiform, fleshy, few noded, with 1–3 leaves toward apex, covered by leaf sheaths below. Leaves conduplicate, longer than pseudobulbs, leathery, narrowing toward base then dilating into broad leaf sheaths at base. Inflorescences from apical nodes or terminal, racemose, shorter than leaves, few to many flowered; peduncle lacking sterile bracts; floral bracts small, shorter than or ca. as long as pedicel. Flowers resupinate or not resupinate, not opening widely, small, hairy or glabrous; pedicel and ovary glabrous or pubescent. Dorsal sepal free; lateral sepals obliquely triangular, forming a distinct conic mentum with column foot. Petals free, smaller than sepals; lip recurved, entire or 3-lobed; lateral lobes erect; mid-lobe entire, callus of 2 or 3 ridges. Column slightly arcuate, short; pollinia 8, in 2 groups, clavate, each group attached by caudicles to its own viscidium.

Perhaps 20 species: from Sri Lanka and SE Asia to New Guinea, NE Australia, and the SW Pacific islands; one species in China.

**1. *Bryobium pudicum*** (Ridley) Y. P. Ng & P. J. Cribb, *Orchid Rev.* 113: 272. 2005.

蕨兰 xian lan

*Eria pudica* Ridley, *J. Linn. Soc., Bot.* 32: 294. 1896; *E. monophylla* Schlechter.

Rhizome 3–4 mm in diam. Pseudobulbs 0.5–1 cm apart on rhizome, ± fusiform, 3–4 cm × 5–7 mm, enclosed in 4 or 5 membranous sheaths when young, 2- or 3-noded, apex 1- or rarely 2-leaved. Leaf blade oblanceolate or elliptic-lanceolate, 10–15 × 1.4–2.4 cm, obtuse; petiole 3–3.5 cm. Inflorescence arising from near apex of pseudobulb, 3–4 cm, densely grayish white pubescent, more than 10-flowered; peduncle ca. 1.2 cm; floral bracts ovate, ca. 3 mm, abaxially sparsely grayish white

pubescent, acute. Flowers greenish white, sepals and petals with red veins, abaxially sparsely grayish white pubescent, column white, foot reddish brown; pedicel and ovary 3–4 mm, densely grayish white pubescent. Dorsal sepal elliptic, ca. 3 × 1.5 mm, acute; lateral sepals obliquely ovate, ca. 3.5 × 2.2 mm, acute; mentum short. Petals ovate-lanceolate, ca. 3 × 1.5 mm, glabrous, acute; lip rhombic or broadly elliptic in outline, ca. 3 × 2.5–3 mm, obtuse, base and apex ± fleshy, shallowly 3-lobed or nearly unlobed, base with 1 reddish brown oblong callus ca. 1 mm, on either side with a rounded and a subobovate-rounded reddish brown callus, and near apex with a reddish brown anchor-shaped median appendage. Column ca. 1 mm, foot ca. 1.5 mm. Fl. Jun–Jul.

Epiphytic on tree trunks in forests; ca. 1500 m. S Yunnan [Malay Archipelago (Borneo), Malaysia (Peninsular), Singapore].

**127. PINALIA** Lindley, *Orchid. Scelet.* 14, 21, 23. 1826.

蕨兰属 ping lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

*Eria* sect. *Hymeneria* Lindley; *E.* sect. *Urostachya* Lindley; *Hymeneria* (Lindley) M. A. Clements & D. L. Jones; *Urostachya* (Lindley) Brieger.

Herbs, epiphytic or terrestrial. Stems close together, elliptic in transverse section, of several equally or unequally enlarged internodes each covered by a semitransparent leaf-sheath, giving rise to a distinct venation on stem, with leaves on upper half or a few leaves near apex. Leaves linear, lanceolate, or narrowly elliptic, mostly leathery, without a distinct petiole. Inflorescences synanthous, axillary, erect or nodding, racemose, laxly to densely many flowered, leaving a pit on stem when shed, axis usually with small, scalelike brown hairs; floral bracts conspicuous and often large. Flowers widely opening or not, color very variable, small to medium-sized. Sepals densely to sparsely pubescent abaxially; dorsal sepal narrowly triangular or narrowly elliptic; lateral sepals triangular, ventrally broadened at base, attached to a long column foot to form a mentum. Petals similar in size and color to dorsal sepal; lip 3-lobed, hinged at base to column foot; disk usually adorned with papillose keels of various lengths and numbers, or without keels; anther cap easily detached; pollinia 8, clavate.

About 160 species: from NW Himalayas and NE India to Myanmar, S China, Vietnam, Laos, Thailand, the Malay Archipelago, NE Australia, and the Pacific islands; 17 species (six endemic) in China.

- 1a. Inflorescence secund ..... 1. *P. stricta*  
 1b. Inflorescence not secund, usually spirally arranged on axis.  
 2a. Lip entire, simple.  
   3a. Pseudobulbs often branching, branches 10–15 cm, 4–6-leaved; lip with 2 reddish brown basal blotches, disk with 2 short lamellae ..... 2. *P. copelandii*  
   3b. Pseudobulbs not branching, 3–5-leaved; lip not as above.  
     4a. Leaves ca. 1 cm wide; sepals ca. 3 mm; lip grooved, disk without keels ..... 3. *P. longlingensis*  
     4b. Leaves 3.5–4.5 cm wide; sepals ca. 9 mm; lip with 2 dark red keels ..... 4. *P. ovata*

- 2b. Lip 3-lobed.
- 5a. Lip contiguously joined to column foot.
- 6a. Inflorescence broadly cylindric, densely many flowered, usually 3–5 × 1.5–2.5 cm ..... 5. *P. spicata*
- 6b. Inflorescence a laxly flowered cylindric raceme.
- 7a. Pseudobulbs narrowly obovoid or clavate; leaves 3–6 × 1–2 cm; lip ± rhombic in outline ..... 6. *P. bipunctata*
- 7b. Pseudobulbs cylindric; leaves 10–15 × 2.6–3 cm; lip broadly ovate in outline ..... 7. *P. conferta*
- 5b. Lip attached by a hinge to column foot.
- 8a. Pseudobulbs consisting of 1 or 2 distinct internodes.
- 9a. Pseudobulbs 8–17 cm; leaves fleshy, 13–23 × ca. 2 cm; flowers yellowish brown; lip 5-lobed, disk thickened, strongly convex, with 3 transverse basal channels ..... 9. *P. pachyphylla*
- 9b. Pseudobulbs 2.5–3.5 cm; leaves, flowers, and lip without above combination of characters.
- 10a. Pseudobulbs cylindric, 0.2–0.5 cm in diam.; flowers 5–10 mm in diam.; lip mid-lobe warty-rugulose; disk with variable calli, usually with 2 basal calli; flowers pale cream-colored, lip with yellowish red markings ..... 8. *P. excavata*
- 10b. Pseudobulbs ellipsoid, 1–1.5 cm in diam.; flowers ca. 3 mm in diam.; lip mid-lobe not warty-rugulose; disk with 4 or 5 slightly thickened veins; flowers greenish yellow ..... 10. *P. yunnanensis*
- 8b. Pseudobulbs consisting of several internodes.
- 11a. Pseudobulbs narrowly cylindric, 8–17 × 0.3–0.8 cm, coherent at base; sepals and petals pure white ..... 11. *P. graminifolia*
- 11b. Pseudobulbs flasklike or ovoid, shorter and broader, stacked; sepals and petals variably colored.
- 12a. Pedicel and ovary glabrous.
- 13a. Pseudobulbs fusiform, sometimes bottle-shaped, sometimes compressed, 2–4 cm; leaves 4–10 cm ..... 12. *P. acervata*
- 13b. Pseudobulbs narrowly ovoid or subcylindric, 0.8–2.5 cm; leaves (2–)3–6 cm ..... 13. *P. donnaiensis*
- 12b. Pedicel and ovary pubescent or puberulent.
- 14a. Plants small, 4–7 cm tall; leaves 3.5–5 × 0.5–0.7 cm; inflorescence 1–3-flowered; flowers white; sepals ca. 8 mm; lip ca. 7.5 × 4 mm, mid-lobe ovate, obtuse, thickly verruculose-rugose, disk with 2 short keels ..... 14. *P. szetschuanica*
- 14b. Plants larger, 12–27 cm tall; leaves 10–25 × 0.8–2.5 cm; inflorescence ca. 6- to many flowered; flowers, sepals, and lip without above combination of characters.
- 15a. Lip with 5 obscure keels on disk confluent below ..... 15. *P. quinquelamellosa*
- 15b. Lip with 3 keels on disk.
- 16a. Sepals and petals buff-yellow to greenish yellow with red veins and yellow apices; lip 8–10 × 7–8 mm ..... 16. *P. amica*
- 16b. Sepals and petals pure white; lip 3–7 × 2–5 mm ..... 17. *P. obvia*

**1. *Pinalia stricta*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

鹅白苹兰 e bai ping lan

*Eria stricta* Lindley, Coll. Bot. ad t. 41b. 1826; *E. secundiflora* Griffith; *Mycaranthes stricta* (Lindley) Lindley.

Rhizome inconspicuous. Pseudobulbs clustered, cylindric, 2–10 cm × 1–4 mm, slightly dilated toward apex, apex 2-leaved. Leaf blade lanceolate or oblong-lanceolate, 8–10 × 0.6–2 cm, acute; petiole ca. 6 mm. Inflorescences 1–3, subterminal, 8–10 cm, secund, densely many flowered; rachis and pedicel and ovary white cottony-hairy; floral bracts rhombic, ca. 1 mm, glabrous. Sepals densely white cottony-hairy abaxially; dorsal sepal ovate, ca. 2 × 1.5 mm, acute; lateral sepals ovate-triangular, ca. 2 × 2 mm, obtuse; mentum ca. 1 mm. Petals ovate, ca. 2 × 1.5 mm, glabrous, obtuse; lip subsquare-orbicular in outline, ca. 2 × 2 mm, distally shallowly 3-lobed; lateral lobes small; mid-lobe ± oblate, ca. 0.5 × 1–1.5 mm, obtuse-rounded; disk with 3 thickened lamellae from base to base of mid-lobe and a globose callus between 2 lateral lobes near mid-lobe base.

Column ca. 1.5 mm, each side obtriangular-winged; foot ca. 2 mm. Capsule fusiform, ca. 5 × 3 mm, densely white cottony-hairy, shortly pedicellate. Fl. Nov–Feb, fr. Apr–May. 2n = 40.

Lithophytic on rocks on shaded slopes or epiphytic on tree trunks along valleys; 800–1300 m. SE Xizang, SE Yunnan [Bhutan, NE India, Myanmar, Nepal, N Vietnam].

**2. *Pinalia copelandii*** (Leavitt) W. Suarez & Cootes, Orchideen J. 16(2): 70. 2009.

台湾苹兰 tai wan ping lan

*Eria copelandii* Leavitt, Philipp. J. Sci., C, 4: 203, 226. 1909; *E. formosana* Rolfe; *E. plicatilabella* Hayata; *E. tomentosiflora* Hayata.

Rhizome stout. Pseudobulbs often branched, branches cylindric, 10–15 cm, often slightly dilated toward apex, apex of branch 4–6-leaved. Leaf blade lanceolate, 12–15 × 1.2–1.5 cm, base attenuate and articulate, apex subacute. Inflorescences 1 or 2, subterminal, usually pendulous, 7–13 cm, several to many flowered; rachis reddish brown tomentose; floral bracts re-

curved, green, elliptic to lanceolate, 6–8.5 mm, hairy at first, soon becoming glabrous, subacute. Flowers yellowish green, slightly tinged with reddish brown; pedicel and ovary 5–9 mm, reddish brown tomentose. Sepals tomentose abaxially; dorsal sepal narrowly elliptic, ca.  $9 \times 3.2$  mm, obtuse; lateral sepals obliquely ovate, ca.  $8.5 \times 4.2$  mm, obtuse; mentum short. Petals reddish brown, ovate-elliptic, ca.  $7.5 \times 2.5$  mm, glabrous, obtuse; lip recurved, ovate,  $3-4 \times 1.8-2.5$  mm, adaxially with 2 short lamellae, base with a colored blotch on either side, margin entire, apex mucronate. Column ca. 2 mm; foot ca. 2 mm. Fl. Mar–Apr.  $2n = 38$ .

Epiphytic on tree trunks in forests; 200–1500 m. Taiwan [Philippines].

**3. *Pinalia longlingensis*** (S. C. Chen) S. C. Chen & J. J. Wood, **comb. nov.**

龙陵苹兰 long ling ping lan

Basionym: *Eria longlingensis* S. C. Chen, Acta Phytotax. Sin. 26: 238. 1988.

Pseudobulbs 3-leaved. Leaves not completely spreading at anthesis, shortly petiolate, suboblong or oblong-lanceolate, 6–8 × ca. 1 cm, apex acute or obtuse. Inflorescence solitary, subterminal, ca. 6 cm, many flowered, brownish tomentose; peduncle stout, slightly fleshy, glabrous; floral bracts ovate-lanceolate or ovate, 3–5 mm, ± glabrous, obtuse or acute. Flowers yellow, 3–4 mm in diam. Dorsal sepal oblong-elliptic,  $3-3.5 \times$  ca. 1.5 mm, glabrous, margin undulate, apex obtuse; lateral sepals nearly as long as dorsal sepal, ca. 4 mm wide, oblique, acute. Petals similar to dorsal sepal, but slightly smaller, glabrous, margin undulate, apex obtuse; lip ± flabellate, 2.5–3.5 mm wide, adaxially grooved, base narrowed into a claw ca. 3 mm, margin entire, apex obtuse and mucronate. Column ca. 0.8 mm, thick; foot 2–2.5 mm. Fl. Aug.

• Epiphytic on tree trunks; ca. 2000 m. SW Yunnan.

**4. *Pinalia ovata*** (Lindley) W. Suarez & Cootes, Orchideen J. 16(2): 71. 2009.

大脚筒 da jiao tong

*Eria ovata* Lindley, Edwards's Bot. Reg. 30: ad t. 29. 1844; *E. luchuensis* Yatabe; *E. nudicaulis* Hayata; *E. ovata* var. *retroflexa* (Lindley) Garay & H. R. Sweet; *E. retroflexa* Lindley; *Pinalia retroflexa* (Lindley) Kuntze.

Pseudobulbs tufted, cylindrical, usually  $10-25 \times 1-2$  cm, 2–4-noded, apex 4- or 5-leaved. Leaves shortly petiolate, narrowly elliptic,  $12-16 \times 3.5-4.5$  cm, apex obtuse. Inflorescence subterminal, ca. 15 cm, glabrous, densely many flowered; floral bracts yellow, narrowly elliptic, ca.  $8 \times 3.5$  mm, acute. Flowers yellowish white; pedicel and ovary 4.5–6 mm. Dorsal sepal narrowly elliptic, ca.  $9.5 \times 2.7$  mm, acute; lateral sepals obliquely narrowly ovate, ca.  $9 \times 3$  mm, acute. Petals elliptic, ca.  $8 \times 2.4$  mm, acuminate; lip triangular-ovate or rhombic-ovate in outline, ca.  $3.5 \times 2.3$  mm, adaxially with 2 dark red keels running to near apex, strongly contracted at base, articulate with column foot, margin entire, apex acute. Column ca. 1.8 mm; foot very short. Fl. Jul.  $2n = 36, 38, 40, 44$ .

Epiphytic on tree trunks in forests; below 800 m. Taiwan [Indonesia, Japan (Ryukyu Islands), New Guinea, Philippines].

**5. *Pinalia spicata*** (D. Don) S. C. Chen & J. J. Wood, **comb. nov.**

密花苹兰 mi hua ping lan

Basionym: *Octomeria spicata* D. Don, Prodr. Fl. Nepal. 31. 1825; *Eria convallarioides* Lindley; *E. convallarioides* var. *major* Lindley; *E. salwinensis* Handel-Mazzetti; *E. spicata* (D. Don) Handel-Mazzetti.

Pseudobulbs contiguous, cylindrical or fusiform,  $3-16 \times 0.5-1.5$  cm, with 1 internode, distally 2–4-leaved. Leaves petiolate, elliptic or obovate-lanceolate,  $5-22 \times 1-4$  cm, apex obtuse. Inflorescences 1–3, arising from near apex of pseudobulb, 3–5 cm, densely many flowered, with 2 basal sheaths; rachis, pedicel, and ovary densely rusty puberulent; floral bracts lanceolate, ca. 8 mm, glabrous, acuminate. Flowers white, lip apex yellow; pedicel and ovary 2–4 mm. Dorsal sepal elliptic, ca.  $6 \times 2.5$  mm, obtuse-rounded; lateral sepals ovate-triangular, oblique, ca.  $6 \times 3.5$  mm, acute. Petals elliptic, ca.  $5 \times 2$  mm, obtuse-rounded; lip subrhombic in outline, ca.  $5 \times 5$  mm, base narrowed into a claw, 3-lobed; lateral lobes perpendicular to mid-lobe, ovate-triangular; mid-lobe deltoid, ca.  $1 \times 1.5$  mm, thickened, acuminate. Column ca. 2 mm, upper part slightly enlarged; foot ca. 3 mm. Capsule cylindrical, ca.  $1.5$  cm × nearly 3 mm. Fl. Jul–Oct.  $2n = 20 + 2B, 38, 40$ .

Epiphytic on trees on wooded slopes or lithophytic on rocks in valley forests; 800–2800 m. S and SE Xizang, S Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, N Vietnam].

**6. *Pinalia bipunctata*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

双点苹兰 shuang dian ping lan

*Eria bipunctata* Lindley, Edwards's Bot. Reg. 27(Misc.): 83. 1841; *E. eberhardtii* Gagnepain.

Rhizome inconspicuous. Pseudobulbs contiguous, narrowly obovoid or clavate, somewhat compressed,  $3-4$  cm ×  $8-12$  mm, usually with 1 or 2 nodes, apex usually 4-leaved (only 1 or 2 persistent on old pseudobulb). Leaves shortly petiolate, obovate, obovate-elliptic, or elliptic,  $3-6 \times 1-2$  cm, base attenuate, apex obtuse. Inflorescences often 2, arising from near apex of pseudobulb, arching, 3–4 cm, sparsely pubescent, sparsely 10- or more flowered; floral bracts reflexed, broadly elliptic, ca. 5 mm, acute. Flowers white, glabrous; pedicel and ovary ca. 5 mm, sparsely pubescent. Dorsal sepal broadly elliptic, ca.  $5 \times 2$  mm, obtuse-rounded; lateral sepals oblong-elliptic, ca.  $6 \times 4$  mm, acute; mentum ca. 3 mm. Petals oblong, ca.  $4 \times 1.5$  mm, obtuse-rounded; lip rhombic in outline, ca.  $4 \times 4$  mm, 3-lobed; lateral lobes perpendicular to mid-lobe, subtriangular, ca. 3 mm; mid-lobe subtriangular, ca.  $1 \times 1$  mm, conspicuously thickened. Column ca. 2 mm (with anther cap); foot ca. 3 mm. Fl. Jul.

Epiphytic on tree trunks in forests; 1700–1800 m. S Yunnan [NE India, Thailand, Vietnam].

**7. *Pinalia conferta*** (S. C. Chen & Z. H. Tsi) S. C. Chen & J. J. Wood, **comb. nov.**

密苞苹兰 mi bao ping lan

Basionym: *Eria conferta* S. C. Chen & Z. H. Tsi, Acta Bot. Yunnan. 6: 383. 1984.

Rhizome stout. Pseudobulbs tufted, straight or slightly curved, cylindrical, with 3–5 nodes, ridged when dried, apex 3-leaved. Leaf blade oblong-oblong-lanceolate or narrowly elliptic, 10–15 × 2.6–3 cm, papery, apex acuminate; petiole ca. 1 cm. Inflorescence arising from upper part of pseudobulb, ca. 5 cm, many flowered, glabrous; rachis with stripes; floral bracts sometimes turning black, ovate-lanceolate or lanceolate, usually 1.4–1.6 cm, margin ciliate. Flowers white, ca. 2 mm in diam., apex of lip yellow; pedicel and ovary 1.5–3 mm, slightly pubescent. Dorsal sepal ovate-elliptic, 3–3.5 × ca. 2 mm, glabrous, acute; lateral sepals obliquely ovate, 3–3.5 × ca. 2.5 mm, glabrous. Petals subovate, slightly shorter than sepals, glabrous; lip broadly ovate in outline, 0.5–3 mm, base with a claw 0.7–0.9 mm, 3-lobed; lateral lobes subovate, ca. 0.8 mm, obtuse; mid-lobe triangular-ovate, similar in size to lateral lobes, fleshy, obtuse; disk with 3 veins, sometimes slightly thickened at base. Column 1.5–2 mm, stout, ca. 1.5 mm wide; foot ca. 0.5 mm. Fl. Jul.

- Epiphytic on trees. SE Xizang.

**8. *Pinalia excavata*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

反苞苹兰 fan bao ping lan

*Eria excavata* Lindley, Gen. Sp. Orchid. Pl. 67. 1830; *E. flava* Lindley var. *rubida* Lindley; *E. sphaerochila* Lindley.

Rhizome rather short, stout. Pseudobulbs borne ca. 1 cm apart from each other, cylindrical, ca. 3 cm, consisting of 1 distinct internode, sheathing at base, apex 4- or 5-leaved. Leaf blade elliptic-oblong-lanceolate, 16–18 × 2–3.4 cm, base contracted into petiole, apex acute. Inflorescence arising from leaf axil, erect, 15–18 cm, reddish brown pubescent, sparsely few flowered; floral bracts lanceolate, 7–8 mm, abaxially brown pubescent, apex acuminate. Flowers white; pedicel and ovary 7–8 mm, brown pubescent; sepals and petals brown pubescent abaxially. Dorsal sepal subelliptic, ca. 9 × 3 mm, acute; lateral sepals falcate-lanceolate, ca. 9 × 4 mm, acute. Petals elliptic, ca. 6 × 2 mm, acute; lip suborbicular, nearly 5 mm, concave at base, 3-lobed from near base; lateral lobes ovate-triangular, small, obtuse, each with an erect callus adaxially; mid-lobe subreniform, ca. 4 × 5 mm, apex emarginate, warty-rugulose, with variable calli, usually 2-callose basally, sometimes with 5 flabellate, lamellate or thickened veins from base; central one extending to apex forming an apiculum. Column ca. 1 mm; foot incurved. Capsule cylindrical, 1–1.5 cm. Fl. Jun.  $2n = 34, 40$ .

Broad-leaved forests along valleys; 1700–2100 m. S and SE Xizang [Bhutan, NE India, Nepal].

**9. *Pinalia pachyphylla*** (Averyanov) S. C. Chen & J. J. Wood, **comb. nov.**

厚叶苹兰 hou ye ping lan

Basionym: *Eria pachyphylla* Averyanov, Turczaninowia 5(4): 77. 2002; *E. crassifolia* Z. H. Tsi & S. C. Chen (1994), not Ridley (1915).

Rhizome stout, densely covered with membranous sheaths. Pseudobulbs oblong, 8–17 × nearly 1 cm, 1-noded, young pseudobulb arising from near middle of an old pseudobulb,

apex 2–4-leaved. Leaves sessile, oblong, 13–23 × ca. 2 cm, fleshy, base narrowed, articulate, apex acuminate. Inflorescence subterminal, ca. 24 cm, yellowish brown tomentose, many flowered; floral bracts lanceolate, 1.5–3 cm, both surfaces yellowish brown tomentose, apex acute. Flowers yellowish brown, ± fleshy; pedicel and ovary ca. as long as or shorter than floral bracts. Sepals densely yellowish brown tomentose abaxially; dorsal sepal oblong, 12–15 × 6–8 mm, 7-veined, slightly obtuse; lateral sepals subtriangular, 10–12 × 8–10 mm. Petals oblong, 12–13 × 4–5 mm, glabrous, 3-veined, obtuse; lip 5-lobed, 2 basal lobes ± auriculate; 2 lateral lobes conduplicate or subcylindrical; mid-lobe recurved, oblong, truncate; disk thickened, strongly convex, adaxially papillate, near base with 3 transverse channels. Column ca. 4 mm, stout; foot ca. 5 mm. Fl. Apr–Jun.  $2n = 38$ .

Epiphytic on trees or lithophytic on rocks in forests; 600–1100 m. S Guangxi, SW Guizhou, S Yunnan [N Vietnam].

**10. *Pinalia yunnanensis*** (S. C. Chen & Z. H. Tsi) S. C. Chen & J. J. Wood, **comb. nov.**

滇南苹兰 dian nan ping lan

Basionym: *Eria yunnanensis* S. C. Chen & Z. H. Tsi, Acta Bot. Yunnan. 6: 381. 1984.

Pseudobulbs ellipsoid, 2.5–3 × 1–1.5 cm, 1- or 2-noded, usually with a smaller leaf near or above middle and 3 or 4 much larger leaves at apex; small leaf narrowly ovate, 1.5–6.5 cm; apical leaves narrowly oblong-lanceolate or lanceolate, (4–)8–16.5 × 0.6–1.4 cm, base attenuate into petiole 1–2 cm, apex acuminate. Inflorescences 1 or 2, subterminal, suberect, 4.5–7.5 cm, many flowered; rachis sparsely rusty puberulent; floral bracts reflexed, brown when dried, lanceolate, 4–5 mm, membranous. Flowers greenish yellow, ca. 3 mm in diam.; pedicel and ovary 1–1.5 mm. Dorsal sepal broadly ovate or ovate-elliptic, ca. 3 × 2 mm, glabrous, acuminate or obtuse; lateral sepals obliquely ovate, similar in size to dorsal sepal. Petals ovate or broadly ovate, ca. 2 × 1.5–1.8 mm, acute; lip ± cross-shaped in outline, 2–2.5 mm, base with a grooved claw 0.6–0.8 mm, 3-lobed; lateral lobes ± quadrate-flabellate, ca. 1 × 1 mm, margins undulate; mid-lobe oblong, ca. 1.2 × 1 mm; disk with 4 or 5 slightly thickened veins. Column ca. 0.7 mm; foot ca. 1.1 mm. Fl. Jul–Aug.

- Epiphytic on tree trunks in dense thickets; ca. 1500 m. S Yunnan.

**11. *Pinalia graminifolia*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

禾颐苹兰 he yi ping lan

*Eria graminifolia* Lindley, J. Proc. Linn. Soc., Bot. 3: 54. 1858.

Rhizome short. Pseudobulbs densely arranged in a row on rhizome, cylindrical, 8–17 cm × 3–8 mm, apex 5- or 6-leaved. Leaves sessile, elliptic or oblong-lanceolate, 5–16 × 0.8–3 cm, base contracted, apex acuminate or long acuminate. Inflorescences 1–3, subterminal, shorter than leaves, more than 10-flowered; rachis and ovary densely yellowish brown pubescent; floral bracts ovate, 5–10 mm, glabrous, long acuminate. Flow-

ers white, spotted with yellow on lip. Dorsal sepal oblong, 6–8 × ca. 2 mm, obtuse or acuminate; lateral sepals subfalcate, ca. 8 × 3 mm, acuminate. Petals narrowly oblong, 5–6 × ca. 2 mm, obtuse; lip obovate in outline, ca. 5 × 4 mm, 3-lobed from near middle; lateral lobes divaricate, oblong, apex reflexed; mid-lobe nearly oblate, rounded or acute, with a high central lamella from base to apical 2/3; disk with 3 thickened veins, lateral veins each with a triangular callus halfway. Column ca. 2 mm; foot ca. 2 mm. Capsule cylindrical, ca. 1 cm × 3 mm. Fl. Jun–Jul, fr. Aug.  $2n = 38, 42$ .

Epiphytic on tree trunks or lithophytic on rocks in forests; 1600–2500 m. S and SE Xizang, NW to SE Yunnan [Bhutan, NE India, Myanmar, Nepal].

**12. *Pinalia acervata*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

钝叶葶兰 *dun ye ping lan*

*Eria acervata* Lindley, J. Hort. Soc. London 6: 57. 1851; *E. poilanei* Gagnepain.

Pseudobulbs usually 2 or 3, or sometimes 8 closely and regularly arranged into a row, fusiform, sometimes bottle-shaped, sometimes compressed, 2–4 × 0.6–1.5 cm, apex 2–4-leaved. Leaves sessile, oblong-lanceolate, 4–10 × 0.8–2 cm, base attenuate, apex obtuse and slightly unequally 2-lobed. Inflorescences 1–3, subterminal, 3–6 cm, 4–7-flowered; rachis glabrous; floral bracts ovate or ovate-lanceolate, 0.5–1 cm, margin sparsely denticulate, apex long acuminate. Flowers white, sepals tinged green at apex, lip yellow; pedicel and ovary ca. 1 cm. Dorsal sepal narrowly ovate, ca. 6 × 2 mm, 5-veined, acuminate; lateral sepals falcate-lanceolate, ca. 7 × 5–6 mm, acuminate. Petals lanceolate, ca. 6 × 2 mm, obtuse; lip broadly cuneate in outline, ca. 7 × 6 mm, base attached to column foot at a right angle, 3-lobed; lateral lobes falcate-oblong, ca. 2 mm wide; mid-lobe orbicular, ca. 3 × 3 mm; disk with 3 keeled lamellae from base to middle of mid-lobe. Column ca. 3 mm; foot ca. 4 mm. Capsule narrowly cylindrical, ca. 2.7 × 0.4 cm. Fl. Aug, fr. Sep.  $2n = 38, 40$ .

Epiphytic on tree trunks in open forests; 600–1500 m. SE Xizang, S Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**13. *Pinalia donnaiensis*** (Gagnepain) S. C. Chen & J. J. Wood, **comb. nov.**

中越葶兰 *zhong yue ping lan*

Basionym: *Dendrobium donnaiense* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 21: 740. 1950; *Eria donnaiensis* (Gagnepain) Seidenfaden.

Rhizome stout, ca. 5 mm in diam. Pseudobulbs borne 4–9 mm apart on rhizome, narrowly ovoid or nearly cylindrical, 0.8–2.5 cm × 3–6 mm, wrinkled when dried, with 3 or 4 leaves at or near apex. Leaf blade linear or narrowly elliptic-linear, (2–)3–6 × 0.6–1.4 cm, papery, base contracted into a short petiole, apex obtuse or sometimes obliquely apiculate. Inflorescence subterminal, 2–3 cm, 3–6-flowered; rachis nearly glabrous; floral bracts oblong-lanceolate to elliptic, 4–6 mm. Flowers white or reddish; pedicel and ovary 1–1.4 cm, nearly glabrous. Dor-

sal sepal narrowly elliptic, 7–9 × 3–3.5 mm; lateral sepals obliquely triangular-lanceolate, 6.5–7.5 × 2.5–3 mm. Petals narrowly elliptic, ca. 5 × 2 mm; lip subovate in outline, 5.5–6 mm, base contracted into a short claw, distally 3-lobed; lateral lobes subovate; mid-lobe broadly ovate, not thickened or fleshy, margin undulate; disk with 3 longitudinal lamellae running from near base to mid-lobe. Column 1–2 mm; foot 3–4 mm. Fl. Jun–Aug.

Epiphytic on trees in open forests or thickets; 1000–1500 m. S and SE Yunnan [Laos, Vietnam].

**14. *Pinalia szetschuanica*** (Schlechter) S. C. Chen & J. J. Wood, **comb. nov.**

马齿葶兰 *ma chi ping lan*

Basionym: *Eria szetschuanica* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 12: 348. 1922; *E. lochongensis* C. L. Tso.

Plants 4.5–7 cm tall. Pseudobulbs contiguous, regularly arranged in a row on rhizome, oblong, slightly curved, 1–3 cm × 5–10 mm, apex 2–4-leaved. Leaves shortly petiolate, oblong-lanceolate, 3.5–5 × 0.4–0.7 cm, base attenuate, apex obtuse. Inflorescences 1 or 2, subterminal, shorter than leaves, 1–3-flowered; peduncle ca. 2 cm, with small sheaths at base; rachis often brownish villous; floral bracts lanceolate, ca. 6 mm, acute. Flowers white, lip yellow; pedicel and ovary longer than floral bract, brown villous. Dorsal sepal elliptic, ca. 8 × 3 mm, obtuse; lateral sepals obliquely oblong, ca. 8 × 4 mm, obtuse. Petals obovate-oblong, ca. 8 × 2 mm; lip obovate, ca. 6 × 5 mm, base attenuate, 3-lobed; lateral lobes ± suborbicular, ca. 2.5 × 2.5 mm, obtuse-rounded; mid-lobe ovate, 2–3 × ca. 2 mm, ± thickened, adaxially papillate, obtuse; disk with 3 veins from base to base of mid-lobe. Column ca. 3 mm; foot ca. 3 mm. Capsule cylindrical, ca. 1.5 cm, brown villous. Fl. May–Jun.

• Lithophytic on rocks along valleys; ca. 2300 m. Guangdong, W Hubei, Hunan, Sichuan, Yunnan.

**15. *Pinalia quinquelamellosa*** (Tang & F. T. Wang) S. C. Chen & J. J. Wood, **comb. nov.**

五脊葶兰 *wu ji ping lan*

Basionym: *Eria quinquelamellosa* Tang & F. T. Wang, Contr. Inst. Bot. Natl. Acad. Peiping 2: 135. 1934.

Pseudobulbs contiguous, usually laterally compressed, oblong-ellipsoid, ca. 3.5 × 1.5 cm, slightly wrinkled, apex 3-leaved. Leaves subsessile, narrowly oblong, 13–17 × ca. 1.4 cm, both surfaces ± scurfy-mealy, apex acute. Inflorescence ca. 12 cm, villous, laxly more than 20-flowered; floral bracts lanceolate, longer than pedicel and ovary, membranous, acuminate. Flowers glabrous; pedicel and ovary 6–8 mm, slender, pubescent. Dorsal sepal ligulate, ca. 7 × 2 mm, acuminate; lateral sepals falcate-ovate, ca. 6 × 3 mm, acute. Petals falcate, narrowly ligulate, ca. 6 × 1.5 mm, obtuse; lip subobovate, ca. 6 × 4 mm, with a sulcate claw at base, 3-lobed near middle; lateral lobes subovate-falcate, ca. 1.3 mm, acute; mid-lobe oblate, ca. 2 × 2.5 mm, obtuse; disk with 5 inconspicuous lamellae connate at base. Column ca. 3 mm. Fl. unknown.

• Lithophytic on rocks. Hainan.

**16. *Pinalia amica*** (H. G. Reichenbach) Kuntze, Revis. Gen. Pl. 2: 679. 1891.

粗茎苹兰 cu jing ping lan

*Eria amica* H. G. Reichenbach, Xenia Orchid. 2: 162. 1870; *E. andersonii* J. D. Hooker; *E. confusa* J. D. Hooker; *E. hypomelana* Hayata; *Pinalia andersonii* (J. D. Hooker) Kuntze; *P. confusa* (J. D. Hooker) Kuntze.

Pseudobulbs fusiform or cylindrical, 3.5–14 × 0.4–1.6 cm, apex 1–3-leaved. Leaf blade linear, oblong, or ovate-elliptic, 10–21 × 0.8–2.3 cm, base attenuate to short petiole or subsessile, apex acute. Inflorescences 1 or 2(–4), arising from middle or upper part of pseudobulb, rarely near base, suberect, 3–7 cm, sparsely 6–10-flowered; rachis with dense rusty hairs; floral bracts elliptic or elliptic-lanceolate, 8–12 × 3–5 mm, glabrous. Flowers: sepals and petals buff-yellow, with red veins and yellow apices, lip pink with bright yellow apex, lateral lobes and keels red; pedicel and ovary 1.5–2 cm, with dense rusty hairs. Sepals with rusty hairs; dorsal sepal oblong-lanceolate, ca. 10 × 2 mm, obtuse; lateral sepals obliquely ovate-triangular, ca. 10 × 4 mm, acuminate; mentum ca. 3 mm. Petals obovate-lanceolate, 8–9 × ca. 2 mm, acuminate; lip subobovate-elliptic in outline, ca. 8 × 6 mm, 3-lobed; lateral lobes incurved, ovate-elliptic, ca. 3 × 1.5 mm, obtuse; mid-lobe reniform, 3–4 × ca. 4.5 mm, fleshy except for middle part, apex emarginate; disk with 3 lamellae; central lamella extending to mid-lobe and thickened there, lateral 2 to near base of mid-lobe and thickened in apical half. Column ca. 4 mm (not including anther cap); foot ca. 3

mm. Capsule obovoid-cylindric, ca. 3 cm × 2–3 mm, with rusty hairs; fruiting pedicel 9–12 mm, hairy. Fl. Mar–Apr, fr. Jun. *2n* = 36, 38, 40.

Epiphytic on trees in forests; 800–2200 m. Taiwan, S Yunnan [Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**17. *Pinalia obvia*** (W. W. Smith) S. C. Chen & J. J. Wood, **comb. nov.**

长苞苹兰 chang bao ping lan

Basionym: *Eria obvia* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 335. 1915.

Pseudobulbs ± tufted, fusiform, 4–6.5 × 1–1.4 cm, apex 3- or 4-leaved. Leaves subsessile, elliptic or obovate-lanceolate, 5–20 × 1.5–3 cm, base attenuate, apex obtuse. Inflorescences 1–3, subterminal, many flowered; peduncle 3–4 cm; rachis with yellowish brown hairs or nearly glabrous; floral bracts lanceolate, 1–2 cm, long acuminate. Flowers white. Dorsal sepal lanceolate, 8–10 × 2–3 mm, obtuse; lateral sepals lanceolate, 7–9 × 3–5 mm, acuminate. Petals linear-lanceolate, 7–8 × 1–2 mm, acuminate; lip suboblong in outline, 3–7 × 3–5 mm, 3-lobed above middle; lateral lobes subovate, 1–2 mm, acute; mid-lobe oblong, 2–3 × 1–2 mm, rounded; disk with 3 lamellae, central lamella running to base of mid-lobe, lateral lamellae shorter but higher than central one. Column 2–4 mm; foot 2–4 mm. Capsule obovoid-cylindric, 1.5–2 cm. Fl. Apr–May, fr. Sep–Oct.

• Epiphytic on tree trunks in forests; 700–2000 m. W Guangxi, Hainan, S Yunnan.

## 128. TRICHOTOSIA Blume, Bijdr. 342. 1825.

毛鞘兰属 mao qiao lan shu

Chen Xinqi (陈心启 Chen Sing-chi), Luo Yibo (罗毅波); Jeffrey J. Wood

Herbs, epiphytic, lithophytic, or rarely terrestrial. Stems long or short, leafy throughout except at base, usually throughout with reddish brown, rarely white, hispid hairs, sometimes hairs restricted to leaf sheaths and inflorescences. Inflorescences lateral, from any node, piercing leaf sheath, short and few flowered, or long, pendulous, and many flowered; floral bracts at right angles to rachis, large, concave, hairy. Flowers resupinate, not opening widely, small to medium-sized. Sepals red hairy abaxially, lateral sepals adnate to column foot forming a mentum. Lip entire to obscurely 3-lobed; disk with or without keels, sometimes papillose. Column with a foot; pollinia 8.

About 50 species: from mainland Asia through SE Asia to New Guinea and the Pacific islands; four species (one endemic) in China.

- 1a. Stems creeping, less than 4 cm; inflorescence 1-flowered ..... 4. *T. dasyphylla*  
 1b. Stems erect or pendulous, usually longer; inflorescence 1–6-flowered.  
 2a. Stems pendulous, more than 20 cm, new growth pale hirsute, old growth brown hispid; leaves 10–18 mm wide; inflorescence 3–6-flowered; flowers white, flushed pink ..... 1. *T. pulvinata*  
 2b. Stems erect, 3–12 cm, white hirsute; leaves 3–5 mm wide; inflorescence 1-flowered; flowers yellowish green or yellow.  
 3a. Lip with 2 purple central calli ..... 2. *T. dongfangensis*  
 3b. Lip with an abaxial conical apical callus ..... 3. *T. microphylla*

**1. *Trichotosia pulvinata*** (Lindley) Kraenzlin in Engler, Pflanzenr. 50(IV. 50. II. B. 21): 138. 1911.

高茎毛鞘兰 gao jing mao qiao lan

*Eria pulvinata* Lindley, J. Proc. Linn. Soc., Bot. 3: 56. 1858; *E. rufinula* H. G. Reichenbach; *Pinalia pulvinata* (Lindley) Kuntze; *P. rufinula* (H. G. Reichenbach) Kuntze; *Trichotosia rufinula* (H. G. Reichenbach) Kraenzlin.

Plants reddish brown tomentose. Stem pendulous, cylindrical, often to 50–100 cm, 6–8 mm in diam., with many nodes, internodes ca. 2 cm. Leaves alternate along stem, lanceolate or oblong-lanceolate, oblique, 6–10 × 1–1.8 cm, both surfaces reddish brown tomentose, sheathing at base, apex acuminate; sheaths 1.5–2 cm, reddish brown tomentose, amplexicaul. Inflorescence borne above middle of stem, arising opposite leaves, ca. 2 cm, 3–6-flowered; floral bracts ovate-lanceolate, 5–6 mm,

reddish brown tomentose abaxially. Flowers white, flushed pink; pedicel and ovary ca. 6 mm. Sepals reddish brown tomentose abaxially; dorsal sepal oblong, ca.  $10 \times 3$  mm, obtuse; lateral sepals ovate-triangular, oblique, ca.  $10 \times 4$  mm. Petals lanceolate, ca.  $8 \times 2$  mm, glabrous, obtuse; lip subspatulate in outline, ca.  $13 \times 4$  mm, entire, margin reflexed; disk with an elongate pulvinate callus toward apex. Column ca. 4 mm, apex slightly dilated; foot ca. 5 mm. Capsule ellipsoid, ca.  $1 \text{ cm} \times 5$  mm, hirsute. Fl. Mar, fr. next Jul.

Lithophytic on rocks in forests; 1200–2000 m. S Guangxi, S Yunnan [Cambodia, India, Laos, Malaysia (Peninsular), Myanmar, Thailand, Vietnam].

**2. *Trichotosia dongfangensis*** X. H. Jin & L. P. Siu, *Ann. Bot. Fenn.* 41: 465. 2004.

东方毛鞘兰 *dongfang mao qiao lan*

Rhizome creeping, branching, ca. 1.5 mm in diam. Stems borne ca. 1 cm apart, 3–8 cm, bearing 5–7 leaves closely arranged in 2 rows. Leaves fleshy, oblong to lanceolate, ca.  $10 \times 5$  mm, acuminate, blade and sheath densely covered with white hairs. Inflorescence lateral, 1-flowered; peduncle ca. 4 mm; floral bracts 4, subulate,  $1\text{--}3 \times \text{ca. } 1$  mm, hairy. Flower yellowish green; pedicel and ovary ca. 1 mm. Sepals coarsely hairy abaxially; dorsal sepal narrowly elliptic, ca.  $3 \times 2$  mm, obtuse; lateral sepals obliquely triangular, ca.  $5 \times 3$  mm, truncate. Petals lanceolate, ca.  $2.5 \times 1.5$  mm, glabrous, acute; lip fleshy, entire, tongue-shaped, ca.  $7 \times 3$  mm, rounded, shortly hairy, slightly concave at base, with a subglobose basal callus and 2 purple calli at center. Column subterete, ca. 1.2 mm, foot ca. 4 mm. Fl. Oct–Nov.

• Epiphytic on tree trunks in tropical montane evergreen forests; 1300–1500 m. Hainan (Dongfang).

**3. *Trichotosia microphylla*** Blume, *Bijdr.* 343. 1825.

小叶毛鞘兰 *xiao ye mao qiao lan*

*Eria microphylla* (Blume) Blume; *Pinalia microphylla* (Blume) Kuntze.

Plants 4–6 cm tall, white hirsute. Rhizome long, slender. Stems  $\pm$  tufted or 1–1.5 cm apart, erect, cylindrical, 4–12 cm, ca. 2 mm in diam., covered with leaf sheaths. Leaves 10–12, alternate, fleshy; leaf blade narrowly elliptic or oblanceolate, 8–17  $\times$  3–5 mm, both surfaces hirsute, apex obtuse. Inflorescence arising from upper portion of stem, opposite a leaf, 1-flowered;

peduncle covered by 1 or 2 sheaths; floral bracts densely arranged, lanceolate, ca. 6 mm, covered with long hairs, acuminate. Flowers yellow; pedicel and ovary ca. 3 mm, covered with long hairs. Sepals white hirsute abaxially; dorsal sepal ovate, ca.  $3 \times 1.5\text{--}2$  mm, obtuse or acuminate; lateral sepals oblong, ca.  $5 \times 3$  mm, obtuse; mentum ca. 4 mm. Petals oblong, ca.  $2.5 \times 1.5$  mm, rounded, glabrous; lip subobovate-oblong, ca.  $5 \times 2.5$  mm, slightly contracted near middle, abaxially hirsute, base connected at a right angle with column foot, margin entire, apex obtuse or subtruncate; disk with 5 lamellae extending from base to near apex, near middle with a purple ellipsoid callus on either side. Column ca. 1.5 mm; thickened; foot ca. 4 mm. Capsule ellipsoid-cylindric, ca.  $6 \times 2.5$  mm, densely white hirsute; fruiting pedicel ca. 2 mm. Fl. Apr–Jun, fr. Nov.  $2n = 24 + 5B, 24 + 9B$ .

Epiphytic on tree trunks in forests; 1000–1500 m. Hainan, S Yunnan [Indonesia, Malaysia, Thailand, Vietnam].

**4. *Trichotosia dasyphylla*** (E. C. Parish & H. G. Reichenbach) Kraenzlin in Engler, *Pflanzenr.* 50(IV. 50. II. B. 21): 138. 1911.

瓜子毛鞘兰 *gua zi mao qiao lan*

*Eria dasyphylla* E. C. Parish & H. G. Reichenbach, *Trans. Linn. Soc. London* 30: 147. 1874; *Pinalia dasyphylla* (E. C. Parish & H. G. Reichenbach) Kuntze.

Plants 2–3 cm tall, grayish white hirsute, with  $\pm$  tufted rhizomes. Stem very short. Leaves 2–5, tufted, petiolate, elliptic or obovate-cuneate, 10–15  $\times$  4–6 mm, fleshy, apex obtuse; petiole 3–4 cm, running down to a trumpet-shaped basal sheath. Inflorescence axillary, with a solitary flower; peduncle 5–10 mm, with 2 trumpet-shaped basal sheaths; floral bracts persistent, ca. 2 mm, acuminate. Flowers pale yellow; pedicel very short. Sepals with dense long white hairs abaxially; dorsal sepal ovate-lanceolate,  $3\text{--}4 \times 1\text{--}2$  mm, obtuse; lateral sepals obliquely triangular,  $5\text{--}6 \times \text{ca. } 4$  mm, obtuse; mentum ca.  $4 \times 2$  mm. Petals oblong,  $3\text{--}4 \times \text{ca. } 1$  mm, abaxially with dense white long hairs, apex obtuse; lip obovate-oblong,  $5\text{--}6 \times \text{ca. } 3$  mm, slightly contracted at middle, thickened, abaxially with white long hairs, margin ciliate, apex subtruncate, with 2 suboblong calli on both sides, with a slightly thickened area between calli. Column ca. 1.5 mm; foot ca. 4 mm. Capsule obovoid-cylindric,  $5\text{--}6 \times$  nearly 3 mm, with white long hairs. Fl. Jun–Sep.

Epiphytic on trees; 900–1600 m. S and SW Yunnan [India, Laos, Myanmar, Nepal, Thailand, Vietnam].

## 129. OXYSTOPHYLLUM Blume, *Bijdr.* 335. 1825.

拟石斛属 *ni shi hu shu*

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic, erect, repent, or pendulous. Rhizome short; roots wiry. Stem not swollen, covered in distichous leaf bases. Leaves equitant, iridiform, rigid, with an abscission layer at apex of conduplicate leaf sheath. Inflorescences subterminal or lateral, simple or compound, flowering successively; floral bracts persistent, often forming dense tufts. Flowers not opening widely, fleshy, rigid; ovary almost sessile. Dorsal sepal free, rigid; lateral sepals obliquely triangular, forming a distinct mentum with column foot. Lip very fleshy, entire, hinged to apex of column foot, saccate at base, with a conic subapical wart below, secreting sticky liquid at base and along grooved adaxial surface. Column short; foot longer than column proper; pollinia 4, in pairs, attached to prominent caudicles.

About 38 species: widely distributed from SE Asia to New Guinea and the Solomon Islands; one species (endemic) in China.

**1. *Oxystophyllum changjiangense*** (S. J. Cheng & C. Z. Tang) M. A. Clements, *Telopea* 10: 276. 2003.

拟石斛 ni shi hu

*Dendrobium changjiangense* S. J. Cheng & C. Z. Tang, *Acta Phytotax. Sin.* 18: 98. 1980.

Rhizome creeping. Stems erect or decumbent, 6–9 cm, 2–4 mm in diam., branched or unbranched, completely enclosed in leaf sheaths. Leaves distichous, ascending, densely telescopic, laterally compressed and shortly sword-shaped, 3–5 cm, 6–10 mm or more wide, thickly fleshy, sheathing at base. Inflorescences often subterminal, ca. 1 cm, flowers opening one at a time in succession; floral bracts broadly ovate, 4–7 mm, membranous, acute; pedicel and ovary ca. 3 mm. Flowers spreading,

purplish black, thickly fleshy. Dorsal sepal elliptic, 4–5 × 2–2.5 mm or more, acute; lateral sepals obliquely ovate-triangular, ca. as long as dorsal sepal and slightly broader, base oblique, apex acute; mentum large. Petals oblong, 4–4.5 × ca. 1 mm, rounded and mucronulate; lip ligulate, 6–7 × 2.5–3 mm or more, thickly fleshy, with a subapical wart abaxially, lateral margins slightly lacerate at middle, rounded, adnate to column foot at apex, recurved above middle. Column deep purple, ca. 1.5 mm, foot 4–5 mm, ca. 1.3 mm wide; anther cap subconic, front margin truncate, adaxially with dense, thin papillae.

• Epiphytic on tree trunks in open mountain forests, lithophytic on rocks in mountain valleys; ca. 1000 m. Hainan.

This species was misidentified as *Dendrobium concinnum* Miquel in *Fl. Hainan.* (4: 221. 1977).

### 130. *CALLOSTYLIS* Blume, *Bijdr.* 340. 1825.

美柱兰属 mei zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Tylostylis* Blume.

Herbs, epiphytic. Rhizome stout, creeping, covered by sheaths. Stems well spaced on a stout rhizome, or tufted, short to elongate, pseudobulbous, thick, somewhat clavate and consisting of only a few internodes, or terete and with many internodes, base loosely covered by dried sheaths, leafy mostly in upper part. Leaves 2–5, distichous, arising from nodes at apex of pseudobulb, suberect, conduplicate, leathery. Inflorescences axillary, short, with many flowers opening in succession, erect or spreading, axis covered by short, dense, stellate hairs. Flowers resupinate or not resupinate, usually cream-colored to orange-yellow, often with a dark brown lip, medium-sized, pubescent. Sepals with dense brown stellate hairs abaxially; dorsal sepal free, elliptic or elliptic-ovate; lateral sepals obliquely triangular, ventrally broadened at base, adnate to much elongated column foot forming a long, distinct mentum. Petals free, oblong, smaller than sepals, narrow; lip entire, articulate to column foot, closely pressed to column and column foot, often expanding at base or folded in such a way as to form a pouch. Column curving, short, foot at right angles to column, often somewhat sigmoid, shorter or longer than column, with an apical fleshy swelling; pollinia 8, obliquely shortly clavate, ± equal in shape and size.

Five or six species: China, Himalayan region, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam; two species in China.

- 1a. Pseudobulbs remote, 6–16 cm, clavate to flask-shaped, 4 or 5 leaved; lip 3.5–4 × 2–3 mm, margin in distal 1/3 usually strongly recurved giving it a pentagonal appearance when viewed from above; callus round, entire ..... 1. *C. rigida*  
 1b. Pseudobulbs tufted, 20–70(–90) cm, terete, many leaved; lip ca. 10 × 5–6 mm; disk with 3 white pubescent lamellae from base to apex ..... 2. *C. bambusifolia*

**1. *Callostylis rigida*** Blume, *Bijdr.* 341. 1825.

美柱兰 mei zhu lan

*Callostylis rigida* subsp. *discolor* (Lindley) Brieger; *Eria discolor* Lindley; *E. elongata* Blume; *E. pendula* Ridley; *E. pholidotoides* Gagnepain; *E. rigida* H. G. Reichenbach (1857), not Blume (1856); *Tylostylis discolor* (Lindley) J. D. Hooker; *T. rigida* (Blume) Blume.

Rhizome creeping, 4–8 mm in diam., with internodes 1–2 cm and cylindric sheaths 1–1.5 cm. Pseudobulbs shiny, ± oblong-fusiform or narrowly fusiform, 6–16 × 2–3 cm, distally 4- or 5-leaved. Leaf blade glossy, suboblong or narrowly elliptic, 12–17 × 2.4–4.3 cm, leathery, base contracted into a short petiole, apex unequally bilobed. Inflorescences often 2–4, racemose, 1.5–4.5 cm, more than 10-flowered; peduncle 2.5–3.5 cm, shortly brown tomentose; floral bracts reflexed, suborbicular or broadly ovate, 3–4 mm, both surfaces shortly tomentose. Flowers greenish yellow, 1.2–1.5 cm in diam.; sepals with grayish brown hairs abaxially and sparsely white pubescent

adaxially; lip brown; column foot with a dark purple callus. Dorsal sepal elliptic, 8–10 × 4–5 mm, obtuse; lateral sepals slightly shorter and broader. Petals narrowly elliptic-obovate, 7–8 × 3.5–4 mm; lip ± broadly cordate or broadly ovate, 3.5–4 × 2–3 mm, mucronate, with a cushionlike callus in basal half. Column curved forward at right angle. Capsule narrowly oblong, 3–4 cm × 6–9 mm, with 6 longitudinal ribs, ± hairy. Fl. and fr. May–Jun.  $2n = 20, 40$ .

Epiphytic on trees in mixed forests; 600–1700 m. S Yunnan [India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**2. *Callostylis bambusifolia*** (Lindley) S. C. Chen & J. J. Wood, **comb. nov.**

竹叶美柱兰 zhu ye mei zhu lan

Basionym: *Eria bambusifolia* Lindley, *J. Proc. Linn. Soc.*, Bot. 3: 61. 1858; *Cylindrolobus bambusifolius* (Lindley) Brieger; *Pinalia bambusifolia* (Lindley) Kuntze.

Stems tufted, terete, 20–70(–90) cm, 3–7(–25) mm in

diam., with many internodes and leaves. Leaves distichous, mostly on upper part of stem; blade narrowly lanceolate, 10–22 × 1–3 cm, papery, base with a long amplexicaul sheath, apex acuminate. Inflorescences 2–7, arising from near apex of stem, opposite to leaves, 10–22 cm; rachis usually zigzag, base often with 2 or 3 sterile bracts; rachis, pedicel, ovary, and abaxial surface of floral bracts and sepals densely grayish brown hairy; floral bracts reflexed, obovate-oblong or subrhombic, ca. 5 mm, adaxially sparsely hairy. Flowers white, with brownish red veins; pedicel and ovary 1–4 cm. Dorsal sepal oblong-lanceolate, ca. 12 × 3 mm, obtuse; lateral sepals obliquely oblong-lan-

ceolate, ca. 10 × 5 mm, obtuse. Petals oblong-lanceolate, ca. 11 × 2.5 mm, obtuse; lip ovate-oblong in outline, ca. 10 × 5–6 mm, subentire; lateral lobes rudimentary, base and apex ± thickened, mucronate, base with an upcurved claw ca. 2 mm; disk brownish red, with 3 densely white pubescent lamellae extending from base to apex, lamellae thickened at base, distally becoming thinner and disappearing. Column ca. 8 mm (including anther cap), with a wing ca. 1 mm wide on either side. Fl. Dec. 2n = 38.

Epiphytic on tree trunks in forests; 900–1200 m. Guangxi, S Yunnan [NE India, Myanmar, Thailand, Vietnam].

### 131. *PORPAX* Lindley, Edwards's Bot. Reg. 31(Misc.): 62. 1845.

盾柄兰属 *dun bing lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic, tiny, clump-forming. Pseudobulbs crowded together, flattened globose, usually wider than long, 2- or 3-leaved, covered by a sheath that disintegrates into a fine fibrous network or into radiating fibers; sheaths white, with reticulate or other veins. Leaves appearing at or after anthesis; blade elliptic, ovate, or oblong, sometimes minutely hairy on margin, apex obtuse or acute. Inflorescence 1-flowered (rarely 2- or 3-flowered), borne either from base of pseudobulb, breaking through sheath, or from apex of a developed pseudobulb; peduncle and pedicel very short, flower appearing sessile at edge or center of pseudobulb; floral bract conspicuous, enclosing lower part of flower. Flowers orange-red to deep dull red, sometimes flushed with greenish yellow. Dorsal sepal connate with lateral sepals at least at its base; lateral sepals connate nearly, or completely, to apex, forming a tube and a mentum with column foot. Petals spatulate to oblong, narrow, smaller and shorter than sepals, sometimes hairy; lip completely enclosed in tube, very small, much shorter than petals, obscurely 3-lobed, usually recurved; disk with a basal callus. Column short but distinct, with conspicuous foot; pollinia 8, waxy, in 2 groups, each group attached to a viscidium; rostellum rather large, often covering stigma entrance.

About 11 species: mainland Asia, from India through Thailand and Indochina to Peninsular Malaysia, with one outlying species in Borneo; one species in China.

**1. *Porpax ustulata*** (E. C. Parish & H. G. Reichenbach) Rolfe, *Orchid Rev.* 16: 8. 1908.

盾柄兰 *dun bing lan*

*Eria ustulata* E. C. Parish & H. G. Reichenbach, *Trans. Linn. Soc. London* 30: 147. 1874; *Pinalia ustulata* (E. C. Parish & H. G. Reichenbach) Kuntze.

Pseudobulbs flattened globose, 4–5 × 5–6 mm, covered with strongly reticulate-veined sheaths; reticulate veins convex, with meshes ca. 5 mm in diam. Leaves 2, developing at anthesis; leaf blade obovate, elliptic, or suboblong, 1.5–2.5 × 0.8–1.4 cm, 13–15-veined, base contracted into a short petiole, margin thinly ciliate, apex rounded or slightly acute; petiole 2–4

cm. Inflorescence arising between 2 apical leaves, very short, 1- or 2-flowered; floral bracts small. Flowers suberect, red, 6–7 mm; pedicel and ovary 2–3 mm, pubescent. Dorsal sepal ovate, 6–7 × 3–4 mm, abaxially pubescent, connate to lateral sepals shortly at base, acute or shortly acuminate at apex; lateral sepals fused with each other at 1/2–2/3 their length, base dilated forming a subglobose sac, abaxially hairy. Petals spatulate, 5–6 × ca. 2 mm, margin ± erose, adaxially with faint small silvery-white dots; lip recurved, suboblong-lanceolate, ca. 2 × 0.7 mm, base contracted, distal margin shortly fimbriate, apex cuspidate. Column very short, foot short. Capsule broadly obovoid, ca. 3 × 3.5 mm; fruiting pedicel 4–5 mm. Fl. and fr. Jun.

Epiphytic on trees in valley forests; 600–1500 m. S Yunnan [Myanmar, Thailand].

### 132. *CERATOSTYLIS* Blume, *Bijdr.* 304. 1825.

牛角兰属 *niu jiao lan shu*

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Ritaia* King & Pantling.

Herbs, epiphytic or lithophytic. Rhizome short or rather long, creeping or pendulous; roots fibrous. Stems simple or branched, tufted, sometimes terete and rushlike, 1-leaved, with thin, brown, often reticulate basal sheaths, sometimes entirely covered by membranous, reddish brown sheaths, pseudobulbs absent. Leaves borne at apex of stem or branches, usually linear, narrowly lanceolate, or subcylindric, leathery, fleshy or subterete, rarely thinly textured, base articulate. Inflorescence terminal, usually with several clustered flowers, rarely reduced to a solitary flower. Flowers resupinate, small, rarely large and showy. Sepals similar, erect, connivent; lateral sepals adnate at base to column foot forming a saccate or spurlike mentum, enclosing basal part of lip. Petals narrower than sepals; lip adnate to apex of column foot by a long incumbent claw, slightly or partly thickened, spurless, entire or inconspicuously 3-lobed, usually with longitudinal calli. Column short, dilated above, apex bilobed or with 2 spatulate erect arms, foot long; anther terminal, incumbent; pollinia 8, in 2 groups, waxy, sessile, commonly adhering to a small viscidium.

About 100 species: tropical Asia to New Guinea and the Pacific islands; three species (one endemic) in China.

- 1a. Leaves subterete, grooved on one side; stem more than 20 cm, only base enclosed in scalelike sheaths ..... 3. *C. subulata*  
 1b. Leaves linear to narrowly oblong; stem less than 10 cm, completely enclosed in scalelike sheaths.  
 2a. Stem (1.5–)2–7 cm, branching ..... 1. *C. himalaica*  
 2b. Stem ca. 1 cm, unbranched ..... 2. *C. hainanensis*

**1. *Ceratostylis himalaica*** J. D. Hooker, Fl. Brit. India 5: 826. 1890.

叉枝牛角兰 cha zhi niu jiao lan

*Ritaia himalaica* (J. D. Hooker) King & Pantling.

Plants epiphytic or lithophytic. Stems clustered, pendulous, (1.5–)2–7 cm, dichotomously branched, completely enclosed in scalelike sheaths; sheaths reddish brown or pale reddish brown, ovate-lanceolate, 5–10 mm, membranous, apex long acuminate. Leaf blade linear or narrowly oblong, 3.5–6.5 × 0.3–0.7 cm, fleshy, obliquely notched, acute; petiole 4–6 cm. Inflorescence arising from leaf base, subcapitate, 1- or 2-flowered; peduncle and pedicel ca. 4 mm, ± pubescent; peduncle with 2 sheaths; floral bracts ovate, 4–5 × 1.5–2 mm, sheathing, acute to acuminate. Flowers small, white spotted with purplish red, column yellow. Dorsal sepal oblong-ovate, 5–6 × 2–3.5 mm, abaxially pubescent; lateral sepals broadly ovate, 3.5–4.5 mm, abaxially pubescent. Petals linear, 3.5–4.5 × ca. 1 mm, glabrous; lip suboblong, cymbiform, 2–3 mm, thickened, base deeply saccate, margin entire, apex with a cushionlike callus abaxially; disk slightly hairy. Column very short, apical arms horn-shaped, foot short. Capsule ellipsoid, 6–7 × 3–4 mm. Fl. and fr. Apr–Jun.

Epiphytic on trees or lithophytic on rocks in forests; 900–1700 m. SE Xizang, S Yunnan [Bhutan, NE India, Laos, Malaysia, Myanmar, Nepal, Vietnam].

**2. *Ceratostylis hainanensis*** Z. H. Tsi, Acta Phytotax. Sin. 33: 582. 1995.

牛角兰 niu jiao lan

*Ceratostylis caespitosa* (Rolfe) Tang & F. T. Wang, Acta Phytotax. Sin. 1: 87. 1951, not L. O. Williams (1938); *Eria caespitosa* Rolfe; *Trichotisia caespitosa* (Rolfe) Kraenzlin.

Plants epiphytic or lithophytic. Rhizome short. Stems clustered, ca. 1 cm, unbranched; basal sheaths reddish brown, ovate-lanceolate or ovate, 5–10 mm. Leaf blade shortly petiole, linear-oblong, 30–60 × 2.5–4(–5) mm, articulate, unequally bilobed or sometimes ± unlobed. Inflorescence termi-

nal, usually 1-flowered; floral bracts persistent, ca. 1 mm, scarious, amplexicaul at base. Flowers fragrant, white, with purplish stripes near base; peduncle and pedicel 4–5 mm. Dorsal sepal elliptic-oblong, 4–5 × ca. 2 mm, subacute; lateral sepals ± broadly oblong, 6–7 × ca. 3 mm; mentum ca. 2 mm. Petals lanceolate-oblong, 3.5–4 × ca. 1.5 mm, obtuse; lip ± broadly elliptic-rhombic, 5–6 × 3.5–4 mm, inconspicuously 3-lobed; lateral lobes subelliptic; mid-lobe broadly cordate-ovate, fleshy; disk with 2 longitudinal lamellae; lamellae fleshy, villous at base. Column very short, foot distinct. Capsule subellipsoid, 5–6 × 2.5–3.5 mm. Fl. and fr. May–Jun.

• Epiphytic on trees in forests, lithophytic on rocks along streams; 700–1000 m. Hainan.

**3. *Ceratostylis subulata*** Blume, Bijdr. 306. 1825.

管叶牛角兰 guan ye niu jiao lan

*Appendicula teres* Griffith; *Ceratostylis teres* (Griffith) H. G. Reichenbach.

Plants epiphytic or lithophytic. Rhizome short. Stems clustered, suberect, cylindric, rushlike, 6–18(–26) cm, apex with 1 leaf and 1 shortened inflorescence; basal sheaths reddish brown, ovate-lanceolate, 5–20 mm. Leaf often deciduous after anthesis, erect, subcylindric, 2.3–5.2 cm × ca. 2 mm, attenuate toward apex. Inflorescence terminal, capitate, sessile, several flowered, base with several sterile bracts 5–7 mm; floral bracts 4–6 mm. Flowers greenish yellow or yellow; pedicel and ovary very short, sparsely hairy. Sepals oblong, ca. 2.5 × 1 mm, abaxially hairy, subacute; lateral sepals slightly wider than dorsal sepal; mentum subclavate, ca. 0.5 mm, slightly 2-lobed, outer surface shortly hairy. Petals lanceolate-rhombic, ca. 3 × 0.7 mm, glabrous, acute; lip somewhat spatulate, 2–3 × ca. 1.5 mm, distal part thickened and fleshy, base narrowed into a claw; claw with 2 longitudinal lamellae adaxially. Column short, foot distinct. Capsule obovoid-ellipsoid or ellipsoid, 5.5–6.5 × 2.5–3.5 mm. Fl. and fr. Jun–Nov.  $2n = 40$ .

Epiphytic on trees or lithophytic on rocks in forest; 700–1100 m. Hainan [Cambodia, India, Indonesia, Laos, Malaysia, Philippines, Thailand, Vietnam].

### 133. CRYPTOCHILUS Wallich, Tent. Fl. Nepal. 36. 1824.

宿苞兰属 su bao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Xiphosium* Griffith.

Herbs, epiphytic or lithophytic. Rhizome creeping. Pseudobulbs tufted, ovoid or dilated, enclosed within several acute, imbricate, brown sheaths below, 1-leaved at apex or with 2 or 3 leaves toward apex, covered when young by acute sheaths. Leaves suberect to erect, conduplicate, leathery, articulate to apex of sheath. Inflorescence terminal, synanthous, racemose, secund; floral bracts prominent, lanceolate, almost as long as flowers. Flowers resupinate, campanulate or opening widely, spreading or subnutant, white, pink, red, or yellow, small, glabrous. Sepals fused into a cylindrical tube except for their apical 1/4, or dorsal sepal free, lateral sepals

oblique at base, attached to column foot to form a conic mentum. Petals free, enclosed in tube, oblanceolate, smaller than sepals; lip entire and ecallose, or 3-lobed and callose, recurved in apical half, lacking a spur, firmly attached to column foot to form an obscure mentum. Column with a foot ca. as long as or longer than column; anther 8-locular; pollinia 8, clavate, attached to a prominent, elongate, narrowly elliptic viscidium, bifid at apex; rostellum prominently bilobed; ovary markedly keeled, triangular in cross section.

About ten species: Bhutan, S China, N India, Laos, Myanmar, Nepal, Thailand, Vietnam; three species (one endemic) in China.

- 1a. Pseudobulbs 1-leaved; floral bracts 2–5 cm; sepals dorsally carinate; inflorescence laxly 2–5-flowered; flowers white or pink ..... 3. *C. roseus*  
 1b. Pseudobulbs 2-leaved; floral bracts 6–21 mm; sepals not dorsally carinate; inflorescence subdensely 7- to many flowered; flowers yellow or scarlet.  
 2a. Sepaline tube yellow; pollinia yellow ..... 1. *C. luteus*  
 2b. Sepaline tube scarlet; pollinia green ..... 2. *C. sanguineus*

**1. *Cryptochilus luteus*** Lindley, J. Proc. Linn. Soc., Bot. 3: 21. 1858 [*“lutea”*].

宿苞兰 su bao lan

*Cryptochilus farreri* Schlechter.

Pseudobulbs clustered on a short rhizome, cylindrical, 1.5–3.5 cm × 5–10 mm, 2-leaved. Leaf blade narrowly oblong or suboblanceolate-oblong, 5–16.5 × 1–2.5 cm, papery, acuminate; petiole 1–3 cm. Inflorescence subdensely 20–40-flowered; peduncle 7–14 cm, slender, glabrous; rachis 3.5–8 cm; floral bracts alternate, narrowly lanceolate, 6–14 mm, grooved, long acuminate. Flowers yellowish green or yellow; pedicel and ovary 3–4 mm, densely pubescent. Sepals connate into an urceolate tube, 3–5 mm, outer surface glabrous; free apical lobes ovate-triangular, ca. 1 mm; lateral sepals convex on one side; mentum saccate, short. Petals hidden in mentum, obovate-lanceolate, 3.5–4 × ca. 0.8 mm; lip subrhombic-cuneate, 3.5–4 × ca. 0.8 mm, base slightly curved, apex obtuse. Column short, thick, apex dilated, with a short foot. Capsule suboblong, 6–7 × 3–3.5 mm. Fl. Jun–Jul, fr. Sep–Oct.

Epiphytic on trees or lithophytic on rocks in dense forests or at forest margins; 1000–2300 m. W to SE Yunnan [Bhutan, NE India, N Vietnam].

**2. *Cryptochilus sanguineus*** Wallich, Tent. Fl. Nepal. 36. 1824 [*“sanguinea”*].

红花宿苞兰 hong hua su bao lan

Rhizome short. Pseudobulbs ovoid to ellipsoid-cylindric, 1.5–3 cm × 5–8(–10) mm, sheathed at base, 2-leaved. Leaf blade narrowly oblong or oblanceolate-oblong, 6–15 × 1.5–3 cm, papery, shortly acuminate; petiole 7–15 cm. Inflorescence subdensely 10–30-flowered; peduncle 9.5–19 cm, glabrous; rachis 4–9 cm, glabrous; floral bracts distichous, subulate-lanceolate, 5–21 mm, grooved, pubescent externally, long acuminate. Flowers 6–11 mm, sepaline tube scarlet with purple apices; petals, lip, and column yellow; pedicel and ovary 4–10 mm,

densely white pubescent. Sepals connate into a tube 6–9 mm, outer surface densely white villous; free apical lobes ovate-triangular, 3–4 mm, ± glabrous; lateral sepals conspicuously convex on one side at base forming a saccate mentum. Petals hidden in mentum, oblanceolate, 5–6 × ca. 1 mm; lip completely hidden in sepaline tube, suboblong, ca. 7 × 2 mm. Column short, thick, with a short foot. Fl. Jun–Aug. *2n* = 38.

Epiphytic on trees in forests; 1800–2100 m. SE Xizang, NW Yunnan [Bhutan, NE India, Myanmar, Nepal].

**3. *Cryptochilus roseus*** (Lindley) S. C. Chen & J. J. Wood, **comb. nov.**

玫瑰宿苞兰 mei gui su bao lan

Basionym: *Eria rosea* Lindley, Bot. Reg. 12: ad t. 978. 1826; *Octomeria rosea* (Lindley) Sprengel; *Pinalia rosea* (Lindley) Kuntze; *Xiphosium roseum* (Lindley) Griffith.

Rhizome stout, ca. 1 cm in diam. Pseudobulbs contiguous, or 1–2 cm apart from each other, ovoid, 2–5 × 1–2 cm, enclosed in sheaths when young, apex 1-leaved. Leaf blade lanceolate or oblong-lanceolate, 16–40 × 2–5 cm, thickly leathery, obtuse or acute; petiole 3–6 cm. Inflorescence nearly as long as leaf, laxly 2–5-flowered; floral bracts deciduous when fruiting, linear, 2–5 cm. Flowers white or pink; pedicel and ovary 1–3 cm. Dorsal sepal ovate-oblong, ca. 12 × 5 mm, dorsally carinate; lateral sepals triangular-lanceolate, ca. 14 × 8–9 mm, dorsally carinate, obtuse; mentum ca. 4 mm. Petals subrhombic, ca. 11 × 6 mm, base cuneate, apex obtuse; lip obovate-elliptic or subovate in outline, 13–14 × 8–10 mm, base narrowed or subtruncate, 3-lobed; lateral lobes incurved, subovate; mid-lobe subspatulate or subquadrate, 4–6 × 4–5 mm, apex rounded and emarginate; disk with 2 or 3 thickened lamellae running from base to base of mid-lobe, further divided into 7 thinner lamellae. Column ca. 6 mm, apex slightly dilated; foot 4–6 mm. Capsule cylindrical, 3–4 cm. Fl. Jan–Feb, fr. Mar–Apr.

• Epiphytic on trees or lithophytic on rocks in dense forests; ca. 1300 m. Hainan, Hong Kong.

### 134. AGROSTOPHYLLUM Blume, Bijdr. 368. 1825.

禾叶兰属 he ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Chitonochilus* Schlechter; *Diploconchium* Schauer.

Herbs, epiphytic. Stems clustered, without pseudobulbs, erect or pendulous, slender, bilaterally flattened, with many internodes, leafy. Leaves distichous, usually twisted at base to lie in one plane, usually narrowly oblong to linear-lanceolate, narrow, rather thin,

with black- or brown-edged imbricate sheaths, base sheathing and articulate. Inflorescence terminal, usually globose heads on an elongate axis, or in a panicle, surrounded by bracts, often densely many flowered, rarely reduced to a few flowers or a solitary flower. Flowers resupinate, white or yellow, occasionally reddish, small, often self-pollinating. Sepals and petals free. Lateral sepals forming a mentum containing saccate lip base. Petals narrower than sepals; lip entire or 3-lobed, saccate base divided from blade by a transverse partition, forming hypochile and epichile; hypochile saccate at base, often with callus inside. Column short or rather long, foot rudimentary; anther incumbent; pollinia 8, waxy, usually with short caudicle, commonly attached to a solitary viscidium; stigma suborbicular, concave, large; rostellum conspicuous, subtriangular.

Between 40 and 50 species: Old World tropics from the Seychelles and tropical Asia east to the Pacific islands, with the center of distribution in New Guinea; two species in China.

- 1a. Leaves 4–8 mm wide; flowers ± tinged with purplish red; petals broadly subrhombic-elliptic ..... 1. *A. callosum*  
 1b. Leaves 1.5–2.5 mm wide; flowers white, later turning yellow; petals linear ..... 2. *A. inocephalum*

**1. *Agrostophyllum callosum*** H. G. Reichenbach in Seemann, Fl. Vit. 296. 1868.

禾叶兰 he ye lan

Plants 30–60 cm tall or taller. Rhizome creeping, 3–4 mm in diam. Stems borne 1–2 cm apart on rhizome, erect, slender, terete below middle, ± compressed above, unbranched, with many distichous leaves. Leaf blade grasslike, 8–13(–17) × 0.4–0.8 cm, papery, attenuate gradually from base to apex, unequally bilobed, sheathing at base; sheaths tubular, 2–3.5 cm, margin black membranous. Inflorescence terminal, subcapitate, 1–2 cm in diam., densely several to 10-flowered; floral bracts cymbiform, suboblong, 0.5–2 cm. Flowers reddish or white and tinged with purplish red; pedicel very short; ovary 5–6 mm. Dorsal sepal orbicular, ca. 4 mm; lateral sepals broadly ovate-orbicular, ca. 4 × 5 mm, base embracing lip. Petals subrhombic-elliptic, ca. 2.5 × 3 mm, base contracted; lip ± broadly oblong, ca. 3.5 mm, slightly contracted at middle, base shallowly saccate, inside with a callus; callus laterally 2-branched. Column ca. 2 mm. Capsule ellipsoid, ca. 5 × 3.5 mm. Fl. and fr. Jul–Aug.  $2n = 38, 40$ .

Epiphytic on trees in dense forests; 900–2400 m. NE and SW Hainan, SE Xizang, S Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

**2. *Agrostophyllum inocephalum*** (Schauer) Ames, Orchida-ceae 2: 148. 1908.

台湾禾叶兰 tai wan he ye lan

*Diploconchium inocephalum* Schauer, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1): 428. 1843; *Agrostophyllum formosanum* Rolfe.

Plants 20–40 cm tall. Stems tufted, slender at base, dilated gradually upward, internodes ca. 4 cm, enclosed by persistent leaf sheaths. Leaf blade linear, 15–25 × 1.5–2.5 cm, apex obtuse and often unequally bilobed, sheathing at base; sheaths persistent, somewhat conduplicate, 4–5 cm, rigid. Inflorescence terminal, capitate, 1.5–2.5 cm in diam., branched, many flowered, each branch 2- or 3-flowered; floral bracts many. Flowers white or turning yellow later, small; pedicel and ovary ca. 7 mm. Dorsal sepal ovate-oblong, 4–5 × 2–2.5 mm, rounded; lateral sepals ovate, ca. 4.5 × 2–2.5 mm, acute. Petals linear, ca. 3.5 × 1 mm; lip ca. 4 mm, slightly contracted and with a transverse ridge at middle, forming a subglobose sac at base and a concave limb above middle. Column 3–4 mm. Fl. Feb–Mar.

Epiphytic on trees in evergreen forests. S Taiwan [Philippines].

### 135. APPENDICULA Blume, Bijdr. 297. 1825.

牛齿兰属 niu chi lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, lithophytic, or rarely terrestrial. Stems tufted, erect or pendulous, often ± compressed, slender, with many nodes, simple or branched, pseudobulbs absent, enclosed in persistent basal sheaths of leaves. Leaves many, distichous, flat, often twisted at base so that blades all lie in one plane, with tubular amplexicaul sheaths at base, articulate. Inflorescences terminal, lateral, or both, usually rather short, sometimes shortened and capitate, few to many flowered; floral bracts persistent. Flowers resupinate, white or greenish, very small. Sepals free; lateral sepals adnate at base to column foot forming a mentum. Petals often slightly smaller than dorsal sepal; lip adnate at base to column foot, unlobed or sometimes slightly 3-lobed, base saccate, apex recurved, adaxially with a round or concave basal appendage, sometimes lengthened into small keels, sometimes with a medium keel or callus on distal surface or mid-lobe. Column stout, with long and broad foot; anther subterminal, erect; pollinia 6, waxy, subclavate, in 2 groups, on a slender solitary forked caudicle or 2 separate ones, attached to a common viscidium; rostellum erect, large, often 2-lobed.

About 60 species: tropical Asia to Oceania, mainly in Indonesia and New Guinea; four species in China.

- 1a. Leaves lanceolate-oblong, ca. 5 cm, apex acuminate and shallowly bilobed; lip with a hairy appendage ..... 3. *A. fenixii*  
 1b. Leaves oblong to narrowly ovate-elliptic, 1–4 cm, apex obtuse or rounded and shallowly bilobed; lip with a glabrous appendage.  
 2a. Adaxial surface of lip with a lamellate appendage in distal half and another appendage near base ..... 1. *A. cornuta*  
 2b. Adaxial surface of lip with only one appendage near base or middle.

- 3a. Lip suborbicular in outline; flowers greenish or greenish white; leaves not turning blackish when dried ..... 2. *A. reflexa*  
 3b. Lip subglobose in lower half, epichile broadly ovate, subacute; flowers white; leaves turning blackish  
 when dried ..... 4. *A. annamensis*

**1. *Appendicula cornuta*** Blume, Bijdr. 302. 1825.

牛齿兰 niu chi lan

*Appendicula bifaria* Lindley; *A. bifaria* var. *wallichiana* J. D. Hooker; *Dendrobium bifarium* (Lindley) J. D. Hooker, nom. superfl.; *Podochilus cornutus* (Blume) Schlechter.

Plants epiphytic or lithophytic. Stems tufted, ascending or pendulous, subterete, 20–50 cm, 2–3 mm in diam., unbranched, internodes ca. 1 cm, completely enclosed in tubular sheaths of leaves. Leaves many, distichous, alternate; blade narrowly ovate-elliptic or suboblong, 25–35 × 6–12 mm, apex unequally 2-lobed or emarginate, often apiculate, tubular-sheathed at base; sheaths persistent, ca. 1 cm, amplexicaul. Inflorescence terminal or lateral, shorter than leaves, usually 1–1.5 cm, 2–6-flowered; floral bracts often reflexed, lanceolate, 4–5 mm. Flowers white, ca. 5 mm in diam.; pedicel and ovary 3–5 mm. Dorsal sepal elliptic, ca. 3.5 × 1.8–2 mm, concave, acuminate; lateral sepals obliquely triangular, 4–5 × 2–2.5 mm; mentum ca. 1 mm. Petals ovate-oblong, 2.5–3 × ca. 1.5 mm; lip suboblong, 3.5–4 × ca. 1.5 mm, slightly contracted near middle, margin crisped, apex obtuse, distal part with a thickened lamellate appendage, with another large appendage near base; basal appendage spreading backward, suborbicular or broadly ligulate, margin incurved. Column ca. 2 mm, foot 2–2.5 mm. Capsule ellipsoid, 5–6 × 2.5–3 mm. Fl. Jul–Aug, fr. Sep–Oct.

Lithophytic on rocks in forests or on humid cliffs; below 800 m. S Guangdong, Hainan [Cambodia, NE India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**2. *Appendicula reflexa*** Blume, Bijdr. 301. 1825.

台湾牛齿兰 tai wan niu chi lan

*Appendicula cornuta* Blume var. *formosana* (Hayata) S. S. Ying; *A. formosana* Hayata; *A. formosana* var. *kotoensis* (Hayata) T. P. Lin; *A. kotoensis* Hayata; *Podochilus kotoensis* (Hayata) S. S. Ying; *P. taiwanianus* S. S. Ying.

Plants epiphytic. Stems tufted, suberect or pendulous, 40–50 cm, internodes ca. 1 cm, completely enclosed in tubular leaf sheaths. Leaves many, distichous; blade oblong to elliptic, 2–4 × 0.7–1.5 cm, base with tubular sheaths, articulate, apex obtuse or rounded, shallowly bilobed, often aristate in sinus. Inflorescence terminal or lateral, ca. 1 cm, 5–15-flowered; floral bracts ovate or subtriangular, 1.5–2 mm. Flowers greenish or greenish white, fleshy; pedicel and ovary ca. 2 mm. Dorsal sepal oblong-ovate, ca. 2.5 × 1.5 mm, obtuse; lateral sepals triangular-ovate, 3–3.5 × 2–2.5 mm; mentum ca. 1.5 mm. Petals obovate-elliptic, 1.8–2.5 × 0.7–1 mm; lip obovate-suborbicular in outline, 2.3–3 mm, contracted near middle, with a concave base and a broader limb, with a shortly ligulate appendage toward saccate base. Column ca. 0.8 mm, foot conspicuous. Fl. Jan–Dec.

Epiphytic on tree trunks in evergreen forests; 100–1200 m. S Taiwan [India (Nicobar Islands), Indonesia, Malaysia, New Guinea, Philippines, Thailand, Vietnam; Australia, Pacific islands (Solomon Islands)].

**3. *Appendicula fenixii*** (Ames) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 1: 336. 1912.

长叶牛齿兰 chang ye niu chi lan

*Podochilus fenixii* Ames, Philipp. J. Sci., C, 6: 48. 1911; *Appendicula terrestris* Fukuyama.

Plants terrestrial. Stems ascending, 35–50 cm, completely enclosed in tubular leaf sheaths. Leaves many, distichous; blade lanceolate-oblong, ca. 5 × 1–1.3 cm, base with tubular sheaths, apex acuminate, obliquely bilobed. Inflorescence terminal or lateral, 0.5–2 cm, ca. 10-flowered; floral bracts ovate, 3–4 mm. Flowers white, not opening widely; pedicel and ovary 4–5 mm. Dorsal sepal ovate, 3.5–4 × ca. 2.5 mm; lateral sepals obliquely triangular, slightly larger than dorsal sepal; mentum short. Petals elliptic or oblong, ca. 3 × 1.5 mm, obtuse; lip ± pandurate-oblong, 4–4.5 × 2.5–3 mm, concave at base, adaxially with a ligulate hairy appendage extending from middle to base, with 2 small ridges above middle and another small apical callus. Column short, foot long. Fl. Jan–Dec.

Forests; 200–400 m. S Taiwan [Philippines].

**4. *Appendicula annamensis*** Guillaumin, Bull. Soc. Bot. France 77: 340. 1930.

小花牛齿兰 xiao hua niu chi lan

Plants lithophytic. Stems tufted, densely leafy, to 33 cm, ca. 1.5 mm in diam. Leaves spreading; blade pale green, drying blackish, ovate-oblong to ovate-elliptic or elliptic, 0.8–1.7 × 0.5–0.8 cm, weakly obtusely bilobed, minutely apiculate. Inflorescences usually pseudoterminal, 5–20 × 5–8 mm, successively ca. 20-flowered but usually with 1–3 flowers open at once; floral bracts ovate, 2–2.5 × 1.5–2 mm, acute, deflexed. Flowers white. Dorsal sepal broadly ovate, ca. 2.5 × 1.8 mm, acute, weakly dorsally carinate; lateral sepals broadly obliquely ovate, ca. 3 × 2.1 mm, subacute; mentum rather tapered, ca. 1 mm. Petals oblong-elliptic, ca. 2 × 1–1.1 mm, obtuse to subacute; lip ca. 3 × 2 mm, subglobose in basal half, in upper half a broadly ovate, subacute epichile; callus retrorse, varying from fleshy, prostrate, flattish, and subquadrate to thinly fleshy, erect, cupulate-concave, and transversely elliptic. Column ca. 1.5 mm including ca. 0.9-mm-long rostellum; foot ca. 1 mm; anther cap lacking a distinct median umbo. Fl. Apr–May.

Lithophytic on rocks on steep slopes. S Hainan [Vietnam].

In October 1937, T. Tang and F. T. Wang determined *Fung 20206* (AMES, K), from Hainan, as the Philippine species *Appendicula micrantha* Lindley. Their determination was eventually published by Merrill and F. P. Metcalf (Lingnan Sci. J. 21: 6. 1945) and followed in FRPS (19: 60. 1999). Ormerod (Taiwania 49: 95. 2004) re-identified *Fung 20206*, as well as *How 72125* (AMES) also from Hainan, as *A. annamensis*.

*Appendicula annamensis* differs from *A. micrantha* in its black-drying leaves, flowers with a slightly more tapered (not squarish) mentum, petals oblong-elliptic (not obliquely obovate-elliptic), dorsal sepal much broader, and anther cap lacking a distinct median umbo.

**136. PODOCHILUS** Blume, Bijdr. 295. 1825.柄唇兰属 *bing chun lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Epiphytes or lithophytes, small, rather delicate, often forming dense mats. Stems tufted, erect to spreading, slender, with many nodes, completely enclosed in tubular sheaths of leaves, leafy. Leaves distichous, alternate, lying in one plane by twisting of sheathing bases, usually small, short, sheaths tubular, articulate. Inflorescences terminal, lateral, or both, rarely exceeding 2 cm, few to many flowered; floral bracts persistent. Flowers resupinate, white or green, often with purple markings, minute or small, often not opening widely. Sepals adnate at base, or free; lateral sepals broad at base and adnate to column foot forming an often spurlike mentum. Petals often slightly smaller than dorsal sepal; lip attached to end of column foot, entire or obscurely 3-lobed, narrow, with a simple or bilobed basal appendage. Column short, foot long and often curved upward; anther erect, anther cap long acuminate; pollinia 4, waxy, separate, on 1 or 2 caudicles, often narrowly obovoid, commonly attached to a solitary viscidium.

About 60 species: from India and Sri Lanka to China, south and east through Indonesia and New Guinea to the Pacific islands; two species (one endemic) in China.

- 1a. Leaves equitant, not articulate at base, ensiform in lateral view, V-shaped in cross section, erect-patent ..... 1. *P. oxystophylloides*  
 1b. Leaves not equitant, articulate at base, distantly inserted along stem ..... 2. *P. khasianus*

**1. *Podochilus oxystophylloides*** Ormerod, *Taiwania* 48: 143. 2003.

云南柄唇兰 *yun nan bing chun lan*

Epiphytes. Stems terete, densely leafy, to 15.5 cm, ca. 2 mm in diam. Leaves erect-patent, folded longitudinally, V-shaped in cross section, ensiform in lateral view; blade to 13.5 × 4.5 mm, not articulate at base, acute. Inflorescence pseudoterminal, zigzag, successively in total 3-flowered, 3–5 mm; floral bracts ovate, ca. 4.5 × 2 mm, acute. Flowers white; pedicel and ovary terete, clavate, ca. 3.2 mm. Dorsal sepal ovate-elliptic, ca. 4.2 × 2 mm, subacute; lateral sepals with lower basal half dilated-saccate to form a ca. 2-mm-long pseudomentum, midvein slightly carinate externally, obliquely broadly ovate, ca. 3.8 × 3 mm, subacute. Petals with a short claw connate to column, free part obliquely ovate, ca. 3.5 × 2 mm, 1-veined, obtuse; lip ca. 4.2 × 2.5 mm; claw ligulate, ca. 1 mm; blade 3-lobed, constricted in basal third; basal lobe concave-saccate, transversely elliptic or subcordate; terminal lobe ovate, shortly retuse, ca. 3 × 2.5 mm. Column 2–2.5 × ca. 1.5 mm; anther cap ovate-lanceolate, ca. 2 × 0.5 mm, apex shortly bifurcate. Fl. May–Aug.

- Epiphytic in thickets. SW Guangxi (Shiwan Dashan).

Material of this species was first identified as *Podochilus cultratus* Lindley (*Seidenfaden, Bot. Tidsskr.* 68: 57. 1973).

**2. *Podochilus khasianus*** J. D. Hooker, *Fl. Brit. India* 6: 81. 1890.

柄唇兰 *bing chun lan*

*Podochilus chinensis* Schlechter.

Stems tufted, ascending, subterete, 4–12 cm, internodes 3–4 mm, completely enclosed in sheaths. Leaves many, distichous; blade often slightly dark brown when dried, narrowly oblong or narrowly oblong-lanceolate, often ± falcately curved, 6–7 × 1.5–2.5 mm, somewhat fleshy, with amplexicaul tubular sheaths at base, articulate, margin incurved, apex acuminate or acute. Inflorescence terminal or lateral, 3–5 mm, usually 2–4-flowered; floral bracts ovate-lanceolate, 1.5–2 mm, 3–5-veined. Flowers white or tinged with green, very small; pedicel and ovary 0.5–1 mm. Dorsal sepal ovate-lanceolate, 2–2.2 × 1–1.2 mm, acuminate; lateral sepals ovate-triangular, 2.2–2.5 mm. Petals suboblong, ca. 1.6 × 0.7 mm; lip oblong, 1–2.4 × 0.8–0.9 mm, slightly contracted at middle, both basal sides dilated, slightly thickened and incurved, attached at base to column foot by a distinct claw. Column short, both sides with conspicuous arms, foot ca. 0.7 mm. Capsule ellipsoid, 2.5–3 × ca. 1.8 mm. Fl. and fr. Jul–Sep.

Epiphytic on trees in forests or along streamsides; 400–1900 m. Guangdong, SW Guangxi, Hainan, S Yunnan [Bangladesh, Bhutan, NE India, N Vietnam].

**137. THELASIS** Blume, Bijdr. 385. 1825.矮柱兰属 *ai zhu lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

*Euproboscis* Griffith.

Herbs, epiphytic, rather small. Stems either pseudobulbous, 1- or 2-leaved, with sheaths and sometimes additional smaller leaves at base, or short and not thickened with several leaves in 2 close opposite ranks, laterally compressed and overlapping at base. Leaves narrow, rather thin, sometimes articulate at base. Inflorescence lateral, scape arising from base of pseudobulb or node of short stem, usually slender, many flowered. Flowers resupinate, greenish yellow or white, very small, not opening widely. Sepals similar, sometimes connivent; lateral sepals concave, often carinate abaxially. Petals slightly smaller than sepals; lip sessile on base of column, entire, usually broadest and concave at base, narrowed at apex. Column short, without a foot; anther erect; pollinia 8, in 2 groups of 4, waxy, on a slender caudicle attached to a nearly narrowly elliptic viscidium; rostellum terminal, erect, 2-lobed, acuminate; stigma large.

About 20 species: from India eastward to New Guinea and the Pacific islands; two species in China.

- 1a. Lateral sepals strongly carinate abaxially; lip incurved at margin ..... 1. *T. pygmaea*  
 1b. Lateral sepals not carinate abaxially; lip not incurved at margin ..... 2. *T. khasiana*

**1. *Theclasis pygmaea*** (Griffith) Blume, Fl. Javae Nov. Ser. 1: 19. 1858–1859.

矮柱兰 ai zhu lan

*Euproboscis pygmaea* Griffith, Calcutta J. Nat. Hist. 5: 372. 1844; *Theclasis clausa* Fukuyama; *T. elongata* Blume; *T. hongkongensis* Rolfe; *T. pygmaea* var. *multiflora* J. D. Hooker.

Pseudobulbs tufted, flattened globose, 3–10 × 7–18 mm, apex often with 1 large leaf and 1 (or 2) smaller leaves. Larger leaf blade narrowly oblong-ob lanceolate to nearly narrowly oblong, (2.7–)4–8(–12) × 0.6–1.3 cm, slightly fleshy, base contracted into a short, conduplicate petiole, apex obtuse, acute, or unequally bilobed; small leaf blade suboblong, 0.7–1.5 cm, sometimes absent. Inflorescence 10–20(–30) cm, slender, with 2 or 3 basal sheaths; rachis ± arching, 5–10 cm, often thickened, densely many flowered; floral bracts persistent, often slightly tinged with purplish, ovate-triangular or ovate-lanceolate, ca. 2 mm. Flowers yellowish green, not opening widely; pedicel and ovary ca. 3 mm. Dorsal sepal ovate-lanceolate or oblong-lanceolate, 2–2.5 × ca. 1 mm; lateral sepals similar to dorsal sepal, cymbiform, abaxially keeled or sometimes narrowly winged. Petals suboblong or narrowly oblong, ca. 2 × 0.7 mm; lip ovate-triangular, ca. 1.8 × 1.2 mm, margin incurved, apex acuminate. Column short. Fl. Apr–Oct.  $2n = 30$ .

Epiphytic on tree trunks and branches or lithophytic on rocks in forests or along valleys; below 2000 m. Hainan, Hong Kong, E and S

Taiwan, S and SE Yunnan [India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; Pacific islands (Solomon Islands)].

**2. *Theclasis khasiana*** J. D. Hooker, Fl. Brit. India 6: 87. 1890.

滇南矮柱兰 dian nan ai zhu lan

*Theclasis pygmaea* (Griffith) Blume var. *khasiana* (J. D. Hooker) Schlechter.

Pseudobulbs contiguous, ovoid, 1–1.5 × 1–1.5 cm, apex with 1 leaf or sometimes with another smaller leaf. Larger leaf blade lanceolate-linear or narrowly oblong, 9–12 × 1.2–1.5 cm, base contracted into petiole 1.5–2 cm, apex obtuse; smaller leaf blade (if present) subelliptic, ca. 1 cm. Inflorescence arising from base of pseudobulb, 16–19 cm, scape slender, with 2 or 3 tubular sheaths below middle; rachis slightly arching, 6–7 cm, 20- or more flowered; floral bracts ovate-lanceolate, 2–2.5 mm. Flowers yellowish green, not opening widely; pedicel and ovary 2–2.5 mm. Dorsal sepal ovate, 2.5–3.1 × ca. 1.5 mm, acuminate; lateral sepals similar to dorsal sepal, slightly cymbiform, abaxially not keeled or sometimes base slightly ridged. Petals narrowly oblong, 2.1–2.4 × ca. 0.8 mm; lip ovate-lanceolate, ca. 3 × 1.3 mm, margin not involute. Column short. Fl. Jul.

Epiphytic on tree trunks in open forests; 900–2000 m. S Yunnan [India, Thailand, N Vietnam].

### 138. *PHREATIA* Lindley, Gen. Sp. Orchid. Pl. 63. 1830.

馥兰属 fu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Plexaure* Endlicher.

Herbs, epiphytic. Stems pseudobulbous or caulescent, former 1–3-leaved, latter with up to 12 leaves, very short or elongate. Leaves distichous or arranged in a fan, erect to spreading, terminal, sometimes fleshy, jointed on equitant sheaths, articulate. Inflorescences lateral or arising from base of pseudobulb, racemose, laxly to densely many flowered. Flowers resupinate, pale green or white, minute, opening widely or not, often self-pollinating. Sepals similar, free, sometimes connivent; lateral sepals often ± adnate to column foot forming a mentum. Petals often smaller than sepals; lip often with a basal claw attached to end of column foot, base concave or ± saccate, margin entire or obscurely 3-lobed. Column short, with a conspicuous foot; anther terminal, obtuse at apex; pollinia 8, in 2 groups of 4, waxy, attached by a narrow caudicle to a small viscidium.

About 190 species: from Sri Lanka and mainland Asia, through SE Asia, to Australia, New Guinea, and the Pacific islands, most species occurring in Indonesia and New Guinea; four species (two endemic) in China.

- 1a. Stem elongate, not pseudobulbous, pendulous, 10–20 cm ..... 4. *P. caulescens*  
 1b. Stem very short or pseudobulbous, less than 3 cm.  
 2a. Stem very short, not pseudobulbous, enclosed in leaf sheaths; leaves 4–6(–10) ..... 1. *P. formosana*  
 2b. Stem pseudobulbous, ovoid to subglobose, ± naked; leaves 1–3.  
 3a. Pseudobulbs subglobose or ovoid, taller than broad; lip minutely hairy ..... 2. *P. morii*  
 3b. Pseudobulbs flattened globose, broader than tall; lip glabrous ..... 3. *P. taiwaniana*

**1. *Phreatia formosana*** Rolfe ex Hemsley, Ann. Bot. (Oxford) 9: 156. 1895.

馥兰 fu lan

*Octarrhena formosana* (Rolfe ex Hemsley) S. S. Ying; *O.*

*kotoinsularis* (Fukuyama) S. S. Ying; *Phreatia evardii* Gagne-pain; *P. kotoinsularis* Fukuyama.

Stems tufted, very short, not pseudobulbous, enclosed in leaf sheaths. Leaves subbasal, 4–6(–10), distichous on short stem; leaf blade linear, 7–13 × 0.8–1 cm, base slightly con-

tracted and dilated into equitant sheaths, articulate, apex obtuse or retuse. Inflorescence axillary, erect, 6–7 cm, slender, with 3 ovate-lanceolate sheaths below middle; rachis 2–5 cm, many flowered; floral bracts subovate, 1–1.5 mm. Flowers white or greenish white, ca. 2 mm in diam.; pedicel and ovary 2–3 mm. Dorsal sepal elliptic-ovate, ca. 1.5 × 1 mm, obtuse; lateral sepals obliquely ovate-triangular, ca. 1.5 × 1.5 mm. Petals sub-elliptic, ca. 1 × 0.6 mm; lip suboblate, ca. 1 × 1.3 mm, base with a short claw and slightly saccate. Column short, foot distinct. Capsule ellipsoid, ca. 3 × 1.5 mm. Fl. Aug, fr. Sep–Oct.

Epiphytic on trees in open places of forests; 800–1800 m. C and S Taiwan, S Yunnan [Thailand, Vietnam].

**2. *Phreatia morii*** Hayata, Icon. Pl. Formosan. 4: 58. 1914.

大馥兰 da fu lan

Pseudobulbs tufted, ovoid-globose, ca. 1.5 cm in diam., often covered with membranous sheaths, with 2 or rarely 3 leaves at apex. Leaf blade narrowly oblong or narrowly elliptic, 8–18 × 1.5–2.5 cm, base contracted and with convolute sheaths, articulate, apex acute. Inflorescence arising from base of pseudobulb, 30–40 cm tall, slender, with 4–6 lax sheaths below; rachis ca. 10 cm, many flowered; floral bracts narrowly elliptic, ca. 4.5 mm. Flowers white, not opening widely; pedicel and ovary ca. 3.5 mm. Dorsal sepal ovate-elliptic, ca. 2.8 × 2–2.3 mm, concave, rounded; lateral sepals obliquely ovate, ca. 3 × 2.5 mm. Petals ovate-oblong, 2.2–2.5 × ca. 1.6 mm; lip contracted near middle, with a basal globose sac and a distinct claw, and an ovate limb distally; limb minutely hairy adaxially. Column short, with a distinct foot. Fl. Jun.

• Epiphytic on tree trunks or lithophytic on rocks along stream-sides; below 1500 m. Taiwan.

**3. *Phreatia taiwaniana*** Fukuyama, Bot. Mag. (Tokyo) 49: 441. 1935.

台湾馥兰 tai wan fu lan

*Thelasis taiwaniana* (Fukuyama) S. S. Ying.

Rhizome creeping. Pseudobulbs contiguous, nearly flattened globose, 3–5 cm, ca. 8 mm in diam., apex 1- or 2-leaved. Leaf blade linear or narrowly oblong, 1.5–4.5 × 0.3–0.8 cm, base slightly contracted and with sheaths, articulate, apex obtuse or acute. Inflorescence arising from base of pseudobulb, 5–10 cm, slender, with several sheaths; rachis 1–2 cm, many flowered; floral bracts elliptic, ca. 2.6 mm. Flowers white, opening widely; pedicel and ovary 2.5–3 mm. Dorsal sepal triangular-ovate or triangular-oblong, 2–2.5 × 1–1.3 mm, obtuse; lateral sepals subtriangular or ovate-triangular, oblique, ca. 2.5 × 2 mm. Petals oblong-ovate, 1.7–2 × ca. 1 mm; lip ovate-cordate, 1.5–2 mm, base shortly clawed and with a shallow sac. Column short, foot distinct. Fl. Jun–Jul.

• Epiphytic on large trees in moist forests; 800–1500 m. Taiwan.

**4. *Phreatia caulescens*** Ames, Orchidaceae 2: 200. 1908.

垂茎馥兰 chui jing fu lan

*Octarrhena caulescens* (Ames) Ames.

Stem tufted, pendulous, usually 10–20 cm, not pseudobulbous, completely enclosed in overlapping brown basal leaf sheaths. Leaves many, distichous on upper part of stem; leaf blade linear, ca. 6 × 0.6 cm, acute. Inflorescence axillary, lateral, arching, ca. 8 cm, slender; rachis conspicuously longer than peduncle; floral bracts ovate, ca. 3 mm, acute. Flowers whitish, ca. 3 mm in diam.; pedicel and ovary ca. 3 mm. Sepals ovate, ca. 1.5 × 1 mm, acute. Petals elliptic, ca. 1.3 × 1 mm, acute; lip ± broadly oblong, ca. 1.5 × 1 mm, with short claw and a shallow sac at base. Column short. Fl. Aug.

Epiphytic on large tree trunks at forest margins; ca. 1500 m. S Taiwan [Philippines; Pacific islands (Vanuatu)].

**139. DENDROBIUM** Swartz, Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 82. 1799, nom. cons.

石斛属 shi hu shu

Zhu Guanghua (朱光华), Ji Zhanhe (吉占和 Tsi Zhan-huo); Jeffrey J. Wood, Howard P. Wood

Herbs epiphytic, lithophytic, or less often terrestrial, polymorphic, deciduous or evergreen. Stems either: 1) rhizomatous, 2) erect and many noded, 3) erect and 1-noded or several noded from a many-noded rhizome, or 4) without a rhizome, new stems of many nodes arising from base of old ones; 1 or 2(–500) cm, tough or fleshy, 1 to several internodes swollen at or near base or along entire length to form canelike pseudobulbs, ± covered with sheathing leaf bases and cataphylls, often turning yellow when dried. Leaves 1 to many, alternate, apical or distichous along stem, linear, lanceolate, oblong, or ovate, sometimes subterete or terete, papery to rigid and leathery, sometimes with black or brown trichomes especially on sheath, base articulate and often with clasping sheaths, apex usually 2-lobed or emarginate. Inflorescences lateral, generally distal, in some sections pseudoterminal, 1- to many flowered, usually racemose, erect, horizontal, or pendulous; floral bracts usually insignificant. Flowers extremely variable in color and shape, often showy, very small to large, resupinate or not resupinate, usually spreading, ephemeral or long-lived. Sepals similar, free, short to filiform; lateral sepals adnate to elongated column foot and part of lip to form a mentum, 0.1–3 cm. Petals free, margin entire to fimbriate; lip entire to distinctly 3-lobed, base joined to column foot, sometimes narrowly clawed at base, sometimes forming a closed spur with lateral sepals to which it may be joined laterally for a short distance; disk with 1 to several keels, sometimes verrucose-papillose, calli rarely present, sometimes with a transverse basal ridge. Column short, stout; foot long, sometimes with a protuberance adaxially; apical stelia obscure to distinct; viscidium present; pollinia 4 in appressed pairs, waxy, ovate or oblong, naked, i.e., without caudicles or stipes.

About 1,100 species: India across to Japan, south to Malaysia and Indonesia, east to Australia, New Guinea, and the Pacific islands; 78 species (14 endemic) in 14 sections in China.

See the monograph by Seidenfaden (Opera Bot. 83: 1–295. 1985) and the book by H. P. Wood (Dendrobiums. 2006).

### Key to sections

- 1a. Stems with up to 4 internodes near base swollen and fleshy to form distinct fusiform pseudobulbs, upper part of stem thin and wiry; flowers ephemeral ..... 12. *D. sect. Crumenata* (p. 395)
- 1b. Stems uniformly thick, fleshy or not, or fusiform, ovoid, or clavate; flowers ephemeral to long-lived.
  - 2a. Stems uniformly narrow, often wiry, internodes never fleshy or swollen.
    - 3a. Leaves leathery or thinly leathery, dorsiventral, grasslike ..... 1. *D. sect. Grastidium* (p. 372)
    - 3b. Leaves thick and fleshy, cylindrical, subcylindrical, or laterally compressed and shortly ensiform.
      - 4a. Leaves laterally compressed and shortly ensiform, 5–6 mm wide; mentum 5–7 mm ..... 13. *D. sect. Aporum* (p. 396)
      - 4b. Leaves subulate-cylindrical or subcylindrical, 1.5–3 mm wide; flowers pale yellow, large; dorsal sepal ca. 12 mm; mentum ca. 20 mm ..... 14. *D. sect. Strongyle* (p. 397)
  - 2b. Stems with most internodes fleshy and swollen.
    - 5a. Leaf sheaths, sometimes also leaf blade and inflorescence, with blackish or dark brown hairs ..... 10. *D. sect. Formosa* (p. 391)
    - 5b. Leaf sheaths, leaf blades, and inflorescences glabrous.
      - 6a. Leaf sheaths insignificant; stems fusiform to clavate, swollen, often angled, sometimes compressed, with 1–5 ± sheathless leaves clustered at apex; flowers mostly in pendulous, many-flowered racemes from upper nodes ..... 2. *D. sect. Densiflora* (p. 374)
      - 6b. Leaf sheaths distinct, often covering most of internodes; otherwise without above combination of characters.
        - 7a. Inflorescences several, lateral or subterminal on current year's stem; flowers several, small; lip 3-lobed; stems often tufted, often small ..... 11. *D. sect. Stachyobium* (p. 393)
        - 7b. Inflorescences lateral, usually on leafless stems, pendulous or vertical on stem, most often with a short peduncle; flowers most often solitary or few, sometimes fascicled, rarely many on a longer raceme; plants often rather large and robust.
          - 8a. Mid-lobe of lip hairy.
            - 9a. Mid-lobe of lip fringed ..... 7. *D. sect. Stuposa* (p. 389)
            - 9b. Mid-lobe of lip downy.
              - 10a. Inflorescences many per stem, few flowered; flowers mostly purple or white, less often yellow; lip usually with expanded mid-lobe ..... 3. *D. sect. Dendrobium* (p. 376)
              - 10b. Inflorescences few, distal, often only 1 per stem, many flowered; flowers usually yellow; lip expanded ..... 4. *D. sect. Holochrysa* (p. 384)
          - 8b. Mid-lobe of lip glabrous.
            - 11a. Flowers usually with a short, saccate mentum.
              - 12a. Inflorescences 1(or 2)-flowered, on leafy stems; dorsal sepal ca. 8 mm; mid-lobe of lip with distinct keels ..... 5. *D. sect. Distichophylla* (p. 388)
              - 12b. Inflorescences 2–6-flowered, on leafless stems; dorsal sepal 13–20 mm; mid-lobe of lip without keels ..... 6. *D. sect. Breviflora* (p. 388)
            - 11b. Flowers with a long narrow mentum; lip with a long narrow claw.
              - 13a. Lip abruptly broadened from a narrow claw, not forming a spurlike structure with column foot; mentum pointing away from ovary ..... 8. *D. sect. Calcarifera* (p. 390)
              - 13b. Lip gradually broadened over its length, with a narrow base that forms a spurlike structure (closed spur) with column foot; mentum held parallel to ovary ..... 9. *D. sect. Pedilonum* (p. 390)

### Key to species

- 1a. Leaf sheaths insignificant; inflorescence pendulous, arising from leaf axil near stem apex; flowers yellow or white tinged with yellow, never with green.
  - 2a. Stems 1-leaved, 4-angled.
    - 3a. Inflorescence much longer than stem, many flowered; stems to 10 cm; adaxial surface of lip with only base and center pubescent, margin glabrous ..... 7. *D. lindleyi*
    - 3b. Inflorescence shorter or slightly longer than stem, 1–3-flowered; stems 3(–5) cm; entire adaxial surface of lip pubescent ..... 8. *D. jenkinsii*
  - 2b. Stems 2–5-leaved, terete or laterally compressed, sometimes with many angles or ridges.
    - 4a. Sepals and petals white; stem with many ridges; leaves usually 1.5–2 cm apart; inflorescence dense; lip entire, orange ..... 12. *D. thyrsiflorum*
    - 4b. Sepals and petals yellow.

- 5a. Inflorescence dense; dorsal sepal ca. 1.5 cm; petal margin finely dentate; upper side of lip rather long ciliate, more sparsely so toward edges; leaves borne close together on a many-angled stem; floral bracts to ca. 2.4 cm ..... 11. *D. densiflorum*
- 5b. Inflorescence lax; dorsal sepal 1.8–2 cm.
- 6a. Stems distinctly laterally compressed, clavate; petal margin entire; lip margin minutely erose to ciliate-hairy ..... 9. *D. sulcatum*
- 6b. Stems not laterally compressed, thickly fusiform, with many ridges; petal margin minutely dentate; lip margin undulate ..... 10. *D. chrysotoxum*
- 1b. Leaf sheaths distinct; inflorescence and flowers without above combination of characters.
- 7a. Leaves and leaf sheaths with dark hairs, at least when young.
- 8a. Mentum saccate, 4–13 mm.
- 9a. Sepals and petals white.
- 10a. Lip with mid-lobe reflexed, yellow to orange, lateral lobes bright red, disk with 5 irregularly papillate ridges; stems obovoid to nearly globose ..... 58. *D. bellatulum*
- 10b. Lip not reflexed, white with darker throat, disk with 3 granulate lamellae ..... 59. *D. christyanum*
- 9b. Sepals and petals yellow; stems 5–21 cm.
- 11a. Stems 5–11 cm, 12–15 mm in diam.; dorsal sepal strongly keeled abaxially; ovary prominently 3-ribbed; mentum ca. 4 mm ..... 60. *D. trigonopus*
- 11b. Stems to 21 cm, 3–4 mm in diam.; dorsal sepal not keeled; ovary rounded; mentum 10–13 mm ..... 61. *D. sinense*
- 8b. Mentum narrowly conic (shaped like a candle snuffer), 15–30 mm, forming spur.
- 12a. Ovary 3-ribbed; spur ± curved, often sigmoid ..... 64. *D. cariniferum*
- 12b. Ovary terete or somewhat rounded-clavate; spur straight.
- 13a. Petals broadly ovate, ca. 40 × 32 mm, much wider than sepals ..... 63. *D. wattii*
- 13b. Petals oblong, lanceolate, or oblong-elliptic, 15–20 × 4–10 mm, narrower than sepals or nearly equally wide.
- 14a. Flower opening widely; petals and sepals nearly equal in width; sepals dorsally keeled ..... 65. *D. williamsonii*
- 14b. Flower narrowly tubular; stem pendulous; petals narrower than sepals; sepals thickened along dorsal midvein, but not alate ..... 62. *D. longicornu*
- 7b. Leaves and leaf sheaths glabrous.
- 15a. Stem with a few internodes near base swollen into a spindle-shaped pseudobulb, remainder of stem narrowly cylindrical or laterally compressed.
- 16a. Leaves leathery, dorsiventrally compressed ..... 71. *D. crumenatum*
- 16b. Leaves fleshy, laterally compressed or cylindrical.
- 17a. Leaves laterally compressed and shortly ensiform, base 3–4 mm wide ..... 72. *D. equitans*
- 17b. Leaves terete, cylindrical, or subterete.
- 18a. Leaves terete, 1.5–2.5 mm wide at base; lip mid-lobe papillose ..... 73. *D. exile*
- 18b. Leaves slender, hairlike, less than 1 mm wide ..... 74. *D. pseudotenellum*
- 15b. Stem without any group of swollen internodes, uniformly narrowly cylindrical or laterally compressed.
- 19a. Leaves thick and fleshy, cylindrical, subcylindrical, or laterally compressed and ensiform.
- 20a. Leaves subcylindrical, almost subulate or laterally compressed and shortly ensiform, 1–4 mm wide; flowers white or pale yellow, lip spotted yellow; mentum 1–2 cm.
- 21a. Leaves ensiform; flowers large; mentum to 2 cm; lip with 2(–4) thickened raised veins, densely papillose distally ..... 77. *D. parciflorum*
- 21b. Leaves almost subulate; flowers smaller; mentum less than 1 cm; lip smooth ..... 78. *D. hainanense*
- 20b. Leaves laterally compressed and broadly ensiform, 5–6 mm wide; flowers very small, white, lip tinged with red, or pale yellowish white; mentum 5–7 mm.
- 22a. Stems to 60 cm, leaves smaller toward stem apex; flowers in groups of 2 or 3 along terminal part of stem ..... 75. *D. spatella*
- 22b. Stems to 23 cm, leaves uniform along stem; flowers subterminal ..... 76. *D. terminale*
- 19b. Leaves flat with distinct abaxial and adaxial surfaces.
- 23a. Leaves elliptic, subcordate and clasping at base, distichous, connivent to one another; flowers borne on leafy stems; sepals and petals reflexed ..... 52. *D. ellipsophyllum*
- 23b. Leaves not as above.
- 24a. Stem evenly narrowly cylindrical (internodes never swollen), surface glossy, rigid; leaves narrow, grasslike; inflorescence 1- or 2-flowered.
- 25a. Flowers white; inflorescences axillary along lower part of leafless stem, without protective sheaths ..... 39. *D. leptocladum*

- 25b. Flowers yellow or yellowish green; inflorescence axillary along leafy stem, emerging from a protective sheath and piercing subtending sheath, appearing opposite next proximal leaf.
- 26a. Lip entire, spatulate or narrowly lanceolate; sepals and petals obtuse to rounded ..... 1. *D. salaccense*
- 26b. Lip distinctly or indistinctly 3-lobed; sepals and petals long acuminate.
- 27a. Flowers not opening widely; lip rhombic, mid-lobe ovate-triangular, margin fimbriate, disk pubescent ..... 2. *D. furcatopedicellatum*
- 27b. Flowers opening fully; lip not as above, disk glabrous.
- 28a. Lip mid-lobe ovate, long acuminate, margin undulate ..... 3. *D. somae*
- 28b. Lip mid-lobe oblong, obtuse, margin not noticeably undulate ..... 4. *D. luzonense*
- 24b. Stems cylindrical or compressed, sometimes upper part thickened and clavate, internodes swollen or not, with longitudinal stripes or ribs, sometimes entirely enclosed in leaf sheaths, fleshy; leaves grasslike or not.
- 29a. Plants short, grasslike; inflorescences borne laterally from leaf axils, usually from distal nodes on current year's mature stem, nearly erect and parallel to stem, with many small flowers; sepals less than 2 mm wide.
- 30a. Lip entire, elliptic ..... 66. *D. porphyrochilum*
- 30b. Lip 3-lobed.
- 31a. Inflorescence ca. as long as leaves; lip pale green, suborbicular ..... 69. *D. compactum*
- 31b. Inflorescence longer than leaves.
- 32a. Lateral lobes of lip entire or slightly inconspicuously toothed ..... 70. *D. sinominutiflorum*
- 32b. Lateral lobes of lip with comblike teeth.
- 33a. Base of sepals and petals with purplish red venation, entire lip deep purplish violet ..... 67. *D. strongylanthum*
- 33b. Sepals and petals white or yellow, lateral lobes of lip purplish violet ..... 68. *D. monticola*
- 29b. Plants tall, not grasslike; inflorescence exserted, but never erect and parallel to stem, with a few to many medium-sized to large flowers; sepals more than 3 mm wide.
- 34a. Mentum long, spurlike or tubular.
- 35a. Flowers white with pale purple veins; stems often branched ..... 56. *D. chameleon*
- 35b. Flowers pale to dark purple; stems unbranched ..... 57. *D. goldschmidtianum*
- 34b. Mentum short and broadly blunt.
- 36a. Lip saclike or slipperlike, margin strongly involute.
- 37a. Stems cylindrical; leaf 10–15 cm; inflorescence to 10-flowered; dorsal sepal 24–35 mm ..... 42. *D. moschatum*
- 37b. Stems strongly compressed; leaf 6–8 cm; inflorescence 1-flowered; dorsal sepal ca. 16 mm ..... 43. *D. menglaense*
- 36b. Lip not saclike or slipperlike, margin spreading to recurved.
- 38a. Lip boat-shaped or subglobose, mid-lobe deflexed, acuminate.
- 39a. Stems swelling toward apex from a narrow basal portion; column foot ca. 2.5 mm, much shorter than column proper; lip hypochile much larger than epichile, deeply concave, subglobose, with orbicular sides embracing column, entire inner surface finely ciliate, epichile triangular-acute, inner surface glabrous, ecallose ..... 53. *D. hercoglossum*
- 39b. Stems ± of equal width, not swollen distally; column foot ca. 10 mm, much longer than column proper; lip hypochile reduced to a neck, epichile cymbiform, finely pubescent at apex and along median line, glabrous toward margin, with a large glossy basal central callus ..... 54. *D. aduncum*
- 38b. Lip not as above.
- 40a. Flowers white, lip with a yellow patch; sepals ca. 8 mm; lip conspicuously 3-lobed, margin finely toothed above middle, front margin densely long ciliate-hairy; inflorescence 2-flowered ..... 55. *D. stuposum*
- 40b. Flowers often not white; sepals more than 10 mm; lip entire or inconspicuously 3-lobed, adaxial surface usually papillose to pubescent, sometimes with a callus near base but without any other ornaments; inflorescences 1–4-flowered.
- 41a. Sepals and petals pale yellow, creamy yellow, or golden yellow, never tinged with purple or any other color except on lip ..... Key 2
- 41b. Sepals and petals purplish red, white, or pale yellowish green, turning pale or creamy yellow, apex often purplish red ..... Key 3

**Key 2**

- 1a. Upper part of stem often branched; leaves linear, less than 7 mm wide, retuse; petals clavate, cordate-mucronate ..... 40. *D. hancockii*
- 1b. Stem unbranched; leaves more than 1 cm wide, apex acute, not retuse or bilobed; petals not clavate.

- 2a. Inflorescences subumbellate, almost sessile, 2–6-flowered; lip disk with 2 purplish red spots ..... 14. *D. chrysanthum*
- 2b. Inflorescences racemose or 1-flowered.
- 3a. Stems often with thickened middle and distal internodes, sometimes fusiform or slightly clavate; lip rounded.
- 4a. Lip with 1 transversely lunate deep purple spot, margin compoundly fimbriate ..... 47. *D. fimbriatum*
- 4b. Lip with 2 chestnut spots, margin slightly erose ..... 48. *D. gibsonii*
- 3b. Stems cylindric, of even width, never swollen.
- 5a. Inflorescences on leafy stems; lip golden yellow; peduncle perpendicular to stem; petals golden yellow, entire.
- 6a. Inflorescence 2–7-flowered; lip ± reniform-rounded, with 2 purple spots ..... 37. *D. hookerianum*
- 6b. Inflorescence 1- or 2-flowered; lip rounded, without purple spots.
- 7a. Flowers solitary in leaf axil, waxy when dry; lip ovate-rhombic, without any stripes ..... 41. *D. lohohense*
- 7b. Inflorescences 1- or 2-flowered, very rarely solitary, racemose or subumbellate; flowers not waxy when dry ..... 51. *D. henryi*
- 5b. Inflorescences on leafless stems.
- 8a. Floral bracts cymbiform, 15–30 mm; peduncle sheaths 5–20 mm.
- 9a. Stem clavate; inflorescences stiffly arching, to 7-flowered; lip with a central maroon spot ..... 45. *D. denneanum*
- 9b. Stem linear; inflorescences erect, 1 or 2 (or 3)-flowered; lip uniformly yellow with purplish lines toward base.
- 10a. Inflorescence ca. 1 cm; floral bracts membranous, white, 12–13 mm ..... 44. *D. chryseum*
- 10b. Inflorescence ca. 6 cm; floral bracts thickly papery, pale purplish, 15–20 mm ..... 46. *D. jiajiangense*
- 8b. Floral bracts ovate, 2–5 mm; peduncle 3–10 mm.
- 11a. Flowers creamy yellow or pale yellow; lip ovate-lanceolate, margin entire ..... 13. *D. heterocarpum*
- 11b. Flowers golden yellow; lip relatively wider, margin erose, undulate, or long fimbriate.
- 12a. Lip subreniform, with purplish red stripes near base, margin erose or undulate.
- 13a. Stem ± compressed fusiform, 8–15 × ca. 1.5 cm; lip margin undulate; inflorescences always 1 per node ..... 49. *D. capillipes*
- 13b. Stem cylindric, 50–100 × 0.3–0.6 cm; lip margin erose; inflorescences often 2 per node ..... 50. *D. dixanthum*
- 12b. Lip suborbicular or ovate-triangular, uniformly golden yellow, margin with branched fimbriae.
- 14a. Petal margin densely long ciliate; lip suborbicular, margin with short branched fimbriae ..... 6. *D. harveyanum*
- 14b. Petal margin entire; lip ovate-triangular, strongly plumose with long branched fimbriae especially along apical margin ..... 5. *D. brymerianum*

**Key 3**

- 1a. Stem nodes and internodes swollen, at least on branches, sometimes moniliform.
- 2a. Stems slender, multi-branched, nodes and internodes swollen and moniliform; leaves less than 5 mm wide, distal on branches ..... 15. *D. falconeri*
- 2b. Stems often stout, unbranched; leaves more than 5 mm wide.
- 3a. Peduncle with sheaths 2–3 cm; flowers white, stained purplish red at apex; lip retuse, disk yellow with 2 dark purple spots ..... 16. *D. wardianum*
- 3b. Peduncle at base with sheaths 3–6 cm; flowers not as above.
- 4a. Floral bracts ovate, 5–6 mm; inflorescences subterminal from a leafy stem; flowers white with roseate tips; lip disk golden yellow below middle, with several purplish red stripes at base on either side; individual internodes swollen and obconic ..... 19. *D. findlayanum*
- 4b. Floral bracts broadly ovate, 7–10 mm; inflorescences on leafless stems; flowers white with pale purple or purplish red tips.
- 5a. Stem nodes ± swollen, but not moniliform; lip disk at center with a pale yellow lunate spot, both sides of base with several purplish red stripes ..... 17. *D. gratiosissimum*
- 5b. Nodes and internodes swollen, moniliform; lip disk below middle with golden yellow spot, base without purplish red stripes ..... 18. *D. pendulum*
- 1b. Stem nodes and internodes not swollen.
- 6a. Stem often narrow in lower part, wider distally; leaf apex unequally bilobed.
- 7a. Lip broadly ovate, much larger than petals ..... 28. *D. nobile*
- 7b. Lip broadly oblong, ca. as large as petals or smaller ..... 29. *D. linawianum*
- 6b. Stem usually evenly cylindric, becoming narrower distally.
- 8a. Sheaths on internodes with green and white stripes; flowers pale purplish red; lip suborbicular, pale purplish red above middle, golden yellow below middle ..... 26. *D. crepidatum*
- 8b. Sheaths on internodes without green and white stripes.
- 9a. Sepals and petals uniformly purple or purplish red.

- 10a. Lip margin entire, only minutely hairy; sepals ca. 3.5 cm; lip blade broadly ovate, purplish red at edge, disk with 1 deep purple spot below middle surrounded by a white circle ..... 27. *D. lituiflorum*
- 10b. Lip margin fimbriate-hairy; sepals ca. 2.7 cm; lip blade rhombic-orbicular, disk with deep purple spots on either side which coalesce ..... 20. *D. parishii*
- 9b. Sepals and petals white, yellowish green, or pale yellow, sometimes tinged with purplish red at apex only.
- 11a. Stems clambering, limp, and pendulous, branching distally; flowers solitary, borne on a leafy stem (but leaves often variably deciduous); sepals and petals white or white tinged with pale purplish red; sepals 1.7–2 cm; petals entire; lip golden yellow, with margin pale purplish red ..... 21. *D. loddigesii*
- 11b. Stems not as above; inflorescence 1–3(–6)-flowered, on leafless stems.
- 12a. Lip fimbriate, compoundly ciliate; sepals and petals white with purplish red tip; lip reniform-orbicular, white tinged with purplish red at apex, lip disk with a yellow spot on either side ..... 22. *D. devonianum*
- 12b. Lip not fimbriate, compoundly ciliate; otherwise without above combination of characters.
- 13a. Floral bracts 10–12 mm, papery; anther cap with dense long crystal-like papillae; sepals and petals white, usually with a pale purple blotch toward tip; lip orange-yellow tinged with purplish red at apex ..... 25. *D. crystallinum*
- 13b. Floral bracts 2–8 mm, membranous; anther cap glabrous or finely papillate; sepals and petals white, apex pale purplish red; sepals 2.3–3 cm; lip suborbicular, with purplish red stripes at base on either side, apex pale purplish red, disk yellow.
- 14a. Petals conspicuously wider than sepals; flowers pink; stem often slender; peduncle short, arising from nodes ..... 23. *D. cucullatum*
- 14b. Sepals and petals nearly equal in width or petals wider; flowers white, pink, yellowish, greenish, or brown; stem robust or slender.
- 15a. Sepals and petals nearly equal in width; flowers pink; stem robust; peduncle inconspicuous, arising from a cymbiform channel on nodes ..... 24. *D. polyanthum*
- 15b. Petals usually wider than sepals; flowers white, pale pink, yellowish, greenish, or brown; stem slender.
- 16a. Mentum ca. 1 cm, tubular; sepals and petals not spreading; lip densely curled pale yellow villous on disk, margin fimbriate ..... 38. *D. xichouense*
- 16b. Mentum 5–8 mm, rounded to conic; sepals and petals spreading to recurved; lip with disk glabrous or with purplish hairs, margin entire.
- 17a. Bracts without reddish brown mottling; stems 1.5–11 cm; sepals and petals uniformly pale pink or yellowish white with pale pink apex.
- 18a. Stems 6–11 cm, cylindric, distinctly flexuous; sepals and petals yellowish white with pale pink apex, lip with purple at base and along margin and apex ..... 35. *D. flexicaule*
- 18b. Stems 1.5–3 cm, fusiform-obovoid; sepals and petals uniformly pale lilac-pink, lip with 2 yellowish patches on either side ..... 36. *D. wangliangii*
- 17b. Bracts with transverse reddish brown mottling at base or near middle; stems to 60 cm (rarely less than 10 cm in dwarf plants of *D. moniliforme*); sepals and petals uniformly white, yellowish green, or brown.
- 19a. Sepals and petals recurved, revolute, brown ..... 32. *D. fanjingshanense*
- 19b. Sepals and petals spreading, ± flat, white or pale greenish cream.
- 20a. Dorsal sepal 3–4 cm, lanceolate; lip 2.3–2.5 cm, pale yellow, rarely white; stems 40–70 cm; petals lanceolate ..... 31. *D. okinawense*
- 20b. Dorsal sepal much shorter, 1.5–2.5 cm, ovate-oblong or lanceolate; lip 1.2–2 cm, varying in color; stems 10–40 cm; petals lanceolate, subelliptic, oblong, or ovate-oblong.
- 21a. Flowers white, lip white with a green spot in gullet, or tinged pale rose, usually with a distal purple crescent ..... 30. *D. moniliforme*
- 21b. Flowers whitish to yellowish or yellowish to greenish, sometimes tinted pink, lip not as above, without a green spot in gullet.
- 22a. Inflorescence (1–)3–8-flowered; flowers yellowish to greenish, never tinted pink; anther cap cream, sometimes with purple tip ..... 33. *D. catenatum*
- 22b. Inflorescence 1–3-flowered; flowers whitish to yellowish, often tinted pink; anther cap wholly bright purple ..... 34. *D. scoriarum*

**1. *Dendrobium* sect. *Grastidium* (Blume) Blume, Tab. Pl. Jav. Orchid. ad t. 4. 1825.**

禾叶组 he ye zu

*Grastidium* Blume, Bijdr. 333. 1825.

Stems glossy, narrowly cylindrical, rigid, leafy, continuing to lengthen for many years. Leaves grasslike (in Chinese species). Inflorescences axillary, emerging from a protective bract and piercing subtending sheath, appearing opposite next proximal leaf, new lateral inflorescence buds usually progressing distally, one at each node, allowing gregarious blooming at any season; a small but conspicuous pair of convex, indurate, laterally compressed sheaths penetrating enclosing sheath, shielding buds; each inflorescence flowering once, usually producing a pair of flowers. Flowers resupinate or not resupinate, ephemeral, stellate, usually facing one another, or sometimes in parallel or opposite directions. Sepals and petals often filiform. Mentum inconspicuous, decurved, conic. Lip 3-lobed or entire, ornamented with ridges that fragment distally into irregular calli or excrescences.

About 200 species: from NE India and Sri Lanka east to Australia and Tahiti, with a well-marked center of diversity in New Guinea; four species (two endemic) in China.

**1. *Dendrobium salaccense*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 86. 1830.

竹枝石斛 zhu zhi shi hu

*Grastidium salaccense* Blume, Bijdr. 333. 1825; *Callista intermedia* (Teijsmann & Binnendijk) Kuntze; *C. salaccense* (Blume) Kuntze; *Dendrobium bambusifolium* E. C. Parish & H. G. Reichenbach; *D. cathcartii* J. D. Hooker; *D. haemoglossum* Thwaites; *D. intermedium* Teijsmann & Binnendijk.

Stem erect, tough, bamboolike, cylindrical, to 1 m, 3–4 mm in diam., unbranched, with many nodes, internodes 2–2.5 cm, enclosed in leaf sheaths. Leaves arranged in 2 rows, narrowly lanceolate, ca. 15 × 2 cm, base contracted into a sheath, acuminate toward apex, apex ± hooked on one side; sheaths articulate at junction with blade. Inflorescence emerging through sheaths, apparently leaf-opposed, 1–4-flowered; peduncle very short, base with 2 or 3 bracts; floral bracts pale brown, shell-like, ca. 3 mm. Pedicel and ovary yellowish green, ca. 1.7 cm, slender. Flowers spreading, small; sepals and petals yellowish brown, lip purple, column and anther cap yellow. Dorsal sepal subelliptic, 8–9 × 3.5–4 (or more) mm, 9-veined, obtuse to rounded; lateral sepals obliquely ovate-lanceolate, nearly as large as dorsal sepal, base adnate to column foot, apex obtuse to rounded; mentum ca. 6 mm. Petals suboblong, ca. as long as dorsal sepal, but slightly narrower, 3-veined, marginal veins branched, apex obtuse to rounded; lip obovate-elliptic, ca. 12 × 5 mm, adaxial surface with 1 central yellow ridge, with a long tapelike callus near apex, rounded, mucronate. Column ca. 4 mm; anther cap conic.

Epiphytic on tree trunks in forests, lithophytic on rocks in open forests; 600–1000 m. Hainan, SE Xizang (Mêdog), S Yunnan (Mengla) [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

**2. *Dendrobium furcatopedicellatum*** Hayata, Icon. Pl. Formosan. 4: 39. 1914.

双花石斛 shuang hua shi hu

*Grastidium furcatopedicellatum* (Hayata) Rauschert.

Stem erect, cylindrical, 30–40 cm or longer, ca. 2 mm in diam., upper part with opposite leaves, internodes 3–5 cm. Leaves linear, ca. 11 × 0.4 cm, leathery, 3-veined, base slightly contracted and then dilated into sheath, apex acuminate; leaf sheath tubular, ca. 3.5 cm, tightly embracing internodes. Inflorescence umbellate, lateral, 2-flowered, spreading at right angle outward; peduncle ca. 13 mm, with 1 or 2 basal sheaths. Pedicel and ovary ca. 1 cm. Flowers opening slightly, pale yellow; sepals with purple spots on both sides at middle. Sepals

narrowly lanceolate, ca. 3 cm, base ca. 3.5 mm wide; mentum ca. 5 mm, ± curved. Petals ca. as long as sepals, but relatively narrow; lip 3-lobed; lateral lobes erect, small, obtuse; mid-lobe triangular-lanceolate, somewhat large, 1–1.5 cm, margin fimbriate-toothed, apex recurved; disk pubescent.

- Mountain forests. C and S Taiwan.

**3. *Dendrobium somae*** Hayata, Icon. Pl. Formosan. 6: 71. 1916 [“*somai*”].

小双花石斛 xiao shuang hua shi hu

*Grastidium somae* (Hayata) Rauschert.

Stems clustered, erect, cylindrical, 60–100 cm, slender, 2–2.5 mm in diam., internodes 1–3 cm. Leaves alternate along upper part of stem, narrowly lanceolate, 7–10 × 0.5–0.6 (or more) cm, base contracted and enlarged into sheath, apex acuminate; leaf sheath tubular, tightly embracing stem, jointed at junction with leaf blade. Inflorescence umbellate, lateral on leafy stems, 2-flowered; peduncle ca. 4 mm, with 1 basal sheath 1–1.7 cm. Flowers spreading; sepals and petals yellowish green, lip yellow. Dorsal sepal narrowly lanceolate, 13–17 × 2.5–3.5 (or more) mm, 7-veined, long acuminate; lateral sepals similar but base oblique and adnate to column foot; mentum 4–6 mm. Petals linear, 13–15 × 1–2 (or more) mm, 3-veined, long acuminate; lip ovate, 13–14 × 5–6.5 (or more) mm, 3-lobed above middle; lateral lobes erect, oblong-triangular, acute; mid-lobe ovate, ca. 6 × 4 mm, long acuminate; disk glabrous, with 3 parallel stripes; mid-lobe veins forming fimbriate ridged projections. Column ca. 3 mm.

- Tree trunks in mountain forests; 500–1500 m. Taiwan (Hengchun, Taibei, Taidong).

**4. *Dendrobium luzonense*** Lindley, Edwards’s Bot. Reg. 30(Misc.): 54. 1844.

吕宋石斛 lü song shi hu

*Grastidium luzonense* (Lindley) M. A. Clements & D. L. Jones.

Stems tufted, stiff, straight, to 7.5 cm, ca. 2.7 mm in diam., greenish brown, leafy in upper part, internodes 2.5–3.5 cm, loosely covered with leaf sheaths. Leaves linear, ca. 9 × 0.9 cm, base contracted, articulated with tubelike sheath, apex acuminate. Inflorescences lateral on leafy part of stem, 2-flowered, sessile. Pedicel and ovary ca. 1.1 cm. Flowers yellowish, lip brownish, central part yellow, glabrous, ca. 1.6 cm wide. Dorsal sepal oblong, ca. 9 × 4 mm, apex revolute; lateral sepals ca. 9 mm, ca. 7 mm wide at base, ± recurved; mentum ca. 4 mm. Petals oblong-lanceolate, ca. 8 × 3 mm, acute; lip 3-lobed, ca. 8.5

mm, glabrous, central part slightly ridged, basal part clawed and connate with column foot; mid-lobe oblong, 4–4.5 × ca. 3.5 mm, obtuse; lateral lobes triangular or toothlike, ca. 2 mm, acute. Column ca. 3 × 2 mm; foot ca. 4 mm; pollinia oblong.

Epiphytic on tree trunks and branches in forest bordering a creek; ca. 400 m. Taiwan (Taidong) [Philippines].

This species was first recorded from China by W. M. Lin, T. C. Hsu, and T. P. Lin (Taiwania 52: 284–286. 2007).

**2. *Dendrobium* sect. *Densiflora*** Finet, Bull. Mus. Hist. Nat. (Paris) 9: 295. 1903.

顶叶组 ding ye zu

*Callista* Loureiro.

Roots smooth. Stems pseudobulbous, generally compressed clavate or fusiform, often stout, with longitudinal ridges, distal internodes and sheaths reduced, carrying fewer but larger leaves, new shoots starting unpredictably and growing rapidly. Leaves clustered at stem apex, lasting several years; blade leathery, not decurrent at base. Inflorescence usually pendulous, borne from leaf axils near apex of penultimate and older stems, up to 60-flowered. Flowers yellow or white tinged with yellow, never tinged with green.

About 14 species: China, India, Indochina, Myanmar, Thailand; eight species in China.

**5. *Dendrobium brymerianum*** H. G. Reichenbach, Gard. Chron., n.s., 2: 323. 1875.

长苏石斛 chang su shi hu

*Callista brymeriana* (H. G. Reichenbach) Kuntze.

Stems erect or decumbent, usually 20–30 cm, often with 2 internodes dilated at middle and fusiform, to 11 mm in diam., base and upper part 3–5 mm in diam., unbranched, with several nodes, internodes 2.5–3 cm, ± longitudinally ridged, pale yellow tinged with dirty black when dry. Leaves often 3–5, on upper part of stem, narrowly oblong, 7–13.5 × 1.2–2.2 cm, leathery, base slightly contracted and with clasping sheath, apex acuminate. Inflorescence a raceme arising laterally on leafless previous year's stem, suberect, 1- or 2-flowered; peduncle 1–4 cm; basal sheaths 4 or 5, overlapping, shortly tubular, membranous, basal ones shortest, ca. 2 mm, longer distally; floral bracts ovate-lanceolate, 7–12 mm, membranous, apex subobtuse. Pedicel and ovary to 5 cm. Flowers spreading, slightly thickly textured, golden yellow; column yellow, white on upper sides; anther cap pale yellowish white. Dorsal sepal oblong-lanceolate, ca. 25 × 8 mm, 7-veined, obtuse; lateral sepals sublanceolate, ca. 25 × 8 mm, base oblique, apex acute; mentum ca. 3 mm, shortly obtuse. Petals oblong, ca. 25 × 7 mm, 7-veined, entire, obtuse; lip ovate-triangular, ca. 20 × 15 mm, adaxially densely pubescent, base shortly clawed, margin shortly fimbriate below middle, above middle (especially at apex) with long and branched fringes, apical fringe longer than lip, apex slightly obtuse. Column ca. 3 mm; anther cap narrowly conic, ca. 5 mm, densely finely papillate, front margin slightly irregular. Capsule narrowly cylindrical, ca. 1.7 × 1 cm, 6-ribbed.

Epiphytic on tree trunks at forest margins; 1100–1900 m. S Yunnan [Laos, Myanmar, N Thailand, N Vietnam].

**6. *Dendrobium harveyanum*** H. G. Reichenbach, Gard. Chron., n.s., 19: 624. 1883.

苏瓣石斛 su ban shi hu

*Callista harveyana* (H. G. Reichenbach) Kuntze.

Stems fusiform, usually curved, 8–16 cm, 8–12 mm in diam., rigid, unbranched, with 3–9 nodes, internodes 1.5–2.5 cm, with many twisted longitudinal ridges, brownish yellow when dry, glossy. Leaves often 2 or 3, on upper part of stem,

ascending, oblong or narrowly oval-oblong, 10.5–12.5 × 1.6–2.6 cm, leathery, base contracted, with clasping leathery sheath, apex acute. Inflorescence subterminal on previous year's or older leafy stem, pendulous, 3.5–9 cm, slender, laxly few flowered; peduncle with basal sheaths 3 or 4, ovate; floral bracts ovate-triangular, ca. 1 mm. Pedicel and ovary ca. 2.5 cm. Flowers spreading, thinly textured, golden yellow. Dorsal sepal lanceolate, ca. 12 × 5–6 (or more) mm, 5- or 6-veined, slightly obtuse; lateral sepals ovate-lanceolate, ca. 12 × 7 mm, 7-veined, apex slightly obtuse; mentum subglobose, ca. 3 mm. Petals oblong, ca. 12 × 7 mm, 3-veined, margin densely long fimbriate, apex obtuse; lip suborbicular, concave, ca. 2 cm wide, base narrowed into a short claw, margin compoundly fimbriate; disk densely shortly villous. Column ca. 4 mm; anther cap subconic, ± glabrous, front margin irregularly dentate, apex obtuse.

Epiphytic on tree trunks in open forests; 1100–1700 m. S Yunnan (Mengla) [Myanmar, N Thailand, Vietnam].

**7. *Dendrobium lindleyi*** Steudel, Nomencl. Bot., ed. 2, 1: 490. 1840.

聚石斛 ju shi hu

*Dendrobium aggregatum* Roxburgh, Fl. Ind., ed. 1832, 3: 477. 1832, not Kunth (1816); *Callista aggregata* Kuntze; *D. alboviride* Hayata var. *majus* Rolfe; *D. lindleyi* var. *majus* (Rolfe) S. Y. Hu; *Epidendrum aggregatum* Roxburgh ex Steudel.

Stems pseudobulbous, dense or tufted, fusiform or ovoid-cylindrical, ± laterally compressed, 1–5 cm, 5–15 mm in diam., with 2–5 nodes, contracted at base, internodes 1–2 cm, with 4 ribs, pale yellowish brown and glossy when dry, with white membranous sheaths. Leaf usually solitary, oblong, 3–8 × 0.6–3 (or more) cm, leathery, base contracted, not decurrent into clasping sheaths, margin ± undulate, apex obtuse and emarginate. Inflorescence subterminal, to 27 cm, much longer than leaves, laxly several to more than 10-flowered; floral bracts narrowly ovate-triangular, ca. 2 mm. Pedicel and ovary yellowish green, tinged with pale purple, 6–30 mm. Flowers spreading, thinly papery, orange. Dorsal sepal ovate-lanceolate, ca. 20 × 7–8 (or more) mm, slightly obtuse; lateral sepals nearly equal to dorsal sepal; mentum subglobose, ca. 5 mm. Petals broadly elliptic, ca. 2 × 1 cm, bluntly rounded; lip transversely oblong or subreniform, usually ca. 1.5 × 2 cm, each side embracing

column below middle, entire, often emarginate; disk densely pubescent below middle. Column short and thick, ca. 4 mm; anther cap subglobose, glabrous, front margin irregular.

Epiphytic on trees in sunny open forests; below 1000 m. Guangdong, Guangxi, SW Guizhou, Hainan (Ce He) [Bhutan, India, Laos, Myanmar, Thailand, Vietnam].

**8. *Dendrobium jenkinsii*** Wallich ex Lindley, Edwards's Bot. Reg. 25: ad t. 37. 1839.

小黄花石斛 xiao huang hua shi hu

*Callista aggregata* Kuntze var. *jenkinsii* (Wallich ex Lindley) Brieger; *Dendrobium aggregatum* Roxburgh var. *jenkinsii* (Wallich ex Lindley) King & Pantling; *D. marseillei* Gagnepain.

Stems pseudobulbous, aggregated, appressed to substrate, ovoid, compressed, 1–2.5 cm, 4-angled, ridged, with 2 or 3 nodes, 1-leaved. Leaf apical, 1–3 × 0.5–0.8 cm. Inflorescence lateral from pseudobulb, shorter than or nearly as long as stem, 1–3-flowered; peduncle ca. 1.4 cm, glabrous; floral bracts lanceolate, 15–25 × 4–5.5 mm, membranous, acute. Pedicel and ovary 4–5 cm, slender. Flowers ca. 4 cm, uniformly yellow-orange. Dorsal sepal oblong-elliptic, 10–12 × 5–6 mm, 5-veined, obtuse; lateral sepals narrowly ovate-elliptic, 13–14 × 4–5 mm, 5-veined, apex obtuse; mentum 4–5 mm wide. Petals elliptic-ovate to orbicular, 1–1.6 × 0.5–0.9 cm, 5-veined; lip transversely obcordate, 1.5–2.2 × 1.7–2.8 cm (when spread out), adaxial surface pubescent centrally, entire, erose. Column ca. 6 mm, thick.

Open forests; 700–1300 m. S Yunnan [Bhutan, NE India, N Laos, Myanmar, N Thailand, N Vietnam].

**9. *Dendrobium sulcatum*** Lindley, Edwards's Bot. Reg. 24: ad t. 65. 1838.

具槽石斛 ju cao shi hu

*Callista sulcata* (Lindley) Kuntze.

Stem pseudobulbous, erect, clavate, compressed, narrowed toward base, 24–38 cm, 3–4 mm in diam. below, 1–2.5 cm in diam. at widest point, grooved, unbranched, nodes several, with longitudinal stripes, internodes 2–5 cm, with a membranous sheath, yellowish brown and glossy when dry. Leaves 3 or 4, subterminal, sessile, distichous, broadly elliptic to elliptic-ovate, 18–21 × ca. 4.5 cm, papery, apex acute. Inflorescence axillary, adjacent to leaf, subdensely 5–10-flowered; peduncle 2.5–3 cm, rachis short; basal sheaths 3 or 4, overlapping at base, distant above, ovate, 3.5–5 × 2–3 mm, membranous, 3-veined, subacute; floral bracts ovate, 3–4 × 2–3 mm, membranous, 3-veined, apex acute. Pedicel and ovary ca. 2.5 cm, slender. Flowers thin, uniformly golden yellow, lip with red-purple markings or stripes at base. Dorsal sepal oblong, ca. 25 × 9 mm, 5- or 6-veined, apex subacute; lateral sepals nearly equal to dorsal sepal; mentum conic, ca. 5 mm, broad and obtuse. Petals subobovate, ca. 24 × 11 mm, 5-veined, base contracted into a short claw, margin entire, apex acute; lip suborbicular to wedge-shaped, incurved, 18–20 × ca. 20 mm, adaxial surface densely pubescent near margin, base shortly clawed, margin minutely erose to ciliate-hairy, apex emarginate. Column ca. 5 mm; an-

ther cap backward and forward compressed, subglobose or conic, glabrous, front margin ± irregular, apex emarginate.

Epiphytic on tree trunks in dense forests; 700–800 m. S Yunnan (Mengla) [NE India, N Laos, Myanmar, N Thailand].

**10. *Dendrobium chrysotoxum*** Lindley, Edwards's Bot. Reg. 33: ad t. 19. 1847.

鼓槌石斛 gu chui shi hu

*Callista chrysotoxa* (Lindley) Kuntze; *Dendrobium chrysotoxum* var. *delacourii* Gagnepain.

Stem pseudobulbous, erect, fusiform, 6–30 cm, 1.5–5 cm in diam. at middle, with 2–5 internodes, with many bluntly rounded ridges, golden yellow when dry. Leaves 2–5, subterminal, oblong, to 19 × 2–3.5 cm or wider, leathery, base contracted, not decurrent into clasping sheaths, apex acute and hooked. Inflorescence subterminal, ascending or slightly pendulous, to 20 cm, laxly many flowered; peduncle and rachis stout, basal sheaths 4 or 5; floral bracts ovate-lanceolate, 2–3 mm, membranous, apex acute. Pedicel and ovary to 5 cm. Flowers slightly fragrant, thickly textured, golden yellow, lip deeper golden yellow with red stripes on each side at base, anther cap pale yellow. Dorsal sepal oblong, 12–20 mm, 5–9 mm wide at middle, 7-veined, slightly obtuse; lateral sepals nearly equal to dorsal sepal; mentum subglobose, ca. 4 mm wide. Petals ob-lanceolate, ca. as long as dorsal sepal, ca. 2 × as wide as sepals, ca. 10-veined, margin minutely dentate, apex rounded; lip nearly reniform-orbicular, ca. 20 × 23 mm, adaxially densely pubescent, margin undulate, apex shallowly bilobed; disk often V-shaped, raised, sometimes with U-shaped chestnut spots. Column ca. 5 mm; anther cap tower-shaped.

Epiphytic on tree trunks in sunny evergreen broad-leaved forests, lithophytic on rocks in open forests; 500–1600 m. S and W Yunnan [NE India, Laos, Myanmar, Thailand, Vietnam].

**11. *Dendrobium densiflorum*** Wallich, Pl. Asiat. Rar. 1: 34. 1830.

密花石斛 mi hua shi hu

*Callista densiflora* (Wallich) Kuntze; *Dendrobium clavatum* Roxburgh (1832), not Wallich ex Lindley (1852).

Stems strongly clavate, swollen, ± pseudobulbous at base, 25–40 cm, to 2 cm in diam., internodes clavate, expanding to a swollen node, obscurely 4-angled, sometimes ridges inconspicuous, yellow, pale brown and glossy when dry, sheathless. Leaves 3 or 4, subterminal, oblong-lanceolate, 8–17 × 2.6–6 cm, leathery, base not decurrent into clasping sheath, apex acute. Inflorescence subterminal, pendulous, densely many flowered; peduncle with 2–4 sheaths at base; rachis 6–16 cm; floral bracts broadly oblong or obovate, 12–15 × 6–10 (or more) mm, membranous, strongly ca. 10-veined, revolute, obtuse. Pedicel and ovary whitish green, 2–2.5 cm. Flowers spreading, 3–4 cm in diam.; sepals and petals pale yellow, lip golden yellow, column and anther cap orange-yellow. Dorsal sepal ovate, 17–21 × 8–12 (or more) mm, 5-veined, obtuse; lateral sepals nearly as large as dorsal sepal, ovate-lanceolate, 5- or 6-veined, apex subacute; mentum subglobose, ca. 5 mm wide. Petals suborbicular, 15–20 × 11–15 mm, with 3 main veins and

many secondary veins, base contracted into a short claw, margin erose above middle; lip orbicular-rhombic, 17–22 × up to 22 mm, both surfaces densely lanate above middle, shortly clawed, both sides embracing column below middle, apex rounded. Column ca. 4 mm; anther cap compressed subglobose or conic, front margin truncate, finely notched.

Epiphytic on tree trunks in evergreen broad-leaved forests, lithophytic on rocks in mountain valleys; 400–1000 m. N Guangdong, Guangxi, Hainan, SE Xizang [Bhutan, NE India, Myanmar, Nepal, N Thailand].

S. Y. Hu (Quart. J. Taiwan Mus. 26: 151. 1973) misidentified material of this species as *Dendrobium amabile* (Loureiro) O'Brien.

Seidenfaden (Opera Bot. 83: 23. 1985) included *Dendrobium guibertii* Carrière (Rev. Hort. 48: 431. 1876), from N Thailand, in the synonymy of *D. densiflorum*. However, H. P. Wood (Dendrobiums, 637–638. 2006) maintained it as a distinct, late-flowering (July–August) species, conceding that its true distribution remains unclear because of prevalent misidentification. A brief description is provided here for comparison with *D. densiflorum*. Stem clavate, to 80 cm, 4-grooved. Leaves 3–5, usually 4, ca. 10.5 × 5.5 cm. Inflorescence pendulous, 22–30 cm, developing very rapidly, with buds packed together, as in *D. densiflorum*, up to 60-flowered. Flowers ca. 4 cm in diam., sepals and petals pale yellow, lip deeper yellow.

**12. *Dendrobium thyrsoiflorum*** H. G. Reichenbach ex André, Ill. Hort. 22: 88. 1875.

球花石斛 qiu hua shi hu

*Callista thyrsoiflora* (H. G. Reichenbach ex André) M. A.

Clements; *Dendrobium densiflorum* Wallich var. *alboluteum* J. D. Hooker; *D. galliceanum* Linden.

Stems erect or ascending, cylindric, 12–46 cm, stout, 7–16 mm in diam., base contracted and narrowly cylindric, with several nodes, with several longitudinal ridges, yellowish brown and glossy. Leaves 3 or 4 on upper part of stem, alternate, oblanceolate, 9–16 × 2.4–5 cm, leathery, base not decurrent into clasping sheaths, but narrowed into a stalk ca. 6 mm, apex acute. Inflorescence arising laterally on previous year's leafy stem, pendulous, 10–16 cm, densely many flowered; peduncle with 3 or 4 papery basal sheaths; floral bracts pale white, obovate, 10–15 × 5–13 (or more) mm, papery, with several veins, not convolute when dry, apex bluntly rounded. Pedicel and ovary with pale white stripes tinged with purple, 2.5–3 cm. Flowers spreading, thin; sepals and petals white, sometimes flushed pink especially abaxially, lip golden yellow, column white, foot pale yellow, anther cap white. Dorsal sepal ovate, ca. 15 × 8 mm, 5-veined, entire, obtuse; lateral sepals slightly obliquely ovate-lanceolate, ca. 17 × 7 mm, 5-veined, entire, obtuse; mentum subglobose, ca. 4 mm wide. Petals suborbicular, ca. 14 × 12 mm, 7-veined with many secondary veins, base with claw ca. 2 mm, margin irregularly finely toothed above base, apex bluntly rounded; lip suborbicular to triangular, ca. 15 × 19 mm, abaxially sparsely pubescent, adaxially densely pubescent, bluntly rounded, base with claw ca. 3 mm; claw ornamented with a ligulate structure; column foot ca. 4 mm; anther cap compressed, conic.

Epiphytic on tree trunks in mountain forests; 1100–1800 m. SE Yunnan [NE India, Laos, Myanmar, N Thailand, Vietnam].

### 3. *Dendrobium* sect. *Dendrobium*

石斛组 shi hu zu

Roots smooth. Stem erect or pendulous, tall, leafy stems swollen or fusiform, many species deciduous, fleshy or slightly so, evenly swollen and cylindric or with some internodes swollen and fusiform, often longitudinally ridged when dry, leafy. Leaf blade dorsiventral, base decurrent, forming clasping sheaths. Inflorescences numerous, short, few-flowered racemes, lateral, often distal. Flowers opening simultaneously, large, pink to purple or white, rarely yellow, lip with a contrasting disk, mentum short, in most species enclosing nectary formed by matching cavities in column foot and base of lip, nectar present in a few species, lip entire or sometimes inconspicuously 3-lobed, surface tomentose-downy (velvety).

About 54 species: mostly Himalayan, from India through China to Japan, also Indonesia, Malaysia, and New Guinea, with one species extending to Australia; 27 species (six endemic) in China.

**13. *Dendrobium heterocarpum*** Wallich ex Lindley, Gen. Sp. Orchid. Pl. 78. 1830.

尖刀唇石斛 jian dao chun shi hu

*Callista aurea* (Lindley) Kuntze; *C. heterocarpa* (Wallich ex Lindley) Kuntze; *Dendrobium atractodes* Ridley; *D. aureum* Lindley; *D. minahassae* Kraenzlin.

Stems often ascending, ± clavate, 5–27 cm, 1–1.5 cm in diam., thickly fleshy, base contracted, thickened toward apex, unbranched, with several ± swollen nodes, internodes 2–3 cm, golden yellow when fresh, sulfur-yellow tinged with dirty black when dry. Leaves oblong-lanceolate, usually 7–10 × 1.2–2 cm, leathery, base with clasping sheath, apex acute or slightly obtuse; leaf sheath papery. Inflorescence a raceme arising from apical part of deciduous old stem, 1–4-flowered; peduncle 2–3

mm; basal sheaths 2 or 3, membranous; floral bracts pale white, broadly ovate, 4–9 mm, membranous, apex obtuse. Pedicel and ovary ca. 2 cm. Flowers scented, spreading; sepals and petals silver-white or creamy yellow, lateral lobes of lip yellow with red striation, mid-lobe silver or creamy yellow, column white, purplish red on sides, yellow on inner surface, foot yellow. Dorsal sepal oblong, 27–30 × ca. 8 mm, 5-veined, apex obtuse; lateral sepals obliquely ovate-lanceolate, ca. as large as dorsal sepal, main veins 7, secondary veins many, base slightly oblique, apex subacute; mentum conic, ca. 7 mm. Petals ovate-oblong, 25–28 × 9–10 (or more) mm, main veins 5, secondary veins many, margin entire, apex acute; lip ovate-lanceolate, nearly as long as sepals, inconspicuously 3-lobed; lateral lobes erect, middle part downcurved, adaxially with dense, short, reddish brown hairs, margin entire; mid-lobe acute. Column ca. 3 mm, front (adaxial surface) base slightly dilated; anther cap

conic, ca. 2.5 mm, densely finely papillate, front margin denticulate.

Epiphytic on tree trunks in open forests; 1500–1800 m. S and W Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

**14. *Dendrobium chrysanthum*** Wallich ex Lindley, Edwards's Bot. Reg. 15: ad t. 1299. 1829.

束花石斛 *shu hua shi hu*

*Callista chrysantha* (Wallich ex Lindley) Kuntze; *Dendrobium chrysanthum* var. *anophthalma* H. G. Reichenbach; *D. chrysanthum* var. *microphthalma* H. G. Reichenbach.

Stems pendulous or curving, cylindrical, 50–200 cm, stout, 5–15 mm in diam., upper part sometimes upcurved, fleshy, unbranched, with many nodes, internodes 3–4 cm, pale yellow or yellowish brown when dry. Leaves distichous along entire stem, oblong-lanceolate, usually 13–19 × 1.5–4.5 cm, papery, base sheathing, apex acuminate; leaf sheath papery, sheath mouth often open cupular when dry, often pale white. Inflorescences (apparently) leaf-opposed, lateral, on upper part of mature leafy stems, fasciculate, almost sessile, 2–6-flowered; floral bracts ovate-triangular, ca. 3 mm, membranous. Pedicel and ovary slightly compressed, 3.5–6 cm, ca. 2 mm in diam. Flowers thickly textured, yellow, lip disk with a chestnut blotch on either side. Dorsal sepal ± concave, oblong or elliptic, 15–20 × 9–11 (or more) mm, 7-veined, apex obtuse; lateral sepals slightly concave, obliquely ovate-triangular, 15–20 × 10–12 mm, 7-veined, base slightly oblique and broad, apex obtuse; mentum ca. 4 mm, broad and obtuse. Petals slightly concave, obovate, 16–22 × 11–14 (or more) mm, 7-veined, margin entire or sometimes finely erose, apex rounded; lip concave, reniform or transversely oblong, ca. 18 × 22 mm, abaxially densely barbellate except for middle, adaxially densely barbellate, base abruptly contracted into short claw, with an oblong callus, margin entire, apex rounded; disk with a broad and thick ridge extending from base to middle. Column ca. 4 mm, foot ca. 6 mm; anther cap conic, ca. 2.5 mm, nearly glabrous, front margin nearly entire. Capsule elongate, cylindrical, ca. 7 × 1.5 cm.

Epiphytic on tree trunks in dense forests, lithophytic on wet rocks in valleys; 700–2500 m. W Guangxi, S Guizhou, SE Xizang, S Yunnan [Bhutan, N India, Laos, Myanmar, Nepal, N Thailand, Vietnam].

Z. H. Tsi and S. C. Chen (Acta Phytotax. Sin. 33: 291. 1995) named Chinese material of this species as "*Dendrobium ochreatum* Lindley" (in Wallich, Numer. List, no. 7410. 1832), which is a nomen nudum and therefore was not validly published.

**15. *Dendrobium falconeri*** Hooker, Bot. Mag. 82: ad t. 4944. 1856.

串珠石斛 *chuan zhu shi hu*

*Callista falconeri* (Hooker) Kuntze; *Dendrobium erythroglossum* Hayata.

Stems pendulous, cylindrical, 30–40 cm or longer, slender, 2–3 mm in diam., fleshy, many branched, often swollen at branched nodes and moniliform, internodes often dilated above middle, to 3.5 cm on main stem, to 1 cm on branches, brownish yellow when dry, sometimes tinged with dirty black. Leaves

often 2–5, alternate on upper part of branches, narrowly lanceolate, 5–7 × 0.3–0.7 (or more) cm, leathery, base sheathing, apex obtuse or acute and slightly hooked; leaf sheath usually pale pink, tubular, papery. Inflorescences lateral, 1-flowered from each peduncle (occasionally a second peduncle arising creating a 2-flowered inflorescence); peduncle 5–15 mm, slender; basal sheaths 1 or 2, tubular, membranous; floral bracts white, ovate, 3–4 mm, membranous. Pedicel green; ovary yellowish green with purplish red spots, ca. 1.5 cm, slender. Flowers spreading, large, thinly textured; sepals pale purple or red with deep purple tip, petals white with purple apex, lip white with purple tip, yellow on both sides at base, disk with a deep purple blotch, column foot pale red, anther cap creamy white. Dorsal sepal ovate-lanceolate, 30–36 × 7–8 (or more) mm, 8- or 9-veined, base slightly contracted, apex acuminate; lateral sepals ovate-lanceolate, ca. as large as dorsal sepal, 8- or 9-veined, base oblique, apex acuminate; mentum subglobose, ca. 6 mm. Petals ovate-rhombic, 29–33 × 14–16 mm, main veins 5 or 6, secondary veins many, base cuneate, apex subacute; lip ovate-rhombic, ca. as long as petals but much wider, adaxially densely barbellate, margin denticulate, apex obtuse or slightly acute. Column ca. 2 mm; foot ca. 6 mm; anther cap subconic, ca. 2 mm, densely bristly, front margin lacerate, apex broadly obtuse and concave.

Lithophytic on rocks in valleys or epiphytic on tree trunks in dense forests; 800–1900 m. E and N Guangxi (Lingchuan, Lingui), SE Hunan (Zixing), W Taiwan (Jiayi to Miaoli), SE to W Yunnan [Bhutan, NE India, Myanmar, N Thailand, Vietnam].

The Taiwanese form has consistently concolorous flowers with pink sepals and petals.

**16. *Dendrobium wardianum*** Warner, Select Orchid. Pl. 1: t. 19. 1862.

大苞鞘石斛 *da bao qiao shi hu*

*Callista wardiana* (Warner) Kuntze.

Stems pendulous, cylindrical, 11–50 cm, 5–10 mm or more in diam., fleshy, with many swollen nodes, upper part ± upcurved, internodes 2–2.5 cm, pale yellow when dry. Leaves oblong, 8–11 × 1.5–1.8 (or more) cm, leathery, base with clasping sheath, apex slightly obtuse and hooked on one side; leaf sheath papery when dry, sheath mouth open cupular. Inflorescence on old leafless stems, 1- or 2-flowered; peduncle 3–5 mm; basal sheaths 2 or 3, pale white when dry, broadly ovate, 3–5 mm, papery, obtuse; floral bracts broadly ovate, 7–10 mm, papery, apex obtuse. Pedicel and ovary pale purple, ca. 2 cm. Flowers fragrant, spreading, papery; sepals and petals white with pale purple tips, lip with many purplish red stripes on each side, disk with a pale yellow transverse semilunar central blotch, column white, front side with purple stripes, anther cap white. Dorsal sepal ovate-lanceolate, 23–25 × 7–8 (or more) mm, 7-veined, apex acute or slightly obtuse; lateral sepals suborbicular, equal in size, 7-veined, base oblique, apex acute; mentum subglobose, small, ca. 3 mm. Petals obliquely ovate, 23–25 × 13–14 mm, main veins 5, secondary veins many, base contracted into a short claw, margin entire, apex obtuse; lip nearly broadly obovate, ca. 23 × 20 mm, adaxially densely barbellate, base cuneate, margin ciliate, apex rounded. Column ca. 4 mm; anther cap

subconic, densely finely papillate, front margin irregularly dentate. Capsule ovoid, ca.  $3 \times 1.3\text{--}1.6$  cm.

Epiphytic on tree trunks in open forests; 1300–1900 m. SE to W Yunnan [?Bhutan, NE India, Myanmar, N Thailand, N Vietnam].

**17. *Dendrobium gratiosissimum*** H. G. Reichenbach, Bot. Zeitung (Berlin) 23: 99. 1865.

杯鞘石斛 bei qiao shi hu

*Callista boxallii* (H. G. Reichenbach) Kuntze; *C. gratiosissima* (H. G. Reichenbach) Kuntze; *Dendrobium boxallii* H. G. Reichenbach; *D. bullerianum* Bateman.

Stems pendulous, cylindrical, to 50 cm, ca. 5 mm in diam., fleshy, with many swollen nodes, upper part  $\pm$  upcurved, internodes 2–2.5 cm, pale yellow when dry. Leaves oblong, 8–11  $\times$  1.5–1.8 (or more) cm, leathery, base with clasping sheath, apex slightly obtuse and hooked on one side; leaf sheath papery when dry, sheath mouth open cupular. Inflorescence on old leafless stems, 1- or 2-flowered; peduncle 3–5 mm; basal sheaths 2 or 3, pale white when dry, broadly ovate, 3–5 mm, papery, obtuse; floral bracts broadly ovate, 7–10 mm, papery, apex obtuse. Pedicel and ovary pale purple, ca. 2 cm. Flowers fragrant, spreading, papery; sepals and petals white with pale purple tips, lip with many purplish red stripes on each side, disk with a pale yellow transverse semilunar central blotch, column white, front side with purple stripes, anther cap white. Dorsal sepal ovate-lanceolate, 23–25  $\times$  7–8 (or more) mm, 7-veined, apex acute or slightly obtuse; lateral sepals suborbicular, equal in size, 7-veined, base oblique, apex acute; mentum subglobose, small, ca. 3 mm. Petals obliquely ovate, 23–25  $\times$  13–14 mm, main veins 5, secondary veins many, base contracted into a short claw, margin entire, apex obtuse; lip nearly broadly obovate, ca. 23  $\times$  20 mm, adaxially densely barbellate, base cuneate, margin ciliate, apex rounded. Column ca. 4 mm; anther cap subconic, densely finely papillate, front margin irregularly dentate. Capsule ovoid, ca.  $3 \times 1.3\text{--}1.6$  cm.

Epiphytic on tree trunks in open forests; 800–1700 m. S Yunnan [NE India, Laos, Myanmar, N Thailand, Vietnam].

**18. *Dendrobium pendulum*** Roxburgh, Fl. Ind., ed. 1832, 3: 484. 1832.

肿节石斛 zhong jie shi hu

*Callista crassinodis* (Benson ex H. G. Reichenbach) Kuntze; *C. pendula* (Roxburgh) Kuntze; *Dendrobium crassinode* Benson ex H. G. Reichenbach.

Stems ascending or pendulous, cylindrical, usually 22–40 cm, 1–1.6 cm in diam., fleshy and thick, unbranched, moniliform with many swollen nodes, internodes 2–2.5 cm, pale yellow tinged with gray when dry. Leaves oblong, 9–12  $\times$  1.7–2.7 cm, leathery, base with clasping sheath, apex acute; leaf sheath thinly leathery, sheath mouth  $\pm$  open when dry. Inflorescences often arising from upper part of deciduous stems, 1–3-flowered; peduncle somewhat thick and short, 2–5 mm; basal sheaths 1 or 2, tubular, ca. 6 mm; floral bracts pale white, broadly ovate, ca. 8 mm, papery, apex obtuse. Pedicel yellowish green; ovary pale purplish red, 3–4 cm. Flowers scented, spreading, large, waxy when dry; sepals and petals white, tipped purplish red, men-

tum purplish red, lip white, golden yellow below middle, upper part purplish red. Dorsal sepal oblong, ca. 30  $\times$  10 mm, 5-veined, acute; lateral sepals similar in size and shape, 5-veined, base slightly oblique, apex acute; mentum subconic, ca. 5 mm. Petals broadly oblong, ca. 30  $\times$  15 mm, 6-veined, secondary veins many, base subcuneately narrowed, margin denticulate, apex obtuse; lip suborbicular, ca. 25 mm, very shortly clawed, both sides embracing column below middle, margin ciliate, both surfaces pubescent. Column ca. 4 mm, lower part enlarged, abaxially slightly finely papillate; anther cap subconic, finely papillate-hairy, apex slightly narrowed and subtruncate and eroded.

Epiphytic on tree trunks in open forests; 1000–1600 m. S Yunnan [NE India, Laos, Myanmar, N Thailand, Vietnam].

**19. *Dendrobium findlayanum*** E. C. Parish & H. G. Reichenbach, Trans. Linn. Soc. London 30: 149. 1874 [*“findleyanum”*].

棒节石斛 bang jie shi hu

*Callista findlayana* (E. C. Parish & H. G. Reichenbach) Kuntze.

Stems erect or ascending, ca. 20 cm, 7–10 mm in diam., unbranched, with several nodes, internodes compressed clavate or clavate, 3–3.5 cm, base often with persistent papery leaf sheaths. Leaves alternate on upper part of stem, lanceolate, 5.5–8  $\times$  1.3–2 cm, leathery, base with clasping sheath, apex slightly obtuse and unequally bilobed. Inflorescences from old stems after leaves have fallen, 2-flowered; peduncle 6–16 cm; basal sheaths ca. 5 mm, membranous; floral bracts ovate-triangular, ca. 6 mm, membranous. Pedicel and ovary pale rose, 5–6 cm. Flowers spreading; sepals and petals white with roseate tip, lip base roseate, with purplish red stripes on both sides, disk golden yellow at center, column with purplish red stripes at front, anther cap white. Dorsal sepal oblong-lanceolate, 35–37  $\times$  ca. 9 mm, 5-veined, subobtuse to acute; lateral sepals ovate-lanceolate, 35–37  $\times$  ca. 9 mm, 5-veined, apex subacute; mentum subcylindrical, ca. 5 mm. Petals broadly oblong, 35–37  $\times$  ca. 18 mm, 5-veined, base shortly clawed, apex acute; lip suborbicular, concave, ca. 24 mm wide, densely pubescent, acute. Column ca. 8 mm; anther cap bluntly rounded.

Epiphytic on tree trunks in open forests; 800–900 m. S Yunnan (Mengla) [N Laos, Myanmar, N Thailand].

This species was named after its collector, Mr. James Findlay (E. C. Parish in F. Mason, Burmah, ed. [4], 2: 159. 1883). The spelling used in the protologue must therefore be treated as an orthographical error.

**20. *Dendrobium parishii*** H. G. Reichenbach, Bot. Zeitung (Berlin) 21: 236. 1863.

紫瓣石斛 zi ban shi hu

*Callista parishii* (H. G. Reichenbach) Kuntze; *Dendrobium polyphlebium* H. G. Reichenbach.

Stems ascending or pendulous, cylindrical, usually 10–30 cm or longer, stout, 1–1.3 cm in diam., upper part  $\pm$  curved, unbranched, with several nodes, internodes to 4 cm. Leaves narrowly oblong, 7.5–12.5  $\times$  1.6–1.9 cm, leathery, apex obtuse and unequally bilobed; leaf sheath white, membranous. Inflo-

rescence lateral on old leafless stem, 1–3-flowered; peduncle 3–5 mm; basal sheaths 3 or 4, overlapping, short; floral bracts ovate-lanceolate, ca. 7 mm, acute. Pedicel and ovary 4–5 cm. Flowers spreading, large, thin, purplish red, disk with a deep purple blotch on either side, column white, anther cap purple. Dorsal sepal obovate-lanceolate, ca.  $27 \times 7$  mm, 5-veined, apex obtuse; lateral sepals ovate-lanceolate, ca. as long as dorsal sepal and slightly narrower, 5-veined, apex acuminate; mentum narrowly conic, ca. 6 mm, obtuse. Petals broadly elliptic, slightly shorter but much wider than sepals, 5-veined, base shortly clawed, margin ciliate or denticulate, apex acute; lip rhombic-orbicular, ca.  $20 \times 16$  mm, both surfaces densely pilose, shortly clawed, claw with a raised notched ridge on front, both sides embracing column below middle, margin densely ciliate, apex acute. Column ca. 7 mm; anther cap conic, surface papillate, front margin irregularly denticulate.

Guizhou (Xingyi), SE Yunnan (Wenshan) [NE India, Laos, Myanmar, Thailand, Vietnam].

**21. *Dendrobium loddigesii*** Rolfe, Gard. Chron., ser. 3, 2: 155. 1887.

美花石斛 mei hua shi hu

*Callista loddigesii* (Rolfe) Kuntze; *Dendrobium loddigesii* var. *album* Tang & F. T. Wang.

Stems often pendulous, cylindrical, 10–45 cm, slender, ca. 3 mm in diam., soft, sometimes branched, with many nodes, internodes 1.5–2 cm, golden yellow when dry. Leaves alternate along entire stem, ligulate, oblong-lanceolate, or slightly obliquely oblong, usually  $2\text{--}4 \times 1\text{--}1.3$  cm, leathery, base sheathing, apex acute and slightly hooked; leaf sheath membranous, veins raised into a lattice when dry; sheath mouth often open when dry. Inflorescence lateral on upper part of old leafy stem, 1- or 2-flowered; peduncle 2–3 mm; basal sheaths 1 or 2, cupular, short, membranous; floral bracts ovate, ca. 2 mm, membranous, apex obtuse. Pedicel and ovary 2–3 cm. Flowers pale pink or purplish red, adaxial surface of lip golden yellow at center, pale purplish red on edge, column white, front lateral sides with red stripes, anther cap white. Dorsal sepal ovate-oblong,  $17\text{--}20 \times$  ca. 7 mm, 5-veined, apex acute; lateral sepals lanceolate,  $17\text{--}20 \times 6\text{--}7$  (or more) mm, 5-veined, base oblique, apex acute; mentum subglobose, ca. 5 mm. Petals elliptic, ca. as long as dorsal sepal, 8–9 (or more) mm, 3–5-veined, margin entire, apex slightly obtuse; lip suborbicular, 17–20 mm in diam., both surfaces densely pubescent, margin shortly fimbriate, apex emarginate. Column ca. 4 mm; anther cap subconic, densely finely papillate-hairy, front margin irregularly dentate.

Epiphytic on tree trunks in mountain forests, lithophytic on rocks in forests; 400–1500 m. Guangdong (Hong Kong, Luofu Shan), Guangxi, SW Guizhou, Hainan (Baisha), S Yunnan (Mengla, Simao) [Laos, N Vietnam].

**22. *Dendrobium devonianum*** Paxton, Paxton's Mag. Bot. 7: 169. 1840.

齿瓣石斛 chi ban shi hu

*Callista devoniana* (Paxton) Kuntze; *C. moulmeinensis* (E. C. Parish ex J. D. Hooker) Kuntze; *Dendrobium devonianum*

var. *rhodoneurum* H. G. Reichenbach; *D. moulmeinense* E. C. Parish ex J. D. Hooker; *D. pulchellum* Roxburgh ex Lindley var. *devonianum* (Paxton) H. G. Reichenbach.

Stems pendulous, cylindrical, 50–70(–100) cm, slender, 3–5 mm in diam., slightly fleshy, unbranched, with many nodes, internodes 2.5–4 cm, often pale brown tinged with dirty black when dry. Leaves narrowly ovate-lanceolate,  $8\text{--}13 \times 1.2\text{--}2.5$  cm, leathery, base with clasping sheath, apex long acuminate; leaf sheath often with purplish red dots, papery when dry. Inflorescences often several, on old leafless stems, 1- or 2-flowered; peduncle green, ca. 4 mm; basal sheaths 2 or 3, dry, membranous; floral bracts ovate, ca. 4 mm, membranous, apex subacute. Pedicel and ovary green, tinged with brown, 2–2.5 cm. Flowers scented, spreading, thinly textured; dorsal sepal white, upper part tinged with purplish red, veins purple, lip white, front purplish red, with purplish red stripes on both sides below middle, disk with a yellow spot on either side, column white, both front sides with purple stripes, anther cap white. Dorsal sepal ovate-lanceolate, ca.  $25 \times 9$  mm, 5-veined, apex acute; lateral sepals similar in size and shape, but base slightly oblique; mentum subglobose, ca. 4 mm. Petals ovate, ca.  $26 \times 13$  mm, 3-veined, lateral main veins often branched, base shortly clawed, margin shortly fimbriate, apex subacute; lip suborbicular, ca. 3 cm, base shortly clawed, margin compound fimbriate, adaxially densely barbellate. Column ca. 3 mm; anther cap subconic, densely finely papillate, front margin irregularly dentate, apex slightly concave.

Epiphytic on tree trunks in thick mountain forests; ca. 1900 m. NW Guangxi (Longlin), SW Guizhou (Luodian, Xingyi), SE Xizang (Médog), SE to W Yunnan [Bhutan, NE India, Myanmar, N Thailand, Vietnam].

**23. *Dendrobium cucullatum*** R. Brown, Bot. Reg. 7: ad t. 548. 1821.

兜唇石斛 dou chun shi hu

*Dendrobium pierardii* Roxburgh ex J. D. Hooker; *D. pierardii* var. *cucullatum* (R. Brown) J. D. Hooker.

Stems pendulous, cylindrical, 30–60(–90) cm, slender, 4–7(–10) mm in diam., fleshy, unbranched, with many nodes, internodes 2–3.5 cm. Leaves lanceolate or ovate-lanceolate,  $6\text{--}8 \times 2\text{--}3$  cm, leathery, base sheathing, apex acuminate; leaf sheath pale white when dry, papery, sheath mouth open cupular. Inflorescences multiple, on deciduous or leafy old stems, very short, 1–3-flowered; peduncle 2–5 mm; basal sheaths 3 or 4, 2–3 mm, membranous; floral bracts pale white, ovate, ca. 3 mm, membranous, apex acute. Pedicel and ovary deep brown, tinged with green, 2–2.5 cm. Flowers spreading, pendulous; sepals and petals white tinged with pale purplish red or distal part pale purplish red, lip with purplish red striation on both sides at base, pale yellow above middle, pale pink below middle, column white with red stripes on both front sides, anther cap white. Dorsal sepal sublanceolate, ca.  $23 \times 5\text{--}6$  (or more) mm, 5-veined, apex subacute; lateral sepals similar in size and shape, 5-veined, base oblique, apex acute; mentum narrowly conic, ca. 5 mm, obtuse. Petals elliptic, ca.  $23 \times 9\text{--}10$  (or more) mm, 5-veined, margin entire, apex obtuse; lip broadly obovate or suborbicular,  $25\text{--}26 \times$  ca. 25 mm, laterally embracing column and

trumpet-shaped, both surfaces densely pubescent, base narrowly clawed, margin irregularly denticulate. Column ca. 3 mm; anther cap subconic, densely finely papillate-hairy, front margin broadly emarginate. Capsule narrowly obovoid, ca. 4 × 1.2 cm, with a stalk 1–1.5 cm.

Epiphytic on tree trunks in open forests, lithophytic on rocks in mountain valleys; 400–1500 m. NW Guangxi, SW Guizhou (Xingyi), SE to W Yunnan [Bhutan, India, Laos, Malaysia, Myanmar, Nepal, Vietnam].

Some early authors identified material of *Dendrobium cucullatum* as *D. aphyllum* (Roxburgh) C. E. C. Fischer (*Limodorum aphyllum* Roxburgh), but Christenson & H. P. Wood (Orchids 72: 775. 2003) showed Roxburgh's plant to be *D. macrostachyum* Lindley, not *D. cucullatum*.

**24. *Dendrobium polyanthum*** Wallich ex Lindley, Gen. Sp. Orchid. Pl. 81. 1830.

报春石斛 bao chun shi hu

*Callista cretacea* (Lindley) Kuntze; *C. primulina* (Lindley) Kuntze; *Dendrobium cretaceum* Lindley; *D. nobile* Lindley var. *pallidiflorum* Hooker; *D. primulinum* Lindley.

Stems pendulous, cylindrical, usually 20–35 cm, stout, 8–13 mm in diam., fleshy, unbranched, deciduous, with many nodes, internodes 2–2.5 cm. Leaves alternate along entire stem, lanceolate or ovate-lanceolate, 8–10.5 × 2–3 cm, papery, apex obtuse and unequally bilobed; leaf sheath papery or membranous. Inflorescence arising from old stems after leaves have fallen, 1–3-flowered; peduncle penetrating 2 sheaths, cymbiform-concave, ca. 2 mm; basal sheaths 3 or 4, 2–3 mm, membranous; floral bracts pale white, ovate, 5–9 mm, membranous, apex obtuse. Pedicel and ovary yellowish green, 2–2.5 cm. Flowers spreading, pendulous; sepals and petals pale roseate or white (*D. cretaceum*), lip pale yellow with pale roseate tip, disk with purplish red stripes, column white, anther cap purple. Dorsal sepal narrowly lanceolate, ca. 30 × 6–8 (or more) mm, 3–5-veined, subacute; lateral sepals similar in size and shape, 3–5-veined, base oblique, apex subacute; mentum narrowly conic, ca. 5 mm, obtuse. Petals narrowly oblong, ca. 30 × 7–9 mm, 3–5-veined, margin entire, apex obtuse; lip broadly obovate, shorter than wide, ca. 35 mm wide, both sides embracing column in lower half, both surfaces densely pubescent, margin irregularly denticulate. Column ca. 3 mm; anther cap elliptic-conic, densely papillate-hairy, front margin broadly emarginate, apex ± concave.

Epiphytic on tree trunks in open forests; 700–1800 m. S Yunnan [N India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**25. *Dendrobium crystallinum*** H. G. Reichenbach, Gard. Chron. 1868: 572. 1868.

晶帽石斛 jing mao shi hu

*Callista crystallina* (H. G. Reichenbach) Kuntze; *Dendrobium crystallinum* var. *hainanense* S. J. Cheng & C. Z. Tang.

Stems erect or ascending, cylindrical, 60–70 cm, 5–7 mm in diam., slightly fleshy, unbranched, with many nodes, internodes 3–4 cm. Leaves oblong-lanceolate, 9.5–17.5 × 1.5–2.7 cm, leathery, with several dorsiventrally raised veins, base with

clasping sheath, apex long acuminate. Inflorescences several, arising from apex of old deciduous stems, 1- or 2-flowered; peduncle short, 6–8 mm; basal sheaths 3 or 4, 3–5 mm; floral bracts pale white, oblong, 1–1.5 cm, membranous, apex acute. Pedicel and ovary 3–4 cm. Flowers spreading, large; sepals and petals creamy white, upper part purplish red, lip orange, upper part purplish red. Dorsal sepal narrowly oblong-lanceolate, ca. 3.2 × 0.7 cm, 5-veined, acuminate; lateral sepals similar in size, 5-veined, base slightly oblique, apex acuminate; mentum narrowly conic, ca. 4 × 2 mm. Petals oblong, ca. 32 × 12 mm, 7-veined, margin ± undulate, apex acute; lip suborbicular, ca. 25 mm, both surfaces densely pubescent, margin entire. Column ca. 4 mm; anther cap narrowly conic, densely white crystalline papillate, front margin irregularly dentate. Capsule elongate, cylindrical, ca. 6 × 1.7 cm.

Epiphytic on tree trunks at forest margins or in open forests; 500–1700 m. Hainan, S Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

**26. *Dendrobium crepidatum*** Lindley & Paxton, Paxt. Fl. Gard. 1: 63. 1850.

玫瑰石斛 mei gui shi hu

*Callista crepidata* (Lindley & Paxton) Kuntze; *C. lawiana* (Lindley) Kuntze; *Dendrobium lawianum* Lindley.

Stems pendulous, green, cylindrical, usually 30–40 cm, stout, ca. 1 cm in diam., fleshy, base slightly contracted, unbranched, with many nodes, internodes 3–4 cm, with green and white-striped sheaths, purplish bronze when dry. Leaves narrowly lanceolate, 5–10 × 1–1.25 cm, subleathery, base with clasping sheath, apex acuminate; leaf sheath membranous. Inflorescence arising from old stems after leaves have fallen, very short, 1–4-flowered; peduncle ca. 3 mm; basal sheaths 3 or 4, scarious; floral bracts ovate, ca. 4 mm, apex acute. Pedicel and ovary pale purplish red, ca. 3.5 cm. Flowers spreading, thick, sometimes cleistogamous; sepals and petals white, pale purple above middle, waxy when dry, lip pale purplish red above middle, golden yellow below middle, column white, front with 2 purplish red stripes. Dorsal sepal subelliptic, ca. 21 × 10 mm, 5-veined, obtuse; lateral sepals ovate-oblong, nearly as large as dorsal sepal, 5-veined, midvein on abaxial surface ± keeled, base oblique, apex obtuse; mentum subglobose, small, ca. 5 mm. Petals broadly obovate, ca. 21 × 12 mm, 5-veined, rounded; lip orbicular or broadly obovate, length subequal to width, ca. 2 cm, both sides embracing column below middle, adaxially densely pubescent. Column ca. 3 mm; anther cap subconic, front margin denticulate, apex narrowed and arching forward.

Epiphytic on tree trunks in open forests, lithophytic on rocks in mountain valleys; 1000–1800 m. SW Guizhou, S Yunnan [Bhutan, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**27. *Dendrobium lituiflorum*** Lindley, Gard. Chron. 1856: 372. 1856.

喇叭唇石斛 la ba chun shi hu

*Callista lituiflora* (Lindley) Kuntze; *Dendrobium hanburyanum* H. G. Reichenbach.

Stems pendulous, cylindrical, 30–40 cm or longer, 7–10 mm

in diam., slightly fleshy, unbranched, with many nodes, internodes 3–3.5 cm. Leaves narrowly oblong, 7.5–18 × 1.2–1.5 (or more) cm, leathery, base sheathing, apex acuminate and slightly hooked on one side. Inflorescences many, arising from old leafless stems, 1- or 2-flowered; peduncle nearly perpendicular to stem, 5–10 mm; basal sheaths 3 or 4, pale white, to 1.5 cm, papery, apex obtuse; floral bracts pale white, ovate, 1–13 mm, apex subacute. Pedicel and ovary ca. 2.5 cm. Flowers spreading, purple, large, membranous; inner surface of lip with a deep purple spot surrounded by a white circle. Dorsal sepal oblong-lanceolate, ca. 35 × 7 mm, 7-veined, apex acute; lateral sepals similar to dorsal sepal and equal in size, 7-veined, base slightly oblique; mentum subglobose, ca. 4 mm. Petals subelliptic, ca. 40 × 15 mm, 7-veined, margin entire, apex acute; lip subobovate, shorter than petals, embracing column on both sides and trumpet-shaped below middle, adaxially densely barbellate, margin irregularly denticulate. Column ca. 4 mm, base dilated; anther cap conic, finely papillate, front margin entire, apex ± truncate and concave.

Epiphytic on tree trunks in broad-leaved forests; 800–1600 m. SW and W Guangxi, SW Yunnan (Zhenkang) [NE India, Laos, Myanmar, Thailand, Vietnam].

**28. *Dendrobium nobile*** Lindley, Gen. Sp. Orchid. Pl. 79. 1830.

石斛 shi hu

*Callista nobilis* (Lindley) Kuntze; *Dendrobium coerulescens* Wallich ex Lindley; *D. formosanum* (H. G. Reichenbach) Masamune; *D. lindleyanum* Griffith; *D. nobile* var. *absoluteum* Huyen & Averyanov; *D. nobile* var. *formosanum* H. G. Reichenbach; *D. nobile* f. *nobilis* (H. G. Reichenbach) M. Hiroe; *D. nobile* var. *nobilis* H. G. Reichenbach.

Stems erect, cylindrical, 10–60 cm, stout, to 1.3 cm in diam., fleshy, base conspicuously contracted, unbranched, with many, sometimes slightly swollen, nodes, internodes 2–4 cm, golden yellow when dry. Leaves oblong, 6–11 × 1–3 cm, leathery, base with clasping sheath, apex obtuse and unequally bilobed. Inflorescences arising from old stems before or after leaves have fallen, 2–4 cm, 1–4-flowered; peduncle 5–15 mm; basal sheaths several, tubular; floral bracts ovate-lanceolate, 6–13 mm, membranous, apex acuminate. Pedicel and ovary pale purple, 0.3–0.6 cm. Flowers large, all parts white, tinged with pale purple at apex, sometimes entirely pale purplish red, with purplish red striation on either side at base of lip, or lip disk with a central purplish red spot, sometimes white, column green, anther cap purplish red. Dorsal sepal oblong, 25–35 × 10–14 mm, 5-veined, apex obtuse; lateral sepals similar, 5-veined, base oblique, apex acute; mentum conic, ca. 6 mm. Petals ± obliquely broadly ovate, 25–35 × 18–25 mm, main veins 3, secondary veins many, base shortly clawed, margin entire, apex obtuse; lip broadly ovate, 25–35 × 22–32 mm, both surfaces densely pubescent, base shortly clawed, embracing column below middle, margin shortly ciliate, apex obtuse. Column ca. 5 mm, base slightly dilated; anther cap conic, densely finely papillate, front margin with irregular sharp teeth.

Epiphytic on tree trunks in mountain forests, lithophytic on rocks in mountain valleys; 500–1700 m. NE to W Guangxi, Guizhou, Hainan (Baisha), Hong Kong, W Hubei (Yichang), S Sichuan, Taiwan, SE

Xizang (Médog), Yunnan [Bhutan, India, Laos, Myanmar, Nepal, N Thailand, Vietnam].

**29. *Dendrobium linawianum*** H. G. Reichenbach, Ann. Bot. Syst. 6: 284. 1861.

矩唇石斛 ju chun shi hu

*Callista linawiana* (H. G. Reichenbach) Kuntze; *Dendrobium alboviride* Hayata.

Stems erect, cylindrical, somewhat compressed, usually 25–30 cm, stout, 1–1.5 cm in diam., unbranched, lower part narrowed, with several nodes, internodes slightly obconic, 3–4 cm, longitudinally grooved, yellowish brown when dry. Leaves oblong, 4–7(–10) × 2–2.5 cm, leathery, base dilated into clasping sheaths, apex obtuse and unequally bilobed. Inflorescence from old leafless stems, 2–4-flowered; peduncle 7–8 mm; basal sheaths 2 or 3, tubular, short; floral bracts ovate, 3–4 mm, apex acute. Pedicel and ovary to 5 cm; ovary slightly arcuate. Flowers spreading, large, white, sometimes upper part purplish red; lip white, upper part purplish red, disk with purplish red stripes on each side at base, anther cap white. Dorsal sepal oblong, 22–35 × 7.5–9.5 (or more) mm, 5-veined, slightly obtuse; lateral sepals ± obliquely oblong, ca. as large as dorsal sepal, 5-veined, base oblique, apex slightly obtuse; mentum narrowly conic, ca. 8 mm. Petals elliptic, 22–35 mm, much broader than sepals, shortly clawed, obtuse; lip broadly oblong, ca. as large as petals or slightly smaller, both sides embracing column below middle, adaxially densely pubescent, shortly clawed, both lateral margins denticulate below middle, front reflexed, obtuse. Column ca. 4 mm, foot ca. 8 mm; anther cap glabrous.

• Epiphytic on tree trunks in mountain forests; 400–1500 m. E Guangxi (Jinxu), Taiwan.

**30. *Dendrobium moniliforme*** (Linnaeus) Swartz, Nova Acta Regiae Soc. Sci. Upsal., ser. 2, 6: 85. 1799.

细茎石斛 xi jing shi hu

*Epidendrum moniliforme* Linnaeus, Sp. Pl. 2: 954. 1753; *Callista candida* (Wallich ex Lindley) Kuntze; *C. japonica* (Blume) Kuntze; *C. moniliformis* (Linnaeus) Kuntze; *C. spathacea* (Lindley) Kuntze; *Dendrobium candidum* Wallich ex Lindley; *D. castum* Bateman ex H. G. Reichenbach; *D. crispulum* Kimura & Migo; *D. heishanense* Hayata; *D. japonicum* (Blume) Lindley; *D. kosepangii* C. L. Tso; *D. kwangtungense* C. L. Tso; *D. monile* (Thunberg) Kraenzlin; *D. nienkui* C. L. Tso; *D. spathaceum* Lindley; *D. taiwanianum* S. S. Ying; *D. tosaense* Makino var. *chingshuishanianum* S. S. Ying; *D. wilsonii* Rolfe; *D. yunnanense* Finet; *D. zonatum* Rolfe; *E. monile* Thunberg, nom. illeg. superfl.; *Limodorum monile* Thunberg, nom. illeg. superfl.; *Onychium japonicum* Blume.

Stems erect, cylindrical, usually 10–30 cm or longer, slender, 3–6 mm in diam., with many nodes, internodes 1.5–2.5 cm, golden yellow or yellow tinged with dark gray when dry. Leaves several, often alternate on stem above middle, lanceolate, oblong, or narrowly oblong, 3–5(–7) × 0.5–1.2(–1.5) cm, base decurrent into clasping sheaths, apex obtuse and slightly unequally bilobed. Inflorescences 1 to several, borne above middle of deciduous or leafy old stem, usually 1–3-flowered;

peduncle 3–5 mm; floral bracts pale white, tinged with brown spots, ovate, 3–7(–8) × 2–3(or more) mm, dry, membranous, apex obtuse or acuminate. Pedicel and ovary white, 1–3 cm, slender. Flowers sometimes fragrant, yellowish green, creamy white, or white tinged with pale purplish red; lip white, pale yellowish green, or greenish white, spots tinged with pale brown or purplish red to pale yellow, often with a purplish red, pale brown, pale yellow, or yellowish green central spot near base of mid-lobe, column white, foot often with purplish red stripes at base, anther cap white or pale yellow. Sepals and petals similar, ovate-oblong, oblong-lanceolate, or ovate-lanceolate, (10–)13–40 × (1.5–)3–10 mm, 5- or 6-veined, apex acute, acuminate, or obtuse; lateral sepals oblique and adnate to column foot; mentum conic or subglobose, 4–15 × ca. 5 mm, obtuse. Petals subelliptic, (23–)25–40 × 10–15 mm, 5- or 6-veined, acute; lip ovate-lanceolate in outline, slightly shorter than sepal, base cuneate, distinctly or inconspicuously 3-lobed; lateral lobes subrounded, erect, embracing column, margin entire or irregularly toothed; mid-lobe ovate to ovate-lanceolate, glabrous, base often with an elliptic callus, margin entire, apex acute or slightly obtuse; disk densely pubescent between 2 lateral lobes. Column 3–4 mm, foot ca. 1.5 cm, glabrous or sometimes hairy; anther cap conic, sometimes densely finely papillate, apex unlobed.

Epiphytic on tree trunks in broad-leaved forests, lithophytic on rocks in forests and cliffs in valleys; 600–3000 m. SW Anhui, N and SE Fujian, S Gansu, N and SW Guangdong, N Guangxi, E Guizhou, Henan, Hunan, Jiangxi, Shaanxi, S Sichuan, Taiwan, NW to SE Yunnan, N Zhejiang [Bhutan, NE India, Japan, Korea, Myanmar, Nepal, N Vietnam].

*Dendrobium moniliforme* var. *malipoense* L. J. Chen & Z. J. Liu (J. Wuhan Bot. Res. 26: 358. 2008), described from Yunnan (Malipo), is said to differ in its very small, fusiform stems 4–6 cm, inflorescence axis 1–2 cm, dorsal sepal narrowly oblong, and lip with three lamellae. However, H. P. Wood is skeptical that the taxon is really distinct from typical *D. moniliforme*.

**31. *Dendrobium okinawense*** Hatusima & Ida, J. Geobot. 18: 77. 1970.

琉球石斛 liu qiu shi hu

Stems slender, terete, pendulous, 40–70 cm, 4–7 mm in diam., leafy in upper part, internodes cylindrical, 2–5 cm, yellowish green. Leaves linear-lanceolate, 5.5–10 × 0.6–0.8 cm, base rounded, apex acute to obtuse. Inflorescences borne from upper nodes of stem, 1–3-flowered, often 2-flowered; floral bracts 2 or 3, imbricate, ovate-triangular, 3–6 mm. Flowers usually pale yellow, 3–4 cm wide. Dorsal and lateral sepals lanceolate, 3–4 cm × 3.5–4 mm, acute; mentum 9–12 mm. Petals lanceolate, 3–4 cm, clawed, acute; lip oblong-lanceolate, ca. 2.5 cm, acute; disk with 2 central keels on basal portion, pilose. Column ca. 2 mm, foot 8–10 mm, concave; anther cap cucullate, ca. 1.5 mm.

Epiphytic in broad-leaved forests; 900–1200 m. Taiwan (Taidong) [Japan].

This species was first recorded from China by S. W. Chung and S. Y. Lu (Taiwania 52: 106–112. 2007).

**32. *Dendrobium fanjingshanense*** Z. H. Tsi ex X. H. Jin & Y. W. Zhang, Acta Phytotax. Sin. 39: 269. 2001.

梵净山石斛 fan jing shan shi hu

Stems clustered, cylindrical, 35–60 cm, slender, 2–5 mm in diam., internodes green or pale yellowish green with white membranous leaf sheaths, grooved and angular. Leaf blade linear or linear-lanceolate, 6–8 × 0.9–1.2 cm, leathery or thinly leathery, base narrowed into amplexicaul sheath, apex obtuse or obliquely retuse; leaf sheath with raised veins. Inflorescence lateral on previous year's leafless stem, ascending, to 6 cm, 1- or 2(or 3)-flowered; peduncle 2.5–3 cm; basal sheaths 3 or 4, cupular or tubular, pale purplish, 4–15 mm, thickly papery, with raised veins; floral bracts pale purplish, cymbiform, 15–20 × ca. 5 mm, thickly papery, obtuse. Pedicel and ovary 1–2.5 cm. Flowers scented, spreading, golden yellow; base of lip purple striate, disk sometimes golden yellow spotted, anther cap white. Dorsal sepal oblong or oblong-elliptic, 24–26 × 10–11 mm, 6- or 7-veined, obtuse; lateral sepals shorter and narrower, 6- or 7-veined, base slightly oblique, apex obtuse; mentum conic, 3–4 mm. Petals broadly elliptic or ovate, 14–22 × 11–17 mm, 3-veined, lateral major veins branched, apex rounded; lip broadly ovate, 17–21 × 21–22 mm, adaxially densely tomentose, with claw 3–4 mm, margin irregularly denticulate. Column 4–5 mm, foot ca. 3 mm; anther cap conic, front margin toothed.

• Epiphytic on tree trunks; 800–1500 m. Guizhou.

**33. *Dendrobium catenatum*** Lindley, Gen. Sp. Orchid. Pl. 84. 1830.

黄石斛 huang shi hu

*Callista stricklandiana* (H. G. Reichenbach) Kuntze; *Dendrobium funiushanense* T. B. Chao, Zhi X. Chen & Z. K. Chen; *D. huoshanense* C. Z. Tang & S. J. Cheng; *D. officinale* Kimura & Migo; *D. pere-fauriei* Hayata; *D. stricklandianum* H. G. Reichenbach; *D. tosaense* Makino; *D. tosaense* var. *pere-fauriei* (Hayata) Masamune.

Stems erect or pendulous, cylindrical, 3–35(–60) cm, slender, 2–7 mm in diam., sometimes to 18 mm in diam. above base, unbranched, with many nodes, internodes (0.3–)1.3–4 cm, pale yellowish green, sometimes with pale purplish red dots, pale yellow when dry. Leaves often 2–5 along upper part of stem, ligulate-oblong or oblong-lanceolate, 3–21 × 0.5–1.5 cm, papery, base slightly oblique and decurrent into clasping sheaths, margin and midvein often tinged with pale purple, apex obtuse and ± hooked, subacute, or slightly unequally bilobed; leaf sheath often with purple spots, upper margin separate from stem and open when old, with a deep green split. Inflorescences 1–3 from leafy or old leafless stems, (1–)3–8-flowered; peduncle 2–10 mm; rachis upcurved, 2–4 cm; basal sheaths 1–4, ovate-lanceolate, 3–4 mm, papery, apex acute; floral bracts pale white, sometimes tinged with chestnut, narrowly lanceolate or ovate, 3–7 mm, dry, membranous, apex obtuse or acute. Pedicel and ovary yellowish green, 2–4 cm. Flowers spreading; sepals and petals yellowish green, pale yellowish white, or white, often turning creamy yellow later, mentum white tinged yellowish green, lip white or pale yellow, with a reddish or reddish brown transverse mark, with a green or yellow basal callus, with purplish red stripes on both sides below middle, disk with a pur-

plish red transverse spot above middle, column greenish white or yellowish green, with a purple spot on each side at apex, foot yellowish green with purplish red stripes, middle with an eggplant-purple spot, anther cap cream-colored, sometimes with a purple tip. Dorsal sepal ovate-oblong or ovate-lanceolate, 12–17 × 4–7 mm, 3–5-veined, acute or slightly obtuse; lateral sepals obliquely ovate-triangular or falcate-lanceolate, ca. as long as dorsal sepal, 10–13 mm wide at base, 3–5-veined, apex obtuse or acute; mentum subrectangular to conic, 5–7 × to ca. 6 mm, rounded. Petals oblong or ovate-oblong, 12–16 × 4–7 (or more) mm, 5–7-veined, apex obtuse or acute; lip elliptic-rhombic, broadly ovate, or ovate-lanceolate, 13–17 × 8–11 (or more) mm, slightly cuneate at base, entire or obscurely 3-lobed, middle recurved, margin ± undulate, apex acute; disk densely finely papillate-hairy or pilose, medially with a low thickening, terminating at ca. middle. Column 2–4 mm, foot 0.7–1 cm, upper part with lax purple-tipped hairs, apex purplish red, strongly thickened at point of attachment to lip; anther cap narrowly subelliptic, ovate-triangular, or ovate-conic, 1.5–3 mm, nearly glabrous, apex subacute and bilobed, lobes sharply toothed.

Lithophytic in moderately damp mountains; ca. 1600 m. SW Anhui (Dabie Shan), W Fujian (Ninghua), NW Guangxi (Tian'e), Sichuan, Taiwan, SE Yunnan, E Zhejiang (Tiantai, Xianju, Yinxian) [Japan].

**34. *Dendrobium scoriarum*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 201. 1921.

广西石斛 guang xi shi hu

*Dendrobium guangxiense* S. J. Cheng & C. Z. Tang; *D. mitriferum* Averyanov (2000), not J. J. Smith (1910).

Stems erect, slender, to 60 cm, 2–3 mm in diam. Leaves oblong, 4–4.5 × 1–1.5 cm, leathery, base sheathing. Inflorescences on old leafless stems, 1–3-flowered. Pedicel and ovary ca. 2.5 cm. Flowers whitish to yellowish, tinted pink, lip pale yellow flushed purple at base, with a purple transverse mark, anther cap wholly bright purple. Dorsal sepal ovate-lanceolate, ca. 15 mm, 5-veined, acute; lateral sepals ca. 16 mm, ca. 13 mm wide at base, 5-veined, subacute. Petals lanceolate, ca. 14 × 6 mm, very thin textured, subacute; lip 3-lobed, ca. 12 mm, ca. 9 mm wide at middle, margins serrulate, minutely pubescent near base; lateral lobes orbicular, ca. 4 mm in diam.; mid-lobe similar to lateral lobes, broadly ovate, ca. 6 mm, apex acute; disk ca. 4 mm, with central, ± square, swollen callosity. Column short.

Lithophytic on rocks or epiphytic on trees; ca. 1500 m. Guangxi, Yunnan [Vietnam].

**35. *Dendrobium flexicaule*** Z. H. Tsi, S. C. Sun & L. G. Xu, Bull. Bot. Res., Harbin 6(2): 113. 1986.

曲茎石斛 qu jing shi hu

?*Dendrobium henanense* J. L. Lu & L. X. Gao.

Stems cylindrical, slightly upcurved, 6–11 cm, 2–3 mm in diam., unbranched, with several nodes, internodes 1–1.5 cm, pale brownish yellow when dry. Leaves 2–4, alternate on upper part of stem, oblong-lanceolate, ca. 3 × 0.7–1 (or more) cm, subleathery, base decurrent into clasping sheaths, apex obtuse and slightly hooked. Inflorescences on old stems after leaves have fallen, 1- or 2-flowered; peduncle 1–2 cm, ca. 1 mm in diam.; basal sheaths 3 or 4, 2–4 mm, membranous; floral bracts

pale white, ovate-triangular, ca. 3 mm, apex acute. Pedicel and ovary yellowish green, tinged with pale purple, 3–4.5 cm. Flowers spreading; dorsal sepal yellowish green abaxially, upper part slightly tinged with pale purple; lateral sepals yellowish green, upper distal margins tinged with pale purple, mentum yellowish green; petals: lower part yellowish green, upper part pale purple; lip pale yellow, front margin pale purple, margin purple below middle, disk with a large purple flabellate blotch at middle front part, callus yellow; column yellowish green, stelia purple at base on outside, foot with 2 rounded purple spots, lower part yellowish green, apex purple, anther cap creamy white. Dorsal sepal oblong, ca. 28 mm, ca. 8 mm wide at middle, 5-veined, apex obtuse; lateral sepals obliquely ovate-lanceolate, ca. as long as dorsal sepal and broader, 5-veined, obtuse; mentum conic, ca. 8 × 10 mm, nearly rounded. Petals elliptic, ca. 25 mm, ca. 13 mm wide at middle, 5-veined, apex obtuse; lip broadly ovate, ca. 17 × 14 mm, adaxially densely pubescent, rear part with a saddle-shaped callus, base cuneate, margin inconspicuously 3-lobed, apex acute. Column ca. 3 mm, foot ca. 10 mm, sparsely covered with bifid hairs, upper part of hairs purple; column teeth 2, deltoid; anther cap subrhombic, ca. 2.5 mm, basal front margin with irregular teeth, apex deeply bilobed, lobes sharply toothed.

• Lithophytic on rocks in mountain valleys; 1200–2000 m. Henan, Hubei (Shennongjia), E Hunan (Heng Shan), SC Sichuan (Ganluo).

**36. *Dendrobium wanglingii*** G. W. Hu, C. L. Long & X. H. Jin, Bot. J. Linn. Soc. 157: 217. 2008.

王氏石斛 wang shi shi hu

Stems in 2 ranks along creeping rhizome, fusiform or slightly obovoid, 1.5–3 cm, to ca. 8 mm in diam., unbranched, with 3–6 nodes, internodes 0.2–0.8 cm, leaf sheaths membranous. Leaves 2–4, elliptic, 1–2 × 0.5–0.8 cm, apex acute; leaf sheath tightly embracing stem, membranous, white. Inflorescences on old leafless stems, 1-flowered; peduncle 0.4–0.7 cm; floral bracts ca. 1 mm. Pedicel and ovary 1.5–2 cm. Sepals and petals lilac-pink, lip white, lilac toward tip, with 2 greenish yellow patches on either side. Dorsal sepal ovate-elliptic, ca. 16 mm, ca. 4 mm wide at base, ca. 6 mm wide above, 5-veined, apex acute; lateral sepals obliquely triangular-oblong, ca. 20 × 6 mm, 5-veined, apex acute and slightly revolute; mentum sacate, ca. 5 × 4 mm, rounded. Petals elliptic, ca. 17 × 9 mm, 5-veined, margin slightly revolute, irregularly minutely toothed toward apex, apex obtuse; lip broadly obovate to flabellate, 20–22 × 15–18 mm, base cuneate, margin undulate; disk densely pubescent. Column 2–3 mm; stelia obtusely triangular, very short; foot ca. 5 mm; anther cap conic, ca. 2 mm, basal front margin 2-lobed, lobes obtusely triangular, irregularly toothed, apex and back 2-lobed, lobes rounded, finely verruculose. Capsule 1–1.5 × 0.5–0.8 cm.

• Epiphytic on deciduous *Quercus yunnanensis* in mixed deciduous and evergreen forests dominated by *Quercus*; ca. 2200 m. N Yunnan.

**37. *Dendrobium hookerianum*** Lindley, J. Proc. Linn. Soc., Bot. 3: 8. 1858.

金耳石斛 jin er shi hu

*Callista hookeriana* (Lindley) Kuntze; *Dendrobium fimbratum* Hooker var. *bimaculosum* Tang & F. T. Wang.

Stems pendulous, cylindric, 30–80 cm, 4–7 mm in diam., rigid, unbranched, with many nodes, internodes 2–5 cm, pale yellow when dry. Leaves alternate along entire stem, ovate-lanceolate or oblong, 7–17 × 2–3.5 cm, leathery, base slightly contracted and dilated into sheaths, upper part asymmetric, apex long acute; leaf sheath tightly embracing stem. Inflorescences 1 to several, along distal part of current season's mature leafy stems, 4–10 cm, laxly 2–7-flowered; peduncle 2.5–5 cm, often spreading outward at 90° angle to stem; basal sheaths 3 or 4, overlapping, lowermost shortest, upper longest; floral bracts ovate-lanceolate, 4–6 mm, apex acute. Pedicel and ovary 3–4 cm. Flowers spreading, thinly textured, golden yellow, disk with a purple blotch on each side. Dorsal sepal elliptic-oblong, 24–35 × 9–16 mm, 7-veined, acute; lateral sepals oblong, 24–35 × 9–16 (or more) mm, 7-veined, base oblique, apex subobtuse or acute; mentum conic, ca. 8 mm. Petals oblong, 24–35 × 10–18 (or more) mm, 7-veined, margin entire, apex subobtusate; lip suborbicular, 20–30 mm wide, adaxially densely pubescent, base shortly clawed, claw with a callus, margin compound fimbriate. Column ca. 4 mm, upper part enlarged; anther cap conic, glabrous, front margin denticulate.

Lithophytic on rocks in mountain valleys, epiphytic on tree trunks in mountain forests; 1000–2300 m. SE Xizang, W Yunnan [E and NE India].

H. P. Wood (Dendrobiums, 641. 2006) considered *Dendrobium hookerianum* to be on the borderline between *D.* sect. *Dendrobium* and *D.* sect. *Holochrysa*.

**38. *Dendrobium xichouense*** S. J. Cheng & C. Z. Tang, Acta Bot. Yunnan. 6: 280. 1984 [“*xichouensis*”].

西畴石斛 xi chou shi hu

Stems clustered, cylindric, equally thick above and below, upper part ± upcurved, 10–13 cm, ca. 4 mm in diam., unbranched, with many nodes, internodes 1–2 cm, enclosed in leaf sheaths that turn grayish white when mature. Leaves oblong or oblong-lanceolate, to 4 × ca. 1 cm, leathery, base with clasping sheath, apex obtuse and unequally bilobed. Inflorescence arising laterally on previous year's leafless stem, ca. 2 cm, 1- or 2-flowered; floral bracts small. Pedicel and ovary yellowish green, ca. 6 mm. Flowers fragrant, not spreading; sepals

and petals white, slightly tinged with pink, mentum pale yellowish green, lip white, disk yellow. Dorsal sepal suboblong, ca. 12 × 4 mm, apex acute; lateral sepals similar in size; mentum narrowly tubular, ca. 10 mm. Petals obovate-rhombic, slightly shorter than dorsal sepal, ca. 4 mm wide; lip subovate, ca. 16 mm, ca. 9 mm wide at most, base clawed, apex obtuse, lateral margins upcurved below middle, margin fimbriate; disk densely curled pale yellow villous.

• Epiphytic on tree trunks in mountain forests on limestone; ca. 1900 m. SE Yunnan (Xichou).

The present authors have not seen the type specimen (at IBSC). This treatment is based on the protologue.

**39. *Dendrobium leptocladum*** Hayata, Icon. Pl. Formosan. 4: 43. 1914.

菱唇石斛 ling chun shi hu

*Dendrobium tenuicaule* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 316. 1911, not J. D. Hooker (1890), nor Ridley (1899); *Grastidium leptocladum* (Hayata) Rauschert.

Stem pendulous, narrowly cylindric, 20–50 cm, ca. 1.5 mm in diam., usually branched, internodes 1.5–2 cm. Leaves linear or grasslike, 5–10 × 2.5–5 (or more) cm, base sheathing, with joint at junction with leaf blade, apex acute; leaf sheath persistent, tightly embracing stem. Inflorescence on lower part of leafless stem, 1- or 2-flowered. Pedicel and ovary 6–10 mm. Flowers half opening, snow-white. Dorsal sepal elliptic, ca. 12 × 4 mm, apex acute; lateral sepals obliquely ovate-lanceolate, ca. as long as dorsal sepal, 4–6 (or more) mm, base oblique, apex acute; mentum long and narrow, ca. 4 mm. Petals narrowly elliptic, ca. 12 × 3.5 mm, apex acute; lip rhombic, 14–15 × 7–8 (or more) mm, adaxial surface with curly hairs in center above middle, base contracted into a claw, margin inconspicuously 3-lobed; disk with 1 longitudinally compressed, thick central ridge. Column ca. 1 mm, foot ca. 5 mm, anther cap subrounded.

• Epiphytic on tree trunks in mountain forests, lithophytic on rocky cliffs in mountain valleys; 600–1600 m. Taiwan (Nantou, Taidong).

#### 4. *Dendrobium* sect. *Holochrysa* Lindley, J. Proc. Linn. Soc., Bot. 3: 7. 1858.

寡花组 gua hua zu

Roots smooth. Stems tall, leafy, uniformly swollen, fusiform, or tapered, semideciduous. Inflorescences a subterminal, multi-flowered (to 10-flowered) raceme borne on leafless penultimate stems or older stems, generally distal, arching. Flowers usually yellow (pink or orange in *Dendrobium moschatum*), creamy white with pink stripes, lip with dark spots [in *D. pulchellum* Roxburgh ex Lindley]; some species or varieties have a single or double maroon blotch on lip.

About 14 species: Himalayas, India to Taiwan and Indochina, one species extending to Indonesia; 12 species (three endemic) in China.

**40. *Dendrobium hancockii*** Rolfe, J. Linn. Soc., Bot. 36: 11. 1903.

细叶石斛 xi ye shi hu

*Dendrobium odiosum* Finet.

Stems erect, cylindric or sometimes with several nodes dilated and fusiform above base, to 80 cm, 2–20 mm in diam.,

rigid, usually branching, internodes to 4.7 cm, with longitudinal channels or stripes, deep yellow or orange when dry, glossy. Leaves often 3–6, alternate on main stem and upper part of branches, linear, 2.5–7 × 0.3–0.6 (or more) cm, with leathery sheaths at base, apex obtuse and unequally bilobed. Inflorescence 1–2.5 cm, 1- or 2-flowered raceme; peduncle 5–10 mm; floral bracts ovate, ca. 2 mm, membranous, apex acute. Pedicel and ovary pale yellowish green, 12–15 mm; ovary slightly

dilated; many clones  $\pm$  cleistogamous. Normal flowers slightly fragrant, spreading, thickly textured; sepals and petals golden yellow, lip golden yellow, lateral lobes with a few red striations inside, disk often pale green. Dorsal sepal ovate-elliptic, (10–)18–24  $\times$  (3.5–)5–8 mm, 7-veined, apex acute; lateral sepals ovate-lanceolate, ca. as long as dorsal sepal, but slightly narrower, 7-veined, apex acute; mentum broadly conic, ca. 5 mm. Petals obliquely obovate or subelliptic, ca. as long as dorsal sepal and broader, 7-veined, apex acute; lip 10–20 mm long and wide, with a basal callus, middle 3-lobed; lateral lobes embracing column,  $\pm$  subrounded, apex rounded; mid-lobe suboblate or ensiform-rounded, acute; disk with short, dense papillae between lateral lobes and extending to mid-lobe. Column ca. 5 mm, base slightly dilated, foot ca. 6 mm; column teeth subtriangular, apex short and obtuse; anther cap obliquely conic, surface smooth, front with 3 ridges, front margin denticulate.

Epiphytic on tree trunks in mountain forests, lithophytic on rocks in mountain valleys; 700–1500 m. S Gansu, NW Guangxi, S Guizhou, Henan, SE Hubei, SE Hunan, Shaanxi, S Sichuan, NE and SE Yunnan [N Vietnam].

One of us (H. P. Wood, *Dendrobiums*, 638, 2006) has noted that the sectional placement of *Dendrobium hancockii* remains unclear. In addition, two entities are being offered as *D. hancockii* in the horticultural trade, both often mislabeled “*D. hainanense*.” One, true *D. hancockii*, has leaves linear, retuse, ca. 3 cm  $\times$  3 mm; petals clavate; and lip inrolled with clear lateral lobes. The other, an undescribed taxon, has leaves lanceolate, ca. 15 cm  $\times$  3 mm; sepals and petals narrower and pointed; and lip flat, cordate, with lateral lobes indistinct.

**41. *Dendrobium lohohense*** Tang & F. T. Wang, *Acta Phytotax. Sin.* 1: 82. 1951.

罗河石斛 *luo he shi hu*

Stems cylindrical, to 80 cm, 3–5 mm in diam., slightly rigid, with many nodes, internodes 13–23 mm, upper nodes bearing roots and new shoots (keikis), golden yellow when dry, with several longitudinal ridges. Leaves borne in 2 rows, oblong, 3–4.5  $\times$  0.5–1.6 (or more) cm, leathery, with clasping sheaths at base, apex acute; sheath sparsely clasping when dry, sheath mouth often open. Inflorescences 1-flowered, arising laterally on top of stem or axillary, erect; peduncle absent; floral bracts broadly ovate, small, ca. 3 mm, waxy, apex acute. Pedicel and ovary to 15 mm; ovary often clavate. Flowers spreading, waxy yellow, slightly fleshy. Dorsal sepal elliptic, ca. 15  $\times$  9 mm, 7-veined, bluntly rounded; lateral sepals obliquely elliptic, slightly longer than dorsal sepal, but relatively narrow, 7-veined, obtuse; mentum subglobose, ca. 5 mm. Petals elliptic, ca. 17  $\times$  10 mm, 7-veined, bluntly rounded; lip entire, obovate, ca. 20  $\times$  17 mm, base cuneate and both sides embracing column, front margin irregularly denticulate. Column ca. 3 mm, apex with 2 teeth on either side; anther cap subspherical, glabrous, margin denticulate, apex subtruncate and reflexed upward. Capsule elliptic-globose, ca. 4  $\times$  1.2 cm.

• Mountain valleys, lithophytic on rocks at forest margins; 1000–1500 m. Chongqing, N Guangdong, SE Guangxi, W Guizhou, W Hubei, Hunan, SE Yunnan.

One of us (H. P. Wood) notes that the plant described in the protologue of *Dendrobium lohohense* is very similar to *D. henryi*, and the two taxa may be conspecific.

**42. *Dendrobium moschatum*** (Buchanan-Hamilton) Swartz, *Neues J. Bot.* 1: 94. 1805.

杓唇石斛 *shao chun shi hu*

*Epidendrum moschatum* Buchanan-Hamilton in Symes, *Embassy Ava*, 478. 1800; *Callista calceolaria* (Carey ex Hooker) Kuntze; *C. moschata* (Buchanan-Hamilton) Kuntze; *Cymbidium moschatum* (Buchanan-Hamilton) Willdenow; *Dendrobium calceolaria* Carey ex Hooker; *D. cupreum* Lindley; *D. moschatum* var. *cupreum* (Lindley) H. G. Reichenbach; *D. moschatum* var. *unguipetalum* I. Barua; *Thicuania moschata* (Buchanan-Hamilton) Rafinesque.

Stems erect, cylindrical, to 1 m, stout, 6–8 mm in diam., rigid, unbranched, with many nodes, internodes ca. 3 cm. Leaves alternate along upper part of stem, oblong to oval-lanceolate, 10–15  $\times$  1.5–3 cm, leathery, base with clasping papery sheaths, apex acuminate or unequally bilobed. Inflorescences racemose, on old leafless stems, pendulous, ca. 20 cm, laxly several to more than 10-flowered; peduncle ca. 5 cm; basal sheaths 4, overlapping, cupular; floral bracts oblong, 12–20  $\times$  3–5 (or more) mm, leathery, apex obtuse. Pedicel and ovary to 5 cm. Flowers deep yellow [or pink or white with rose tips], disk with a pale purplish brown blotch on either side, column yellow, anther cap purple. Dorsal sepal oblong, 24–35  $\times$  11–14 mm, 6- or 7-veined, apex obtuse; lateral sepals oblong, 24–35  $\times$  9–10 (or more) mm, 5-veined, base slightly oblique, apex slightly acute; mentum conic, short and wide, ca. 6 mm. Petals obliquely broadly ovate, 26–35  $\times$  17–23 mm, 7-veined, apex obtuse; lip rounded, slipperlike, ca. 24  $\times$  22 mm, abaxially glabrous, adaxially densely pubescent, margin involute and cucullate. Column ca. 4 mm, foot ca. 4 mm; anther cap conic, adaxially glabrous, front margin irregularly denticulate.

Epiphytic on tree trunks in open forests; ca. 1300 m. S and W Yunnan [Bhutan, N India, Laos, Myanmar, Nepal, Thailand, Vietnam].

Plants from China and Thailand, including the type of *Dendrobium cupreum*, are  $\pm$  yellow-flowered and thus differ from plants from the rest of the range, including the type of *D. moschatum*, which has pink or white flowers with rose tips. This might well deserve formal taxonomic recognition.

**43. *Dendrobium menglaense*** X. H. Jin & H. Li, *Ann. Bot. Fenn.* 43: 296. 2006 [“*menglaensis*”].

勐腊石斛 *meng la shi hu*

Stems  $\pm$  clustered, compressed, 10–20 cm, to 7 mm wide, at apex ca. 1.5 mm in diam., often branching from upper nodes, internodes 2–2.5 cm, enclosed by persistent leaf sheaths. Leaf apparently solitary, subterminal, lanceolate, 6–8  $\times$  ca. 1.5 cm, apex unequally acuminate. Inflorescence from apex of previous year’s leafy or deciduous stem, ca. 1 cm, 1-flowered; bract ovate, ca. 2 mm. Pedicel and ovary ca. 2 cm. Flowers yellow, lip golden yellow with purple blotch near center of epichile, column yellow, anther cap white. Dorsal sepal elliptic, ca. 16  $\times$  8 mm, 7-veined, acute; lateral sepals obliquely elliptic, ca. 20  $\times$  9 mm, 7-veined; mentum oblong, short and wide, ca. 7  $\times$  5 mm. Petals narrowly ovate, ca. 15  $\times$  8 mm, 7-veined; lip slipper-shaped, ca. 20  $\times$  8 mm, with incurved margin; hypochile ca. 5  $\times$  5 mm; lateral lobes inrolled, entire; epichile ca. 15  $\times$  8 mm, apex 2-lobed. Column ca. 4 mm, adaxially hairy, foot ca. 9 mm.

• Lithophytic or rarely epiphytic, on limestone; ca. 1200 m. S Yunnan (Mengla).

This species is known only from a single population with only ca. 50 plants.

**44. *Dendrobium chryseum*** Rolfe, Gard. Chron., ser. 3, 3: 233. 1888.

线叶石斛 xian ye shi hu

*Aporum rivesii* (Gagnepain) Rauschert; *Callista aurantiaca* Kuntze; *Dendrobium aurantiacum* H. G. Reichenbach (1887), not (F. Mueller) F. Mueller (1870); *D. aurantiacum* var. *zhaajuense* (S. C. Sun & L. G. Xu) Z. H. Tsi; *D. chryseum* var. *bulangense* G. X. Ma & J. Xu; *D. clavatum* Wallich ex Lindley var. *aurantiacum* Tang & F. T. Wang; *D. flaviflorum* Hayata; *D. rivesii* Gagnepain; *D. rolfei* A. D. Hawkes & A. H. Heller; *D. tibeticum* Schlechter; *D. zhaajuense* S. C. Sun & L. G. Xu.

Stems cylindric, usually 25–35 cm, slender, 2–4 mm in diam., unbranched, with many nodes, internodes 2.5–4 cm, pale yellow or yellowish brown when dry. Leaves linear or narrowly oblong, 8–10 × 0.4–1.4 cm, leathery, base sheathing, apex obtuse and emarginate or sometimes subacute and obliquely hooked; leaf sheath tightly embracing stem. Inflorescence lateral on old leafless stem, ca. 1 cm, usually 1 or 2(or 3)-flowered; peduncle suberect, ca. 0.5 cm; basal sheaths 3 or 4, overlapping, pale white, cupular or tubular, papery, basal ones short, distally elongate, 5–20 mm; floral bracts pale white, cymbiform, 12–13 × ca. 5 mm, membranous, apex obtuse. Pedicel and ovary ca. 3 cm. Flowers spreading, ca. 6.5 cm wide, concolorous yellow, center a darker shade, occasionally with large purple spots on sepals and petals and a purple spot on lip disk, inner surface of lip sometimes with several red stripes. Dorsal sepal oblong-elliptic, 23–25 × 11–14 mm, 5-veined, obtuse; lateral sepals slightly obliquely oblong, ca. as long as dorsal sepal or slightly narrower, 5-veined, apex obtuse; mentum conic, ca. 6 mm. Petals elliptic or broadly elliptic-obovate, 24–26 × 14–17 mm, 3-veined, lateral major veins branched, apex obtuse; lip suborbicular, ca. 25 × 22 mm, adaxially densely pilose, both sides embracing column below middle, claw ca. 3 mm, margin irregularly denticulate, disk without markings. Column ca. 4 mm, foot ca. 3 mm; anther cap narrowly conic, ca. 4 mm, glabrous, apex subtruncate. Fl. May–Jun.  $2n = 38$ .

Epiphytic on tree trunks in high-mountain broad-leaved forests; 1700–2600 m. C Sichuan (Ebian, Emei Shan), Taiwan, NW to SE Yunnan [NE India, Myanmar].

*Dendrobium chryseum* has been more widely known as *D. aurantiacum* H. G. Reichenbach but that name is illegitimate because it is a later homonym. Plants from 1700–1800 m in C and S Sichuan and Yunnan with pale purple markings on the sepals and a purple spot on the lip disk have been referred to *D. aurantiacum* var. *zhaajuense*.

Seidenfaden (Opera Bot. 83. 1985) united two distinct entities under *Dendrobium chryseum*, namely *D. chryseum* and *D. denneanum* (see below).

**45. *Dendrobium denneanum*** Kerr, J. Siam Soc., Nat. Hist. Suppl. 9: 229. 1933.

叠鞘石斛 die qiao shi hu

*Callista clavata* Kuntze; *Dendrobium aurantiacum* H. G. Reichenbach var. *denneanum* (Kerr) Z. H. Tsi; *D. clavatum* Wallich ex Lindley (1852), not Roxburgh (1832).

Stems robust, to 47 cm, more than 4 mm in diam. Leaves oblanceolate, to 11 × 1.8–4.5 cm. Inflorescences subapical on leafless penultimate and older stems, stiffly arching, 5–14 cm, to 7-flowered; floral bracts prominent, 1.8–3 cm. Flowers ca. 5 cm wide, orange-yellow, lip with a maroon center or large purple spots on adaxial surface; many clones ± cleistogamous.

Epiphytic on tree trunks in open forests; 600–2500 m. W Guangxi, S Guizhou, Hainan (Bawangling), NW to SE Yunnan [India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**46. *Dendrobium jiajiangense*** Z. Y. Zhu, S. J. Zhu & H. B. Wang, Bull. Bot. Res., Harbin 28: 385. 2008.

夹江石斛 jia jiang shi hu

Stems clustered, cylindric, 35–60 cm, slender, 2–5 mm in diam., internodes green or pale yellowish green with white membranous leaf sheaths, grooved and angular. Leaf blade linear or linear-lanceolate, 6–8 × 0.9–1.2 cm, leathery or thinly so, base narrowed into amplexicaul sheath, apex obtuse or obliquely retuse; leaf sheath with raised veins. Inflorescence lateral on previous year's leafless stem, ascending, to 6 cm, 1 or 2(or 3)-flowered; peduncle 2.5–3 cm; basal sheaths 3 or 4, pale purplish, cupular or tubular, thickly papery, 4–15 mm, with raised veins; floral bracts pale purplish, cymbiform, 15–20 × ca. 5 mm, thickly papery, apex obtuse. Pedicel and ovary 1–2.5 cm. Flowers scented, spreading, golden yellow, base of lip purple striate, disk sometimes golden yellow spotted, anther cap white. Dorsal sepal oblong or oblong-elliptic, 24–26 × 10–11 mm, 6- or 7-veined, apex obtuse; lateral sepals shorter and narrower, 6- or 7-veined, base slightly oblique, apex obtuse; mentum conic, 3–4 mm. Petals broadly elliptic or ovate, 14–22 × 11–17 mm, 3-veined, lateral major veins branched, apex rounded; lip broadly ovate, 17–21 × 21–22 mm, adaxially densely tomentose, with claw 3–4 mm, margin irregularly denticulate. Column 4–5 mm, foot ca. 3 mm; anther cap conic, front margin toothed.

• 1000–1300 m. Sichuan.

This species is known to us only from the protologue.

**47. *Dendrobium fimbriatum*** Hooker, Exot. Fl. 1: ad t. 71. 1823.

流苏石斛 liu su shi hu

*Callista fimbriata* (Hooker) Kuntze; *C. oculata* (Hooker) Kuntze; *Dendrobium fimbriatum* var. *oculatum* Hooker; *D. paxtonii* Paxton.

Stems rigid, decumbent or pendulous, cylindric or sometimes slightly fusiform above base, 50–100 cm, stout, 8–12(–20) mm in diam., unbranched, with many nodes, internodes 3.5–4.8 cm, longitudinally grooved, pale yellow or pale yellowish brown when dry. Leaves oblong or oblong-lanceolate, 8–15.5 × 2–3.6 cm, leathery, with tightly clasping leathery sheaths at base, apex acute, sometimes slightly bilobed. Inflorescences racemose, 5–15 cm, laxly 6–12-flowered; peduncle

2–4 cm; rachis thin, ± curved; basal sheaths several, overlapping, tubular, basal one shortest, ca. 3 mm, terminal ones to 10 mm, membranous; floral bracts ovate-triangular, 3–5 mm, membranous, apex acute. Pedicel and ovary pale green, 2.5–3 cm. Flowers slightly fragrant, spreading, thinly textured; sepals and petals golden yellow, lip a deeper hue, with purplish red stripes on either side at base, disk with a lunate transverse deep purple marking. Dorsal sepal oblong, 13–18 × 6–8 (or more) mm, 5-veined, margin entire, apex obtuse; lateral sepals ovate-lanceolate, ca. as long as dorsal sepal and slightly narrower, 5-veined, base oblique, margin entire, apex obtuse; mentum rotund, ca. 3 mm. Petals oblong-elliptic, 12–19 × 7–10 (or more) mm, 5-veined, margin slightly erose, apex obtuse; lip suborbicular, 15–20 mm, adaxially densely pubescent, base narrowed into a claw ca. 3 mm, margin compound fimbriate. Column ca. 2 mm, foot ca. 4 mm; anther cap conic, glabrous, front margin denticulate.

Epiphytic on tree trunks in dense forests, lithophytic on damp rocks in mountain valleys; 600–1700 m. NW to S Guangxi, S Guizhou, S Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

**48. *Dendrobium gibsonii*** Lindley, Paxton's Mag. Bot. 5: 169. 1838.

曲轴石斛 qu zhou shi hu

*Callista binocularis* (H. G. Reichenbach) Kuntze; *C. gibsonii* (Lindley) Kuntze; *Dendrobium binoculare* H. G. Reichenbach; *D. fimbriatum* Hooker var. *gibsonii* (Lindley) Finet; *D. fuscatum* Lindley.

Stems oblique or pendulous, cylindrical, 35–100 cm, 7–8 mm in diam., rigid, upper part sometimes slightly curved, unbranched, with many nodes, internodes 2.4–3.4 cm, with longitudinal grooves, pale yellow when dry. Leaves oblong or sub lanceolate, 10–15 × 2.5–3.5 cm, leathery, base with papery sheaths, apex acute. Inflorescence apical on old leafless stem, often pendulous, 15–20 cm, sparsely several to 10- or more flowered; peduncle 1–2 cm; rachis dark purple, often flexuous; basal sheaths 4 or 5, overlapping, tubular or cupular, basal ones ca. 3 mm, upper ones to 1 cm, papery; floral bracts lanceolate, concave, cymbiform, 5–7 mm, apex acute. Pedicel and ovary 2.5–3.5 cm. Flowers spreading, orange, disk with a rounded chestnut or deep purple blotch on each side, anther cap pale yellow. Dorsal sepal elliptic, 14–16 × 10–11 (or more) mm, 7-veined, apex obtuse; lateral sepals oblong, 14–16 × 9–10 (or more) mm, 7-veined, apex obtuse; mentum subglobose, ca. 4 mm. Petals subelliptic, 14–16 × 8–9 (or more) mm, 5-veined, margin entire, apex obtuse; lip subreniform, ca. 15 × 17 mm, adaxially densely finely papillate, base clawed, margin shortly fimbriate, apex emarginate. Column ca. 3 mm, foot ca. 3 mm; anther cap nearly subglobose, glabrous, front margin slightly erose.

Epiphytic on tree trunks in open forests; 800–1000 m. Guangxi (Lingyun), S Yunnan [Bhutan, NE India, Myanmar, Nepal, N Thailand, Vietnam].

**49. *Dendrobium capillipes*** H. G. Reichenbach, Gard. Chron. 1867: 997. 1867.

短棒石斛 duan bang shi hu

*Callista capillipes* (H. G. Reichenbach) Kuntze.

Stems nearly compressed fusiform, 8–15 cm, at middle ca. 1.5 cm in diam., fleshy, unbranched, with many obtuse longitudinal ridges and few internodes. Leaves 2–4, near apex of stem, narrowly oblong, usually 10–12 × 1–1.5 cm, leathery, base dilated into clasping sheaths, apex slightly obtuse and obliquely emarginate. Inflorescences from old leafless stems, suberect, 12–15 cm, laxly 2- to several flowered; peduncle with 2 or 3 sheaths at base, membranous; floral bracts pale white, ovate, small, ca. 5 × 3 mm, apex acute. Pedicel and ovary pale yellowish green, ca. 2 cm. Flowers spreading; sepals and petals golden yellow, lip a deeper hue, with purplish red stripes, column golden yellow. Dorsal sepal ovate-lanceolate, ca. 12 mm, ca. 5 mm wide at middle, 3-veined, apex acute; lateral sepals nearly equal in size to dorsal sepal; mentum oblong, ca. 4 mm, obtuse-rounded. Petals ovate-elliptic, ca. 15 × 9 mm, 4-veined, apex slightly obtuse; lip subensiform, ca. 20 × 25 mm, both surfaces densely pubescent, embracing column on both sides at base, margin undulate, apex emarginate. Column ca. 4 mm; anther cap ± tower-shaped, front margin subtruncate and notched; clinandrium broad, both lateral upper margins irregularly notched.

Epiphytic on tree trunks in evergreen broad-leaved forests; 900–1500 m. S Yunnan [NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

A related Indochinese species, *Dendrobium braianense* Gagnepain (Bull. Mus. Natl. Hist. Nat., sér. 2, 10. 436. 1938), originally described from Vietnam and treated in synonymy under *D. capillipes* by Seidenfaden (Opera Bot. 114: 229. 1992), is a showier, more floriferous plant. This entity reappeared in markets in Thailand in the 1990s and was treated as a distinct species by H. P. Wood (Dendrobiums, 599–600. 2006), with *D. capillipes* var. *elegans* H. G. Reichenbach and *D. ejirii* T. Yukawa in synonymy. H. P. Wood believes that *D. braianense* may not occur in China, although he included Yunnan within its distribution in his book (loc. cit.: 600). A brief description is provided here for comparison with *D. capillipes*: stem pseudobulbous, slightly clavate, to 17 × 1.5 cm, variably deciduous; leaf ca. 10 × 2.5 cm; inflorescences borne on last year's leafy or leafless stems, sometimes on older stems; racemes lateral, up to 3 per stem, arching, up to 7-flowered (bloom may repeat at a different node); flowers ca. 4 cm in diam.; anther cap pointed.

**50. *Dendrobium dixanthum*** H. G. Reichenbach, Gard. Chron. 1865: 674. 1865.

黄花石斛 huang hua shi hu

*Callista dixantha* (H. G. Reichenbach) Kuntze.

Stems erect or pendulous, cylindrical, 50–100 cm, slender, 3–6 mm in diam., unbranched, deciduous, with many nodes, internodes 2.5–3 cm, with many longitudinal ridges, pale yellow when dry. Leaves ovate-lanceolate, 8–11 (–13) × ca. 1 cm, leathery, base with clasping sheath, apex long acuminate. Inflorescences often 2–4, from old leafless stems, 2–5-flowered; peduncle 1–2 cm, slender; basal sheaths 2 or 3, short, membranous; floral bracts ovate, ca. 2 mm, membranous, acute. Pedicel and ovary ca. 2 cm, slender. Flowers spreading, thinly textured, deep yellow, lip with purplish red stripes on either side at base. Dorsal sepal oblong-lanceolate, ca. 23 × 6 mm, 5-veined, apex acute; lateral sepals equal in size to dorsal sepal, base slightly

oblique; mentum subcylindric, ca. 4 mm. Petals suboblong, ca.  $23 \times 10$  mm, 5-veined, base contracted, margin irregularly denticulate, apex acute; lip suborbicular, ca.  $22 \times 25$  mm, adaxially densely barbellate, margin erose, apex emarginate. Column very short, ca. 5 mm, foot ca. 4 mm; anther cap conic, densely finely papillate, front margin irregularly dentate, apex obtuse. Capsule narrowly cylindric,  $6-7 \times 0.5-0.6$  cm, with a stalk ca. 1 cm.

Epiphytic on tree trunks in mountain forests; 800–1200 m. S Yunnan [Laos, Myanmar, Thailand].

This species was misidentified by S. C. Chen and Z. H. Tsi (Orchids China, 156. 1998) as *Dendrobium moulmeinense* (a synonym of *D. devonianum* in the present treatment).

**51. *Dendrobium henryi*** Schlechter, Repert. Spec. Nov. Regni Veg. 17: 67. 1921.

疏花石斛 shu hua shi hu

*Dendrobium daoense* Gagnepain; *D. evaginatum* Gagnepain; *Grastidium daoense* (Gagnepain) Rauschert.

Stems ascending or pendulous, cylindric, 30–80 cm, 5–8 mm in diam., unbranched, with many nodes, internodes 3–4.5 cm, pale yellow when dry. Leaves oblong or oblong-lanceolate,  $8.5-11 \times 1.7-3$  cm, leathery, base contracted and dilated into

sheaths, apex acuminate or acute; leaf sheath tightly embracing stem, papery, sheath mouth often open when dry. Inflorescence on middle part of old leafy or leafless stems, 1- or 2-flowered; peduncle nearly perpendicular to stem, 1.5–2.5 cm; basal sheaths 3 or 4, tubular, 2–3 mm, membranous; floral bracts ovate-triangular, 6–9 mm, papery, apex obtuse. Pedicel and ovary ca. 2 cm. Flowers fragrant, thinly textured, golden yellow. Dorsal sepal ovate-oblong,  $23-30 \times 10-12$  (or more) mm, 7-veined, with many transverse veins, apex obtuse; lateral sepals ovate-lanceolate,  $23-30 \times 10-12$  (or more) mm, apex acuminate; mentum broadly conic, ca. 5 mm, apex rounded. Petals slightly obliquely broadly ovate, slightly shorter than sepal, but relatively wide, 7-veined, with many secondary veins, base shortly clawed, apex acute; lip suborbicular, 2–3 cm, base with a claw ca. 3 mm, both sides embracing column, margin irregularly denticulate; disk concave, densely finely papillate. Column ca. 3 mm; anther cap conic, ca. 2 mm, densely finely papillate, front margin  $\pm$  irregularly serrate.

Epiphytic on tree trunks in mountain forests, lithophytic on damp rocks in mountain valleys; 600–1700 m. C and N Guangxi, SW Guizhou, S Hunan, S Yunnan [Thailand, N Vietnam].

H. P. Wood (Dendrobiums, 640. 2006) tentatively placed *Dendrobium henryi* in *D.* sect. *Holochrysa*.

**5. *Dendrobium* sect. *Distichophylla*** J. D. Hooker, Fl. Brit. India 5: 711. 1890 [*“Distichophyllae”*].

心叶组 xin ye zu

Roots smooth. Stem evenly swollen, cylindric, leafy, usually tall, in some species deciduous. Leaves closely spaced, distichous, in 2 rows, usually short, stiffly textured, base cordate, clasping, and decurrent into sheaths. Inflorescences borne at each node on recent and older leafy stems, 1- to several flowered. Flowers solitary, leaf opposed, resupinate or not resupinate, usually white, medium-sized, shortly pedicellate. Sepals and petals sometimes reflexed; mentum straight, narrowly saccate, its elements fused distally into a spur.

About 30 species: Himalayas to Oceania, most in Indonesia; one species in China.

**52. *Dendrobium ellipsophyllum*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 81. 1951.

反瓣石斛 fan ban shi hu

*Distichorchis ellipsophylla* (Tang & F. T. Wang) M. A. Clements.

Stems erect or ascending, cylindric, ca. 50 cm, ca. 5 mm in diam., uniformly thick, with longitudinal ribs, unbranched, with many nodes, internodes ca. 2 cm, enclosed in leaf sheaths. Leaves alternate and dense along whole stem, elliptic,  $4-5 \times 1.5-1.9$  (or more) cm, base cordate, clasping and decurrent into sheaths tightly embracing stem, apex obtuse and unequally 2-lobed. Inflorescences many, (apparently) leaf-opposed, 1-flowered; floral bracts small. Pedicel and ovary bent downward, ca. 2 cm, slender. Flowers scented, white, disk yellow above mid-

dle, keels brownish purple. Dorsal sepal reflexed, ovate-oblong, ca.  $8 \times 5$  mm, apex acute; lateral sepals reflexed, oblong-lanceolate, ca.  $8 \times 5$  mm, apex acute; mentum angulate, ca. 7 mm. Petals recurved, narrowly lanceolate, ca.  $7 \times 4$  mm, apex acute; lip larger than sepals, fleshy, 3-lobed,  $\pm$  decurved and folded along axis; lateral lobes deltoid, small, ca. 2 mm, acute; mid-lobe nearly transversely oblong or rounded, somewhat large, ca.  $10 \times 15$  mm, subtruncate and broadly emarginate, central part of disk with 3 keeled ridges.

Epiphytic on tree trunks in broad-leaved mountain forests; ca. 1100 m. SE Yunnan (Menghai, Mengla) [Cambodia, Laos, Myanmar, Thailand, Vietnam].

This species was misidentified by Z. H. Tsi (Acta Phytotax. Sin. 18: 434. 1980) as *Dendrobium revolutum* Lindley.

**6. *Dendrobium* sect. *Breviflora*** J. D. Hooker, Fl. Brit. India 5: 711. 1890 [*“Breviflores”*].

瘦轴组 shou zhou zu

Roots smooth. Stem erect or pendulous, tall, slender or slightly swollen, leafy, semideciduous, sometimes growing for 2 years. Inflorescences lateral, short, often distal, pendulous, borne on bare penultimate leads, few flowered, flowers sometimes clustered; peduncle and rachis thin and rigid. Flowers small, pink, white, or brownish. Mentum saccate, with an expanded cavity. Lip concave, cymbiform, entire, interior often shortly hairy.

About seven species: Himalayas, some species extending through Indochina and Malaysia to the Philippines; two species in China.

**53. *Dendrobium hercoglossum*** H. G. Reichenbach, Gard. Chron., n.s., 25: 487. 1886.

重唇石斛 chong chun shi hu

*Callista annamensis* Kraenzlin; *C. hercoglossa* (H. G. Reichenbach) Kuntze; *C. vexans* (Dammer) Kraenzlin; *Dendrobium hercoglossum* var. *album* S. J. Cheng & C. Z. Tang; *D. poilanei* Guillaumin; *D. vexans* Dammer; *D. wangii* C. L. Tso.

Stems pendulous, pale yellow when dry, cylindrical or sometimes thickened from base to upper part, usually 8–40 cm, 2–5 mm in diam., with few to many nodes, internodes 1.5–2 cm. Leaves narrowly oblong or oblong-lanceolate, 4–10 × 0.4–0.8(–1.4) cm, leathery, with tightly clasping sheaths at base, apex obtuse and unequally bilobed. Inflorescences often several, arising from old leafless stems, 2- or 3-flowered; peduncle green, 6–10 mm; rachis sometimes slightly upcurved, 1.5–2 cm, thin and weak, base with 3 or 4 short tubular sheaths; floral bracts ovate-lanceolate, small, 3–5 mm, dry membranous, apex acute. Pedicel and ovary pale pinkish red, 1.2–1.5 cm. Flowers spreading; sepals and petals pale pink, lip white, epichile pale pink, column white, anther cap purple. Dorsal sepal ovate-oblong, 13–18 × 5–8(or more) mm, 7-veined, apex acute; lateral sepals slightly obliquely ovate-lanceolate, ca. as large as dorsal sepal, 7-veined, apex acuminate; mentum very short. Petals obovate-oblong, 12–15 × 4.5–7(or more) mm, 3-veined, apex acute; lip erect, ca. 1 cm, with epichile and hypochile; hypochile subglobose, inner surface densely barbellate, apex densely shortly fimbriate; epichile deltoid, relatively small, glabrous, apex acute. Column ca. 4 mm, lower part enlarged, foot ca. 2 mm, column teeth deltoid, apex slightly obtuse; anther cap subspherical, densely finely papillate, front margin erose.

Epiphytic on tree trunks in dense mountain forests, lithophytic on damp rocks in valleys; 600–1300 m. SW Anhui (Huo Shan), SW Guangdong (Xinyi), Guangxi, SW Guizhou, Hainan, Hunan (Jianghua), S Jiangxi, SE Yunnan [Laos, Malaysia, Thailand, Vietnam].

**7. *Dendrobium* sect. *Stuposa*** Kraenzlin in Engler, Pflanzenr. 45(IV. 50. II. B. 21): 55. 1910.

叉唇组 cha chun zu

Roots smooth. Stem ± pendulous, tall, slightly swollen, leafy, semideciduous. Inflorescences few, short, distal, borne on penultimate stems; rachis and peduncle thin and soft, few flowered. Flowers relatively small, white. Sepals less than 1 cm; mentum broadly conic, without a saccate cavity; lip apex 3-lobed, front margin with dense, long cottony hairs.

About six species: Himalayas to Malesia; one species in China.

**55. *Dendrobium stuposum*** Lindley, Edwards's Bot. Reg. 24(Misc.): 52. 1838.

叉唇石斛 cha chun shi hu

*Callista flavidula* (Ridley ex J. D. Hooker) Kuntze; *C. stuposa* (Lindley) Kuntze; *Dendrobium exsculptum* Teijsmann & Binnendijk; *D. flavidulum* Ridley ex J. D. Hooker; *D. pristinum* Ames; *D. sphenoglossum* H. G. Reichenbach.

Stems cylindrical, 5–30 cm, 3–6 mm in diam., lower part narrowed, with 5–17 nodes, internodes 1.5–2.5 cm, with many

**54. *Dendrobium aduncum*** Wallich ex Lindley, Edwards's Bot. Reg. 28(Misc.): 58. 1842.

钩状石斛 gou zhuang shi hu

*Callista adunca* (Wallich ex Lindley) Kuntze; *Dendrobium aduncum* var. *faulhaberianum* (Schlechter) Tang & F. T. Wang; *D. faulhaberianum* Schlechter.

Stems pendulous, sometimes upper part ± curved, pale yellow when dry, cylindrical, 50–100 cm, 2–5 mm in diam., unbranched, with many nodes, internodes 3–3.5 cm. Leaves oblong or narrowly elliptic, 7–10.5 × 1–3.5 cm, with clasping sheaths at base, apex acute. Inflorescences often several, arising from upper part of deciduous or leafy old stem; rachis ± porrect, 1.5–4 cm, slender, sparsely 1–6-flowered; peduncle 5–10 mm, base with 3 or 4 membranous sheaths 2–3 mm; floral bracts ovate-lanceolate, 5–7 mm, membranous, acute. Pedicel and ovary ca. 1.5 cm. Flowers spreading; sepals and petals pale pink, lip white, callus green, column white, anther cap deep purple. Dorsal sepal oblong-lanceolate, 16–20 × ca. 7 mm, 5-veined, apex acute; lateral sepals obliquely ovate-triangular, ca. as long as or slightly broader than dorsal sepal, 5-veined, apex acute; mentum jarlike, ca. 1 cm. Petals oblong, 14–18 × ca. 7 mm, 5-veined, apex acute; lip concave, cymbiform, broadly ovate when spread, 15–17 mm, claw ca. 5 mm, adaxially densely white barbellate except for claw and both sides of disk, with a square callus near base, apex abruptly contracted, recurved-caudate. Column ca. 4 mm, lower part enlarged, apex with auriculate column teeth on both sides, front densely purple crinite, foot ca. 1 cm long and wide, bent forward, inner surface sometimes sparsely hairy; anther cap nearly subglobose, densely papillate-hairy, front margin irregularly dentate, apex slightly concave.

Epiphytic on tree trunks in mountain forests; 700–1000 m. Guangdong, Guangxi, SW Guizhou, SE Hainan, NE Hunan (Taoyuan), SE Yunnan (Maguan) [Bhutan, NE India, Myanmar, Thailand, Vietnam].

longitudinal ridges. Leaves narrowly oblong-lanceolate, 4–7.5 × 0.4–1.5(or more) cm, leathery, base with clasping sheath, apex slightly obtuse and hooked on one side. Inflorescence apical on old leafless stem, 1–2.5 cm, 2- or 3-flowered; peduncle 10–15 mm, ca. 1 mm in diam.; rachis thin and soft; basal sheaths 3 or 4, broadly cupular; floral bracts oblong, 5–9 × 2.5–3(or more) mm, papery, obtuse. Pedicel and ovary 0.6–1.1 cm, slender. Flowers small, white. Dorsal sepal oblong, ca. 8 × 3 mm, 5-veined, midvein prominent, apex subacute; lateral sepals obliquely ovate-lanceolate, larger than dorsal sepal, 5-veined, midvein abaxially winged especially below middle, apex sub-

acute; mentum conic, ca. 4 mm. Petals obovate-elliptic, ca. 8 × 3 mm, 5-veined, margin near apex sometimes laxly shortly ciliate, apex obtuse; lip obovate-triangular, ca. 9 mm, base cuneate, apex 3-lobed; lateral lobes ovate-triangular, margin with dense, matted, long white cottony hairs, apex sharply toothed; mid-lobe ovate-triangular, margin similarly hairy, obtuse; disk

densely villous, with a broadly keeled rib extending from base to apex, apex thickened. Column short; column teeth triangular, acute.

Epiphytic on tree trunks in open and mountain forests; ca. 1800 m. S Yunnan [Bhutan, NE India, Indonesia, Malaysia, Myanmar, Philippines, Thailand].

**8. *Dendrobium* sect. *Calcarifera*** J. J. Smith, Bull. Dépt. Agric. Indes Néerl. 15: 14. 1908.

长爪石斛组 *chang zhao shi hu zu*

Roots verrucose in most species. Stems often pendulous, slender or fusiform, leafy, semideciduous, often pseudoindefinite (growing more than 1 year). Inflorescences multiple short lateral racemes borne on penultimate and older leafless canes, usually pendulous, in some species geotropic, flowers facing horizontally. Flowers medium-sized to rather large, opening widely, mostly purple, pink, or white. Pedicel inserted at a right angle to mentum. Mentum elongated and narrow, sometimes angled or curled, nectar copious in most species. Lip usually entire, expanded; disk with grooves, ridges, or rarely hairs; claw usually containing a small retrorse spur overhanging nectary. Pollinia usually light colored, shiny.

About 90 species: India to the Philippines, mostly in Indonesia and the Philippines; one species in China.

**56. *Dendrobium chameleon*** Ames, Orchidaceae 2: 174. 1908.

长爪石斛 *chang zhao shi hu*

*Dendrobium longicalcaratum* Hayata; *D. randaiense* Hayata; *Pedilonum longicalcaratum* (Hayata) Rauschert.

Stems pendulous, to 60 cm, thicker from base, multi-branched, each branch ca. 15 cm, with many nodes, internodes obconic-cylindric, ca. 1 cm, ca. 5 mm in diam. Leaves lanceolate or oblong-lanceolate, 3–3.5 × 0.6–1.5 (or more) cm, base contracted and enlarged into sheaths, apex acuminate or sometimes unequally bilobed; leaf sheath tightly embracing stem. Inflorescences lateral on previous year's leafless stems, 1–3 cm, 1–4-flowered; floral bracts ovate-triangular, ca. 6 × 5 mm, 3-

veined, acute. Pedicel and ovary ca. 1.5 cm. Flowers pale green, turning white, tinged with purple or with green veins. Dorsal sepal oblong, 15–18 × 7–8 (or more) mm, apex subacute; lateral sepals obliquely ovate-oblong, nearly as long as dorsal sepal, base oblique and relatively wide; mentum tubular, ca. 15 mm, 4–6 mm wide, obtuse. Petals obliquely oblong, 14–17 × ca. 5 mm, apex obtuse; lip narrowly pandurate, spatulate, ca. 33 × 6–7 (or more) mm, narrowly clawed, connate to mentum at base, with 2 fleshy papillae in front of claw. Column ca. 3 mm, foot to 18 mm; anther cap subglobose.

Epiphytic on tree trunks in mountain forests, lithophytic on rocky cliffs in mountain valleys; 500–1200 m. Taiwan [Philippines].

**9. *Dendrobium* sect. *Pedilonum*** (Blume) Blume, Tab. Pl. Jav. Orchid. ad t. 4. 1825.

距囊组 *ju nang zu*

*Pedilonum* Blume, Bijdr. 320. 1825.

Stem cylindric, stout, fleshy, semideciduous, usually pseudoindefinite (growing more than 1 year), internodes not swollen or obconic-cylindric. Inflorescences condensed racemes, often multiple, borne on penultimate and older leads. Sepals and petals relatively short. Mentum parallel to ovary, allowing flowers to face in all directions, prominent, usually straight, narrowly tubular, broad, fused distally into a closed spur, with a transverse constriction or kink partially obstructing entry into large saccate nectary containing abundant nectar. Lip entire, unexpanded, scoop-shaped, glabrous, unadorned. Pollinia usually dark colored, dull.

About 52 species: mostly in Indonesia and Papua New Guinea, extending to the Philippines and Samoa; one species in China.

**57. *Dendrobium goldschmidtianum*** Kraenzlin, Repert. Spec. Nov. Regni Veg. 7: 40. 1909.

红花石斛 *hong hua shi hu*

*Dendrobium irayense* Ames & Quisumbing; *D. miyakei* Schlechter; *D. pseudohainanense* Matsumura; *D. victoria-reginae* Loher var. *miyakei* (Schlechter) T. S. Liu & H. J. Su; *Pedilonum goldschmidtianum* (Kraenzlin) Rauschert; *P. miyakei* (Schlechter) Rauschert.

Stems erect or pendulous, cylindric, sometimes middle part thickened and slightly fusiform, 40–60 cm, 5–10 mm in diam., base contracted, unbranched, with many nodes, inter-

nodes obconic-cylindric, 1–2 cm. Leaves lanceolate or ovate-lanceolate, 6–10 × 1.2–2 cm, leathery, apex acuminate; leaf sheath green, tinged with red, tightly embracing stem. Inflorescences multiple, lateral on usually bare penultimate and older leads, tufted, 5–25 mm, densely 6–10-flowered; floral bracts ovate-lanceolate, ca. 3 × 2.5 mm, membranous, apex acute. Pedicel and ovary brownish green, ca. 1.3 cm. Flowers not opening widely; sepals, petals, and lip bright red, column yellow, foot yellowish green, anther cap yellow. Dorsal sepal elliptic, ca. 10 × 5 mm, 5-veined, apex obtuse; lateral sepals obliquely ovate, ca. as large as dorsal sepal, 5-veined, base oblique, apex acute; mentum narrowly conic, ca. 1 cm. Petals obliquely obovate-oblong, ca. as long as dorsal sepal or slightly

narrower, 3-veined, base contracted, apex acute; lip spatulate, 15–22 × 7–8.5 (or more) mm, base narrowly clawed, margin entire, apex slightly obtuse. Column ca. 2 mm, foot ca. 1 cm; anther cap conic, front margin finely papillate-hairy.

200–400 m. S Taiwan (Lan Yu) [Philippines].

Matsumura and Hayata (J. Coll. Sci. Imp. Univ. Tokyo 22: 408. 1908) misidentified this species as *Dendrobium hainanense* Rolfe, belonging to section *Strongyle*.

**10. *Dendrobium* sect. *Formosa*** (Bentham & J. D. Hooker) J. D. Hooker, Fl. Brit. India 5: 710. 1890 [“*Formosae*”].

黑毛组 hei mao zu

*Dendrobium* ser. *Formosa* Bentham & J. D. Hooker, Gen. Pl. 3: 500. 1883 [“*Formosae*”].

Roots smooth. Stems linear, mostly tall, stout, usually evergreen, new sheaths (and sometimes leaves) black- or brown hirsute, hairs deciduous when old. Flowers large, usually white, rarely yellow or with a contrasting lip. Mentum prominent, usually straight, conic, elements fused distally into a spur, nectar present in some species. Lip 3-lobed, crest usually finely hairy, often with multiple low keels, blade glabrous.

About 51 species: Himalayas to Indonesia and Philippines; eight species (one endemic) in China.

Reviewer L. Averyanov notes that *Dendrobium chapaense* Averyanov (Rheedea 16: 3. 2006), described from N Vietnam, also occurs in China. However, the present authors could not substantiate this record because they found no relevant specimens.

**58. *Dendrobium bellatulum*** Rolfe, J. Linn. Soc., Bot. 36: 10. 1903.

矮石斛 ai shi hu

Stems erect or ascending, fusiform or shortly clavate, short and stout, 2–5 cm, 3–18 mm in diam., with many longitudinal ridges, unbranched, with 2–5 nodes, internodes 5–10 mm. Leaves 2–4, subterminal, ligulate, ovate-lanceolate, or oblong, 1.5–4 × 1–1.3 (or more) cm, leathery, both surfaces and leaf sheaths densely shortly black hairy at least when young, base decurrent forming clasping sheaths, apex obtuse and unequally bilobed. Inflorescences usually solitary, subterminal on latest or older mature leads, 1–3-flowered; peduncle 2–3 mm; rachis 5–7 mm; floral bracts ovate-lanceolate, 7–10 mm, membranous. Pedicel and ovary ca. 2.5 cm. Flowers spreading, white, mid-lobe of lip golden yellow, inner surface of lateral lobes red. Dorsal sepal ovate-lanceolate, ca. 25 × 10 mm, 7-veined, apex acute; lateral sepals obliquely ovate-lanceolate, ca. 25 × 10 mm, 7- or 8-veined, apex acute; mentum broadly conic, ca. 10 mm. Petals oblanceolate, ca. as long as and wider than dorsal sepal, 5-veined, rounded; lip subpandurate, ca. 30 mm, apex 3-lobed; lateral lobes nearly subovate; mid-lobe subreniform, shallowly bilobed, bent downward; disk irregularly papillate, with 5 irregularly papillate ridges. Column ca. 5 mm; anther cap conic, densely papillate.

Epiphytic on tree trunks in open forests; 1200–2100 m. S Yunnan [NE India, Laos, Myanmar, Thailand, Vietnam].

**59. *Dendrobium christyanum*** H. G. Reichenbach, Gard. Chron., n.s., 1: 178. 1882.

毛鞘石斛 mao qiao shi hu

*Dendrobium margaritaceum* Finet.

Stems erect, subclavate to fusiform, 2–4[–8] cm, 6–9 mm in diam., unbranched, with few nodes. Leaves 2 or 3, subterminal, long-lasting, ovate-lanceolate or oblong, 3–4(–4.5) × ca. 1 cm, abaxial surface and sheath with black hairs, apex obtuse and unequally 2-lobed. Inflorescences subterminal, 1- or 2-flowered. Flowers spreading, white, lip with orange center. Dorsal sepal ovate to ovate-lanceolate, ca. 20 × 8–10 mm,

acute; lateral sepals similar to dorsal sepal; mentum broadly conic, ca. 10 mm. Petals elliptic-oblong, ca. 20 mm, subacute; lip ca. 25 mm, margin undulate, apex 3-lobed; mid-lobe emarginate at apex; disk with 3 granulose lamellae.

Epiphytic at forest margins; 800–1200 m. Yunnan [Thailand, Vietnam].

The altitudinal range is based on records from Vietnam.

The Chinese material has shorter and relatively broader stems than material from elsewhere.

**60. *Dendrobium trigonopus*** H. G. Reichenbach, Gard. Chron., ser. 3, 2: 682. 1887.

翅梗石斛 chi geng shi hu

*Callista trogonopus* (H. G. Reichenbach) Kuntze; *Dendrobium velutinum* Rolfe.

Stems clustered, golden yellow when dry, fusiform or sometimes clavate, 5–11 cm, 12–15 mm in diam. at middle, thick and fleshy, unbranched, with 3–5 nodes, internodes ca. 2 cm. Leaves 3 or 4, subterminal, oblong, 8–9.5 × 1.5–2.5 (or more) cm, thickly leathery, abaxially sparsely black hairy on midvein, midvein concave adaxially, with short clasping sheaths, apex acute. Inflorescences 1 or 2, distal on latest or older mature leafy pseudobulbs, arcuate, 2- or 3-flowered; peduncle 1–4 cm; floral bracts ovate-triangular, ca. 5 mm, fleshy, apex acute. Pedicel and ovary yellowish green, 3–4 cm; ovary triquetrous. Flowers nodding, thick; sepals and petals waxy yellow, lip yellow, disk tinged with pale green. Dorsal and lateral sepals subsimilar, narrowly lanceolate, ca. 30 × 10 mm, strongly keeled, both margins ascending above middle, midvein on abaxial surface slightly raised and wing-shaped, apex acute; lateral sepals with base only partly adnate to column foot; mentum subglobose, ca. 4 mm. Petals ovate-oblong, ca. 25 × 11 mm, 8-veined, apex acute; lip erect, nearly parallel to column, ca. 25 mm, base shortly clawed, apex 3-lobed; lateral lobes embracing column, subobovate, upper margin denticulate, apex rounded; mid-lobe orbicular, smaller than width between 2 lateral lobe apices; disk densely papillose. Column ca. 6 mm, upper margin of teeth with several shallow indentations; anther cap conic, ca. 5 mm, glabrous.

Epiphytic on tree trunks in mountain forests; 1100–1600 m. S Yunnan [Laos, Myanmar, N Thailand, Vietnam].

**61. *Dendrobium sinense*** Tang & F. T. Wang, Acta Phytotax. Sin. 12: 41. 1974.

华石斛 hua shi hu

Stems erect or arcuate, ascending, cylindrical, slender, occasionally dilated and clavate distally, to 21 cm, 3–4 mm in diam., unbranched, with many nodes, internodes 1.5–3 cm. Leaves several, distichous, usually alternate along upper part of stem, ovate-oblong, 6–11 × 2.5–4.5 (or more) cm, with black hairs on both surfaces when young, hairs often deciduous when old, base decurrent and forming clasping sheaths, apex obtuse and unequally bilobed; leaf sheaths with thick black hairs when young. Flowers solitary on upper portion of leafy stem; floral bracts ovate-lanceolate, 6–7 mm, abaxially densely black hairy, acute. Pedicel and ovary 1.5–2.5 cm; base with 2 or 3 unequal sheaths; ovary slightly clavate. Flowers yellow, apex of lip mid-lobe purplish red, lamellae red. Dorsal sepal ovate, ca. 20 × 7–9 (or more) mm, 5-veined, apex acute; lateral sepals obliquely triangular-lanceolate, upper margin ca. as long as dorsal sepal, wider than dorsal sepal, 7-veined; mentum broadly conic, ca. 13 mm. Petals subelliptic, slightly longer and broader than dorsal sepal, 7-veined, apex slightly obtuse; lip obovate in outline, to 3.5 cm, 3-lobed; lateral lobes subflabellate, embracing column; mid-lobe obovate, bilobed, smaller than width between 2 lateral lobes; disk with 5 crestlike central lamellae. Column ca. 5 mm, teeth triangular, large; anther cap subobovoid, apex slightly bilobed, finely papillate.

• Epiphytic on tree trunks in open and mountain forests; ca. 1000 m. Hainan.

**62. *Dendrobium longicornu*** Lindley, Gen. Sp. Orchid. Pl. 80. 1830.

长距石斛 chang ju shi hu

*Callista longicornu* (Lindley) Kuntze; *Dendrobium bulleyi* Rolfe; *D. flexuosum* Griffith; *D. hirsutum* Griffith; *D. longicornu* var. *hirsutum* (Griffith) J. D. Hooker.

Stems clustered, pendulous, cylindrical, 7–35 cm, 2–4 mm in diam., slightly rigid, unbranched, with many nodes, internodes 2–4 cm. Leaves several, narrowly lanceolate, 3–7 × 0.5–1.4 (or more) cm, leathery, both surfaces and leaf sheaths with blackish brown rigid hairs, base decurrent forming clasping sheaths, apex acuminate, unequally laterally bilobed. Inflorescence subterminal, 1–3-flowered; peduncle ca. 5 mm; basal sheaths 3 or 4, 2–5 mm; floral bracts ovate-lanceolate, 5–8 mm, abaxially dark brown hairy, apex acute. Pedicel and ovary nearly cylindrical, 2.5–3.5 cm. Flowers pendulous, pointing downward, cylindrical, white, lip with central part of disk orange. Dorsal sepal ovate, 15–20 × ca. 7 mm, 7-veined, midvein slightly keeled abaxially, apex acute; lateral sepals obliquely ovate-triangular, ca. as long as dorsal sepal near column side, ca. 9 mm wide at middle, 7-veined, midvein slightly keeled abaxially, apex acute; mentum long and narrow, straight, forming spur, slightly shorter than pedicel and ovary. Petals oblong or lanceolate, 15–20 × 4(–7) mm, 5-veined, margin irregularly denticulate, apex acute; lip subobovate or rhombic,

apex nearly 3-lobed; lateral lobes subobovate, overarching column, 2 lateral lobes farther apart than width of mid-lobe; mid-lobe shallowly bilobed, margin undulate and irregularly toothed, sometimes fimbriate; disk sparsely fimbriate-lacerate along veins, central part with 3 or 4 longitudinal keeled ridges. Column ca. 5 mm, teeth triangular; anther cap nearly flatly conic, front margin densely barbate, apex subtruncate.

Epiphytic on tree trunks in mountain forests; 1200–2500 m. S Guangxi (Shangsi), SE Xizang, NW to SE Yunnan [Bhutan, NE India, Myanmar, Nepal, N Vietnam].

**63. *Dendrobium wattii*** (J. D. Hooker) H. G. Reichenbach, Gard. Chron., ser. 3, 4: 725. 1888.

高山石斛 gao shan shi hu

*Dendrobium cariniferum* H. G. Reichenbach var. *wattii* J. D. Hooker, Bot. Mag. 109: ad t. 6715. 1883; *Callista wattii* (J. D. Hooker) Kuntze.

Stems sometimes curved, cylindrical, equally thick above and below, 12–60 cm, 4–9 mm in diam., rigid, unbranched, with many nodes, internodes 3–5 cm, with longitudinal ribs. Leaves several to 10, along middle and upper part of stem, oblong, 5–9 × 1–2 cm, leathery, abaxially black hirsute when young, base decurrent forming clasping sheaths, apex obtuse and slightly unequally 2-lobed; leaf sheath densely black hirsute. Inflorescence apical on leafy stem, 1- or 2-flowered; peduncle ca. 5 mm; basal sheaths 3 or 4, broadly ovate, 5–10 mm; floral bracts triangular, 7–13 × 6–7 (or more) mm, abaxially with dense black rigid hairs, apex acute. Pedicel and ovary 3–4 cm. Flowers spreading, usually less than 3 cm in diam., white, lip with yellow veins on lateral lobes, disk with a yellow patch. Dorsal sepal oblong, ca. 24 × 7–10 (or more) mm, 5- or 6-veined, apex acute; lateral sepals obliquely lanceolate, upper margin ca. as long as dorsal sepal, lower margin 40–50 × 8–11 (or more) mm, 7- or 8-veined, apex acute; mentum long and narrow, straight, ca. 25 mm, forming spur. Petals oblanceolate, ca. 40 × 32 mm, 7- or 8-veined, bluntly rounded and mucronate; lip ca. 35 mm, less than 30 mm wide across lateral lobes when flattened; lateral lobes obovate, embracing column, front margin slightly undulate; mid-lobe orbicular, 11–15 mm wide, margin irregularly serrate, truncate, usually minutely mucronate, with only an indistinct sinus; disk with a broad median callus splitting into 4 or 5 parallel small keeled ridges extending from base of lip to base of mid-lobe. Column ca. 6 mm; teeth triangular, ca. 2 mm; anther cap subspherical, front margin denticulate, apex slightly concave.

Epiphytic on tree trunks in dense forests; ca. 2000 m. S Yunnan (Jinghong, Mengla) [NE India, Myanmar, N Thailand, Vietnam].

This species has been misidentified as *Dendrobium infundibulum* Lindley (e.g., in FRPS 19: 131. 1999), which was originally described from Myanmar (Moulmein).

**64. *Dendrobium cariniferum*** H. G. Reichenbach, Gard. Chron. 1869: 611. 1869.

翅萼石斛 chi e shi hu

*Callista carinifera* (H. G. Reichenbach) Kuntze.

Stems golden yellow when dry, cylindrical or sometimes enlarged and fusiform, 10–28 cm, ca. 15 mm in diam. at mid-

dle, fleshy and thick, unbranched, with more than 6 nodes, internodes 1.5–2 cm. Leaves several, distichous, oblong or ligulate-oblong, to 11 × 1.5–4 cm, leathery, abaxial surface and leaf sheaths densely black hirsute, base decurrent forming clasping sheaths, apex obtuse and slightly unequally bilobed. Inflorescences subterminal, 1- or 2-flowered; peduncle 5–10 mm, basal sheaths 3 or 4; floral bracts ovate, 4–5 mm, acute. Pedicel and ovary ca. 3 cm; ovary tricarinate. Flowers orange-scented, spreading, thickly textured; ovary yellowish green, sepals pale yellowish white, mentum pale yellow tinged orange-red, petals white, lateral lobes of lip orange-red, mid-lobe yellow, disk reddish orange, column white tinged reddish orange, anther cap white. Sepals dorsally carinate; dorsal sepal ovate-lanceolate, ca. 25 × 9 mm, apex acute; lateral sepals obliquely ovate-triangular, nearly as large as dorsal sepal; mentum angulate, decurved near apex or sigmoid, ca. 20 mm, forming spur. Petals oblong-elliptic, ca. 20 × 10 mm, 5-veined, acute; lip trumpet-shaped, 3-lobed; lateral lobes subobovate, embracing column, front margin denticulate; mid-lobe nearly transversely oblong, front margin irregularly notched, apex concave; disk shortly fimbriate along veins. Column ca. 7 mm; anther cap subspherical, front margin densely papillate-hairy. Capsule ovoid, to 3 cm in diam.

Epiphytic on tree trunks in mountain forests; 1100–1700 m. S Yunnan [NE India, Laos, Myanmar, N Thailand, Vietnam].

**65. *Dendrobium williamsonii*** J. Day & H. G. Reichenbach, Gard. Chron. 1869: 78. 1869.

**11. *Dendrobium* sect. *Stachyobium*** Lindley, Edwards's Bot. Reg. 30(Misc.): 55. 1844.

草叶组 cao ye zu

Roots smooth. Stems usually multiple, generally fusiform, fleshy, leafy, embraced by gibbous sheaths. Inflorescences often multiple, pseudoterminal, occasionally proteranthous (*Dendrobium porphyrochilum*), racemose, multi-flowered, borne on current year's leafy lead, arising from lateral, usually distal nodes, suberect, parallel to stem. Flowers small, usually white. Lip 3-lobed, margin often crisped or pectinate; disk with broad, thick fleshy ridges.

About 39 species: S India and Sri Lanka, Himalayas through Myanmar and Thailand to Indochina, one outlying species in Indonesia (Java); five species (one endemic) in China.

**66. *Dendrobium porphyrochilum*** Lindley, J. Proc. Linn. Soc., Bot. 3: 18. 1858.

单葶草石斛 dan ting cao shi hu

*Callista porphyrochila* (Lindley) Kuntze; *Dendrobium caespitosum* King & Pantling.

Stems erect, cylindric or narrowly fusiform, 1.5–4 cm, 2–4 mm in diam., fleshy, base slightly contracted, becoming narrowed toward apex above middle, with several internodes, current ones enclosed in leaf sheaths. Leaves 3 or 4, distichous, alternate, narrowly oblong, to 4.5 × 0.6–1 (or more) cm, papery, base contracted and enlarged into sheaths, apex acute and unequally bilobed; leaf sheath gibbous, herbaceous. Inflorescences solitary, proteranthous, apparently terminal, nodding, much taller than leaves, to 8 cm, with several to more than 10 small flowers; floral bracts narrowly lanceolate, ca. 9 × 1 mm, ca. as long as or longer than pedicel and ovary, apex acuminate. Pedicel and ovary hairlike, ca. 8 mm. Flowers scented, not resupinate, spreading, thin, golden yellow, or sepals and petals pale green with red veins, lip deep purplish brown, margin pale

黑毛石斛 hei mao shi hu

*Callista williamsonii* (J. Day & H. G. Reichenbach) Kuntze.

Stems cylindric, sometimes swollen and fusiform, to 20 cm, 4–6 mm in diam., unbranched, with several nodes, internodes 2–3 cm, golden yellow when dry. Leaves several, usually alternate on upper part of stem, oblong, 7–9.5 × 1–2 cm, leathery, with dense black rigid hairs especially on sheaths, base decurrent forming clasping sheaths, apex obtuse and unequally bilobed. Inflorescences subterminal, 1- or 2-flowered; peduncle 5–10 mm; basal sheaths 3 or 4, short; floral bracts ovate, ca. 5 mm, papery, acute; ovary not carinate. Flowers spreading; sepals and petals pale yellow or white, lip pale yellow or white, disk tinged with tangerine. Dorsal sepal narrowly ovate-oblong, 25–34 × 6–9 (or more) mm, narrowly keeled abaxially, 5-veined, acuminate; lateral sepals similar to dorsal sepal but oblique at base, 5-veined; mentum rigid, straight, 15–20 mm, forming spur. Petals similar to sepals; lip ca. 2.5 cm, 3-lobed; lateral lobes embracing column, subobovate, front margin slightly undulate; mid-lobe suborbicular or broadly elliptic, margin undulate, apex acute; disk sparsely shortly fimbriate along veins. Column ca. 6 mm; anther cap broadly conic, front margin densely shortly barbate.

Epiphytic on tree trunks in forests; ca. 1000 m. N Guangxi, Hainan (Wuzhi Shan), SE and W Yunnan [NE India, Myanmar, Vietnam].

green, column white tinged with purple. Dorsal sepal narrowly ovate-lanceolate, 8–9 mm, 1.8–2 mm wide at base, 3-veined, caudate-acuminate; lateral sepals narrowly lanceolate, ca. as long as dorsal sepal and slightly broader, 3-veined, base oblique, apex acuminate; mentum subglobose, small. Petals narrowly elliptic, 6.5–7 × ca. 1.8 mm, apex acute; lip subrhombic or elliptic, concave, ca. 5 × 2 mm, entire, subacute; disk with 3 ± thickened central longitudinal ridges. Column ca. 1 mm, base dilated, foot ca. 1.4 mm; anther cap subglobose, glabrous.

Epiphytic on tree trunks in mountain forests, lithophytic on rocks in forests; ca. 2700 m. N Guangdong (Liannan), W Yunnan (Tengchong) [Bhutan, NE India, Myanmar, Nepal, N Thailand, N Vietnam].

**67. *Dendrobium strongylanthum*** H. G. Reichenbach, Gard. Chron., n.s., 9: 462. 1878.

梳唇石斛 shu chun shi hu

*Callista strongylantha* (H. G. Reichenbach) Kuntze; *Dendrobium ctenoglossum* Schlechter.

Stems erect, cylindric or  $\pm$  narrowly fusiform, 3–27 cm, with sheath 4–10 mm in diam., fleshy, many noded, current ones enclosed in leaf sheaths, previous year's stems golden yellow. Leaf blade distichous, alternate on entire stem, oblong, 4–10  $\times$  1.7 cm, thin, base dilated into gibbous sheaths, apex acute and unequally bilobed; leaf sheaths sparsely clasping when dry, herbaceous, sheath mouth obliquely truncate. Inflorescences 1–4, subterminal or lateral on upper part of stem, suberect, to 13 cm, much taller than leaves, densely 20- or more flowered; rachis slender; floral bracts ovate-lanceolate, 2–4 mm, apex acuminate. Pedicel and ovary ca. 5 mm. Flowers yellowish green, sepals purplish red at base, petals pale yellowish green with purplish red stripes, lip violet, column pale purple. Dorsal sepal narrowly ovate-lanceolate, ca. 11  $\times$  2 mm, 3-veined, long acuminate; lateral sepals falcate-lanceolate, to 14  $\times$  ca. 4.3 mm, 4- or 5-veined, base oblique, abruptly contracted above middle, apex caudate; mentum broadly conic, ca. 4 mm. Petals ovate-lanceolate, slightly smaller than dorsal sepal, 3-veined, apex acute; lip ca. 8  $\times$  4 mm, 3-lobed above middle; lateral lobes ovate-triangular, margin with comb-shaped teeth, apex sharply toothed; mid-lobe triangular, margin wrinkled and crestlike, apex acute; disk with 2 or 3 lamellate ridged projections, ridges thickly fleshy, terminating at base of mid-lobe, apex enlarged. Column subterete, ca. 2 mm, foot margin densely finely papillate; anther cap subglobose, front margin lacerate.

Epiphytic on tree trunks in mountain forests; 1000–2100 m. Hainan (Bawangling), S and W Yunnan [Myanmar, N Thailand, N Vietnam].

**68. *Dendrobium monticola*** P. F. Hunt & Summerhayes, *Taxon* 10: 110. 1961.

藏南石斛 zang nan shi hu

*Callista alpestris* Kuntze; *Dendrobium alpestre* Royle (1839), not Swartz (1799); *D. pusillum* D. Don (1825), not Kunth (1815); *D. roylei* A. D. Hawkes & A. H. Heller.

Stems erect or ascending, to 10 cm, becoming narrower from base, fleshy, current ones enclosed in leaf sheaths, with several nodes, internodes ca. 1 cm. Leaves distichous along whole stem, narrowly oblong, 5–6 cm (or more)  $\times$  3.5–4.5 mm, thinly leathery, base dilated into gibbous sheaths, apex acute and unequally slightly bilobed; leaf sheaths loosely embracing stem, lowermost largest, uppermost smaller, sheath mouth obliquely truncate. Inflorescences 1–4, subterminal or arising from upper part of current year's leafy stems, suberect or nodding, 2.5–5 cm, several flowered; floral bracts narrowly ovate, 2–3 mm, acute. Pedicel and ovary ca. 5 mm, slender. Flowers spreading, white, lateral lobes of lip with purplish red stripes, disk white with purplish red stripes, column foot with purplish red spots. Dorsal sepal narrowly oblong, (5–)7–9  $\times$  1.5–1.8 (or more) mm, 3-veined, acuminate; lateral sepals falcate-lanceolate, 7–9  $\times$  ca. 3.5 mm, 3-veined, base oblique, abruptly contracted above middle and acute; mentum broadly conic. Petals narrowly oblong, 6–8  $\times$  ca. 1.8 mm, 1–3-veined, acuminate; lip subelliptic, 5.5–6.5  $\times$  3.5–4.5 (or more) mm, shortly clawed, slightly crispate at middle, 3-lobed above middle; lateral lobes erect, margin comb-shaped, apex attenuate and sharply dentate;

mid-lobe ovate-triangular, margin cristate-corrugate, acute, reflexed; disk central part with 2 or 3 lamellate ridged projections, ridges thickly fleshy, extending from base of lip to base of mid-lobe, apex slightly enlarged. Column ca. 3 mm, middle part stout, to 1 mm wide, upper part without conspicuous teeth, foot ca. 5 mm, margin densely finely papillate; anther cap subglobose, front margin slightly dentate.

Lithophytic on rocks in mountain valleys; 1700–2200 m. SW Guangxi (Napo), S Xizang (Gyirong, Nyalam) [N India, Laos, Nepal, N Thailand, N Vietnam].

Material of this species has been named as *Dendrobium eriiflorum* Griffith (*Orchids China*, 155. 1998).

**69. *Dendrobium compactum*** Rolfe ex W. Hackett, *Gard. Chron.*, ser. 3, 36: 400. 1904.

草石斛 cao shi hu

*Dendrobium wilmsianum* Schlechter.

Stems cylindric,  $\pm$  fusiform, 1.5–3 cm, 4–5 mm in diam., fleshy, with 3–6 nodes, current ones enclosed in leaf sheaths, previous year's naked stems golden yellow. Leaves 2–5, distichous, alternate, lowermost smaller than upper, oblong, 1–2.5  $\times$  0.4–0.6 cm or more, herbaceous, base dilated into sheaths, apex obtuse and unequally bilobed; leaf sheaths obliquely drum-shaped, papery, loosely clasping; sheath mouth obliquely truncate. Inflorescences 1–5, subterminal or lateral on upper part of current year's stem, erect, usually 1–2 cm, not exceeding leaves, 3–6-flowered; floral bracts ovate-lanceolate, 2–3  $\times$  ca. 1 mm, 1-veined, acute. Pedicel and ovary ca. 4 mm. Flowers spreading, white, lip pale green. Dorsal sepal ovate-oblong, ca. 4  $\times$  1.8 mm, 3-veined, acute; lateral sepals obliquely triangular-lanceolate, ca. 4  $\times$  to 3.5 mm, 3- or 4-veined, base oblique, apex acute; mentum conic. Petals suborbicular, ca. 4  $\times$  1.7 mm margin slightly undulate, apex acute; lip suborbicular, ca. 5  $\times$  4 mm, inconspicuously 3-lobed; lateral lobes subrounded, margin finely toothed above middle; mid-lobe broadly ovate-triangular, margin cristate-corrugate, apex mucronate; disk with fleshy ridges combined by 2 or 3 lamellae, apex slightly narrowed. Column ca. 2 mm, upper part enlarged; anther cap broadly conic, front margin slightly notched. Capsule ovoid, ca. 5 mm in diam., with 3 ribs.

Epiphytic on tree trunks in broad-leaved forests; 1600–1900 m. S Yunnan [Myanmar, N Thailand].

**70. *Dendrobium sinominutiflorum*** S. C. Chen, J. J. Wood & H. P. Wood, **nom. nov.**

勐海石斛 meng hai shi hu

Replaced synonym: *Dendrobium minutiflorum* S. C. Chen & Z. H. Tsi, *Bull. Bot. Res.*, Harbin 9(2): 27. 1989, not *Dendrobium minutiflorum* Kraenzlin in Sarasin & Roux, *Nova Caledonia, Bot.* 1: 84. 1914, nor *Dendrobium minutiflorum* Gagnepain, *Bull. Mus. Natl. Hist. Nat.*, sér. 2, 21: 741. 1950.

Stems narrowly ovoid or  $\pm$  fusiform, 1.5–3 cm, with leaf sheaths 4–5 mm in diam., with 3 or 4 nodes, current ones enclosed in leaf sheaths. Leaves usually 2 or 3, narrowly oblong, 1.5–5.5  $\times$  0.4–0.7 cm or wider, leathery, base dilated into leaf

sheaths, apex obtuse and unequally 2-lobed; leaf sheaths pale white when dry, obliquely drum-shaped, loosely clasping, papery; sheath mouth obliquely truncate. Inflorescences 1–3, subterminal or lateral on upper part of current year's stem, 2–4 cm, several flowered; rachis slender, ca. 0.5 mm in diam.; floral bracts ovate, ca. 3 × 1 mm, membranous, acute. Pedicel and ovary ca. 4 mm. Flowers spreading, greenish white or pale yellow. Dorsal sepal narrowly ovate, ca. 6.5 × 2.5 mm, 5-veined, acute; lateral sepals ovate-triangular, ca. 6.5 × 5 mm, 5-veined, base oblique, apex acute; mentum oblong, ca. 5 mm, obtuse. Petals oblong, ca. 6 × 2 mm, 3-veined, apex acute; lip

suboblong, ca. 5 × 4 mm, 3-lobed above middle; lateral lobes with margin entire or inconspicuously toothed, apex sharply dentate; mid-lobe transversely oblong, margin ± crisped, apex emarginate; disk with 3 lamellae combined into a broadly thickened fleshy ridge, ridge apex terminating at base of mid-lobe. Column short and thick, ca. 2 mm, base dilated; anther cap with apical margin slightly lacerate. Capsule obovoid, nearly equal in length and width, ca. 7 mm, with 3 ribs.

• Epiphytic on tree trunks in open forests; 1000–1400 m. S Yunnan (Menghai, Mengla).

## 12. *Dendrobium* sect. *Crumenata* Pfitzer in Engler & Prantl, Nat. Pflanzenfam. 2(6): 174. 1889.

基肿组 ji zhong zu

*Ceraia* Loureiro.

Roots smooth. Stems tufted, in most species shoot with 3 zones: pseudobulbous, leafy, and flowering, with leaves reduced to scales; fusiform swollen basal portion formed by 1–3 internodes, covered with sheaths and located directly above or several internodes above rhizome; growth continuing in second year; in *Dendrobium crumenatum*: stem flowering after 2 years; thereafter distal stem may branch and continue growth, with branches flowering. Leaves terete, laterally flattened, conduplicate, or canaliculate. Inflorescences multiple, in most species: borne along leafless distal stem, rarely along a fully leafy stem; each compressed into a peduncle, producing 1 or 2 flowers at once in bursts over more than one season (gregarious blooming and ephemeral). Flowers usually white, sometimes yellowish or pink. Mentum prominent, straight or decurved, often saccate, containing a gland near apex of column foot. Lip 3-lobed, lateral lobes vertical, disk often with keels sometimes hairy.

About 76 species: from Thailand to Malaysia through Indonesia and the Philippines to Australia, Fiji, and Guam; four species in China.

**71. *Dendrobium crumenatum*** Swartz, J. Bot. (Schrader) 2: 237. 1799.

木石斛 mu shi hu

*Aporum crumenatum* (Swartz) Brieger; *A. kwashotense* (Hayata) Rauschert; *Callista crumenata* (Swartz) Kuntze; *Ceraia parviflora* (Ames & C. Schweinfurth) M. A. Clements; *Dendrobium crumenatum* var. *parviflorum* Ames & C. Schweinfurth; *D. kwashotense* Hayata; *D. schmidtianum* Kraenzlin; *Oncidium crumenatum* (Swartz) Blume.

Stems slightly compressed, cylindrical, 40–70 cm, upper part slender, with 3 or 4 internodes dilated and fusiform above base, dilated portion of stem to 2 cm in diam., often with longitudinal ridges. Leaves distichous on middle part of stem, ovate-oblong, ca. 6 × 2.5 cm, leathery, with clasping sheaths at base, apex obtuse and unequally bilobed. Inflorescences arising from distal leafless part of stem, usually solitary; floral bracts elliptic, ca. 6 × 2.5 mm. Pedicel and ovary pale red, ca. 15 mm. Flowers lasting for 1 day, initiated 9 days after a rapid temperature drop, strongly fragrant, spreading; sepals and petals white or sometimes tipped pink, lip white, keels yellow, column and anther cap white. Dorsal sepal ovate-lanceolate, 17–22 × ca. 5 mm, slightly obtuse; lateral sepals obliquely ovate-lanceolate, slightly larger than dorsal sepal; mentum narrowly conic, to 15 mm. Petals obovate-oblong, 17–20 × to 7 mm, subacute; lip 24–25 × 13–18 (or more) mm, 3-lobed; lateral lobes erect, subobovate, subtruncate; mid-lobe obovate, ca. 12 × 10 mm, margin crenulate and crisped, mucronate; disk with 5 keeled ridges with denticulate margin. Column ca. 3 mm.

Taiwan (Lu Dao) [Cambodia, India (Andaman Islands), Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

**72. *Dendrobium equitans*** Kraenzlin in Engler, Pflanzenr. 45(IV. 50. II. B. 21): 228. 1910.

燕石斛 yan shi hu

*Aporum equitans* (Kraenzlin) Brieger; *Ceraia batanensis* (Ames & Quisumbing) M. A. Clements; *C. equitans* (Kraenzlin) M. A. Clements; *Dendrobium batanense* Ames & Quisumbing.

Stems erect, cylindrical, compressed, to 40 cm, 1 or 2 internodes above base dilated and fusiform, 2–3 cm. Leaves distichous, ascending, laterally compressed and dagger-shaped, 4–7 cm × 3–4 (or more) mm, fleshy, base with tightly clasping fleshy sheaths, apex acute. Inflorescence axillary in distal leaf axil; floral bracts sheathlike, ca. 4 mm, membranous. Pedicel and ovary ca. 1 cm. Flowers usually solitary, each lasting 1 or 2 days, not opening widely, creamy white, disk yellow in center. Dorsal sepal ovate-lanceolate, ca. 15 mm, ca. 3.5 mm wide at middle, acute; lateral sepals obliquely ovate-lanceolate, nearly as long as dorsal sepal, base oblique; mentum angulate, 8–10 mm. Petals obovate-lanceolate, nearly as large as dorsal sepal, 3-veined, apex acute; lip obovate, ca. 18 mm, ca. 9 mm wide at middle, 3-lobed above middle, base cuneate; lateral lobes erect, subobovate, front margin denticulate; mid-lobe orbicular or transversely oblong, margin lacerate or fimbriate, apex rounded; disk densely finely papillate-hairy. Column ca. 2 mm; anther cap subquadrate, glabrous.

Epiphytic on tree trunks in forests; 100–300 m. S Taiwan (Lan Yu) [Philippines].

This species has been misidentified in Taiwan as *Dendrobium ventricosum* Kraenzlin (e.g., in Fl. Taiwan. 5: 969. 1978).

**73. *Dendrobium exile*** Schlechter, Repert. Spec. Nov. Regni Veg. 2: 85. 1906.

景洪石斛 jing hong shi hu

*Ceraia exilis* (Schlechter) M. A. Clements.

Stems erect, upper part branched, cylindric, to 50 cm, slender, ca. 3 mm in diam., 2 or 3 internodes above base dilated and fusiform; dilated portion of stems ca. 4.5 cm, ca. 8 mm in diam., fleshy, with 4 ribs, with pale white membranous sheaths when young, reddish brown and glossy when old. Leaves often alternate on upper part of branches, erect, terete, 2.5–6 × 1.5–2.5 (or more) cm, base with leathery sheaths, apex acute. Inflorescence axillary on leafy older stems, 1-flowered, up to 4 flowers open at once per stem; floral bracts ovate, ca. 2 mm. Pedicel and ovary ca. 1 cm, slender. Flowers spreading, white, inner surface of lip lateral lobes with a few pale purple spots, disk yellow. Dorsal sepal sub lanceolate, ca. 17 × 2.5 mm, 5-veined, long acuminate; lateral sepals similar to and ca. as large as dorsal sepal; mentum rigid, ca. 1 cm, acute. Petals similar to sepals, ca. 17 × 1.5 mm, 3-veined; lip cuneate at base, 3-lobed above middle; lateral lobes obliquely subovate-triangular, front margin undulate, apex obtuse; mid-lobe narrowly oblong, margin undulate, apex acute; disk sparsely villous, with 3 thick and stout keeled ridges from base to apex. Column ca. 2 mm, foot with a basal callus; anther cap conic. Capsule fusiform, ca. 4 × 0.6 cm.

Epiphytic on tree trunks in open forests; 600–800 m. S Yunnan (Jinghong, Mengla) [Thailand, Vietnam].

**74. *Dendrobium pseudotenellum*** Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 36: 697. 1965.

针叶石斛 zhen ye shi hu

*Ceraia pseudotenella* (Guillaumin) M. A. Clements.

Stems erect, rigid, slender, basal 2 internodes swollen to forming fusiform pseudobulb, others cylindric, 30–43 cm, ca. 2 mm in diam., unbranched, with many nodes, internodes 1–3.5 cm, yellowish brown when dry, glossy. Leaves sparsely distichous, ascending, subterete, slender, 3–9 cm, less than 1 mm wide, fleshy, base with tightly clasping sheaths, apex acute. Peduncle ca. 2 mm; basal sheaths 4 or 5, overlapping; floral bracts ovate, ca. 1.5 mm, acute. Pedicel and ovary ca. 5 mm, slender. Flowers very small, thin, white. Dorsal sepal oblong, ca. 6 × 2.2 mm, 3-veined, obtuse; lateral sepals obliquely ovate-triangular, much larger than dorsal sepal, base very oblique, apex slightly acute; mentum narrowly conic, ca. 9 mm, obtuse. Petals oblong, ca. 6 × 2 mm, 3-veined, obtuse; lip obovate, ca. 11 × 7 mm, margin lacerate-fimbriate, apex 3-lobed; lateral lobes erect; mid-lobe nearly transversely oblong, apex concave; disk with 3 central ridged projections, dilated into plicate ridges at base of mid-lobe. Column ca. 2 mm, foot ca. 8 mm, with a basal callus; anther cap nearly glabrous, apex subtruncate.

Epiphytic on tree trunks in mountain forests; ca. 900 m. S Yunnan (Mengla) [Vietnam].

### 13. *Dendrobium* sect. *Aporum* (Blume) Blume, Tab. Pl. Jav. Orchid. ad t. 4. 1825.

剑叶组 jian ye zu

*Aporum* Blume, Bijdr. 334. 1825; *Macrostomium* Blume.

Roots smooth. Stems wiry, not swollen; shoot possibly requiring 2 years to mature; distal stem position varying. Leaves laterally compressed, distichous, glossy when dry, equitant, rigid, succulent, shortly gladiate, base oblique and relatively wide. Inflorescence position varying, lateral or subterminal, in some species borne on a specialized, leafless terminal extension of stem (pseudoraceme); flowers usually opening one at a time in succession. Flowers small, generally white, sometimes yellowish, rarely purple. Lip with an expanded mid-lobe, lateral lobes usually present, rarely vestigial; disk often callose.

About 56 species: mainly in Indonesia, Malaysia, and the Philippines, outlying species extending to Nepal and New Guinea, at low elevations; two species in China.

**75. *Dendrobium spatella*** H. G. Reichenbach, Hamburger Garten-Blumenzeitung 21: 298. 1865.

剑叶石斛 jian ye shi hu

*Aporum banaense* (Gagnepain) Rauschert; *A. spatella* (H. G. Reichenbach) M. A. Clements; *Callista spatella* (H. G. Reichenbach) Kuntze; *Dendrobium acinaciforme* Roxburgh var. *minus* Tang & F. T. Wang; *D. banaense* Gagnepain.

Stems erect, compressed trilateral, to 60 cm, ca. 4 mm in diam., base contracted, becoming slender distally, unbranched, with many nodes, internodes ca. 1 cm. Leaves distichous, ascending, slightly sparsely overlapping or alternate, laterally compressed and dagger-shaped, 2.5–4 × 0.4–0.6 (or more) cm, thickly leathery or fleshy, base dilated into sheaths tightly embracing stem, grading into sheaths distally, apex acute. Inflorescences lateral along leafless pseudoraceme; floral bracts ca. 1 mm. Pedicel and ovary ca. 6 mm. Flowers very small, white,

lip tinged with red. Dorsal sepal subovate, 3–5 × 1.6–2 (or more) mm, 3-veined, obtuse; lateral sepals obliquely ovate-triangular, 3.5–6 mm, 5-veined, base very oblique, margin close to column, apex acute; mentum 5–7 mm, narrow. Petals oblong, ca. as long as dorsal sepal, but narrower, bluntly rounded; lip adnate to column foot at apex, subspatulate, 8–10 × 4–6 (or more) mm, front margin with bluntly rounded teeth, rounded; disk with 3–5 central ridged projections. Column very short; anther cap slightly toothed along apical margin. Capsule elliptic, 4–7 mm.

Epiphytic on tree trunks at forest margins, lithophytic on rocks in forests; 200–300 m. S Fujian (Nanjing), SW Guangxi (Daxin), Hainan (Baoting, Ledong, Sanya), Hong Kong, S Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Thailand, Vietnam].

This species has been misidentified as *Dendrobium acinaciforme* Roxburgh (e.g., in FRPS 19: 142. 1999), which is in fact a native of Ambon Island in Maluku, Indonesia.

**76. *Dendrobium terminale*** E. C. Parish & H. G. Reichenbach, Trans. Linn. Soc. London 30: 149. 1874.

刀叶石斛 dao ye shi hu

*Aporum terminale* (E. C. Parish & H. G. Reichenbach) M. A. Clements; *A. verlaquii* (Costantin) Rauschert; *Callista terminalis* (E. C. Parish & H. G. Reichenbach) Kuntze; *Dendrobium verlaquii* Costantin.

Stems erect, sometimes upper part branched, compressed trilateral, 10–23 cm, with leaf sheaths ca. 5 mm in diam., base contracted, with many nodes, internodes ca. 1 cm. Leaves distichous, sparsely overlapping, ascending, laterally compressed and dagger-shaped, 3–4 × 0.6–1 (or more) cm, thickly leathery or fleshy, apex acute. Inflorescence subterminal; pe-

duncle very short; basal sheaths several, membranous; floral bracts small. Pedicel and ovary ca. 7 mm, slender. Flowers small, pale yellowish white. Dorsal sepal ovate-oblong, 3–4 × ca. 1.4 mm, 3-veined, subacute; lateral sepals obliquely ovate-triangular, ca. 4 mm, 3- or 4-veined, base very oblique, margin close to column, apex acute; mentum narrowly long, ca. 7 mm. Petals oblong, ca. 10 × 15 mm, 1-veined, apex subobtusely; lip adnate to apex of column foot, subspatulate, ca. 10 × 7 mm, adaxially with thickened callus or crestlike protrusion near apex, front margin undulate, apex 2-lobed. Column ca. 1 mm; anther cap truncate and denticulate at apical margin.

Epiphytic on tree trunks at forest margins, lithophytic on rocks in mountain valleys; 800–1100 m. S Yunnan (Mengla) [NE India, Malaysia, Myanmar, Thailand, Vietnam].

**14. *Dendrobium* sect. *Strongyle*** Lindley & Paxton, Paxt. Fl. Gard. 1: 134. 1850.

圆柱叶组 yuan zhu ye zu

Roots smooth. Stem erect or pendulous, glossy when dry, wiry, not swollen, compressed cylindric, rigid, leafy throughout or with a pseudoraceme. Leaves well spaced, lax and alternate, normally terete, subcylindric, or subulate-cylindric, fleshy. Inflorescences borne on leafy stem or pseudoraceme; flowers small, borne one at a time in succession, lasting a few days to ca. 10 days.

About 20 species: India to S China and New Guinea; two species (one endemic) in China.

**77. *Dendrobium parviflorum*** H. G. Reichenbach ex Lindley, J. Proc. Linn. Soc., Bot. 3: 4. 1858.

少花石斛 shao hua shi hu

*Aporum jenkinsii* Griffith; *Callista jenkinsii* (Griffith) Kuntze.

Stems erect or ascending, compressed cylindric, 10–37(–45) cm, 2–7 mm in diam., rigid, sometimes branched, with many nodes, internodes clavate, 1–2 cm, with longitudinal ribs, yellow when dry, glossy. Leaves distichous, recurved above middle, laterally compressed and subcylindric, ensiform, 1.7–3 × 0.1–0.4 (or more) cm, thickly fleshy, base dilated into clasping sheaths, apex acute or obtuse. Inflorescences bearing flowers successively one at a time from bundle of bracts, lateral on old leafy stem, 2–4 mm; basal sheaths 3 or 4, large; floral bracts ovate, 1–2 mm, membranous. Pedicel and ovary 6–15 mm, slender. Flowers fragrant, spreading, thinly textured, white or pale yellow, adaxial surface of lip with yellow spots. Dorsal sepal ovate to oblong, 3.3–12 × 2.5–5 mm, 7-veined, slightly obtuse or acute; lateral sepals ovate-triangular, ca. as long as dorsal sepal, 3.5–8 mm wide, 7- or 8-veined, base very oblique, apex acute; mentum bent forward, 10–20 × ca. 10 mm. Petals narrowly oblong to oblong, ca. 12 × 3 mm, 3-veined, obtuse or acute; lip spatulate to obovate-triangular, 15–25 × 7–10 mm, front margin undulate, emarginate; central part of disk with 2(–4) thickened raised veins terminating below lip apex, densely papillose near apex. Column 1–3 mm, foot 1–2 cm.

On trees in open forests, on trunks of *Podocarpus* in forests; ca. 1500 m. S Yunnan (Jinghong) [NE India, Laos, Thailand, Vietnam].

P. Ormerod (pers. comm.) questions the identity of the Chinese material, which might prove to be different from true *Dendrobium parviflorum*.

**78. *Dendrobium hainanense*** Rolfe, Bull. Misc. Inform. Kew 1896: 193. 1896.

海南石斛 hai nan shi hu

*Aporum hainanense* (Rolfe) Rauschert.

Stems rigid, ascending, compressed cylindric, slightly falcate, 10–30(–45) cm, 2–3 mm in diam., not branched, with many nodes, leafy throughout, internodes slightly clavate, ca. 1 cm. Leaf blade subcylindric, almost subulate, slender, 2–2.5(–5.5) × 0.1–0.3 cm, thickly fleshy, apex obtuse. Inflorescence arising from upper part of leafless stem, usually 1-flowered; floral bract ovate, ca. 1 mm, membranous. Pedicel and ovary ca. 6 mm, slender. Flower small, white with yellow spot on disk of lip. Dorsal sepal ovate, 3.3–4 × ca. 2.5 mm, 3-veined, apex subobtusely; lateral sepals ovate-triangular, 3.3–4 × ca. 3.5 mm, 3-veined, base oblique, apex acute; mentum ca. 10 mm. Petals narrowly oblong, 3.3–4 × ca. 1 mm, 1-veined, apex acute; lip obovate-triangular, ca. 15 × 7 mm, base clawed, apical margins undulate, apex emarginate; disk smooth. Column 1–1.5 mm, with a foot ca. 1 cm; anther cap semiglobose, glabrous. Fl. Sep–Oct.

● On tree trunks in broad-leaved forests; 1000–1700 m. Hainan.

Material in cultivation labeled "*Dendrobium hainanense*" with uniformly bright yellow flowers is incorrectly named; see the comment under *D. hancockii* (p. 385).

**140. FLICKINGERIA** A. D. Hawkes, Orchid Weekly 2: 451. 1961.

金石斛属 jin shi hu shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Desmotrichum* Blume, Bijdr. 329. 1825, not Kützing (1845, nom. cons.); *Ephemerantha* P. F. Hunt & Summerhayes, nom. illeg. superfl.

Herbs, epiphytic. Basal rhizome branching, creeping or prostrate; roots smooth. Aerial shoots (sympodia) clambering, ascending or pendulous, terminating in a 1-leaved pseudobulb consisting of 1 internode, erect and bushy or drooping and laxly branched, new branches arising at base of pseudobulb, sometimes also from other nodes along erect stems also terminated by a pseudobulb; these aerial sympodia produce progressively smaller units distally, remaining dependent on basal roots. Pseudobulbs usually  $\pm$  laterally compressed, clavate or fusiform. Leaves apical, narrowly to oblong-elliptic, leathery, base slightly contracted, subsessile, not sheathing. Inflorescence producing solitary flowers each on 1 or more short, subterminal, tufted peduncles, borne in front of or behind leaf base, or both, gregariously blooming in response to a stimulus. Flowers fragile, ephemeral, lasting less than a day, thin and membranous. Sepals and petals acute. Mentum conspicuous, deflexed, conic. Petals narrower than sepals; lip 3-lobed or entire, with a distinct hypochile (including lateral lobes), mesochile, and epichile (blade or mid-lobe), 2- or 3-keeled; lateral lobes erect; mid-lobe variable in shape, straight, curved, or very undulate-pleated and transversely bilobulate. Column short, with a long foot; pollinia 4 in 2 pairs, naked, i.e., without a stipe or caudicle, subglobose.

Between 65 and 70 species: S and SE Asia, Australia, Pacific islands; nine species (five endemic) in China.

See the treatment by Seidenfaden (Orchid Genera in Thailand IX. *Flickingeria* Hawkes & *Epigeneium* Gagnep. Dansk Bot. Ark. 34(1): 1–104. 1980).

- 1a. Lip rhombic-ovoid, entire; disk with a fleshy basal appendage ca.  $2.3 \times 2.3$  mm; column with toothed stelidia ..... 1. *F. shihfuana*  
 1b. Lip 3-lobed; disk and column without above combination of characters.  
 2a. Terminal pseudobulb comprising 2 or 3 internodes; mid-lobe of lip very plicate, deeply fimbriate-lacerate, divided into many fine segments ..... 2. *F. comata*  
 2b. Terminal pseudobulb comprising 1 internode; mid-lobe not as above.  
 3a. Inflorescence only emerging from top of pseudobulb just below leaf (abaxial); leaves 1–1.2 cm wide ... 3. *F. angustifolia*  
 3b. Inflorescence appearing only in axil of foliage leaf (adaxial), or simultaneously adaxial and abaxial.  
 4a. Inflorescences borne simultaneously adaxially and abaxially; leaves 1.5–3.6 cm wide, minutely retuse, arista absent or indistinct; lateral lobes of lip red spotted, mid-lobe white, turning pale cream-colored when old; proximal part of keels deep purple, distal wavy part with deep purple edges and spots; pseudobulbs ca.  $4 \times$  as long as broad ..... 4. *F. albopurpurea*  
 4b. Inflorescence adaxial, otherwise without above combination of characters.  
 5a. Mentum at an acute angle to ovary, narrowly conic; sepals and petals milky yellow, spotted with purplish red ..... 5. *F. fimbriata*  
 5b. Mentum perpendicular or at an obtuse angle to ovary; sepals and petals variously colored.  
 6a. Lip 3-keeled, median narrow, outer expanded and undulate distally; flowers pale yellow, unspotted ..... 6. *F. tricarinata*  
 6b. Lip 2-keeled; flowers with or without spots.  
 7a. Sepals and petals lemon-yellow to deep yellow, unspotted; lip red ..... 7. *F. calocephala*  
 7b. Sepals and petals pure white or white, densely spotted purple-red; lip pure white or white with yellow keels.  
 8a. Flowers pure white ..... 8. *F. concolor*  
 8b. Flowers white, densely spotted purple-red, keels yellow, purple-red below ..... 9. *F. bicolor*

**1. *Flickingeria shihfuana*** T. P. Lin & Kuo Huang, *Taiwania* 50: 292. 2005.

士富金石斛 shi fu jin shi hu

Plants suberect to pendulous. Stems up to 30 cm, slender, tufted, frequently branching, internodes terete, clavate, or cylindrical, 2–3 cm  $\times$  2–3 mm, terminal internode enlarged into a pseudobulb. Pseudobulbs greenish, lustrous, flattened, elongate fusiform, ca. 2.8 cm  $\times$  3–3.5 mm, initially covered by sheaths. Leaves articulate, oblong to ovate-oblong, ca.  $4 \times 1.1$ –1.6 cm, leathery, rigid, acute. Inflorescence abaxial or adaxial, 1 or 2 flowers open at a time, subtended by bracts; floral bracts scarious, ca. 3 mm, acute. Flowers ca. 1 cm wide, white with pink markings, sepals greenish at base, spur greenish; pedicel and ovary ca. 6 mm. Sepals oblong, ca.  $5 \times 2.5$  mm, margins reflexed, acute. Petals slender, ca.  $5.5 \times 1$  mm, margins reflexed, acute; lip rhombic-ovoid, reflexed, ca.  $5 \times 5$  mm; disk with a fleshy basal appendage ca.  $2.3 \times 2.3$  mm, spur rounded. Column ca. 2 mm, with triangular, acutely toothed stelidia; anther cap ovoid. Fl. Jun–Oct.

• Epiphytic in montane forests; ca. 1200 m. Taiwan.

**2. *Flickingeria comata*** (Blume) A. D. Hawkes, *Orchid Weekly* 2: 452. 1961.

金石斛 jin shi hu

*Desmotrichum comatum* Blume, *Bijdr.* 330. 1825; *Callista comata* (Blume) Kuntze; *Dendrobium comatum* (Blume) Lindley; *D. fimbriatolabellum* Hayata; *Desmotrichum fimbriatolabellum* (Hayata) Hayata; *Ephemerantha comata* (Blume) P. F. Hunt & Summerhayes; *E. fimbriatolabella* (Hayata) P. F. Hunt & Summerhayes; *E. tairukounia* S. S. Ying; *Flickingeria fimbriatolabellum* (Hayata) A. D. Hawkes; *F. tairukounia* (S. S. Ying) T. P. Lin.

Rhizome creeping, ca. 1.3 cm in diam., stout, internodes 3–6 mm. Pseudobulbs fusiform, ca.  $6.5 \times 1.7$ –2.3 cm. Stems ascending, pale yellow, many branched. Leaf shortly petiolate, ovate to oblong, 5–11  $\times$  2–5 cm, leathery, apex obtuse or rounded. Inflorescence simultaneously adaxial and abaxial, very short, usually 1- or 2-flowered. Flowers thinly textured, fragile,

whitish, with purple spots on sepals and petals, lip yellow; pedicel and ovary ca. 1.5 cm, slender. Dorsal sepal narrowly lanceolate, 10–15 × 3–3.5 mm, acute; lateral sepals linear-falcate, oblique, 10–15 × ca. 4.5 mm; mentum borne at an acute angle to ovary, narrowly conic, ca. 4 mm. Petals linear, 10–15 × 1–1.5 mm, acute; lip obtriangular, 10–15 mm, base cuneate, 3-lobed; lateral lobes subovate, 3.5–4 × 1–1.5 mm, apical margin ± lacerate; mid-lobe very plicate, 10–12 mm, margin deeply fimbriate-lacerate, divided into many fine segments. Column ca. 4 mm, stout, foot ca. 4 mm. Fl. Jul.  $2n = 38$ .

Epiphytic on tree trunks along streams and in mixed forests, cliffs; 100–1000 m. E and S Taiwan [Indonesia, Malaysia, New Guinea, Philippines; Australia, Pacific islands].

*Flickingeria tairukounia* appears to be a peloric form of *F. comata*.

**3. *Flickingeria angustifolia*** (Blume) A. D. Hawkes, *Orchid Weekly* 2: 452. 1961.

狭叶金石斛 xia ye jin shi hu

*Desmotrichum angustifolium* Blume, *Bijdr.* 330. 1825; *Callista angustifolia* (Blume) Kuntze; *Dendrobium angustifolium* (Blume) Lindley; *Ephemerantha angustifolia* (Blume) P. F. Hunt & Summerhayes.

Rhizome creeping, 3–4 mm in diam., internodes 5–10 mm. Pseudobulbs golden yellow, slightly compressed, fusiform, 3–3.5 cm × 4–7 mm. Stems pendulous, golden yellow, slender, many branched. Leaf blade narrowly lanceolate, 7–10 × 0.8–1.2 cm, leathery, apex acute and slightly bilobed. Inflorescence abaxial, often 1-flowered, base with 2 or 3 tufted scalelike sheaths. Flowers only lasting half a day, thinly textured; sepals and petals pale yellow with brownish purple stripes, lateral lobes of lip purple with whitish margins, mid-lobe orange; pedicel and ovary ca. 7 mm. Dorsal sepal ovate-elliptic, ca. 5.5 × 3 mm, obtuse; lateral sepals obliquely ovate-triangular, broader and larger than dorsal sepal, base very oblique and broad, apex acute; mentum borne at an acute angle to ovary, ca. 7 mm. Petals ovate-lanceolate, ca. 5 × 2 mm, acute; lip 10–12 × 4–5 mm, with a long claw at base, 3-lobed; lateral lobes erect, apex rounded; mid-lobe subobovate, ca. 5 mm, entire, deeply 2-lobed, apiculate in sinus; lobules subobovate-oblong; disk with 2 lamellae extending from base to base of mid-lobe. Column ca. 3 mm, stout. Fl. Jun–Sep.

Epiphytic on tree trunks in forests; ca. 1000 m. SW Guangxi, Hainan [Indonesia, Malaysia (Peninsular), Thailand, Vietnam].

**4. *Flickingeria albopurpurea*** Seidenfaden, *Dansk Bot. Ark.* 34(1): 48. 1980.

滇金石斛 dian jin shi hu

Rhizome creeping, 4–8 mm in diam., internodes 3–7 mm. Stems usually pendulous, yellow or yellowish brown, many branched. Pseudobulbs golden yellow, slightly compressed, fusiform, 3–8 cm × 7–20 mm. Leaf blade oblong or oblong-lanceolate, 9–19.5 × 1.5–3.6 cm, leathery, base contracted into a very short petiole, apex obtuse and minutely retuse, arista in sinus absent or indistinct. Inflorescence simultaneously adaxial and abaxial, 1- or 2-flowered; peduncle very short, with several

scalelike sheaths. Flowers lasting half a day, thinly textured; pedicel and ovary pale yellow, sepals and petals white, mentum yellowish, lip and column densely spotted purple-red, mid-lobe white, turning pale cream-colored when old, proximal part of keels deep purple, distal wavy part with deep purple edges and spots; pedicel and ovary ca. 5 mm. Dorsal sepal oblong, ca. 10 × 3.5 mm, acute; lateral sepals obliquely ovate-lanceolate, ca. 10 × 3.5 mm, base oblique and relatively wide, apex acute; mentum perpendicular to ovary, ca. 5 mm, obtuse. Petals narrowly oblong, ca. 9 × 2.2 mm, acute; lip ca. 12 mm, 3-lobed; lateral lobes erect, subovate, rounded, ca. 7 mm apart between apices; mid-lobe obovate-flabellate in outline, ca. 5 × 7 mm, 2-lobed, basal margin lacerate-cripsed; disk with 2 lamellae extending from base to narrowed base of mid-lobe, crisped-undulate in apical half. Column ca. 3 mm, stout, foot ca. 5 mm. Fl. Jun–Jul.

Epiphytic on tree trunks in open forests, lithophytic on rocks in forests; 800–1200 m. S Yunnan [Laos, Thailand, Vietnam].

**5. *Flickingeria fimbriata*** (Blume) A. D. Hawkes, *Orchid Weekly* 2: 454. 1961.

流苏金石斛 liu su jin shi hu

*Desmotrichum fimbriatum* Blume, *Bijdr.* 329. 1825; *Dendrobium fimbriatum* (Blume) Lindley (1830), not Hooker (1823); *D. plicatile* Lindley; *Ephemerantha fimbriata* (Blume) P. F. Hunt & Summerhayes.

Rhizome creeping, 5–7 mm in diam., internodes 7–8 mm. Stems ascending or pendulous, many branched. Pseudobulbs golden yellow, compressed fusiform, 3.5–6.5 × 1–2.3 cm. Leaf blade oblong-lanceolate or narrowly elliptic, 10–20 × 3–5 cm, leathery, slightly obtuse; petiole very short. Inflorescence usually 1–3-flowered. Flowers thinly textured; sepals and petals milky yellow, tinged brownish or with purplish red spots, lip whitish, with purple-red spots on lateral lobes and with yellowish white central lamellae; pedicel and ovary ca. 5 mm. Dorsal sepal ovate-lanceolate, ca. 9 × 2.5 mm, acuminate; lateral sepals obliquely ovate-lanceolate, similar in size to dorsal sepal, base oblique and relatively wide, apex acuminate; mentum borne at an acute angle to ovary, narrowly conic, ca. 7 mm. Petals lanceolate, ca. 9 × 2 mm, subacute; lip ca. 1.5 cm, base narrowed and cuneate, 3-lobed; lateral lobes erect, subobovate, entire; mid-lobe flabellate, ca. 8 × 7–8 mm, margin undulate-cripsed, apex subtruncate; disk with 2 or 3 lamellae extending from base to apex of mid-lobe; lamellae crisped in apical half. Column ca. 4 mm, stout, foot ca. 7 mm. Fl. Apr–Jun.

Epiphytic on tree trunks in forests, lithophytic on rocks in forests; 700–1700 m. SW Guangxi, Hainan, SE Yunnan [India (Andaman Islands, Nicobar Islands), Indonesia, Malaysia, Philippines, Thailand, Vietnam].

**6. *Flickingeria tricarinata*** Z. H. Tsi & S. C. Chen, *Acta Phytotax. Sin.* 33: 201. 1995.

三脊金石斛 san ji jin shi hu

*Flickingeria tricarinata* var. *viridilamella* Z. H. Tsi & S. C. Chen.

Rhizome creeping, 4–6 mm in diam., internodes 5–10

mm. Stems pendulous or nearly ascending, golden yellow, often branching. Pseudobulbs golden yellow, fusiform, slightly compressed, 4.5–6.5 cm × 8–15 mm. Leaf blade narrowly ovate-lanceolate, 11.5–12 × ca. 2.5 cm, leathery, apex acuminate and slightly emarginate. Inflorescence usually 1-flowered; peduncle ca. 4 mm. Flowers only lasting half a day, pale yellow, thinly textured; pedicel and ovary ca. 6 mm. Dorsal sepal ± reflexed, ovate-oblong, ca. 14 × 5 mm, acute; lateral sepals obliquely ovate-triangular, similar in size to dorsal sepal, base oblique and relatively wide; mentum perpendicular or at an obtuse angle to ovary, ca. 6 mm, broadly obtuse. Petals ascending, oblong, ca. 10 × 3.2 mm, acute; lip obovate in outline, ca. 12 mm, 3-lobed; lateral lobes suberect, ovate-triangular, ca. 5 × 4 mm, rounded; mid-lobe somewhat transversely narrowly oblong, ca. 4 × 14 mm, adaxially with small papillae, base cuneate, margin undulate, apex with lobules ± narrowly obovate; disk with 2 longitudinal lamellae extending from base to cuneate base of mid-lobe, and 1 central keel extending to near apex of mid-lobe; lamellae taller and crisped in apical half. Column ca. 4 mm, stout; foot ca. 5 mm. Fl. Jun.

- Epiphytic on tree trunks in forests; 800–900 m. S Yunnan.

**7. *Flickingeria calocephala*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 33: 203. 1995.

红头金石斛 hong tou jin shi hu

Rhizome creeping, 5–6 mm in diam., internodes 6–10 mm. Stems pendulous or ascending, golden yellow, branching. Pseudobulbs subcylindric, 4–6.3 cm × 7–9 mm. Leaf blade narrowly oblong, 8.5–12.5 × 1.4–1.6 cm, leathery, acuminate. Inflorescence usually 1- or 2-flowered; peduncle ca. 3 mm. Flowers lasting only half a day, lemon-yellow, lateral lobes of lip pale tangerine, lamellae brownish red; pedicel and ovary ca. 4 mm. Dorsal sepal ovate-oblong, ca. 10.5 × 3.5 mm, acute; lateral sepals obliquely ovate-triangular, similar in size to dorsal sepal, base oblique and broader, apex acute; mentum perpendicular to ovary. Petals narrowly oblong, ca. 9 × 2 mm, acute; lip obovate in outline, ca. 12 mm, ca. 7 mm wide between 2 lateral lobes when flattened, base cuneate, margin 3-lobed; lateral lobes erect, obovate, rounded; mid-lobe somewhat batlike, ca. 4.5 × 10 mm, margin slightly erose; disk with 2 lamellae extending from base to near base of mid-lobe; lamellae crisped undulate in apical half. Column ca. 3 mm; foot ca. 5 mm. Fl. Jun–Jul.

- Epiphytic on tree trunks in forests; ca. 1200 m. S Yunnan.

**8. *Flickingeria concolor*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 33: 204. 1995.

同色金石斛 tong se jin shi hu

Rhizome creeping, ca. 7 mm in diam., internodes ca. 6 mm. Stems pendulous or ascending, pale yellow or golden yellow, ca. 4 mm in diam., usually branching. Pseudobulbs golden yellow, narrowly fusiform, slightly compressed, 5.5–6 cm × 8–13 mm. Leaf blade narrowly elliptic-lanceolate, 11–12 × 1.4–2.2 cm, leathery, acute and slightly bilobed. Peduncle ca. 3 mm, hidden in scalelike sheaths. Flowers only lasting half a day, usually solitary, pure white, thinly textured; pedicel and ovary ca. 5 mm. Dorsal sepal ovate-lanceolate, ca. 8 × 4 mm, acute; lateral sepals similar to dorsal sepal, base broad and oblique; mentum borne at an obtuse angle to ovary, obtuse. Petals narrowly oblong, ca. 10 × 2.5 mm, acute; lip ca. 10 mm, 3-lobed; lateral lobes erect, oblong, ca. 6 × 2.5 mm, rounded; mid-lobe somewhat transversely suboblong, margin inconspicuously erose; disk with 2 longitudinal lamellae extending from base to near base of mid-lobe, and a central keel extending to mid-lobe; lamellae strongly crisped undulate in apical half. Column ca. 3 mm, stout; foot ca. 5 mm. Fl. Jun.

- Epiphytic on tree trunks in forests; ca. 1600 m. S Yunnan.

**9. *Flickingeria bicolor*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 33: 204. 1995.

二色金石斛 er se jin shi hu

Rhizome creeping, 5–7 mm in diam., stout, internodes 3–6 mm. Stems pendulous or ascending, golden yellow, 3–7 mm in diam., usually branching. Pseudobulbs golden yellow, fusiform, slightly compressed, 3.5–5 cm × 13–17 mm. Leaf blade elliptic-lanceolate, 12.5–13.5 × 1.7–2.3 cm, leathery, apex subacute and slightly bilobed. Inflorescence 1–5-flowered; peduncle 2–4 mm, with several tufted scalelike sheaths. Flowers lasting nearly half a day, thinly textured; pedicel and ovary pale yellow, sepals, petals, and lip creamy white or white, with dense purplish red spots on basal half of dorsal sepal and throughout lateral sepals, mentum pale yellow, lamellae on disk tinged with yellowish green or purplish red, column tinged red at base and margin; pedicel and ovary ca. 5 mm. Dorsal sepal oblong, slightly concave, 12–15 × 4–5 mm, acute; lateral sepals oblong-lanceolate, similar in size to dorsal sepal, base broad and oblique; mentum nearly perpendicular to ovary, ca. 5 mm, obtuse. Petals oblong, ca. 10 × 3 mm, acute; lip obovate in outline, ca. 12 mm, base cuneate, margin 3-lobed; lateral lobes suberect, ovate-triangular, ca. 8 × 3 mm, slightly obtuse; mid-lobe somewhat batlike, 2-lobed; lobules subflabellate, erect, basal margin crisped undulate; disk with 2 lamellae extending from base to near base of mid-lobe; lamellae strongly crisped undulate in apical half. Column ca. 3 mm, stout; foot ca. 6 mm. Fl. Jun–Jul.

- Epiphytic on tree trunks in open forests; ca. 900 m. S Yunnan.

## 141. *EPIGENEIUM* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 593. 1932.

厚唇兰属 hou chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Sarcopodium* Lindley & Paxton (1850), not Ehrenberg ex Brongniart (1824).

Herbs, epiphytic or terrestrial. Rhizome aerial, creeping and climbing, terminating in a pseudobulb consisting of 1 internode; roots granulose. New shoot arising at base of pseudobulb, sometimes pendulous, covered with conspicuous imbricate chestnut or

pale brown sheaths when young. Pseudobulbs usually short and conic, or ovoid, often quadrate, remote or less often contiguous, comprised of 1 internode, usually covered with brown sheaths when young, apex 1- or 2[or 3]-leaved. Leaves distal, shortly petiolate or sessile, oblong, obovate, or elliptic, fleshy, leathery, articulate. Inflorescences pseudoterminal, borne generally on most recent pseudobulb, but occasionally on an unflowered or previously flowered penultimate stem, slender, arising between or just below leaves, 1- to several flowered, usually racemose; floral bracts chestnut, usually much shorter than pedicel and ovary, membranous. Flowers long-lasting, resupinate, medium-sized to large, stellate. Sepals and petals free, narrowly elliptic, subequal. Dorsal sepal enclosing column; lateral sepals larger, oblique and adnate to column foot forming a short, conspicuous mentum. Petals long decurrent on mentum, usually slightly narrower; lip pandurate-oblong, rather narrow, 3-lobed; lateral lobes erect; mid-lobe spreading; disk with a callus lobulate or ridged at base, often of 2 longitudinal lamellae. Column short to rather long, with or without short stielidia, foot long; rostellum subrotund, entire; pollinia 4 in 2 pairs (possibly sometimes only 2), waxy, naked, i.e., without caudicle or viscidium.

About 35 species: Bangladesh, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; 11 species (four endemic) in China.

The genus *Epigeneium* was monographed by Seidenfaden (Dansk Bot. Ark. 34(1): 1–104. 1980).

Reviewer L. Averyanov notes that *Epigeneium chapaense* Gagnepain (Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 596. 1932), described from N Vietnam, also occurs in S China. However, the present authors could not substantiate this record because they found no relevant specimens.

1a. Pseudobulbs 1-leaved.

2a. Lip rounded and apiculate or slightly emarginate at apex.

3a. Lip with 2 keels in lower half united apically into a small transverse callus with 3 low keels in front and  $\pm$  continuing to apex ..... 4. *E. nakaharai*

3b. Lip bearing only 3 low keels restricted to middle ..... 5. *E. mimicum*

2b. Lip conspicuously bilobed at apex.

4a. Calli convergent; lateral sepals ca. 9 mm wide; lip epichile ca. 10 mm wide, distinctly wider than hypochile; leaves 2.8–4.6 cm ..... 3. *E. tsangianum*

4b. Calli separate; lateral sepals 5–6 mm wide; lip and leaves without above combination of characters.

5a. Leaves 1–2.3 cm; lip epichile ca. 11 mm wide, apex deeply bilobed; sepals and petals pale pink or reddish orange, lip white ..... 1. *E. fargesii*

5b. Leaves 5–6 cm; lip epichile 8–9 mm wide, apex shallowly bilobed or notched; flowers dull purple to brown ..... 2. *E. clemensiae*

1b. Pseudobulbs 2-leaved.

6a. Dorsal sepal 45–65 mm; leaves (6–)10–22.5 cm ..... 6. *E. amplum*

6b. Dorsal sepal 15–32 mm; leaves 2.5–9.5 cm.

7a. Petals 5–6 mm wide; sepals 22–32 mm; mid-lobe of lip subreniform to obscurely bilobed, emarginate ..... 7. *E. rotundatum*

7b. Petals less than 4 mm wide; sepals 15–25 mm; mid-lobe not as above.

8a. Disk with 3 indistinct keels and a distal callus ..... 8. *E. gaoligongense*

8b. Disk with 3 prominent fleshy carinate lamellae, distal callus absent.

9a. Lateral lobes of lip broad; mid-lobe of lip minutely mucronate to hooked aristate at apex ..... 9. *E. fuscescens*

9b. Lateral lobes of lip narrow; mid-lobe of lip rounded at apex.

10a. Lateral keels on disk most prominent, obliquely truncate apically, median keel very low ..... 10. *E. treutleri*

10b. All keels similar in size and shape in upper half, before fusing in apical quarter, each one terminating in a 2-angled manner ..... 11. *E. Forrestii*

**1. *Epigeneium fargesii*** (Finet) Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 595. 1932.

单叶厚唇兰 dan ye hou chun lan

*Dendrobium fargesii* Finet, Bull. Soc. Bot. France 50: 374. 1903; *Desmotrichum fargesii* (Finet) Kraenzlin; *Sarcopodium fargesii* (Finet) Tang & F. T. Wang.

Rhizome creeping, 2–3 mm in diam., densely covered with chestnut tubular sheaths. Pseudobulbs borne ca. 1 cm apart on rhizome, prostrate below middle, subovate, ca. 10  $\times$  3–5 mm, 1-leaved, with chestnut membranous sheaths at base. Leaf blade chestnut when dried, ovate or broadly ovate-elliptic, 1–2.3  $\times$  0.7–1.1 cm, thickly leathery, base narrowed into short petiole or subsessile, apex rounded and retuse. Inflorescence flowered; peduncle ca. 1 cm, base with 2 or 3 membranous

sheaths; floral bracts ovate, ca. 3 mm, membranous. Flowers not opening widely, sepals and petals pale pink or reddish orange, lip white; pedicel and ovary ca. 7 mm. Dorsal sepal ovate, ca. 10  $\times$  6 mm, acute; lateral sepals obliquely ovate-lanceolate, ca. 15  $\times$  6 mm, acute; mentum ca. 5 mm. Petals ovate-lanceolate, smaller than lateral sepals, acute; lip  $\pm$  oblong-obovate in outline, ca. 2  $\times$  1.1 cm, 3-lobed; lateral lobes erect; mid-lobe spreading, suboblate, deeply bilobed, margin  $\pm$  undulate; disk with 2 longitudinal thickened keels, extending from base to base of mid-lobe, swollen distally. Column ca. 5 mm, stout; foot ca. 1.5 cm. Fl. mainly Apr–May.

Lithophytic on rocks along valleys, epiphytic on tree trunks in forests; 400–2400 m. S Anhui, N and W Fujian, Guangdong, Guangxi, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, C and SE Yunnan, S and SE Zhejiang [Bhutan, Thailand, ?N Vietnam].

**2. *Epigeneium clemensiae*** Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 595. 1932.

厚唇兰 hou chun lan

*Sarcopodium clemensiae* (Gagnepain) Tang & F. T. Wang.

Pseudobulbs usually slightly curved, narrowly ovoid, 10–20 × 4–5 mm, 1-leaved. Leaf blade obovate or obovate-lanceolate, (2.5–)5–6 × ca. 1.3 cm, base cuneate and contracted into short petiole. Inflorescence 1-flowered. Flower purplish brown, relatively thickly textured. Sepals ovate-oblong, ca. 14 × 5 mm; lateral sepals similar in size to dorsal sepal, oblique, subacute. Petals triangular-lanceolate, ca. 7 × 2–3 mm, acuminate; lip pandurate in outline, ca. 2 cm; epichile 8–9 mm wide, wider than or ca. as wide as hypochile, shallowly bilobed; disk with 2 rounded calli at base of epichile. Fl. Oct–Nov.

Epiphytic on tree trunks in dense forests; 1000–1300 m. NE Guizhou, Hainan, SE Yunnan [Laos, Vietnam].

**3. *Epigeneium tsangianum*** Ormerod, Taiwania 49: 97. 2004.

广西厚唇兰 guang xi hou chun lan

Rhizome terete, 15–26 cm, 1–1.5 mm in diam., occasionally branching. Pseudobulbs borne 2–10 mm apart, prostrate, subcylindric-fusiform, 10–15 × 3–5 mm, apex raised, mostly covered by a red-brown drying sheath, 1-leaved. Leaf blade erect, oblong-elliptic, 2.8–4.6 × 1–1.4 cm, stiffly leathery, entire to shortly and obtusely unequally bilobulate; petiole 2–4 mm. Inflorescence 1-flowered; peduncle 11–13.5 mm. Flowers unscented, dull purple to brown; pedicel and ovary 18.5–21 mm. Dorsal sepal ovate, ca. 8 × 5 mm, 7-veined, acute; lateral sepals obliquely ovate-elliptic, ca. 15 × 9 mm, 7-veined, acute; mentum ca. 9 mm. Petals oblong-ligulate, ca. 9 mm, ca. 3.5 mm wide at base, ca. 2.5 mm wide above, 3-veined, basally dilated, apex acute; lip ca. 19 × 10 mm, 3-lobed; hypochile obcordate-cuneate, with 2 apical convergent, subdiscoid fleshy calli; lateral lobes short, ca. 3 mm wide, truncate; epichile broadly cordate-trapeziform, ca. 9 × 10 mm, apex deeply emarginate-bilobulate. Column ca. 3 mm, foot ca. 14.5 mm. Fl. Nov.

• Swampy thickets. Guangxi.

**4. *Epigeneium nakaharae*** (Schlechter) Summerhayes, Kew Bull. 12: 263. 1957 [*“nakaharai”*].

台湾厚唇兰 tai wan hou chun lan

*Dendrobium nakaharae* Schlechter, Repert. Spec. Nov. Regni Veg. 2: 169. 1906 [*“nakaharai”*]; *D. sanseiense* Hayata; *Epigeneium sanseiense* (Hayata) Summerhayes.

Rhizome creeping, with slender and curved roots. Pseudobulbs tufted on rhizome, nearly prostrate below middle and ascending above, ovoid-oblong, 13–30 × 6–10 mm, 1-leaved, with yellowish green or yellow scalelike sheaths at base. Leaf blade erect, elliptic to oblong-obovate, 2–5 × 0.9–1.5 cm, thickly leathery, base contracted, shortly petiolate, articulate, apex rounded and slightly emarginate. Inflorescence 1-flowered; peduncle short, with long sheaths; floral bracts ovate, 3–4 mm, acute. Flower with yellowish green sepals and petals, lip white, all tinged with purplish brown; pedicel and ovary 2–3 cm. Dorsal sepal ovate-lanceolate, 10–17 × 7–8 mm, acute; lateral sepals falcate-lanceolate, 12–19 × 6–8 mm, acute. Petals

narrowly oblong, 12–18 × ca. 4 mm; lip pandurate in outline, 12–19 × 7–9 mm, 3-lobed; lateral lobes erect; mid-lobe orbicular or broadly obovate, 7–8 mm, apex rounded and apiculate or slightly emarginate; disk with 2 longitudinal lamellae adaxially. Column ca. 2 mm, foot 6–10 mm. Fl. Oct–Feb.

• Epiphytic on tree trunks in broad-leaved forests; 700–2400 m. Taiwan.

**5. *Epigeneium mimicum*** Ormerod, Taiwania 48: 139. 2003.

拟色厚唇兰 ni se hou chun lan

Rhizome creeping, terete, rooting, forming chains up to 8 cm, 1–1.5 mm in diam. Pseudobulbs prostrate, apex raised, covered by brown drying sheath, obliquely ellipsoid-fusiform, 1-leaved, up to 4 mm apart, 6–13 × 5–6 mm. Leaf blade erect, ovate-elliptic to elliptic, 1.1–2.4 × 0.7–1 cm stiffly leathery; petiole to 2 mm. Inflorescence subterminal, 1-flowered; peduncle ca. 4 mm. Flowers light red, or with greenish sepals and petals and lip with a red-brown mid-lobe and front of side lobes, lower half of lip greenish; pedicel and ovary terete, ca. 10 mm. Dorsal sepal ovate, ca. 6.5 × 4 mm, 5-veined, acute; lateral sepals broadly ovate-triangular, ca. 10 × 8 mm, 6-veined, acute; mentum 8–10 mm. Petals oblong-lanceolate, ca. 8 × 3 mm, 6-veined, acute; lip 3-lobed, ca. 13.5 × 7.5–8 mm; hypochile obovate, with 3 low longitudinal keels in center, ca. 10 mm, ca. 2 mm wide at base, apex 7.5–8 mm wide; mid-lobe transversely elliptic-reniform, ca. 4 × 7 mm, subacute. Column ca. 1 mm, ca. 3 mm wide below. Fl. Jun.

Epiphyte. ?Guangdong, S Guangxi (Shiwan Dashan) [Thailand].

**6. *Epigeneium amplum*** (Lindley) Summerhayes, Kew Bull. 12: 260. 1957.

宽叶厚唇兰 kuan ye hou chun lan

*Dendrobium amplum* Lindley, Gen. Sp. Orchid. Pl. 74. 1830; *Bulbophyllum amplum* (Lindley) H. G. Reichenbach; *Callista ampla* (Lindley) Kuntze; *C. coelogyne* (H. G. Reichenbach) Kuntze; *D. coelogyne* H. G. Reichenbach; *Epigeneium coelogyne* (H. G. Reichenbach) Summerhayes; *Katherinea ampla* (Lindley) A. D. Hawkes; *K. coelogyne* (H. G. Reichenbach) A. D. Hawkes; *Sarcopodium amplum* (Lindley) Lindley & Paxton; *S. coelogyne* (H. G. Reichenbach) Rolfe.

Rhizome 4–6 mm in diam., usually branched, covered with many tubular sheaths; sheaths chestnut, ca. 2 cm, papery. Pseudobulbs borne 3–14 cm apart from one another, golden yellow when dried, ovoid or elliptic, 20–50 × 7–20 mm, 2-leaved, enclosed in membranous sheaths. Leaf blade elliptic or oblong-elliptic, 6–22.5 × ca. 5.5 cm, leathery, base contracted into petiole ca. 3 cm, apex ± obtuse and retuse. Inflorescence much shorter than leaves, 1-flowered; peduncle 1.5–2 cm, enclosed in 2 sheaths; floral bracts 1–1.7 cm. Flowers spreading, yellowish green, spotted with deep brown, large; pedicel and ovary 4.5–5 cm. Dorsal sepal lanceolate, (35–)45–65 × ca. 8 mm, acute; lateral sepals falcate-lanceolate, ca. 45 × 11–15 mm, acute-acuminate. Petals lanceolate, ca. 14 × 6 mm, acute-acuminate; lip pandurate in outline, ca. 26 mm, 3-lobed; lateral lobes erect, small; mid-lobe subrhombic, ca. 6 mm, ca. as wide as or slightly wider than disk and lateral lobes, obtuse and mucro-

nate; disk with 3 lamellae, median slightly longer. Column ca. 15 mm, stout, foot ca. 14 mm. Fl. Nov.  $2n = 40$ .

Lithophytic on rocks or epiphytic on tree trunks in forests or along streams; 1000–1900 m. S Guangxi, SE Xizang, SE to NW Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

**7. *Epigeneium rotundatum*** (Lindley) Summerhayes, Kew Bull. 12: 264. 1957.

双叶厚唇兰 *shuang ye hou chun lan*

*Sarcopodium rotundatum* Lindley, Fol. Orchid. 2(Sarcopodium): 2. 1853; *Bulbophyllum rotundatum* (Lindley) H. G. Reichenbach; *Callista rotundata* (Lindley) Kuntze; *Dendrobium rotundatum* (Lindley) J. D. Hooker; *Katherinea rotundata* (Lindley) A. D. Hawkes.

Rhizome many branched, covered with papery tubular sheaths ca. 1 cm. Pseudobulbs borne 3–11 cm apart on rhizome, often  $\pm$  curved, ascending, narrowly ovoid, 20–30  $\times$  4–7 mm, 2-leaved, with scalelike basal sheaths. Leaf blade oblong or elliptic, 6–9  $\times$  1.5–2.5 cm, leathery, apex retuse; petiole 5–10 mm. Inflorescence 1-flowered; peduncle ca. 5 mm, enclosed in large membranous sheaths; floral bracts ovate, small, ca. 1 cm, membranous. Flowers yellowish brown; pedicel and ovary ca. 2 cm. Dorsal sepal ovate-lanceolate, 22–32  $\times$  ca. 7 mm, acute; lateral sepals lanceolate, 22–35  $\times$  8–10 mm. Petals oblong-lanceolate, ca. 23  $\times$  5–6 mm, acuminate; lip obovate-oblong in outline, ca. 20 mm, 3-lobed; lateral lobes subovate; mid-lobe ca. 11 mm wide, adaxially with a triangular thickened keel, margin thin, undulate, subreniform to obscurely bilobed, emarginate; disk with 3 lamellae, median much shorter. Column ca. 1 cm, foot ca. 1 cm. Fl. Mar–May.

Lithophytic on rocks or epiphytic on tree trunks in open forests or at forest margins; 1300–2500 m. Guangxi, SE Xizang, NW and SE Yunnan [Bhutan, NE India, Myanmar, Nepal].

**8. *Epigeneium gaoligongense*** H. Yu & S. G. Zhang, Novon 15: 495. 2005.

高黎贡厚唇兰 *gao li gong hou chun lan*

Rhizome creeping, 2–3 mm in diam., usually branching, densely covered with maroon sheaths when young. Pseudobulbs borne 3–9 cm apart on rhizome, narrowly ovoid to cylindrical-ovoid, 15–40  $\times$  5–8 mm, 2-leaved, usually enclosed by sheaths at base. Leaf blade ovate-elliptic or elliptic, 2.5–7  $\times$  1.2–2.8 cm, leathery, rigid, bilobulate; petiole 5–11 mm. Inflorescence terminating in a solitary flower, 2–3 cm, with 2 or 3 sterile basal bracts; peduncle 5–7 mm, enclosed in membranous sheaths; floral bract ovate, small, membranous. Flower ca. 3 cm in diam.; sepals and petals greenish, usually with obscure pale red-purple markings abaxially, lip greenish, densely spotted with red-purple; pedicel and ovary 1.5–2 cm. Dorsal sepal lanceolate, 18–23  $\times$  5–6 mm, obscurely 5-veined; lateral sepals obliquely lanceolate-ovate, 15–19  $\times$  9–10 mm, obscurely 7-veined. Petals linear-lanceolate, 15–21  $\times$  1.5–2 mm, 1-veined; lip ovate-orbicular in outline, 10–15  $\times$  14–20 mm, 3-lobed; lateral lobes erect-incurved, ovate, ca. 11  $\times$  6 mm; mid-lobe broadly ovate, 8–10  $\times$  8–10 mm, acute; disk with 3 indistinct keels and at their top a callus. Column 4–5  $\times$  4–5 mm, stout, foot 5–7 mm. Fl. Jul–Sep.

• Lithophytic on rocks or epiphytic on tree trunks at forest margins; 2400–2600 m. W Yunnan (Lushui).

**9. *Epigeneium fuscescens*** (Griffith) Summerhayes, Kew Bull. 12: 262. 1957.

景东厚唇兰 *jing dong hou chun lan*

*Dendrobium fuscescens* Griffith, Not. Pl. Asiat. 3: 308. 1851; *Bulbophyllum fuscescens* (Griffith) H. G. Reichenbach; *Callista fuscescens* (Griffith) Kuntze; *Katherinea fuscescens* (Griffith) A. D. Hawkes; *Sarcopodium fuscescens* (Griffith) Lindley.

Rhizome ca. 4 mm in diam., often branching, densely covered with tubular sheaths. Pseudobulbs borne 4–6 cm apart from one another, narrowly ovoid, slightly curved, ca. 25  $\times$  5 mm, 2(or 3)-leaved, covered with 2 or 3 chestnut sheaths. Leaf blade oblong, 3–6.5  $\times$  1–1.9 cm, leathery, base subsessile or with a short petiole, apex  $\pm$  obtuse and slightly emarginate. Inflorescence 1-flowered; peduncle ca. 1 cm, base covered with sheaths; floral bracts much shorter than pedicel and ovary. Flowers pale brown; pedicel and ovary ca. 3 cm. Dorsal sepal ovate-lanceolate, 17–20  $\times$  ca. 5 mm, long acuminate; lateral sepals falcate-lanceolate, 21–24  $\times$  5–10 mm, acuminate-caudate. Petals narrowly oblong or linear, 25–30  $\times$  2.5–3 mm, acuminate-caudate; lip ovate-oblong in outline, ca. 15 mm, 3-lobed; lateral lobes erect, suboblong; mid-lobe elliptic, ca. 12  $\times$  6 mm, often hooked aristate; disk with 3 lamellae, median shorter. Column ca. 7 mm, foot ca. 9 mm. Fl. Oct.

Lithophytic on damp rocks along valleys; 1300–2300 m. S Guangxi, SE Xizang, S and W Yunnan [Bhutan, NE India, Nepal].

**10. *Epigeneium treutleri*** (J. D. Hooker) Ormerod, Oasis 1(3): 3. 2000.

长爪厚唇兰 *chang zhao hou chun lan*

*Coelogyne treutleri* J. D. Hooker, Fl. Brit. India 5: 837. 1890; *Epigeneium yunnanense* Tang & Z. H. Tsi; *Pleione treutleri* (J. D. Hooker) Kuntze.

Rhizome branching, densely covered with tubular membranous sheaths ca. 12 mm. Pseudobulbs borne 5–6.5 cm apart on rhizome, ascending, narrowly ovoid, 20–25  $\times$  4–5 mm, 2-leaved, base covered with large sheaths, golden yellow when dried. Leaf blade oblong, 4–6.5  $\times$  1.2–1.4 cm, leathery, subsessile or with petiole ca. 5 mm, apex obtuse and slightly emarginate. Inflorescence 1-flowered; peduncle ca. 1 cm, enclosed in 2 long sheaths; floral bracts subobovate, ca. 9 mm, membranous. Flowers purplish red; pedicel and ovary ca. 2.5 mm. Dorsal sepal lanceolate, 16–23  $\times$  5–7 mm, acuminate; lateral sepals slightly obliquely lanceolate, nearly as long as dorsal sepal, base ca. 7 mm wide, apex acuminate. Petals linear, ca. 23  $\times$  2.5 mm, acute; lip nearly obovate in outline, 14–16 mm, base with a claw ca. 5 mm, 3-lobed; lateral lobes erect, narrowly oblong, rounded; mid-lobe nearly orbicular, ca. 11 mm wide, apiculate; disk with 3 lamellae, outer most prominent and obliquely truncate, median shorter and very low. Column 1–1.2 cm, foot ca. 7 mm. Fl. Oct.

Epiphytic on tree trunks in dense forests; 1400–2400 m. NW Yunnan [India (Sikkim)].

**11. *Epigeneium forrestii*** Ormerod, *Taiwania* 52: 307. 2007.双角厚唇兰 *shuang jiao hou chun lan*

Rhizome terete, 2–2.5 cm, ca. 2.5 mm in diam., occasionally branching, covered in tightly tubular sheaths. Pseudobulbs borne 6–9.5 cm apart, subcylindric-fusiform, 30–58 × 7–8 mm, 2-leaved. Leaf blade oblong-ligulate, 5–9.5 × 1.7–2.35 cm, subleathery, minutely and obtusely bilobed. Inflorescence 1-flowered; peduncle short, hidden by sheathing bracts ca. 2.5 cm. Flowers deep purplish maroon; pedicel and ovary terete, ca. 2.8 cm. Dorsal sepal broadly ovate-lanceolate, ca. 21.5 × 8 mm, subacute; lateral sepals broadly ovate-lanceolate, 20.5–25 × 9–

10 mm, acute; mentum ca. 9 mm. Petals linear-ligulate, 20–21 × 2.5–3 mm, acute; lip 20–22 mm, 3-lobed, medially with sub-similar laminate carinae terminating on base of epichile, outer 2 keels divided in lower 3/4 before fusing in apical quarter, apices biangulate; hypochile obdeltate-obcordate, ca. 8 mm medially, ca. 10.5 mm wide across lateral lobes, free portion of lateral lobes obliquely elliptic, ca. 3 mm medially, obtuse; epichile suborbicular, ca. 12 × 12.5–13 mm. Column subcylindric, 9–10 mm, foot 6–7 mm. Fl. Sep.

• Lithophytic, epiphytic on trees beside streams; 1800–1900 m. W Yunnan (N'mai Hka-Nu Jiang divide).

**142. BULBOPHYLLUM** Thouars, *Hist. Orchid., Tabl. Esp.* 3. 1822, nom. cons.石豆兰属 *shi dou lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Jaap J. Vermeulen*Phyllorkis* Thouars.

Herbs, epiphytic. Rhizome usually rather long, creeping or hanging, usually bearing a series of pseudobulbs, very rarely without pseudobulbs. Pseudobulbs well spaced to clustered on rhizome, each with a single joint. Leaves 1 or rarely 2 or 3, arising from apex of pseudobulbs or very rarely directly from rhizome; leaf blade usually leathery, varying in size. Scape arising laterally from base of a pseudobulb or from a node of rhizome; inflorescence usually racemose or umbellate, 1- to many flowered; floral bracts often small. Flowers small to large. Sepals subequal in size or lateral sepals much longer than dorsal one; lateral sepals free or ± connate on lower or upper edges, base adnate to column foot forming a short mentum. Petals free, usually smaller than sepals; lip often hinged to end of column foot, mobile or sometimes immobile, usually fleshy and recurved. Column short, winged, base with a distinct foot; wings often dilated to form teeth or stielidia; anther 2-locular, sometimes 1-locular; pollinia 4, in 2 pairs, waxy, without appendages, sometimes attached to sticky substance.

About 1,900 species: largely in tropical areas of both Old and New Worlds; 103 species (33 endemic) in 18 sections in China.

*Bulbophyllum formosanum* (Rolfe) K. Nakajima (*Biol. Mag. Okinawa* 10: 36. 1973; *Cirrhopetalum formosanum* Rolfe, *Bull. Misc. Inform. Kew* 1914: 372. 1914), described from Taiwan, is a doubtful species. The original description by Rolfe is quite different from that by Seidenfaden (*Dansk Bot. Ark.* 29(1): 172, fig. 85. 1974), who published the combination *B. formosanum* a year later than Nakajima. An examination of the specimen Seidenfaden cited as type (*Price 1043*, K), which lacks flowers, indicated that its vegetative characteristics are identical with Seidenfaden's figure rather than with Rolfe's description, which seems to refer to another species. Further study is needed.

**Key to sections**

- 1a. Pseudobulbs 2-leaved.
  - 2a. Lateral sepals 2–5 × as long as dorsal sepal ..... 17. *B. sect. Tripudianthes* (p. 438)
  - 2b. Lateral sepals ca. as long as dorsal sepal or slightly longer ..... 18. *B. sect. Pleiophylla* (p. 438)
- 1b. Pseudobulbs, or shoot tip if pseudobulbs inconspicuous, 1-leaved.
  - 3a. All inflorescences 1-flowered.
    - 4a. Petals 5- or more veined.
      - 5a. Dorsal sepal ciliate or denticulate ..... 13. *B. "Section 13"* (63. *B. bicolor*, 69. *B. chinense*; p. 427)
      - 5b. Dorsal sepal glabrous.
        - 6a. Node at base of pedicel at least 1.5 × width of pedicel above subtending bract ..... 2. *B. sect. Sestochilos* (p. 409)
        - 6b. Node at base of pedicel coinciding with bract attachment, or removed from it less than 1 × width of pedicel ..... 1. *B. sect. Leopardina* (p. 406)
    - 4b. Petals 1–3-veined.
      - 7a. New shoots arising well away from basal node of pseudobulb; pseudobulbs distinctly present ..... 5. *B. sect. Macrocaulia* (p. 415)
      - 7b. New shoots arising from base of pseudobulb; or pseudobulbs minute, inconspicuous compared to size of plant.
        - 8a. Lateral sepals ca. 2 × as long as dorsal sepal ..... 13. *B. "Section 13"* (64. *B. omerandrum*; p. 427)
        - 8b. Lateral sepals ca. as long as or slightly longer than dorsal sepal.
          - 9a. Basal node of pedicel well above attachment of floral bract.
            - 10a. Rhizome creeping, roots spreading; petals without appendages ..... 7. *B. sect. Monanthaparva* (p. 416)
            - 10b. Rhizome pendulous, roots growing over it toward point of attachment to substrate; petals with appendages ..... 3. *B. sect. Epicranthes* (p. 410)

- 9b. Basal node of pedicel level with attachment of floral bract.
  - 11a. Pseudobulbs distinctly present ..... 6. *B. sect. Monanthes* (p. 416)
  - 11b. Pseudobulbs absent or minute, inconspicuous compared to size of plant ..... 16. *B. sect. Stachysanthes* (p. 436)
- 3b. Racemose inflorescences (i.e., with 2 or more flowers) present.
  - 12a. Petals 5- or more veined.
    - 13a. Dorsal sepal ciliate or denticulate ..... 13. *B. "Section 13"* (63. *B. bicolor*, 69. *B. chinense*; p. 427)
    - 13b. Dorsal sepal glabrous.
      - 14a. Lateral sepals twisted inward near base so that upper margins are turned toward one another ..... 12. *B. sect. Umbellata* (56. *B. umbellatum*; p. 422)
      - 14b. Lateral sepals not twisted inward near base ..... 1. *B. sect. Leopardina* (p. 406)
  - 12b. Petals 1–3-veined.
    - 15a. Lip with small auricles well above base.
      - 16a. Raceme elongated, or raceme congested and floral bracts longer than pedicel plus ovary ..... 9. *B. sect. Anisopetalon* (p. 418)
      - 16b. Raceme subumbellate, floral bracts shorter than pedicel plus ovary ..... 14. *B. sect. Cirrhopetalum* (72. *B. picturatum*; p. 430)
    - 15b. Lip without auricles well above base, or with retrorse auricles immediately next to ligament.
      - 17a. Petal margins glabrous.
        - 18a. Pseudobulbs inconspicuous, or very small compared to size of plant.
          - 19a. Inflorescence 2- or 3-flowered ..... 16. *B. sect. Stachysanthes* (p. 436)
          - 19b. Inflorescence 5- or more flowered.
            - 20a. Raceme congested, subumbellate ..... 12. *B. sect. Umbellata* (p. 422)
            - 20b. Raceme elongated ..... 16. *B. sect. Stachysanthes* (92. *B. apodum*; p. 436)
        - 18b. Pseudobulbs distinctly present.
          - 21a. Lateral sepals twisted inward near base so that upper margins are turned toward one another; upper margins fused or free; or lateral sepals ca. 8 mm wide.
            - 22a. Lateral sepals fused along their upper margins; or lateral sepals free, and petals 4–7 mm ..... 12. *B. sect. Umbellata* (p. 422)
            - 22b. Lateral sepals free; petals ca. 2 mm ..... 4. *B. sect. Corymbosa* (20. *B. ledungense*; p. 411)
          - 21b. Lateral sepals not twisted inward near base, free, ± spreading; lateral sepals 1–3 mm wide.
            - 23a. Stelidia deltoid to subulate, rounded to acuminate, not twisted inward ..... 4. *B. sect. Corymbosa* (p. 411)
            - 23b. Stelidia clavate (?spatulate), twisted inward ..... 12. *B. sect. Umbellata* (46. *B. macraei*; p. 422)
- 17b. Petal margins (irregularly) denticulate, serrate, ciliate, fimbriate, or with glandular appendages.
  - 24a. Raceme congested, flowers all radiating from ± same point, arranged in an umbel.
    - 25a. Dorsal sepal glabrous with a terminal thread ending in a widened palea, or dorsal sepal ciliate ..... 14. *B. sect. Cirrhopetalum* (p. 430)
    - 25b. Dorsal sepal glabrous without a terminal thread ending in a palea, or dorsal sepal papillose, denticulate, erose, or with glandular appendages.
      - 26a. Lateral sepals twisted inward near base so that upper margins are turned toward one another; upper margins fused or free ..... 13. *B. "Section 13"* (p. 427)
      - 26b. Lateral sepals diverging, not twisted inward ..... 8. *B. "Section 8"* (30. *B. levinei*; p. 417)
  - 24b. Raceme elongate.
    - 27a. Dorsal sepal ciliate.
      - 28a. Lip with minute, retrorse auricles at its base, immediately next to ligament ..... 10. *B. sect. Hirtula* (p. 419)
      - 28b. Lip without auricles at its base ..... 8. *B. "Section 8"* (32. *B. insulsoides*; p. 417)
    - 27b. Dorsal sepal glabrous.
      - 29a. Inflorescence 2- or 3-flowered ..... 13. *B. "Section 13"* (64. *B. omerandrum*; p. 427)
      - 29b. Inflorescence 5- or more flowered.

- 30a. Raceme lax, flowers spaced, scattered.
  - 31a. Column foot elongate, causing a gap between petals and lateral sepals ..... 11. *B. sect. Altisceptrum* (p. 421)
  - 31b. Column foot not elongate, petals and lateral sepals partly overlapping ..... 8. *B. "Section 8"* (31. *B. eublepharum*; p. 417)
- 30b. Raceme dense, flowers arranged in a  $\pm$  regular pattern.
  - 32a. Stelidia without a tooth along lower margin ..... 9. *B. sect. Anisopetalon* (33. *B. brevispicatum*; p. 418)
  - 32b. Stelidia with a distinct tooth along lower margin ..... 15. *B. sect. Brachystachya* (91. *B. repens*; p. 435)

**1. *Bulbophyllum* sect. *Leopardina*** Bentham & J. D. Hooker, Gen. Pl. 3: 502. 1883 [*"Leopardinae"*].

短葶组 duan ting zu

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescences solitary, arising near pseudobulbs, 1-flowered or 2–4-flowered in an elongate or contracted raceme. Pedicel with basal node coinciding with attachment of subtending bract, or no more than  $1 \times$  diam. of pedicel above it. Sepals free,  $\pm$  equal in length or lateral sepals somewhat longer, margins glabrous, 5- or more veined. Petals: margins glabrous to erose, 5- or more veined (3-veined in *Bulbophyllum ambrosia*); lip with or without antrorse auricles along margins well above its base, margins otherwise glabrous to partly or entirely erose or denticulate, adaxially glabrous to variously verrucose or papillose. Column: stigma not protruding at its base, foot distinct; anther: front margin not or slightly projecting, abaxially with a high, conic crest (a small crest in *B. ambrosia*); pollinia 4, with or without stipe, inner more than  $1/2$  as long as outer.

Seventy-two provisionally accepted species: Himalayas to W Pacific; seven species in China.

- 1a. Proximal margin of stigma distinctly protruding ..... 1. *B. striatum*
- 1b. Proximal margin of stigma not protruding.
  - 2a. Anther abaxially with a low, rounded crest.
    - 3a. Lip margins entire ..... 2. *B. ambrosia*
    - 3b. Lip margins erose-lacerate ..... 3. *B. pectinatum*
  - 2b. Anther abaxially with a high, conic or triangular and dorsiventrally flattened crest.
    - 4a. Pseudobulbs prostrate on rhizome for ca.  $2/3$  of their length.
      - 5a. Lip adaxially with 2 high, straight ridges with entire crests; anther abaxially with a dorsiventrally flattened crest ..... 4. *B. psittacoglossum*
      - 5b. Lip adaxially with 2 low, wavy ridges with proximally erose crests; anther abaxially with a conic crest ..... 5. *B. yunnanense*
    - 4b. Pseudobulbs obliquely ascending, or prostrate on rhizome at their base only.
      - 6a. Lip  $5.5\text{--}8.5 \times 4\text{--}6$  mm; stelidia with a distinct, triangular tooth along lower margin ..... 6. *B. griffithii*
      - 6b. Lip  $9.5\text{--}14 \times 6\text{--}9$  mm; stelidia with an inconspicuous, broadly deltoid wing along lower margin ..... 7. *B. leopardinum*

**1. *Bulbophyllum striatum*** (Griffith) H. G. Reichenbach, Ann. Bot. Syst. 6: 257. 1861.

细柄石豆兰 xi bing shi dou lan

*Dendrobium striatum* Griffith, Not. Pl. Asiat. 3: 318. 1851;  
*Sarcopodium striatum* (Griffith) Lindley.

Roots along entire rhizome. Rhizome 1–4 mm in diam., sections between pseudobulbs 1.5–10 cm, bract fibers hardly persistent. Pseudobulbs distant, globose to ovoid,  $0.8\text{--}1.7 \times 0.7\text{--}1.7$  cm. Petiole 1.2–5.5 cm; leaf blade ovate to elliptic,  $2.3\text{--}8 \times 1.2\text{--}3.8$  cm, obtuse. Inflorescence erect to spreading, 2.5–15 cm, 1-flowered or a (subumbellate) raceme, 2–4-flowered; peduncle 1.7–13 cm; bracts 4–6, longest 4.5–9.5 mm; rachis to 1.6 cm; floral bracts ovate,  $4\text{--}7 \times$  ca. 2 mm, acute. Flowers resupinate, fully opening  $\pm$  simultaneously, light greenish or yellowish green, veins purple, lip whitish green or yellow with

purple lines; pedicel and ovary 10–17 mm. Dorsal sepal recurved, elliptic to ovate,  $9\text{--}12 \times 3.3\text{--}4.5$  mm, thin, glabrous, base rather narrowly attached, margins entire, apex acute; lateral sepals free, oblique, triangular,  $8.5\text{--}13.5 \times 3.5\text{--}5$  mm, base rather broadly attached, otherwise as dorsal sepal. Petals recurved, elliptic to ovate-triangular,  $4.5\text{--}7 \times 1.8\text{--}2.4$  mm, thin, glabrous, base rather narrowly attached, margins entire or slightly erose toward tip, apex acute to acuminate; lip recurved at ca.  $1/3$  of its length, ovate,  $5\text{--}8 \times 2.2\text{--}4$  mm (all without artificial spreading), rather thin, glabrous, abaxially with a narrow, retuse median ridge over ca.  $2/3$  of length of lip, adaxially slightly concave and with 2 short, rather inconspicuous, parallel, rounded ridges near base, flat or slightly convex toward tip, margins entire and with 2 minute, antrorse, triangular, acute auricles near base, apex emarginate to rounded. Column 2.8–3.5 mm, stigma inside without keels, its basal margin protruding, column foot without tooth; stelidia rounded to  $\pm$  trun-

cate, ca. 0.7 mm, front margin somewhat erose, acute; anther abaxially glabrous, with a high, conic crest near tip, front margin not drawn out, erose. Fl. Jan–Feb, Oct–Dec.

Rocks in thickets on limestone slopes, epiphytic in forests; 1000–2300 m. SE Yunnan [Bhutan, India, Nepal, Thailand, N Vietnam].

**2. *Bulbophyllum ambrosia* (Hance) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 247. 1919.**

芳香石豆兰 fang xiang shi dou lan

Roots below pseudobulbs only. Rhizome 0.8–3 mm in diam., sections between pseudobulbs 3.5–8 cm, bract fibers moderately persistent. Pseudobulbs distant, narrowly ellipsoid or obovoid to cylindrical, somewhat flattened or not, 1.8–5 × 0.5–0.9 cm. Petiole 0.3–0.9 cm; leaf blade elliptic, 3–9 × 0.8–2.1 cm, rounded to obtuse. Inflorescence erect to spreading, 3–11 cm, 1-flowered, rarely a subumbellate raceme, 2-flowered; peduncle 1.7–8 cm; bracts 3 or 4, longest 3–10 mm; rachis to 0.5 cm; floral bracts ovate, 2.5–5 × 1.5–4 mm, acute. Flowers resupinate, moderately to widely, and simultaneously opening. Pedicel and ovary 8–18 mm. Dorsal sepal recurved, (ovate or) triangular, 9–14 × 6–9 mm, thin, glabrous, base narrowly attached, margin entire, apex acute to acuminate; lateral sepals free, oblique, elliptic to ovate including a winglike, sometimes antrorse widening along lower margin, or triangular, 10–14 × 7–11 mm, base rather broadly attached, otherwise as dorsal sepal. Petals recurved, triangular with lower margin decurrent along column foot, 5–8 × 2.2–4 mm, thin, glabrous, base broadly attached, margins entire, apex acute to acuminate; lip ± reflexed slightly over 1/2 its length, ± elliptic in general outline, 5.5–8 × 5–6 mm (all without artificial spreading), very thick; abaxially with a weak retuse median ridge toward base, surface glabrous; adaxially concave and with a median slit with slightly thickened margins toward base, convex but deeply furrowed toward tip, surface slightly rugose toward tip, apex rounded to apiculate. Column 1.8–3.2 mm, stigma inside without keels, at its base without teeth, column foot without tooth just above ligament; stelia deltoïd to triangular, 0.3–0.8 mm, acute with a minute tooth along upper margin, close to tip, or minutely bifurcate; anther abaxially ± glabrous and with a low, rounded crest; front margin not drawn out, slightly erose.

Epiphytic or lithophytic in forests, thickets, and on various bedrock types including limestone; 600–1500 m. Fujian, S Guangdong, W Guangxi, Hainan, Yunnan [Nepal, Vietnam].

- 1a. Pseudobulbs narrowly ellipsoid to cylindrical, slightly flattened ..... 2a. subsp. *ambrosia*  
 1b. Pseudobulbs obovoid, shortly stipitate, not flattened ..... 2b. subsp. *nepalense*

**2a. *Bulbophyllum ambrosia* subsp. *ambrosia***

芳香石豆兰(原亚种) fang xiang shi dou lan (yuan ya zhong)

*Eria ambrosia* Hance, J. Bot. 21: 232. 1883; *Bulbophyllum watsonianum* H. G. Reichenbach.

Rhizome 1.4–3 mm in diam. Pseudobulbs dull, green, often slightly suffused with purple, narrowly ellipsoid to cylindrical, somewhat flattened, 2.5–5 × 0.5–0.9 cm. Petiole 0.4–0.9

cm; leaf blade 3–9 × 1–2.1 cm, obtuse. Inflorescence 1-flowered, rarely a subumbellate raceme, 2-flowered. Flowers whitish with red veins, sometimes suffused with red toward margins, lip white, with a red median band, top part suffused with red or pink. Dorsal sepal 9–13 × 6–8.3 mm; lateral sepals elliptic to ovate including a winglike, sometimes antrorse widening along lower margin, 10–14 × 7–10 mm. Petals 5–8 × 2.2–4 mm. Fl. Jan–May, Nov–Dec.

Epiphytic or lithophytic in primary ever-wet forests, mixed semi-deciduous forests, coniferous forests, thickets, on various bedrock types including limestone; 600–1300 m. Fujian, S Guangdong, W Guangxi, Hainan, S and SE Yunnan [Vietnam].

**2b. *Bulbophyllum ambrosia* subsp. *nepalense* J. J. Wood, Kew Bull. 41: 820. 1986 [“*nepalensis*”].**

西南石豆兰 xi nan shi dou lan

Rhizome 0.8–1.5 mm in diam. Pseudobulbs glossy, yellowish green, obovoid, not flattened, 1.8–2.5 × 0.7–0.8 cm. Petiole 0.3–0.5 cm; leaf blade 3–5 × 0.8–2 cm, rounded. Inflorescence 1-flowered. Flowers white or yellowish, with red veins, lip greenish white or yellowish, slightly stained with red toward margins. Dorsal sepal 12–14 × 8–9 mm; lateral sepals triangular, 12–14 × 10–11 mm. Petals 5–5.5 × ca. 3.5 mm. Fl. Nov–Dec.

Epiphytic in forests, associated with *Coelogyne cristata*; 1200–1500 m. Yunnan [Nepal].

**3. *Bulbophyllum pectinatum* Finet, Bull. Soc. Bot. France 44: 268. 1897.**

长足石豆兰 chang zu shi dou lan

*Bulbophyllum pectinatum* var. *transarisanense* (Hayata) S. S. Ying; *B. transarisanense* Hayata; *B. transarisanense* f. *alboviride* Fukuyama; *B. viridiflorum* Hayata.

Rhizome 1.8–3 mm in diam., sections between pseudobulbs 0.4–1.2 cm, bract fibers hardly persistent. Pseudobulbs close together, ovoid to almost globose, not or hardly prostrate proximally, 1.1–2.5 × 0.6–1.5 cm. Petiole 0.3–1.5 cm; leaf blade elliptic to ovate, 3–8 × 0.9–2.3 cm, rounded to obtuse. Inflorescence erect to spreading, 6–10 cm, 1-flowered; peduncle 1.2–4.5 cm; bracts ca. 3, longest 6–9 mm; floral bracts tubular for 2/3 or more of their length, 6.5–14 mm, acute. Flowers resupinate, opening wide, pale greenish, often with fine reddish purple spots mainly along veins; lip pale green to white, stained or finely spotted with reddish purple. Pedicel and ovary 32–60 mm. Dorsal sepal recurved with top incurved, ovate, 13–23 × 5–13 mm, rather thin, glabrous, base rather narrowly attached, margin entire, apex obtuse to acute; lateral sepals free, recurved to spreading, elliptic to ovate-triangular, 15–26 × 11–14 mm, (sub-)acute, rather broadly attached, otherwise as dorsal sepal. Petals recurved to spreading, elliptic to ovate-triangular, 10–19 × 5–11 mm, rather thin, glabrous, base rather broadly attached, margins entire, apex obtuse to acute; lip recurved to almost reflexed at ca. 2/3 of its length, ovate-triangular, 10–16 × 7–18 mm (all without artificial spreading), thick but proximally thin toward margins; abaxially with a retuse median ridge up to ca. 2/3 of length of lip, surface glabrous; adaxially deeply concave proximally, with 2 retrorse, dorsiventrally flattened, rounded

lobes close together and covering ligament, toward top slightly concave grading to distinctly convex and with 2 well-spaced, high, narrow, papillose ridges with a deeply erose crest, adaxially papillose-verrucose distally and sometimes in between ridges, surface otherwise glabrous, margins erose-lacerate, more deeply so proximally, apex obtuse. Column 2.5–5 mm, stigma inside with 3 keels, at its base without teeth, column foot without a tooth above ligament; stelia deltoid, 1–2 mm, obtuse; anther abaxially ± glabrous and with a rounded crest; front margin drawn out, erose; pollinia with a fleshy stipe firmly attached to their bases. Fl. (Mar–)Apr–Jul(–Sep).

Epiphytic in forests, also found as a lithophyte along ravines; 1000–2700 m. Taiwan, SE to W Yunnan [NE India, Myanmar, N Thailand, Vietnam].

**4. *Bulbophyllum psittacoglossum*** H. G. Reichenbach, Bot. Zeitung (Berlin) 21: 237. 1863.

滇南石豆兰 dian nan shi dou lan

*Phyllorkis psittacoglossa* (H. G. Reichenbach) Kuntze; *Sarcopodium psittacoglossum* (H. G. Reichenbach) Hooker.

Rhizome 2.8–4 mm in diam., sections between pseudobulbs 1.5–3.8 cm, bract fibers persistent, forming a loose net around pseudobulb. Pseudobulbs distant, ellipsoid to (ob-)ovoid, prostrate on rhizome for ca. 2/3 of their length, 2–3.5 × 1–2 cm. Petiole 1.3–4 cm; leaf blade elliptic to (ob-)ovate, 6–12 × 2.4–4 cm, acute. Inflorescence erect to spreading, 4–9 cm, 1-flowered or a raceme, 2- or 3-flowered; peduncle 0.7–2.5 cm; bracts ca. 2, longest 7–9 mm; rachis 0.3–2 cm; floral bracts elliptic, sometimes tubular at very base only, 4–12 × 2.5–8 mm, acute. Flowers resupinate, moderately opening, (greenish) yellow with dark reddish purple veins, lip yellowish, abaxially mottled with reddish purple, adaxially dark reddish purple. Pedicel and ovary 19–48 mm. Dorsal sepal recurved with top incurved, elliptic to ovate-triangular, 11.5–20 × 4–11.5 mm, rather thick, glabrous, base rather broadly attached, margin entire, apex obtuse to acute; lateral sepals free, recurved, ovate to triangular, 13–20 × 6.5–11 mm, otherwise as dorsal sepal. Petals recurved, elliptic to (ob-)ovate, 11–19 × 3.5–8 mm, rather thick, glabrous, base broadly attached, margins entire, apex obtuse to acute; lip recurved, ovate but constricted ca. halfway, 7–13 × 4–7 mm (all without artificial spreading), thick; abaxially with a retuse median ridge up to 1/2–2/3 of length of lip, surface glabrous; adaxially concave proximally, convex distally, with a median slit over most of length of lip, proximally widening into a shallow cavity bordered by 2 short, distally converging ridges, with 2 more high ridges with straight, entire crests starting at inner surface of auricles and converging gradually, reaching up to ca. 2/3 of length of lip, surface in between finely papillose, surface distally and toward margins almost glabrous to coarsely rugose, margins erose, with a distinct, triangular, obtuse, auricle with a denticulate tip at ca. 1/3 of length of lip, apex obtuse. Column 5–7 mm, stigma inside with 3 keels, at its base without teeth, column foot with a triangular, acute tooth on each side of ligament; stelia triangular to subulate, 1–2 mm, acute, with or without a small antrorse, subacute tooth along upper margin, with a distinct, obliquely antrorse, deltoid, obtuse tooth along lower margin, slightly below middle of column; anther abaxially

± glabrous and with high, dorsiventrally flattened, triangular, obtuse crest; front margin not drawn out, entire; pollinia without a stipe. Fl. May–Jul, Oct–Dec.

Epiphytic in forests; 1100–1700 m. S and SE Yunnan [Myanmar, Thailand, Vietnam].

Chinese records of *Bulbophyllum psittacoglossum* could be based on misidentified plants of *B. pectinatum*.

**5. *Bulbophyllum yunnanense*** Rolfe, J. Linn. Soc., Bot. 36: 14. 1903.

蒙自石豆兰 meng zi shi dou lan

*Bulbophyllum otoglossum* Tuyama.

Rhizome 3.5–5 mm in diam., sections between pseudobulbs 1.5–3.5 cm, bract fibers hardly persistent. Pseudobulbs distant, prostrate on rhizome for ca. 2/3 of their length, ovoid, 2–4.5 × 1–1.4 cm. Petiole 0.2–4 cm; leaf blade elliptic(-ovate), 4–12 × 1.9–3.3 cm, acute. Inflorescence erect to spreading, 3.6–11 cm, 1-flowered or a raceme, 2-flowered; peduncle 0.8–4 cm; bracts ca. 3, longest 7–12 mm; rachis 0.3–1.5 cm; floral bracts usually tubular, 6–12 mm, acute, upper in a raceme sometimes elliptic, ca. 7 mm wide. Flowers resupinate, moderately opening, creamy yellow, densely spotted with red, lip yellow, spotted or suffused with red along sides, column yellow, face red. Pedicel and ovary 13–40 mm. Dorsal sepal recurved with top incurved, ovate, 9.5–12 × 6–9 mm, rather thick, glabrous, base rather broadly attached, margin entire, apex truncate to obtuse, apiculate; lateral sepals free, recurved, 10.5–15.5 × 7–11 mm, rounded to acute, otherwise as dorsal sepal. Petals recurved, elliptic, 7.5–11 × 4–7 mm, rather thin, glabrous, base broadly attached, margins ± entire to finely erose-denticulate, apex obtuse to acute; lip recurved, ovate, 6–10 × 3–5.5 mm (all without artificial spreading), thick; abaxially with a rounded median ridge over most of length of lip, surface glabrous; adaxially slightly concave proximally, convex distally, with a median slit over most of length of lip, proximally deepening and widening into a cavity bordered by 2 short, distally converging ridges, with 2 more ridges with wavy, proximally erose crests starting at lacerate part of margin and running almost parallel or converging slightly up to ca. 2/3 of length of lip, surface in between only slightly verrucose, surface toward margins coarsely and irregularly verrucose, margins deeply denticulate-lacerate at ca. 1/4 of length of lip, otherwise ± entire, apex obtuse. Column 3–4.5 mm, stigma inside with 3 keels, at its base without teeth, column foot without a tooth above ligament; stelia triangular, ca. 1 mm, acute, with or without a small, deltoid, subacute tooth along upper margin, with an inconspicuous, widely deltoid, obtuse wing along lower margin, ca. halfway along column; anther abaxially ± glabrous and with high, narrowly conic, sharp crest; front margin not drawn out, slightly erose; pollinia with a small, thick stipe. Fl. Apr–Jun, Aug.

Epiphytic in (monsoon) forests, also lithophytic; 1400–2900 m. NW and SE Yunnan [Bhutan, Nepal].

**6. *Bulbophyllum griffithii*** (Lindley) H. G. Reichenbach, Ann. Bot. Syst. 6: 247. 1861.

短齿石豆兰 duan chi shi dou lan

*Sarcopodium griffithii* Lindley, Fol. Orchid. 2(Sarcopodium): 6. 1853; *Bulbophyllum calodictyon* Schlechter; *B. chitouense* S. S. Ying.

Rhizome 1.2–2 mm in diam., sections between pseudobulbs 0.4–2 cm, bract fibers hardly persistent. Pseudobulbs close together, not or hardly prostrate proximally, ovoid to almost globose, 0.7–3 × 1.3–2 cm. Petiole 0.2–1.5 cm; leaf blade elliptic to ovate, 2.2–12 × 1–2.8 cm, obtuse to acute. Inflorescence erect to spreading, 3.6–6 cm, 1-flowered; peduncle 0.6–2 cm; bracts ca. 2, longest 5–8 mm; floral bracts tubular for 2/3 or more of their length, 4–6.5 mm, acute. Flowers resupinate, moderately opening, yellow or yellowish green with reddish purple dots, lip yellow, heavily stained with reddish purple adaxially, column yellow. Pedicel and ovary 20–26 mm. Dorsal sepal recurved with top incurved, elliptic to ovate, 8–12 × 4.5–9 mm, rather thick, glabrous, base rather broadly attached, margin entire, apex obtuse to acute; lateral sepals free, recurved, (ovate-)triangular, 9–13 × 6–10 mm, (sub-)acute, otherwise as dorsal sepal. Petals recurved, elliptic to obovate, 6–10 × 3–5 mm, rather thick, glabrous, base broadly attached, margins entire to finely erose-denticulate, apex rounded and apiculate to subacute; lip recurved close to tip, ovate, 5.5–8.5 × 4–6 mm, (all without artificial spreading), thick; abaxially with a rounded median ridge over most of length of lip, surface glabrous; adaxially slightly concave proximally, convex distally, with a median slit over most of length of lip sometimes shortly interrupted proximally, with 2 thin ridges with wavy, erose crests starting on inner surface of auricles and running almost parallel or converging slightly up to ca. 3/4 of length of lip, surface in between partly or almost entirely covered with irregular, wavy transverse ribs, surface toward margins verrucose with verrucae often arranged in oblique, irregular and frequently interrupted crests, margins entire, somewhat irregular distally, with a triangular, obtuse to acute, somewhat erose-lacerate auricle at ca. 1/3 of length of lip, apex rounded to truncate. Column 3.8–5 mm, stigma inside with 3 keels, at its base without teeth, column foot without a tooth above ligament; stelia triangular, 1.2–2 mm, acute, with or without a small subacute tooth along upper margin, with a distinct, spreading, straight, triangular, obtuse to acute tooth along lower margin, ca. halfway along column; anther abaxially ± glabrous and with high, conic, sharp crest; front margin not drawn out, erose; pollinia ?without a stipe. Fl. Feb, Aug, Oct–Nov.

Understory epiphyte in forests; 1000–1700 m. C Taiwan, C and SE Yunnan [Bhutan, India (Sikkim), Nepal, Vietnam].

**7. *Bulbophyllum leopardinum*** (Wallich) Lindley, Gen. Sp. Orchid. Pl. 48. 1830.

**2. *Bulbophyllum* sect. *Sestochilos*** Bentham & J. D. Hooker, Gen. Pl. 3: 502. 1883.

大花组 da hua zu

Rhizome creeping; roots sprouting along rhizome, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescences solitary, arising near pseudobulbs, 1-flowered. Pedicel with basal node distinctly more than 1 × diam. of pedicel above subtending bract. Sepals free, ± equally long, margins glabrous, 5- or more veined. Petals: margins glabrous, 5- or more veined; lip with or without lateral lobes along margins well above its base, margins otherwise glabrous to partly or entirely erose or denticulate, adaxially glabrous. Column: stigma not protruding at its base, foot distinct; anther: front margin not or slightly projecting, abaxially with a low, or a high, conic crest; pollinia 4, inner more than 1/2 as long as outer, all without appendages.

短葶石豆兰 duan ting shi dou lan

*Dendrobium leopardinum* Wallich, Tent. Fl. Napal. 39. 1826; *Bulbophyllum colomaculosum* Z. H. Tsi & S. C. Chen; *Sarcopodium leopardinum* (Wallich) Lindley.

Rhizome 2.5–8 mm in diam., sections between pseudobulbs 1.2–4 cm, bract fibers moderately persistent, sometimes forming a loose net around pseudobulb. Pseudobulbs close together or distant, often somewhat prostrate proximally, ovoid, 2–5.5 × 1–2.5 cm. Petiole 2–8 cm; leaf blade elliptic to obovate, 3.5–18 × 2–6.5 cm, obtuse to acute. Inflorescence erect to spreading, 5–10 cm, 1-flowered or a raceme, 2-flowered; peduncle 0.6–2.5 cm; bracts ca. 2, longest 6–10 mm; rachis 0.2–0.7 cm; floral bracts tubular, 7–14 mm, acute. Flowers resupinate, moderately opening, (creamy) yellow to (pale) green, often partly spotted or suffused with red or purple, sometimes with a yellow halo around numerous red or purple spots, lip yellow, adaxially strongly suffused with red. Pedicel and ovary 28–50 mm. Dorsal sepal recurved with top incurved, elliptic to ovate-triangular, 14–20 × 6.5–13.5 mm, rather thick, glabrous, base rather broadly attached, margin entire, apex truncate and apiculate to acute; lateral sepals free, recurved, ovate to triangular, 15–23 × 10–15 mm, obtuse and apiculate to acute, otherwise as dorsal sepal. Petals recurved, elliptic to ovate, 10–14 × 5–9 mm, rather thick, glabrous, base rather narrowly attached, margins entire, sometimes slightly erose proximally along lower margin, apex acute to acuminate; lip recurved, ovate, 9.5–14 × 6–9 mm (all without artificial spreading), thick; abaxially with a truncate median ridge up to 2/3 of length of lip, surface glabrous; adaxially slightly concave proximally, convex distally, with a median slit over most of length of lip, proximally deepening and widening into a cavity bordered by 2 short, distally converging ridges, with 2 more ridges with straight, proximally erose-verrucose crests starting at lacerate part of margin and running almost parallel or converging slightly over most of length of lip, surface in between glabrous, surface toward margins almost glabrous to finely rugose-verruculose, margins denticulate-lacerate at ca. 1/4 of length of lip, otherwise ± entire, apex obtuse. Column 4–6.5 mm, stigma inside without keels, at its base without teeth, column foot without a tooth above ligament; stelia triangular, 1–2 mm, acute, with or without a small, deltoid, obtuse tooth along upper margin, with an inconspicuous, widely deltoid, obtuse wing along lower margin, ca. halfway along column; anther abaxially ± glabrous and with conic, sharp crest; front margin not drawn out, ± entire; pollinia without a stipe. Fl. Apr–Aug, Oct.

Epiphytic in forests, also lithophytic; 1300–3300 m. S Xizang, S Yunnan [Bhutan, India, Laos, Nepal, N Vietnam].

Seventeen provisionally accepted species: Himalayas to the Philippines and Sulawesi; two species in China.

- 1a. Lip with rounded lateral lobes near middle ..... 8. *B. pteroglossum*  
 1b. Lip without lateral lobes, lanceolate in outline ..... 9. *B. affine*

**8. *Bulbophyllum pteroglossum*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 71. 1919.

曲萼石豆兰 qu e shi dou lan

*Bulbophyllum devangiriense* N. P. Balakrishnan; *B. monanthum* (Kuntze) J. J. Smith (1912), not *B. monanthos* Ridley (1896); *B. tiagii* A. S. Chauhan; *B. uniflorum* Griffith (1851), not Hasskarl (1844); *Phyllorkis monantha* Kuntze; *Sarcopodium uniflorum* Lindley.

Rhizome stout, ca. 5 mm in diam., rooting at nodes. Pseudobulbs 6–8 cm apart from each other, cylindrical, 3–4 cm, ca. 5 mm in diam., with a terminal leaf. Leaf sessile; blade oblong, 18–24.5 × 3.4–5.5 cm, fleshy or thickly leathery, apex obtuse. Scape flattened, arising from nodes of rhizome, pendulous, 5–8 cm, terminating in a solitary flower; floral bracts ovate, much shorter than pedicel and ovary, apex acute. Flowers thickened, erect, pale yellow spotted with red, except purple-red mid-lobe of lip. Dorsal sepal elliptic, concave, 12–15 × ca. 7 mm, apex obtuse; lateral sepals obliquely ovate-triangular, ca. 7 × 6 mm, contracted and twisted above middle, base adnate to column foot forming a broad mentum, apex obtuse. Petals oblong-lanceolate, ca. 8 × 3 mm, margin entire, apex subacute; lip erect, 2–2.5 mm, basal half subsquare, cordate at base, connected to end of column foot by a mobile joint, near middle 3-lobed; lateral lobes erect, their apices ca. 6 mm apart; mid-lobe deltoid, apex obtuse-rounded. Column stout; foot upcurved, ca. 1 cm, with free part ca. 2 mm; stolidia inconspicuous; anther cap nearly subspherical. Fl. Nov.

Tree trunks in forests; ca. 1400 m. S Yunnan [Bhutan, NE India, Myanmar].

**9. *Bulbophyllum affine*** Lindley, Gen. Sp. Orchid. Pl. 48. 1830.

赤唇石豆兰 chi chun shi dou lan

*Bulbophyllum kusukusense* Hayata; *Phyllorkis affinis* (Lindley) Kuntze; *Sarcopodium affine* (Lindley) Lindley & Paxton.

Rhizome stout, 4–5 mm in diam., covered with scalelike sheaths, rooting at nodes. Pseudobulbs erect, 4–8 cm apart from each other, subcylindric, 3–4 cm, 5–8 mm in diam., with a terminal leaf. Petiole 1–2 cm; leaf blade oblong, 6–26 × 1–4 cm, leathery or fleshy, base contracted into petiole, apex obtuse and slightly emarginate. Scape from node of rhizome and base of pseudobulb, 4–8 cm; inflorescence 1-flowered, base with 3–5 sheaths. Pedicel and ovary 3.5–7.5 cm. Flower thickly textured; sepals and petals pale yellow with purplish stripes; lip purple. Dorsal sepal lanceolate, 17–20 × 4–5 mm, apex acute; lateral sepals falcate-lanceolate, similar in size to dorsal sepal, base adnate to column foot forming a broad mentum, apex acute. Petals lanceolate, 11–15 × 3–4 mm, margin entire, apex acute; lip lanceolate, 8–10 mm, fleshy, adaxially glabrous, grooved at base, hinged to end of column foot by a mobile joint, apex acuminate, slightly recurved. Column ca. 5 mm, stout; stolidia inconspicuous; foot ca. 5 mm, without free part; anther cap ca. 3 mm, adaxially finely papillate. Fl. May–Jul. *2n* = 36.

Tree trunks or rocks in forests or along valleys; 100–600 m. S Guangdong, S Guangxi, Hainan, S Taiwan, S Yunnan [Bhutan, NE India, Japan (Ryukyu Islands), Laos, Nepal, Thailand, Vietnam].

**3. *Bulbophyllum* sect. *Epicranthes*** (Blume) J. D. Hooker, Fl. Brit. India 5: 753. 1890 [*“Epicranthes”*].

飘带组 piao dai zu

*Epicranthes* Blume, Bijdr. 306. 1825.

Rhizome spreading to pendulous; roots sprouting along rhizome, growing backward over or alongside rhizome until they reach substrate; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescences arising near pseudobulbs, clustered on a lateral sympodium, 1-flowered. Pedicel with basal node distinctly more than 1 × diam. of pedicel above attachment of subtending bract. Sepals free, ± equally long, margins glabrous, 3-veined. Petals: margins with long appendages of a texture different than petal itself, 3–5-veined; lip: margins without auricles or lateral lobes, otherwise hirsute and conspicuously vesicular on both sides. Column: stigma not protruding at its base, foot distinct; anther: front margin projecting into a retuse beak, abaxially with rounded crest; pollinia 2 or 4, with inner more than 1/2 as long as outer, all usually without appendages.

Thirty-eight provisionally accepted species: Myanmar to W Pacific; one species in China.

**10. *Bulbophyllum haniffii*** Carr, Gard. Bull. Straits Settlement. 7: 20. 1932.

飘带石豆兰 piao dai shi dou lan

Rhizome pendulous, slender, sometimes branched, only basal nodes with many roots. Pseudobulbs close, ovoid, 5–6 mm, 3–4 mm in diam., with a terminal leaf. Leaf sessile; blade

elliptic, 2.2–2.4 × ca. 0.9 cm, fleshy, apex acute. Scape from base of pseudobulb, terminating in a solitary flower; peduncle 2–3 mm, slender, base with 2 cupular sheaths. Pedicel and ovary ca. 3 mm. Sepals free, subequal in size, lanceolate, ca. 5.5 × 2 mm, margin entire, apex acuminate; lateral sepals ca. 1/3 width of base adnate to column foot forming a mentum. Petals lobed almost deeply to base, with a broad sinus, each lobe with

2–4 appendages; appendages grayish black, densely finely papillate, linear-oblong, ca. 3.5 × 0.3 mm, base with a filiform stalk ca. 1.5 mm, apex obtuse; lip lanceolate, ca. 3.5 mm, fleshy, adaxial base grooved and densely papillate-hairy, apex acute. Column ca. 2 mm, ca. 1 mm in diam.; foot ca. 1 mm,

with free part ca. 0.6 mm; stelia very short, dentate; anther cap with 1 crestlike ridge on apical margin. Fl. Jul.

Tree trunks in evergreen broad-leaved forests; ca. 1700 m. S Yunnan [Laos, Malaysia, Myanmar, Thailand].

**4. *Bulbophyllum* sect. *Corymbosa* (Blume) Averyanov, *Opred. Orkhid. Vetnama*, 261. 1994 [“*Corymbosia*”].**

短序组 duan xu zu

*Diphyes* sect. *Corymbosae* Blume, *Bijdr.* 315. 1825 [“*Corymbosia*”].

Rhizome creeping or straggling with roots sprouting mainly below pseudobulbs, or rhizome spreading to pendulous, with roots growing backward over or alongside rhizome until they reach substrate; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescences solitary, arising along length of rhizome or near pseudobulbs, with 3 to many flowers in a contracted to subumbellate raceme (an elongate raceme in *Bulbophyllum reptans* and *B. polyrrhizum*). Pedicel with base ± coinciding with attachment of subtending bract. Sepals free, margins glabrous, 1–3-veined; lateral sepals ca. as long as dorsal sepal or somewhat longer, not twisted inward near base (twisted inward in *B. ledungense*). Petals: margins glabrous, 1–3-veined; lip: margins without auricles or lateral lobes, otherwise ± glabrous, adaxially usually glabrous (with glandular hairs in *B. odoratissimum*). Column: stigma not protruding at its base, foot distinct; anther: front margin not projecting or projecting into a rounded beak, abaxially with or without a rounded crest; pollinia 4, inner more than 1/2 as long as outer, all without appendages.

Seventy-six provisionally accepted species: Himalayas to the Philippines and Sulawesi; 14 species (six endemic) in China.

*Bulbophyllum reptans* and *B. polyrrhizum* may not belong here. The first has spiral vessels in its flower parts similar to Continental African species such as *B. pumilum* (Swartz) Lindley.

- 1a. Raceme elongate, more than 2 cm.  
 2a. Leaves deciduous before anthesis ..... 11. *B. polyrrhizum*  
 2b. Leaves not deciduous at anthesis ..... 12. *B. reptans*
- 1b. Raceme umbellate or subumbellate, sometimes condensed-racemose.  
 3a. Pseudobulbs close, less than 1 cm apart from each other on rhizome.  
 4a. Rhizome patent to pendulous, with roots growing backward alongside it to base.  
 5a. Lateral sepals 2.3–7 mm; petal margins irregularly denticulate ..... 13. *B. corallinum*  
 5b. Lateral sepals 21–23 mm; petal margins entire ..... 14. *B. dulongjiangense*
- 4b. Rhizome creeping or straggling, with roots spreading.  
 6a. Lateral sepals obviously longer than dorsal sepal.  
 7a. Stelia deltoid or broadly triangular ..... 15. *B. sutepense*  
 7b. Stelia narrowly triangular-subulate, slender ..... 16. *B. rubrolabellum*
- 6b. Sepals subequal in length.  
 8a. Floral bracts shorter than pedicel plus ovary; petals elliptic ..... 16. *B. rubrolabellum*  
 8b. Floral bracts longer than pedicel plus ovary; petals ovate-lanceolate ..... 17. *B. tengchongense*
- 3b. Pseudobulbs spaced more than 1 cm apart from each other on rhizome.  
 9a. Scape nearly as long as or slightly longer than pseudobulb.  
 10a. Rhizome stout, 3–4 mm in diam.; pseudobulbs 2–5 cm; dorsal sepal 7–10 mm ..... 18. *B. cauliflorum*  
 10b. Rhizome slender, 1–2 mm in diam.; pseudobulbs 0.8–1.5 cm; dorsal sepal 4–6 mm.  
 11a. Roots only from base of pseudobulbs; scape arising only from base of pseudobulb ..... 19. *B. stenobulbon*  
 11b. Roots from all nodes of rhizome and base of pseudobulb; scape arising from base of pseudobulb or nodes between 2 pseudobulbs ..... 20. *B. ledungense*
- 9b. Scape more than 2 × as long as pseudobulb.  
 12a. Lip adaxially and along margin with glandular hairs ..... 21. *B. odoratissimum*  
 12b. Lip glabrous.  
 13a. Stelia rounded; petals obtuse ..... 22. *B. wuzhishanense*  
 13b. Stelia acute; petals acute to acuminate.  
 14a. Lateral sepals adnate to column foot for 1/5–2/5 of their width; petals narrowly lanceolate, 4–5 mm, apex long acuminate; column foot ca. 0.5 mm, with almost invisible free part ..... 23. *B. kwangtungense*  
 14b. Lateral sepals adnate to column foot over almost their entire width; petals ovate-lanceolate, 3–3.5 mm, apex acute; column foot ca. 2 mm, with its free part 0.8–1 mm ..... 24. *B. shweliense*

**11. *Bulbophyllum polyrrhizum*** Lindley, Gen. Sp. Orchid. Pl. 53. 1830.

锥茎石豆兰 *zhui jing shi dou lan*

Rhizome creeping, ca. 1.5 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 5–10 mm apart on rhizome, ovoid, 7–10 mm, 5–7 mm in diam., apex narrowed and somewhat necklike, with a terminal leaf. Leaf blade narrowly oblong, shorter than scape. Flowers and leaves not appearing at same time. Scapes from base of leafless pseudobulbs, 8–12 cm, slender; raceme 3–6 cm, sparsely with many small flowers; peduncle ca. 1 mm in diam., with 2 or 3 bractlike sheaths; floral bracts ovate, small, ca. 1.5 mm, apex acute. Pedicel and ovary ca. 3 mm. Flowers yellowish green, widely opening. Dorsal sepal subovate, concave, ca. 4 × 2 mm, apex subacute; lateral sepals ovate-lanceolate, ca. 4.5 × 2 mm, apex acute. Petals ovate-triangular, 2.3–2.5 × 1.2–1.3 mm, apex acute; lip reflexed, sub-oblong, ca. 3 × 0.8 mm, adaxially densely minutely papillate, grooved at adaxial base, attached to end of column foot, immobile, apex obtuse-acute. Column ca. 1.2 mm; foot ca. 1 mm; stelidia obliquely triangular-subulate. Fl. Mar.  $2n = 38$ .

Tree trunks in evergreen broad-leaved forests; 900–1400 m. S Yunnan [NE India, Myanmar, Nepal, N Thailand].

**12. *Bulbophyllum reptans*** (Lindley) Lindley, Gen. Sp. Orchid. Pl. 51. 1830.

伏生石豆兰 *fu sheng shi dou lan*

*Tribrachia reptans* Lindley, Coll. Bot. ad t. 41. 1826; *Phylorkis reptans* (Lindley) Kuntze.

Rhizome creeping, 2–3.5 mm in diam., branched, covered with tubular sheaths 7–10 mm. Pseudobulbs 5–9 cm apart on rhizome, ovoid or ovoid-conic, 1–2 cm, 5–10 mm in diam., with a terminal leaf. Petiole 1–2 cm; leaf blade narrowly oblong, 7–8(–15) × 0.7–1(–1.4) cm, leathery, base contracted into petiole, apex obtuse and slightly emarginate. Scape from base of pseudobulb, erect, 12–14 cm, slender; raceme 4–6 cm, usually 3–6-flowered; peduncle with 3 or 4 tubular sheaths; floral bracts ovate-lanceolate, 3–6 mm. Pedicel and ovary 3–5 mm. Flowers pale yellow with purplish red stripes. Sepals lanceolate, 7–10 × 2–2.2 mm, thickly textured, abaxially carinate, apex subacute; lateral sepals slightly longer than dorsal sepal, lower edges of basal half connate to each other, base adnate to column foot. Petals ovate-elliptic or obovate, 3–4 × 1.5–2 mm, thinly textured, entire, obtuse-rounded; lip recurved, slightly longer than petals, somewhat fleshy, entire, obtuse. Column ca. 0.8 mm; foot ca. 2 mm, with free part ca. 1 mm; stelidia filiform or subulate, ca. 0.8 mm. Fl. Jan–Oct.  $2n = 38 + 0-2B, 42$ .

Tree trunks or rocks in evergreen broad-leaved forests; 1000–2800 m. Guangxi, SW Guizhou, Hainan, S and SE Xizang, W to SE Yunnan [Bhutan, NE India, Myanmar, Nepal, Vietnam].

**13. *Bulbophyllum corallinum*** Tixier & Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 35: 204. 1963.

环唇石豆兰 *huan chun shi dou lan*

Rhizome patent to pendulous, with roots creeping alongside it toward base. Pseudobulbs close or ± spaced, ± curved,

subcylindric or ovoid, ca. 1 cm, with a terminal leaf. Leaf sessile; blade narrowly oblong or ligulate, 25–43 × 4–7 mm, apex acute. Scape from base of pseudobulb or node of rhizome, very short; peduncle less than 5 mm; raceme dense with several small flowers, and scalelike sheaths at base; floral bracts membranous, longer than pedicel and ovary, ca. 4 mm, apex acute. Flowers brownish red. Sepals free, thickly textured; dorsal sepal ovate-lanceolate, 2.2–6 × ca. 1 mm, apex acuminate; lateral sepals obliquely ovate-triangular or falcate-lanceolate, 2.3–7 × ca. 1 mm, base adnate to column foot forming a mentum, margins strongly incurved above middle, apex long acuminate. Petals oblong, 1.2–1.8 × 0.5–0.8 mm, membranous, margins irregularly denticulate, apex acute; lip hooked-recurved, ca. 1.3 × 0.3 mm, fleshy, base connected to end of column foot by a mobile joint, margins densely white villous, apex obtuse; disk with 2 keels. Column ca. 0.6 mm; foot ca. 1 mm, with free part ca. 0.3 mm; stelidia fusiform, ca. 0.8 mm; anther cap glabrous, centrally with 1 ridge. Fl. Mar–Sep.

Tree trunks in open forests; 1100–1600 m. S and SE Yunnan [Myanmar, N Thailand, Vietnam].

**14. *Bulbophyllum dulongjiangense*** X. H. Jin, Novon 16: 497. 2006.

独龙江石豆兰 *du long jiang shi dou lan*

Rhizome patent to pendulous, with roots creeping alongside it toward base. Pseudobulbs close, cylindrical, 1.5–2 × 0.5–0.8 cm, with a terminal leaf. Leaves subsessile; blade lanceolate, ca. 35 × 9–10 mm, apex acute. Scape from base of pseudobulb or node of rhizome, very short; peduncle ca. 5 mm; raceme dense with 10–15 small flowers, and 2 or 3 scalelike sheaths at base; floral bracts membranous, longer than pedicel and ovary, 7–8 mm, apex acute. Flowers pale yellow. Sepals free; dorsal sepal linear, 12–14 × ca. 1 mm, apex caudate; lateral sepals obliquely linear, 21–23 × ca. 2 mm, base adnate to column foot forming a mentum, apex caudate. Petals oblong, 1.9–2.1 × 1.3–1.5 mm, membranous, margins entire, apex acuminate; lip hooked-recurved, 2–2.2 × 0.9–1 mm, fleshy, base connected to end of column foot by a mobile joint, margins ciliate, apex obtuse; disk with 2 keels. Column ca. 2.5 mm; foot ca. 2 mm; stelidia narrowly triangular, ca. 2 mm. Fl. Oct–Nov.

• Branches and tree trunks in forests. NW Yunnan (Dulong Jiang).

**15. *Bulbophyllum sutepense*** (Rolfe ex Downie) Seidenfaden & Smitinand, Orchids Thailand 3: 366. 1961.

聚株石豆兰 *ju zhu shi dou lan*

*Cirrhopetalum sutepense* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 376. 1925.

Rhizome creeping, roots spreading. Pseudobulbs contiguous, pyriform or subglobose, 6–12 mm, 5–10 mm in diam., with a terminal leaf, wrinkled when dried. Leaf subsessile; blade oblong or oblong-ligulate, 1.5–4.5 × 0.6–0.9 cm, leathery, base cuneate, apical margins denticulate, apex acute or subobtus. Scapes 1 or 2, from base of pseudobulb, slightly longer than pseudobulb, glabrous; raceme with shortened rachis, umbel-like, often 4- or 5-flowered; peduncle less than 5 mm, enclosed in 3 or 4 membranous sheaths; floral bracts ovate-

lanceolate, ca. 4 mm, apex shortly acute. Flowers pale yellow, with free sepals. Dorsal sepal ovate-lanceolate, concave, 2.2–3 × ca. 1.8 mm, entire, shortly acute, apical margins slightly incurved; lateral sepals obliquely lanceolate, 5–6 × 1.5–1.8 mm, entire, margins in apical half incurved and tubular, apex long acuminate. Petals narrowly oblong, ca. 1.5 × 0.7 mm, entire, acute; lip recurved, nearly ovate-triangular, very small, shorter than petals, 3-lobed; lateral lobes erect, deltoid; mid-lobe narrowly oblong, apex subacute; disk densely papillate adaxially. Column ca. 1.1 mm, stout; stelidia deltoid to broadly triangular, ca. 0.1 mm; foot upcurved, ca. 1.4 mm, with free part ca. 0.8 mm; anther cap subglobose, slightly mucronate. Fl. May.

Tree trunks in mixed forests; 1200–1600 m. S Yunnan [Laos, N Thailand].

**16. *Bulbophyllum rubrolabellum*** T. P. Lin, *Taiwania* 20: 163. 1975.

红心石豆兰 hong xin shi dou lan

*Bulbophyllum fenghuangshanianum* S. S. Ying; *B. odoratissimum* (Smith) Lindley var. *rubrolabellum* (T. P. Lin) S. S. Ying.

Rhizome creeping, roots spreading. Pseudobulbs close, green, ovoid, 8–9 mm, 6–7 mm in diam., with a terminal leaf. Leaf sessile; blade oblong, 2.5–3.5 × 0.8–1 cm, leathery, apex acute. Scape from base of pseudobulb, 1–1.5 cm, with 2 or 3 sheaths; raceme shortened, umbel-like, densely 6–8-flowered; floral bracts ca. 2 mm, apex acute. Pedicel and ovary ca. 2.5 mm. Flowers not resupinate, whitish yellow. Sepals free, subequal, ovate, 3.5–4 × 1.6–2 mm, apex acuminate. Petals elliptic, ca. 1.5 × 0.6 mm, apex acute; lip recurved, red, ligulate, ca. 2.8 mm, hinged to end of column foot by a joint, adaxially minutely papillate. Column whitish yellow, short, ca. 1 mm; stelidia narrowly triangular-subulate, ca. 0.6 mm, slender; foot ca. 2 mm. Capsule ellipsoid, ca. 1 cm. Fl. Sep–Oct.  $2n = 38^*$ ,  $58^*$ .

• Tree trunks in forests; 700–1500(–1800) m. Taiwan.

**17. *Bulbophyllum tengchongense*** Z. H. Tsi, *Bull. Bot. Res., Harbin* 9(2): 29. 1989.

云北石豆兰 yun bei shi dou lan

Rhizome creeping, roots spreading. Pseudobulbs close, subovoid, 5–11 mm, 4–6 mm in diam., with a terminal leaf. Leaf sessile; blade oblong, 1.4–3 × 0.4–1.1 cm, subleathery, apical margins scabrous, apex acute. Scapes 2 or 3, from base of pseudobulb, ca. 1.3 cm, with 2 or 3 tubular sheaths 2–3 mm; raceme shortened, umbel-like, often 4- or 5-flowered; floral bracts ovate-lanceolate, 3–4 mm, apex acute. Pedicel and ovary 2.5–3 mm. Flowers not resupinate, yellowish, with red lip and apical part of sepals. Sepals free, 3.3–4 × 1.6–2 mm, 3-veined, apex acuminate; dorsal sepal ovate; lateral sepals ovate-lanceolate, margins ± incurved. Petals ovate-lanceolate, 1.5–2 × ca. 0.7 mm, 1-veined, apex acute; lip attached to end of column foot, immobile, slightly recurved, ligulate, ca. 2.8 mm, fleshy, adaxially minutely papillate, grooved at base. Column ca. 1.3 mm, foot ca. 2 mm, with free part ca. 1 mm; stelidia conspicuous, subulate, ca. 0.8 mm; anther cap subglobose, apex mucronate. Capsule ovoid, ca. 6 mm, ca. 3 mm in diam. Fl. Jul.

• Tree trunks in forests; ca. 2000 m. SW Yunnan.

**18. *Bulbophyllum cauliflorum*** J. D. Hooker, *Fl. Brit. India* 5: 758. 1890.

茎花石豆兰 jing hua shi dou lan

Rhizome creeping or straggling, stout, 3–4 mm in diam., branched, covered with scalelike sheaths, roots spreading. Pseudobulbs 4–12 cm apart from each other, cylindrical or narrowly ovoid, 2–5 cm, 7–10 mm in diam., with a terminal leaf. Petiole 5–15 mm; leaf blade oblong, 5–10 × 1.4–2.7 cm, leathery, apex obtuse and slightly emarginate. Scape from node of rhizome or base of pseudobulb, erect, nearly as long as pseudobulb; raceme shortened, umbel-like, often 3–5-flowered; peduncle ca. 1 mm in diam., with several tubular sheaths; floral bracts ovate-lanceolate, ca. 4 mm, apex acute. Pedicel and ovary ca. 4 mm. Flowers small, yellowish green. Sepals free, subequal, narrowly lanceolate, 7–10 × ca. 1.5 mm, apex acuminate-caudate. Petals lanceolate, 5–7 × ca. 1.2 mm, entire, acuminate; lip attached to end of column foot by a mobile joint, lanceolate, 3–4 mm, grooved at adaxial base, apex acuminate. Column ca. 0.6 mm, foot ca. 2 mm, with free part ca. 0.5 mm; stelidia fusiform, ca. 1 mm; anther cap subglobose, apex mucronate. Capsule ovoid, ca. 1 cm, ca. 4 mm in diam. Fl. Jun–Jul, fr. Nov.  $2n = 42$ .

Tree trunks or rocks in broad-leaved forests; 800–1800 m. SE Xizang [NE India].

**19. *Bulbophyllum stenobulbon*** E. C. Parish & H. G. Reichenbach, *Trans. Linn. Soc. London* 30: 153. 1874.

短足石豆兰 duan zu shi dou lan

*Bulbophyllum clarkeanum* King & Pantling; *B. youngsayeanum* S. Y. Hu & Barretto; *Phyllorkis stenobulbon* (E. C. Parish & H. G. Reichenbach) Kuntze.

Rhizome creeping or straggling, 1–1.5 mm in diam., branched, rooting from base of pseudobulbs, roots spreading. Pseudobulbs 1.5–3 cm apart from each other, ovoid-cylindrical, usually 1–1.5 cm, 3–6 mm in diam., with a terminal leaf. Petiole 2–3 mm; leaf blade oblong, 1.5–3.3 × ca. 1 cm, leathery, apex obtuse-rounded and slightly emarginate. Scapes 1 or 2, from base of pseudobulb, filiform, 2–3.5 cm, slightly longer than pseudobulb; raceme shortened, umbel-like, often 2–4-flowered; peduncle with 3 or 4 tubular sheaths; floral bracts ovate-lanceolate, 2–3 mm, apex acute. Pedicel and ovary 2.5–3.5 mm. Flowers yellowish, tinged with orange-yellow on lip and apical half of sepals and petals. Sepals free, thickly textured; dorsal sepal narrowly lanceolate, 4.5–5 × 1.3–1.5 mm, apical margins ± incurved, apex long acuminate; lateral sepals similar to but slightly longer than dorsal sepal, base adnate to column foot forming a mentum. Petals ovate, 2–2.4 × 0.8–1 mm, thinly textured, entire, subobtuse; lip spreading horizontally, ligulate or ovate-lanceolate, ca. 2 × 0.5–0.7 mm, fleshy, grooved at base, abaxially densely finely papillate, adaxially often with 3 longitudinal ridges, lateral ridges often thickened and raised, apex rounded or subtruncate, slightly recurved. Column ca. 1.1 mm, stout; stelidia subulate, ca. 0.5 mm; foot slightly upcurved, 1–1.3 mm, with free part ca. 0.3 mm; anther cap subglobose, apex mucronate. Fl. May–Jun.  $2n = 38$ .

Tree trunks or rocks in forests; 1200–2100 m. S and W Guangdong, SW Guizhou, SE Yunnan [Bhutan, India (Sikkim), Laos, Myanmar, Thailand, Vietnam].

**20. *Bulbophyllum ledungense*** Tang & F. T. Wang, *Acta Phytotax. Sin.* 12: 45. 1974.

乐东石豆兰 *le dong shi dou lan*

Rhizome creeping, 1–2 mm in diam., branched, rooting at nodes and from base of pseudobulbs, roots spreading. Pseudobulbs 1–4 cm apart on rhizome, cylindrical or ellipsoid, 8–13 mm, 3–5 mm in diam., with a terminal leaf. Petiole short, 1–2 mm; leaf blade oblong, 1.5–3 × 0.3–0.8 cm, leathery, base contracted into petiole, apex obtuse-rounded and slightly emarginate. Scapes 1 or 2, from base of pseudobulb or nodes of rhizome, erect, 10–20 mm, slender; raceme shortened, umbel-like, 2–5-flowered; floral bracts oblong, small, ca. 2.5 mm, apex acuminate. Pedicel and ovary ca. 2.5 mm. Sepals free, lanceolate, 4–6 × ca. 1.2 mm, thickly textured, apical margins slightly incurved, apex acuminate; lateral sepals slightly longer than dorsal sepal, base adnate to column foot. Petals oblong, ca. 2 × 0.8 mm, entire, shortly acute; lip narrowly oblong, ca. 1.2 × 0.4 mm, fleshy, grooved at base, abaxially ± finely papillate, adaxially with a ridge on either side near margins, apex obtuse-rounded. Column ca. 0.8 mm, stout; stielidia subulate, ca. 0.4 mm; foot ca. 0.8 mm, with free part ca. 0.3 mm; anther cap mucronate at apex. Fl. Jun–Oct.

- Rocks in forests. S Hainan.

**21. *Bulbophyllum odoratissimum*** (Smith) Lindley, *Gen. Sp. Orchid. Pl.* 55. 1830.

密花石豆兰 *mi hua shi dou lan*

*Stelis odoratissima* Smith in Rees, *Cycl.* 34: Stelis no. 12. 1814; *Bulbophyllum congestum* Rolfe; *B. hyacinthodorum* W. W. Smith; *B. trichocephalum* (Schlechter) Tang & F. T. Wang; *B. trichocephalum* var. *wallongense* Agrawala, Sabapathy & H. J. Chowdhery; *Cirrhopetalum trichocephalum* Schlechter.

Rhizome creeping or straggling, 2–4 mm in diam., branched, covered with membranous tubular sheaths, rooting from base of pseudobulbs, roots spreading. Pseudobulbs 4–8 cm apart from each other, subcylindrical, 2.5–5 cm, 3–6(–9) mm in diam., with a terminal leaf. Leaf sessile; blade oblong, 4–13.5 × 0.8–2.6 cm, leathery, apex obtuse and slightly emarginate. Scapes 1 or 2, yellowish green, from base of pseudobulb, erect, to 14 cm; raceme often nodding, shortened, umbel-like, densely more than 10-flowered; peduncle 1–3 mm in diam., with 3 or 4 tubular sheaths 8–10 mm; floral bracts whitish, ovate-lanceolate, 7–10 mm, membranous, apex acuminate. Pedicel and ovary shorter than floral bracts. Flowers slightly fragrant; sepals and petals white, later turning into orange in apical half; lip tangerine. Sepals free, thickly textured; dorsal sepal ovate or ovate-lanceolate, 3–7 × ca. 1.5 mm; lateral sepals lanceolate, 4–14 × ca. 2 mm, margins incurved from middle to apex and tubular or subulate in shape, apex obtuse or subacute. Petals subovate or elliptic, 1–2 × 1–1.5 mm, thinly textured, apex subobtuse; lip slightly recurved, ligulate, fleshy, margins with white glandular hairs, adaxially with 2 densely minutely glandular-hairy ridges, base with a short claw attached to end of

column foot, apex obtuse. Column ca. 1 mm, stout; stielidia ca. 0.2 mm; foot ca. 1 mm, with free part ca. 0.5 mm; anther cap nearly subglobose or cordate, finely papillate. Fl. Apr–Aug. *2n* = 38.

Tree trunks in mixed forests, rocks along valleys; 200–2400 m. Fujian, Guangdong, Guangxi, S Sichuan, SE Xizang, W to SE Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**22. *Bulbophyllum wuzhishanense*** X. H. Jin, *Brittonia* 57: 255. 2005.

五指山石豆兰 *wu zhi shan shi dou lan*

Rhizome creeping, rooting from nodes of rhizome and base of pseudobulbs, roots spreading. Pseudobulbs 1–4 cm apart from each other, ovoid, ca. 0.5 cm, ca. 3 mm in diam., with a terminal leaf. Petiole 2–4 mm; leaf blade oblong, 1.5–3 × 0.8–1 cm, leathery, apex retuse. Scape from base of pseudobulb or node of rhizome, erect, 3.5–4 cm, slender; inflorescence 1-flowered or a shortened, umbel-like raceme, 2- or 3-flowered; peduncle ca. 0.5 mm in diam., with 3–5 bracts; floral bracts lanceolate, ca. 2 mm. Pedicel and ovary 10–15 mm. Flowers white. Sepals free, ovate-triangular, ca. 6 × 3 mm, apex acuminate; lateral sepals ca. 7 × 3 mm, adnate to column foot for more than 1/2 their width; mentum inconspicuous. Petals ovate, ca. 4 × 1.5 mm, entire, obtuse; lip ovate, ca. 4 × 1.5 mm, fleshy, grooved in basal half, adaxially with 2 ridges, apex obtuse. Column 1–1.5 mm; stielidia very short, rounded; foot 1.5–2 mm. Pollinia 2. Fl. Oct.

- Tree trunks in moist tropical forests; ca. 1800 m. Hainan.

The almost vestigial, rounded stielidia are unusual in the section.

**23. *Bulbophyllum kwangtungense*** Schlechter, *Repert. Spec. Nov. Regni Veg.* 19: 381. 1924.

广东石豆兰 *guang dong shi dou lan*

Rhizome creeping or straggling, ca. 2 mm in diam., rooting from nodes of rhizome and base of pseudobulbs, roots spreading. Pseudobulbs 2–7 cm apart from each other, cylindrical, 1–2.5 cm, 2–5 mm in diam., with a terminal leaf. Petiole 1–2 mm; leaf blade oblong, usually 2.5–4.7 × 0.5–1.4 cm, leathery, apex obtuse-rounded and slightly emarginate. Scape from base of pseudobulb or node of rhizome, erect, to 9.5 cm, slender; raceme shortened, umbel-like, 2–4(–7)-flowered; peduncle ca. 0.5 mm in diam., sparsely with 3–5 narrowly tubular sheaths 6–10 mm; floral bracts narrowly lanceolate, ca. 2 mm. Pedicel and ovary ca. 2 mm. Flowers pale yellow. Sepals free, narrowly lanceolate, 8–10 × 1–1.3 mm, apical ca. 3/5 length of margins incurved, apex long acuminate; lateral sepals often slightly longer than dorsal sepal, 1/5–2/5 width of their base adnate to column foot; mentum inconspicuous. Petals narrowly ovate-lanceolate, 4–5 × ca. 0.4 mm, entire, long acuminate; lip narrowly lanceolate, ca. 1.5 × 0.4 mm, fleshy, grooved in basal half, adaxially with 2 or 3 ridges fused halfway to form a thickened ridge, apex obtuse. Column ca. 0.5 mm; stielidia ca. 0.2 mm; foot ca. 0.5 mm, with free part ca. 0.1 mm; anther cap densely minutely papillate. Fl. May–Aug.

- Rocks in forests; 800–1200 m. N Fujian, Guangdong, C and N Guangxi, Guizhou, Hubei, SW Hunan, Jiangxi, S Yunnan, Zhejiang.

**24. *Bulbophyllum shweliense*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 191. 1921.

伞花石豆兰 san hua shi dou lan

*Bulbophyllum craibianum* Kerr.

Rhizome creeping or straggling, slender, ca. 1 mm in diam., branched, rooting from base of pseudobulbs, roots spreading. Pseudobulbs 2–5 cm apart from each other, subcylindric or narrowly ellipsoid-cylindric, 10–15 mm, 4–5 mm in diam., with a terminal leaf. Petiole 1–2 mm; leaf blade oblong, 2–3 × 0.5–1 cm, leathery, base contracted into petiole, apex obtuse-rounded and slightly emarginate. Scapes 1 or 2, from base of pseudobulb, erect, 3–4.5 cm, slender; raceme shortened, umbel-like, 4–10-flowered; peduncle ca. 0.5 mm in diam., with 3

or 4 narrowly tubular sheaths 4–6 mm; floral bracts lanceolate, 2–3 mm. Pedicel and ovary ca. 2 mm. Flowers slightly fragrant, orange. Sepals free, similar to each other, lanceolate, 7.5–8 × ca. 2 mm, apex long acuminate; dorsal sepal with slightly incurved apical margins; lateral sepals with distal margins incurved and tubular, base entirely adnate to column foot forming a subglobose mentum. Petals ovate-lanceolate, 3–3.5 × 1.4–2 mm, entire, shortly acute; lip recurved near apex, ovate-lanceolate in outline, ca. 2 mm, fleshy, glabrous, grooved at base, apex acute. Column ca. 1 mm; stelia subulate, ca. 0.5 mm; foot upcurved, ca. 2 mm, with free part 0.8–1 mm; anther cap obtusely triangular. Fl. Jun.

Tree trunks in forests; 1300–2100 m. N Guangdong, S and W Yunnan [N Thailand, N Vietnam].

**5. *Bulbophyllum* sect. *Macrocaulia*** (Blume) Averyanov, Oprel. Orkhid. Vetnama, 279. 1994.

巨球组 ju qiu zu

*Diphyes* sect. *Macrocaules* Blume, Bijdr. 318. 1825 [*Macrocaulia*].

Rhizome creeping; roots sprouting along rhizome, spreading; new shoots arising well above basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent or deciduous, thin to thick. Inflorescences arising near pseudobulbs, solitary or a few in succession, 1-flowered. Pedicel with basal node distinctly more than 1 × diam. of pedicel above attachment of subtending bract. Sepals free, ± equally long or lateral sepals somewhat longer, margins glabrous, 3-veined. Petals: margins glabrous, 1-veined; lip glabrous adaxially, margins without auricles or lateral lobes, glabrous. Column: stigma not protruding at its base, foot distinct; anther: front margin not or slightly projecting, abaxially with a rounded crest; pollinia 4, inner 1/2 as long as outer or shorter, all without appendages.

Sixty-three provisionally accepted species: Nepal to the Philippines and Sulawesi; three species (one endemic) in China.

- 1a. Lip elliptic to ovate; lip margins rounded in proximal half ..... 25. *B. ovalifolium*  
 1b. Lip with a triangular basal part and a distally swollen top part.  
 2a. Lip 1.5–2 mm, top part coarsely verrucose ..... 26. *B. catenarium*  
 2b. Lip ca. 4 mm, top part glabrous ..... 27. *B. menghaiense*

**25. *Bulbophyllum ovalifolium*** (Blume) Lindley, Gen. Sp. Orchid. Pl. 49. 1830.

卵叶石豆兰 luan ye shi dou lan

*Diphyes ovalifolia* Blume, Bijdr. 318. 1825; *Bulbophyllum ovatilabellum* Seidenfaden.

Plants small. Rhizome creeping. Pseudobulbs contiguous, nearly flattened globose or ellipsoid, 4–10 × 5–8 mm, with a terminal leaf. Leaf subsessile or shortly petiolate; blade elliptic, 10–30 × 4.5–10 mm, leathery, base contracted, apex obtuse. Scapes from base of pseudobulb, erect, 32–60 mm, terminating in a solitary flower; peduncle filiform, 10–30 mm; floral bracts cupular, ca. 2 mm, apex acute. Pedicel and ovary 15–23 mm. Flowers cream-colored or yellow to red, usually with darker veins; lip yellow, orange, or red. Dorsal sepal elliptic, 3.8–6.8 × 1.5–3 mm, apex acute-apiculate, margins glabrous to finely erose to ciliolate distally; lateral sepals elliptic, 4.5–12 × 2–8 mm, ± glabrous, margins entire, apex acute to acuminate. Petals (ob-)ovate-oblong, 1–1.8 × 0.7–1 mm, obtuse, margins entire; lip elliptic to ovate, 1.8–3.5 × 1.2–2.5 mm, fleshy, proximally concave because of upturned margins, margins then folding downward, rounded, adaxial surface distally papillose to verrucose toward margins. Column 1–1.8 mm; stelia narrowly triangular to subulate, 0.5–1 mm, lower margin with a deltoid, ob-

tuse tooth; foot ca. 1.5 mm, with free part ca. 1 mm; anther cap subglobose, papillose. Fl. May.

Tree trunks in forests; ca. 2400 m. Yunnan [Indonesia, Malaysia, Thailand].

This species was first recorded from China, without illustration, by X. H. Jin, H. Li, and D. Z. Li (Acta Phytotax. Sin. 45: 803–804. 2007), as *Bulbophyllum ovatilabellum*.

**26. *Bulbophyllum catenarium*** Ridley, Trans. Linn. Soc. London, Bot. 4: 235. 1894.

链状石豆兰 lian zhuang shi dou lan

Plants small. Rhizome creeping. Pseudobulbs contiguous, flattened globose to flattened cylindric, 1–7 × 1–3 mm, with a terminal leaf. Leaf subsessile; blade elliptic, 4–12 × 3–6 mm, leathery, base contracted, apex obtuse. Scapes from base of pseudobulb, erect, 25–55 mm, terminating in a solitary flower; peduncle filiform, 25–32 mm; floral bracts cupular, 1.5–2.2 mm, apex acute. Pedicel and ovary 10–22 mm. Flowers bright yellow, with or without orange veins, or entirely orange; lip dark red to purple. Dorsal sepal elliptic, 3–6.4 × 2–2.5 mm, margins erose to ciliolate distally, apex acuminate; lateral sepals elliptic, 5–9 × 3.5–5.5 mm, margins entire to slightly erose, apex acuminate. Petals ovate, 1–1.3 × 0.4–0.7 mm, obtuse, mar-

gins entire to finely erose; lip with a triangular basal part and a swollen, subglobose top part, 1.5–2 × 0.8–1.6 mm, fleshy, proximally concave because of upturned margins, margins then folding sharply downward and distinctly angular, adaxial surface coarsely verrucose distally. Column 1–2.5 mm; stelidia narrowly triangular to subulate, 0.5–1 mm, lower margin with inconspicuous, rounded wings; foot ca. 1 mm, with free part very short; anther cap subglobose, papillose. Fl. Apr–May.

Trees in forests; 2200–2300 m. Yunnan [Malay Archipelago (Borneo), Malaysia (Peninsular), Vietnam].

This species was first recorded from China, including color photographs, by Y. M. Shui and W. H. Chen (Seed Pl. Karst Region China 1: 216. 2006).

**27. *Bulbophyllum menghaiense*** Z. H. Tsi, Bull. Bot. Res., Harbin 1(1–2): 109. 1981.

勐海石豆兰 meng hai shi dou lan

Plants small. Rhizome creeping. Pseudobulbs contiguous,

nearly flattened globose, broader than long, 3–4 mm in diam., with a terminal leaf. Leaf subsessile; blade ovate-lanceolate or oblong-ligulate, 4–10 × 2–3 mm, leathery, base contracted, apex acute. Scapes 1 or 2, from base of pseudobulb, erect, 7–10 mm, terminating in a solitary flower; peduncle filiform, 5–7 mm; floral bracts cupular, ca. 1 mm, apex acute. Pedicel and ovary ca. 4 mm. Flowers yellowish with reddish brown veins; lip orange-red. Dorsal sepal ovate, 5.5–7 × ca. 1.8 mm, apex acute-acuminate; lateral sepals ovate-triangular, 6–7 × ca. 2 mm, apex acute. Petals obovate-oblong, ca. 2.2 × 1 mm, entire, obtuse; lip with a triangular basal part and a linear top part, ending in a somewhat swollen tip, ca. 4 × 1.3 mm, fleshy, proximally concave because of upturned margins, margins then folding downward and angular, adaxial surface glabrous. Column ca. 1 mm; stelidia narrowly fusiform, ca. 1.1 mm, lower margin rounded, without a tooth; foot ca. 1.5 mm, upcurved, with free part ca. 0.7 mm; anther cap subglobose, glabrous. Fl. Jul.

• Tree trunks in forests; ca. 1500 m. S Yunnan.

**6. *Bulbophyllum* sect. *Monanthes*** (Blume) Averyanov, Opred. Orkhid. Vetnama, 279. 1994.

单花组 dan hua zu

*Diphyes* sect. *Monanthes* Blume, Bijdr. 311. 1825.

Rhizome creeping; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thin to thick. Inflorescences solitary, or clustered on a lateral sympodium, arising near pseudobulbs, 1-flowered. Pedicel with basal node ± coinciding with attachment of subtending bract. Sepals free [lateral sepals often fused along lower margin in extralimital species], ± equally long, margins glabrous, 3-veined. Petals: margins ± glabrous, 1-veined; lip: margins without retrorse auricles on each side of ligament [these often present in extralimital species], with lateral lobes higher up along margins, margins otherwise ± glabrous, adaxially glabrous. Column: stigma not protruding at its base, foot distinct; anther: front margin not or slightly projecting, abaxially with a rounded crest; pollinia 4, inner ca. 1/2 as long as outer, all without appendages.

One hundred and twenty-two provisionally accepted species: Himalayas to W Pacific; one species in China.

**28. *Bulbophyllum depressum*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 585. 1897.

戟唇石豆兰 ji chun shi dou lan

*Bulbophyllum hastatum* Tang & F. T. Wang.

Rhizome creeping, slender, ca. 1 mm in diam., branched, with 2 or 3 roots at base of pseudobulbs. Pseudobulbs 8–14 mm apart on rhizome, prostrate on rhizome, apical half ascending, obliquely ovoid, small, 4–8 mm, 2.5–4 mm in diam., with a terminal leaf. Petiole 1–2 mm; leaf blade ovate or ovate-lanceolate, 6–15(–23) × 4–8(–10) mm, papery, apex apiculate. Scape from base of pseudobulb or node of rhizome, erect, filiform, ca. 6 mm, 0.3–0.4 mm in diam., terminating in a solitary flower, with 1 membranous sheath at base; floral bracts cupular, shorter than pedicel and ovary, membranous. Pedicel and ovary ca. 1

mm. Flowers very small, erect, purple, with greenish base and apex. Dorsal sepal lanceolate, ca. 3 × 0.7 mm, apex acute-acuminate; lateral sepals falcate-lanceolate, slightly longer than dorsal sepal, ca. 0.7 mm, base adnate to column foot forming a mentum, apex acuminate. Petals elliptic, ca. 2 × 0.5 mm, apex acute; lip subovate in outline, ca. 1.5 mm, glabrous, 3-lobed; lateral lobes erect, suborbicular, their apices ca. 1 mm apart when spreading out, membranous; mid-lobe ligulate, fleshy-thickened, ca. 0.7 mm, apex obtuse; disk with 1 callus running to mid-lobe. Column ca. 1 mm; foot ca. 1.5 mm, without free part; stelidia inconspicuous; anther cap subglobose, glabrous. Fl. Jun–Nov.

Tree trunks in dense forests or rocks along valleys; 400–600 m. SW Guangdong, Hainan, SE Yunnan [India, Thailand].

**7. *Bulbophyllum* sect. *Monanthaparva*** Ridley, J. Linn. Soc., Bot. 32: 269. 1896.

柱唇组 zhu chun zu

Rhizome creeping; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thin to thick. Inflorescences arising near pseudobulbs, solitary or a few together on a lateral sympodium, 1-flowered. Pedicel with basal node more than 1 × diam. of pedicel above attachment of subtending bract. Sepals free, ± equally long, margins glabrous, 3-veined. Petals: margins ± glabrous, 1-veined; lip: margins without auricles

or lateral lobes, margins glandular-papillose, adaxially glandular papillose. Column: stigma not protruding at its base, foot absent or very short; anther: front margin projecting into a triangular beak, abaxially with a slight, rounded crest; pollinia 4, inner more than 1/2 as long as outer, all without appendages.

Twenty-nine provisionally accepted species: Indochina to W Pacific; one species (endemic) in China.

**29. *Bulbophyllum menglunense*** Z. H. Tsi & Y. Z. Ma, Acta Bot. Yunnan. 7: 83. 1985.

勐仑石豆兰 meng lun shi dou lan

Plants small. Rhizome creeping, slender, ca. 1 mm in diam., bearing roots from base of pseudobulbs. Pseudobulbs ca. 1 cm apart on rhizome, ovoid, 5–7 mm, 3–4 mm in diam., base ± prostrate on rhizome, with a terminal leaf. Petiole ca. 1 mm, ± twisted; leaf blade ovate, 8–13 × 5–6 mm, leathery, apex mucronate. Scape from base of pseudobulb or node of rhizome, erect, filiform, 5–7 mm, ca. 0.4 mm in diam., terminating in a solitary flower, with 1 sheath at base; floral bracts cupular, ca. 1 mm,

membranous. Pedicel and ovary ca. 2 mm. Flowers very small, purplish red. Sepals free; dorsal sepal ovate, ca. 2.1 × 0.8 mm, apical margins slightly incurved, apex acuminate; lateral sepals obliquely ovate-lanceolate, ca. 2.2 × 1.1 mm, margins ± incurved above middle, apex acute. Petals elliptic, ca. 1 × 0.7 mm, apex acute; lip slightly recurved, subcylindric, ca. 1.5 × 0.3 mm, fleshy, base connate to end of column foot, immobile, margins in basal half with glandular hairs. Column ca. 1 mm; foot ca. 0.8 mm, without distinct free part; stelia inconspicuous; anther cap subglobose. Fl. Mar.

• Tree trunks in open forests in limestone areas; ca. 800 m. S Yunnan.

### 8. *Bulbophyllum* "Section 8"

穗花组 sui hua zu

Rhizome creeping; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, arising near pseudobulbs, an elongate to ± sub-umbellate raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Dorsal sepal with margin glabrous, papillose, erose, or ciliate; lateral sepals free, ca. as long as or longer than dorsal sepal, with margins glabrous or slightly denticulate, 3–5-veined. Petals: margins denticulate to ciliate, 1–3-veined; lip: margins without auricles or lateral lobes, margins otherwise ± glabrous, adaxially ± glabrous. Column: stigma protruding at its base or not, foot distinct; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 4, inner 1/2 as long as outer or longer, all without appendages.

Six provisionally accepted species: India to Indochina; three species (one endemic) in China.

- 1a. Inflorescence umbellate ..... 30. *B. levinei*  
 1b. Inflorescence racemose.  
   2a. Lip 3.5–4 mm ..... 31. *B. eublepharum*  
   2b. Lip 2–2.8 mm ..... 32. *B. insulsoides*

**30. *Bulbophyllum levinei*** Schlechter, Repert. Spec. Nov. Regni Veg. 19: 381. 1924.

齿瓣石豆兰 chi ban shi dou lan

*Bulbophyllum insulsum* (Gagnepain) Seidenfaden; *Cirrhopetalum insulsum* Gagnepain.

Rhizome creeping, slender. Pseudobulbs close, subcylindric or bottle-shaped, 5–10 mm, 2–4 mm in diam., with a terminal leaf. Petiole 4–10 mm; leaf blade narrowly oblong or obovate-lanceolate, 3–4(–9) × 0.5–0.7(–1.4) cm, thinly leathery, base contracted into petiole, margin slightly undulate, apex subacute. Scape from base of pseudobulb, erect, 3–5 cm, longer than leaves, slender, glabrous; raceme shortened, umbel-like, often 2–6-flowered; peduncle ca. 0.5 mm in diam., sparsely with 2 or 3 tubular sheaths; floral bracts erect, narrowly lanceolate, 2–3.5 mm, apex acuminate. Pedicel and ovary longer than floral bracts. Flowers thinly textured, white tinged with purple. Dorsal sepal ovate-lanceolate, concave, 4–5 × 1.5–2 mm, abruptly contracted and thickened above middle, margin denticulate, apex acute; lateral sepals obliquely ovate-lanceolate, 5–5.5 × 1.5–2 mm, thickened above middle, base adnate to column foot forming a mentum, margins entire, apex cuspidate. Petals connivent to sepals, ovate-lanceolate, ca. 3.5 × 1.5 mm,

margins denticulate, apex long acuminate; lip recurved, lanceolate in outline, 2–2.5 mm, nearly fleshy, basal half grooved, base attached to end of column foot, immobile, margin entire, apex subacute. Column ca. 1.2 mm; stelia filiform, ca. 0.5 mm; foot curved, ca. 1.5 mm, with free part ca. 0.5 mm; anther cap subglobose, apex narrowed and beaked, with a densely finely papillate ridge centrally. Fl. May–Aug.

Tree trunks in forests, rocks along valleys; ca. 800 m. Fujian, S Guangdong, Guangxi, SE Hunan, SW Jiangxi, W to SE Yunnan, Zhejiang [Vietnam].

**31. *Bulbophyllum eublepharum*** H. G. Reichenbach, Ann. Bot. Syst. 6: 252. 1861.

墨脱石豆兰 mo tuo shi dou lan

*Bulbophyllum yuanyangense* Z. H. Tsi.

Pseudobulbs close, cylindric, 4–6.5 cm, 7–10 mm in diam., with a terminal leaf. Petiole 1–2 cm; leaf blade oblong, 13–21.5 × 3.5–4 cm, thickly leathery, base contracted into a petiole, apex acute. Scape from base of pseudobulb, erect, to 55 cm; raceme 9–10 cm, sparsely many flowered; peduncle 2–4 mm in diam., base with 2 or 3 tubular sheaths to 2.5 cm; floral bracts narrowly lanceolate, 5–8 mm, apex long acuminate. Pedicel and

ovary 5–8 mm. Flowers green. Sepals free, ovate-lanceolate, ca. 15 × 6 mm, apex acuminate; dorsal sepal slightly shorter than lateral sepals. Petals broadly elliptic, 3–4 × 2.5–3.5 mm, margins ciliate, apex obtuse; lip oblong-lanceolate, thickly fleshy, grooved at adaxial base, margin glandular-ciliate, apex obtuse and retuse. Column stout, base dilated, with wings enlarged at base; foot short; stelia subulate. Fl. unknown.  $2n = 38$ .

Tree trunks in forests; 2000–2100 m. SE Xizang, NW and SE Yunnan [Bhutan, NE India].

**32. *Bulbophyllum insuloides*** Seidenfaden, Dansk Bot. Ark. 29(1): 89. 1974.

穗花卷瓣兰 sui hua juan ban lan

*Bulbophyllum racemosum* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 317. 1911, not Rolfe (1893); *Cirrhopetalum racemosum* Hayata.

Pseudobulbs close, ovoid-conic, 2.5–3 cm, 8–15 mm in diam., with 1 leaf at apex. Leaf shortly petiolate; blade narrowly oblong, 10–17 × 1.3–3 cm, leathery, base contracted into petiole, apex subacute. Scape from base of pseudobulb, ca. 12 cm, slender; raceme elongate, sparsely 10-flowered; peduncle with 2–4 sheathlike bracts; floral bracts lanceolate, 6–9 mm. Pedicel and ovary shorter than floral bracts. Flowers yellowish green with pale red spots. Dorsal sepal ovate-lanceolate, 6–8 × ca. 2.5 mm, densely ciliate, apex acuminate and recurved; lateral sepals obliquely ovate-lanceolate, 7–11 × 2–3 mm, base adnate to column foot, apex long caudate. Petals ovate, 2–4 × 1.5–2 mm, densely ciliate; lip ligulate, ca. 2.5 × 1.5 mm, adaxially with 3 ridges (central 1 yellow, lateral 2 yellowish white), attached to end of column foot, immobile. Column white, ca. 2 mm, with a foot ca. 2 mm; stelia slender. Fl. Jul–Sep.

• Tree trunks in forests; 1000–2000 m. C and S Taiwan.

### 9. *Bulbophyllum* sect. *Anisopetalon* (Hooker) Lindley, Veg. Kingd. 181. 1846.

异瓣组 yi ban zu

*Anisopetalon* Hooker, Exot. Fl. 2: ad t. 149. 1825.

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, arising near pseudobulbs, an elongate or somewhat contracted raceme. Pedicel with basal node coinciding with attachment of subtending bract. Sepals: margins glabrous, 3-veined; lateral sepals ± fused along their lower margins. Petals: margins glabrous to erose, 1–3-veined; lip: margins without retrorse auricles on each side of ligament, with antrorse, often denticulate auricles higher up along margins (absent in *Bulbophyllum brevispicatum*), margins otherwise ± glabrous to denticulate, adaxially ± glabrous. Column: stigma not protruding at its base, foot distinct; anther: front margin not or slightly projecting, abaxially with or without a low, rounded crest; pollinia 4, inner 1/2 as long as outer or longer, all without appendages.

About 38 provisionally accepted species (several taxa are of uncertain status): India to Vietnam and Peninsular Malaysia; five species (one endemic) in China.

- 1a. Lip without basal auricles on both sides ..... 33. *B. brevispicatum*  
 1b. Lip with 2 basal auricles on both sides.  
   2a. Raceme ca. 8 cm, sparsely flowered ..... 34. *B. rufinum*  
   2b. Raceme 2–7 cm, densely flowered.  
     3a. Flowers yellowish white; floral bracts much longer than flowers; petals acute at apex ..... 35. *B. bittnerianum*  
     3b. Flowers yellowish green or yellowish brown, with purplish red spots or stripes; floral bracts nearly as long as or slightly longer than flowers; petals cuspidate or shortly caudate at apex.  
       4a. Basal auricles of lip subsquare, apex truncate and slightly retuse; column with deltoid teeth ..... 36. *B. crassipes*  
       4b. Basal auricles of lip falcate, apex apiculate and unequally 2- or 3-toothed; column with subulate teeth ..... 37. *B. orientale*

**33. *Bulbophyllum brevispicatum*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 32: 555. 1994.

短序石豆兰 duan xu shi dou lan

Pseudobulbs ca. 2 cm apart from each other, subcylindric, 3–3.5 cm, 5–7 mm in diam., with a terminal leaf. Leaf subsessile; blade oblong, ca. 17 × 2.8 cm, apex acute. Scape from base of pseudobulb, arching, ca. 2 cm; raceme densely 6- or 7-flowered; peduncle with 3 scalelike sheaths ca. 6 mm; floral bracts lanceolate, ca. 6 mm, apex acuminate. Pedicel and ovary 4–5 mm. Flowers purplish red. Dorsal sepal ovate-elliptic, concave, ca. 5 × 3 mm, abaxially densely papillate, apex acute; lateral sepals ovate, nearly as large as dorsal sepal, abaxially densely papillate, their lower edges connate to each other, with

free apex. Petals ovate, ca. 3 × 2 mm, margins irregularly denticulate, apex rounded; lip attached to end of column foot by a mobile joint, recurved, ligulate, ca. 3 mm, fleshy, glabrous, base with 1 central groove, with 2 cornute auricles on both basal sides, apex obtuse-rounded. Column ca. 2 mm; stelia subulate, ca. 1.5 mm, foot with free part ca. 1.5 mm; anther cap tower-shaped, densely papillate. Fl. Jan.

• Tree trunks at forest margins along valleys; 1300–1400 m. S Yunnan.

**34. *Bulbophyllum rufinum*** H. G. Reichenbach, Xenia Orchid. 3: 44. 1881.

窄苞石豆兰 zhai bao shi dou lan

Rhizome stout, 5–6 mm in diam., with scalelike sheaths, rooting from base of pseudobulbs. Pseudobulbs ca. 8 cm apart on rhizome, pale yellow when dried, ovoid-conic, 2.5–4 cm, 1.5–2 cm in diam., with a terminal leaf. Petiole ca. 1 cm; leaf blade oblong, 11–20.5 × ca. 3 cm, fleshy or thickly leathery, base contracted into petiole, apex obtuse and slightly emarginate. Scape from base of pseudobulb, slightly arching, ca. 10 cm, often slender; raceme ca. 8 cm, sparsely many flowered; peduncle with several sheaths at base; floral bracts narrowly oblong-lanceolate, 7–20 mm, apex obtuse. Flowers yellow, thinly textured. Dorsal sepal ovate-lanceolate, ca. 6 × 2 mm, apex acuminate; lateral sepals ovate-lanceolate, ca. 9 × 2.2 mm, their lower edges connate to each other, upper edges incurved, apex acute. Petals obliquely ovate-lanceolate, ca. 2 × 0.9 mm, apex caudate; lip ligulate, ca. 3 × 1 mm, margins finely papillate, grooved at adaxial base, with 2 auricles on both basal sides, apex obtuse; auricles falcate, ca. 0.5 mm, apex acute. Column ca. 1.8 mm; stielidia subulate, ca. 1 mm; foot ca. 1.5 mm, with free part ca. 0.5 mm. Fl. Nov.  $2n = 38$ .

Tree trunks in dense forests; 800–900 m. S Yunnan [Cambodia, Laos, Myanmar, Thailand, Vietnam].

**35. *Bulbophyllum bittnerianum*** Schlechter, *Orchis* 4: 108. 1910.

团花石豆兰 tuan hua shi dou lan

Rhizome stout, 4–5 mm in diam., rooting from nodes of rhizome. Pseudobulbs 3–5 cm apart from each other, ovoid, ca. 2.5 cm, 1.3–2.3 cm in diam., 4-ribbed, with a terminal leaf. Petiole 1–1.5 cm; leaf blade oblong, 15–17.5 × 2–3.5 cm, slightly fleshy, base contracted into petiole, apex subobtuse. Scape from base of pseudobulb, suberect or arching; raceme 3–4 cm, densely many flowered; peduncle stout, with 3 or 4 large sheaths; floral bracts yellowish white, oblong, large, ca. 20 × 7–8 mm, papery, margins with purple spots. Pedicel and ovary yellowish white, ca. 3 mm; flowers enclosed in floral bracts, fleshy; sepals and petals yellowish white spotted with purple; lip yellowish with purple apex. Dorsal sepal oblong, concave, ca. 6.5 × 3.5 mm, entire, obtuse; lateral sepals obliquely ovate, ca. 8 × 4.5 mm, base adnate to column foot, their lower edges connate to each other, apex acute. Petals narrowly ovate, ca. 3 × 1.8 mm, entire, acute; lip ligulate, ca. 3.5 × 1 mm, narrowed toward obtuse apex, adaxial base grooved, with 2 auricles on both basal sides, both surfaces densely papillate. Column ca. 3 mm; foot ca. 2 mm; stielidia deltoid, ca. 1 mm; anther cap yellow, apex beaked. Fl. Jul.

Tree trunks in evergreen broad-leaved forests; ca. 1700 m. S Yunnan [N Thailand].

**36. *Bulbophyllum crassipes*** J. D. Hooker, *Fl. Brit. India* 5: 760. 1890.

短耳石豆兰 duan er shi dou lan

Rhizome stout, 3–4 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 2–30 cm apart from each other, ovoid or conic, 3–4 cm, 1.5–2.5 cm in diam., usually 4- or 5-veined, with a terminal leaf. Petiole 1–2 cm; leaf blade oblong, 12–17 × 2–3.5 cm, fleshy or thickly leathery, apex obtuse and slightly emarginate. Scape from base of pseudobulb, arching, 4–17 cm; raceme 2–7 cm, densely many flowered; peduncle stout, base with 3 or 4 sheaths; floral bracts pale brown, ovate-lanceolate, 5–7 mm, apex acute. Pedicel and ovary 4–5 mm. Flowers yellowish brown. Dorsal sepal oblong, concave, ca. 6 × 3 mm, apex obtuse-rounded; lateral sepals ovate-lanceolate, much longer than dorsal sepal, base ca. 3.5 mm wide, their lower edges connate and upper edges incurved near apex to form an ovoid sac, apex acute. Petals obliquely triangular, 2.5–3 × ca. 2 mm, decurrent to column foot, margins often irregularly denticulate, apex shortly caudate; lip ligulate, longer than petals, fleshy, margin finely papillate, grooved at adaxial base, with 2 auricles on both basal sides; auricles subsquare, ca. 1 mm, apex truncate and slightly retuse. Column ca. 2 mm; stielidia deltoid, ca. 1 mm, apex acute; foot ca. 2 mm, with free part ca. 1 mm; anther cap glabrous. Fl. Apr.  $2n = 38$ .

Tree trunks in evergreen broad-leaved forests; 1100–1200 m. S Yunnan [Bhutan, NE India, Malaysia (Penang), Myanmar, Thailand].

**37. *Bulbophyllum orientale*** Seidenfaden, *Dansk Bot. Ark.* 33(3): 138. 1979.

麦穗石豆兰 mai sui shi dou lan

Rhizome stout, 4–5 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 4–6 cm apart on rhizome, ovoid, usually 2–3 cm, base ca. 1.5 cm in diam., with a terminal leaf. Petiole 0.5–1 cm; leaf blade oblong, 8–30 × 1.5–3.4 cm, leathery or fleshy, base contracted into petiole, apex slightly retuse. Scape from base of pseudobulb, arching, 5–13 cm; raceme 3–6 cm, densely many flowered; peduncle with 4 or 5 large sheaths ca. 2 cm; floral bracts ovate-lanceolate, 5–6 mm, apex acute. Pedicel and ovary ca. 5 mm. Flowers yellowish green, with brown venation on sepals and petals and black spots on lip. Dorsal sepal ovate, ca. 6 × 3 mm, entire, acute; lateral sepals obliquely ovate-lanceolate, ca. 7.5 × 4.2 mm, abaxially slightly papillate, base adnate to column foot, their lower edges connate forming an ovoid sac, apex acute. Petals slightly obliquely triangular, ca. 2.5 × 1.8 mm, slightly decurrent to column foot, apex cuspidate; lip ca. 6 mm, fleshy, centrally grooved in basal half, apex obtuse, recurved, margin papillate, with 2 auricles on both basal sides; auricles falcate, ca. 1.3 × 0.4 mm, apex apiculate and irregularly toothed. Column yellow, subcylindric, ca. 2 mm; foot ca. 3 mm, with free part ca. 1.5 mm; stielidia subulate, ca. 1 mm; anther cap glabrous. Fl. Jun–Sep.  $2n = 38$ .

Tree trunks in evergreen broad-leaved forests; 1000–2000 m. S and SW Yunnan [Thailand, Vietnam].

**10. *Bulbophyllum* sect. *Hirtula*** Ridley, *Mat. Fl. Malay. Penins.* 1: 68. 1908.

硬毛组 ying mao zu

Rhizome creeping; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, arising near pseudobulbs, an elongate raceme. Pedicel with basal node ± coinciding with attachment of subtending bract or well above it. Sepals free, ± equally long, margins

ciliate, adaxially glabrous to hirsute, 3-veined. Petals: margins ciliate, 1-veined; lip: margins with a retrorse auricle immediately next to ligament, without lateral lobes, margins ciliate, adaxially glabrous, finely papillose, verrucose, finely pubescent or velutinous. Column: stigma protruding at its base or not, foot distinct; anther: front margin not projecting, abaxially with a rounded crest; pollinia 4, inner 1/2 as long as outer or longer, all without appendages.

Forty accepted species: India to the Philippines and Sulawesi; four species in China.

See the revision by Vermeulen (Gard. Bull. Singapore 54: 26. 2002).

The New Guinean *Bulbophyllum phreatiops* J. J. Vermeulen is better excluded.

- 1a. Sepals adaxially glabrous ..... 38. *B. secundum*  
 1b. Sepals adaxially partly or entirely pubescent or pilose.  
 2a. Lip distally pouch-shaped, deeply concave adaxially ..... 39. *B. scaphiforme*  
 2b. Lip distally convex, flat, or only slightly concave.  
 3a. Lip 2.8–4.2 × 1–1.6 mm, abaxially convex toward tip ..... 40. *B. nigripetalum*  
 3b. Lip 5–7 × 2–3.3 mm, abaxially ± flat to slightly concave toward tip ..... 41. *B. nigrescens*

**38. *Bulbophyllum secundum*** J. D. Hooker, Fl. Brit. India 5: 764. 1890.

少花石豆兰 shao hua shi dou lan

*Bulbophyllum subparviflorum* Z. H. Tsi & S. C. Chen;  
*Phyllorkis secunda* (J. D. Hooker) O. Kuntze.

Rhizome 0.8–2 mm in diam., sections between pseudobulbs 0.5–1.8 cm. Pseudobulbs close, depressed conic to lenticular, 0.4–1 × 0.6–1.5 cm. Petiole 0.7–1.5 cm; leaf blade elliptic, 3.2–10 × 0.4–1 cm, obtuse to acute. Inflorescence an elongate, rather lax raceme, erect, 7.5–22 cm, 8–23-flowered; peduncle 5–13.2 cm; bracts ca. 4, longest 2–4.5 mm; rachis not thickened, 2.2–11 cm, glabrous; floral bracts triangular, 1–1.8 × 0.8–1.2 mm, acute to acuminate. Flowers distichous or scattered, resupinate, secund, not fully opening, several simultaneously, pale green, often suffused with dull reddish brown or purple toward tip, or almost entirely of that color except for base, lip reddish purple, or brownish green, proximally dark brown along margins. Pedicel and ovary 1.8–6 mm. Dorsal sepal ± porrect, ovate to triangular, 2–3.2 × 0.9–1.3 mm, rather thin, surface glabrous, base rather narrowly attached, margin ciliolate, apex obtuse to acute; lateral sepals recurved, triangular, 2.2–3.8 × 1.3–2.2 mm, upper margin glabrous to sparsely ciliolate, (sub-)acute, otherwise as dorsal sepal. Petals porrect, obovate to spatulate, 1.5–2.5 × 0.6–1 mm, thin, glabrous or slightly papillose toward tip, base broadly attached, margins ciliate, apex rounded to obtuse; lip recurved in proximal half, ovate, 1.8–3 × 0.9–1.2 mm, thick; abaxially with an inconspicuous, retuse ridge toward base, surface glabrous; adaxially slightly concave near base and with a deeply cleft, triangular basal callus, with 2 very weak, rounded ridges diverging proximally and fused to a single slightly convex body in distal half of lip, surface finely papillose to shortly pubescent proximally and glabrous distally, margins ciliate except near tip, apex rounded. Column 1.1–1.3 mm; stelia triangular, 0.3–0.5 mm, acute. Fl. Jan–Feb, May–Jul, Sep.

Epiphytic in montane temperate or tropical evergreen (shrub) forests, also reported from depleted evergreen forests; 1200–2500 m. Yunnan [India, Myanmar, Nepal, Thailand, Vietnam].

**39. *Bulbophyllum scaphiforme*** J. J. Vermeulen, Gard. Bull. Singapore 54: 84. 2002.

囊唇石豆兰 nang chun shi dou lan

Rhizome: sections between pseudobulbs 1.5–2.5 cm. Pseudobulbs close, depressed conic, 1.5–2.5 × 1.5–3 cm. Petiole 1–1.5 cm; leaf blade ?elliptic, 7–9.2 × ca. 1.8 cm, ?subacute. Inflorescence an elongate, rather lax raceme, erect to spreading, 28–54 cm, 23–33-flowered; peduncle 14–25 cm; rachis not thickened, 14–22 cm, glabrous; floral bracts triangular, 3–4 × ca. 2 mm, acute. Flowers spreading to reflexed, secund, not fully opening, many simultaneously, blackish purple, yellowish toward base, or yellowish with blackish purple veins, margins, and scattered spots, lip blackish purple with green or yellowish ridges adaxially. Pedicel and ovary 5.5–9 mm. Dorsal sepal porrect to recurved, ovate, 4.5–7.5 × 2–4.2 mm, rather thin, abaxially glabrous, adaxially pubescent, base rather broadly attached, margin ciliate, apex acute; lateral sepals recurved, elliptic to ovate, 6–8 × 2.5–4.2 mm, acute to acuminate, otherwise as dorsal sepal. Petals ± porrect, spatulate, 2–2.5 × 0.8–1.5 mm, surface pubescent distally, base broadly attached; rather thick with a thick top, margins ciliate distally, apex acute to acuminate; lip recurved in proximal half, pouch-shaped distally, obovate in outline, 4.8–5.5 × 1.8–3.2 mm, rather thin; abaxially with a wide, rounded ridge near base, surface otherwise convex, pubescent, or only so in front of basal ridge and toward margins; adaxially somewhat concave and with a median slit reaching up to ca. 1/3 of lip near base, with 2 distinct, obtuse ridges diverging proximally, running ± parallel over ca. 3/4 of lip, and ending in some irregularly shaped calli, surface with irregular, radiating furrows distally but otherwise glabrous, margins ciliate, apex rounded. Column 1–1.6 mm; stelia triangular, 0.4–0.7 mm, acute. Fl. Mar–May, Jul.

Epiphytic; 1100–1400 m. Yunnan [Thailand, Vietnam].

**40. *Bulbophyllum nigripetalum*** Rolfe, Bull. Misc. Inform. Kew 1891: 197. 1891.

黑瓣石豆兰 hei ban shi dou lan

Rhizome 1.5–3 mm in diam., sections between pseudobulbs 0.6–2.5 cm. Pseudobulbs close, ovoid or broadly conic, 0.9–1.7 × 0.9–1.8 cm. Petiole 0.8–2 cm; leaf blade elliptic, 5.2–17 × 0.6–1.5 cm, obtuse. Inflorescence an elongate, rather lax raceme, erect to spreading, 15–49 cm, 13–32-flowered; peduncle 8–25 cm; bracts ca. 5, longest 4–9 mm; rachis not thickened, 5.5–25 cm, glabrous; floral bracts triangular, 1.8–4.5 × 1–2 mm, acuminate. Flowers spreading to reflexed, secund, not fully opening, many simultaneously, cream-colored or yellow,

near base often with blackish purple veins, sometimes blackish purple distally, or blackish purple all over, lip blackish purple, often yellowish at base. Pedicel and ovary 3.8–6.5 mm. Dorsal sepal porrect to recurved, ovate to triangular, 3.1–6 × 1.3–2.2 mm, rather thin, abaxially glabrous, adaxially pubescent, base rather narrowly attached, margin ciliate, apex obtuse to acute; lateral sepals recurved, 3–6 × 2.2–3 mm, otherwise as dorsal sepal. Petals ± porrect, elliptic to obovate or spatulate, 1.6–2.2 × 0.5–1 mm, rather thin with a thick tip, surface pubescent distally, base broadly attached, margins ciliate distally, apex obtuse to acuminate; lip recurved in proximal half, obovate to elliptic, 2.8–4.2 × 1–1.6 mm, thick and fleshy; abaxially with a wide, rounded ridge near base, surface elsewhere convex, partly or entirely velutinous; adaxially somewhat concave near base, with 3 ridges: 2 distinct, obtuse ridges diverging proximally, continuing over 1/3–3/4 of lip, and a thin, low, sometimes inconspicuous median ridge continuing over ca. 1/2 of lip, surface glabrous, finely velutinous toward margins, margins ciliate, apex rounded to obtuse. Column 1–1.3 mm; stelidia triangular, 0.3–0.6 mm, acute. Fl. Mar–May.

Epiphytic or lithophytic in forests; 1000–1300 m. Yunnan [Thailand].

**41. *Bulbophyllum nigrescens*** Rolfe, Bull. Misc. Inform. Kew 1910: 158. 1910.

钩梗石豆兰 *gou geng shi dou lan*

*Bulbophyllum anguste-ellipticum* Seidenfaden.

Rhizome 2–3.5 mm in diam., sections between pseudobulbs 0.6–2.5 cm. Pseudobulbs close, ovoid or broadly conic, 0.8–1.7 × 1–2 cm. Petiole 0.8–2 cm; leaf blade elliptic to ovate,

6–13 × 0.9–1.7 cm, obtuse. Inflorescence an elongate, rather lax raceme, erect to spreading, 23–44 cm, 13–27-flowered; peduncle 8–22 cm; bracts ca. 5, longest 6.5–9 mm; rachis not thickened, 9–20 cm, glabrous; floral bracts triangular, 1.8–4.5 × 1–2 mm, acuminate. Flowers spreading to reflexed, secund, not fully opening, many simultaneously, yellowish, stained with blackish purple and with blackish purple veins, sometimes entirely blackish purple adaxially and pale reddish brown abaxially, petals and lip almost entirely blackish purple, petals proximally sometimes yellow with a blackish purple vein. Pedicel and ovary 5–11 mm. Dorsal sepal porrect to recurved, ovate to triangular, 5.5–9.5 × 1.8–3.2 mm, rather thin, adaxially pubescent, abaxially glabrous, base rather narrowly attached, margin ciliate, apex obtuse to acute; lateral sepals recurved, 6.5–10.5 × 2.7–4.2 mm, otherwise as dorsal sepal. Petals ± porrect, elliptic to obovate or spatulate, 1.5–2.5 × 0.8–1.5 mm, rather thin with a thick top, surface pubescent distally, base broadly attached, margins ciliate distally, apex obtuse to acuminate; lip recurved in proximal half, obovate to elliptic, 5–7 × 2–3.3 mm, rather thin; abaxially with a wide, rounded ridge near base, surface elsewhere concave to flat, glabrous or partly pubescent; adaxially somewhat concave near base and with a median slit or furrow reaching up to 1/3–2/3 of lip, with 2 distinct, obtuse ridges diverging proximally, continuing over 1/3–3/4 of lip, and often ending in a patch of irregularly shaped verrucae, surface glabrous, margin ciliate, apex rounded to obtuse. Column 1.4–1.8 mm; stelidia triangular, 0.5–0.8 mm, acute. Fl. Jan–May, Jul.

Epiphytic or lithophytic in deciduous or evergreen forests; 700–1800 m. S Yunnan [Thailand, Vietnam].

Chinese records of *Bulbophyllum nigrescens* could be based on misidentified plants.

### 11. *Bulbophyllum* sect. *Altisceptrum* J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 13: 34. 1914.

狭瓣组 *xia ban zu*

Rhizome creeping; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, arising near pseudobulbs, an elongate raceme. Pedicel with basal node well above attachment of subtending bract. Sepals free, margins glabrous, adaxially glabrous, 3-veined. Petals: margins erose, 1-veined; lip: margins without auricles or lateral lobes, margins glabrous, adaxially glabrous. Column: stigma not protruding at its base, foot distinctly elongated so as to leave a gap between lower margin of petal and upper of lateral sepal; anther: front margin not projecting, abaxially with a rounded crest; pollinia 4, inner more than 1/2 as long as outer, all without appendages.

Ten accepted species: Himalayas to the Philippines, Sulawesi, and New Guinea; one species in China.

See the revision by Vermeulen (Gard. Bull. Singapore 54: 26. 2002).

**42. *Bulbophyllum gymnopus*** J. D. Hooker, Fl. Brit. India 5: 764. 1890.

线瓣石豆兰 *xian ban shi dou lan*

*Drymoda gymnopus* (J. D. Hooker) Garay, Hamer & Siegerist; *Phyllorkis gymnopus* (J. D. Hooker) O. Kuntze.

Rhizome 2.5–4.5 mm in diam., sections between pseudobulbs 3–22 cm; bracts densely spotted with purplish brown when young, soon withering, including veins. Pseudobulbs distant, ovoid, 1.2–4 × 0.8–1.5 cm. Petiole 1–3.5 cm; leaf blade elliptic, 4.8–17 × 1–3.2 cm, obtuse. Inflorescence a lax raceme, erect to spreading, 7–23 cm, 7–28-flowered; peduncle 1.8–7 cm; bracts 4–6, longest 5–17 mm; rachis 5–17 cm; floral bracts ovate

to triangular, 1.8–3.5 × 1–1.8 mm, acute. Flowers resupinate; white, pale greenish white, or yellowish, lip yellow or orange, column white to orange. Pedicel and ovary 8–10 mm. Dorsal sepal ovate to triangular, 4.5–7 × 1.4–2.2 mm, thin, surface glabrous or slightly papillose toward tip abaxially, base narrowly attached, margins entire, apex emarginate, rounded to acute; lateral sepals falcate, 5–8 × 1.4–2.5 mm, obtuse, otherwise as dorsal sepal. Petals recurved, falcate, linear with a wide base, 3–5.5 × 0.4–0.7 mm, thin, base broadly attached, margins erose toward tip, apex obtuse to acuminate; lip recurved slightly below middle, ligulate, 2–4 × 0.8–1.3 mm, thick, surface glabrous, abaxially with a distinct, deeply emarginate ridge up to ca. 1/3 of length of lip, adaxially concave near base, often with

2 inconspicuous, obtuse ridges ca. halfway up lip, space in between 2 ridges somewhat channeled, margin of lip entire, glabrous or finely papillose locally, apex obtuse. Column 2–3 mm, foot elongated so that a gap exists between petals and lateral se-

pals; stelidia triangular, 0.4–1 mm, acute. Fl. Jan–Mar, Oct–Dec.

Epiphytic or lithophytic in montane and evergreen forests; 600–2000 m. S Yunnan [Bhutan, India, Thailand].

**12. *Bulbophyllum* sect. *Umbellata*** Benth & J. D. Hooker, Gen. Pl. 3: 503. 1883 [*“Umbellatae”*].

伞形组 san xing zu

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, arising near pseudobulbs, a ± subumbellate raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Sepals: margins glabrous, 3–7-veined; lateral sepals usually longer than dorsal sepal, twisted inward near base, upper margins approaching or meeting and connate (free and not twisted in *Bulbophyllum violaceolabellum*). Petals: margins glabrous, 1–5-veined; lip: margins without auricles or lateral lobes, margins otherwise ± glabrous (ciliolate in *B. unciniferum*), adaxially ± glabrous. Column: stigma not protruding at its base, foot distinct; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 4, inner 1/2 as long as outer or longer, all without appendages.

Thirty-eight provisionally accepted species: India to New Guinea; 19 species (five endemic) in China.

- 1a. Dorsal sepal slightly shorter than lateral sepals ..... 43. *B. violaceolabellum*  
 1b. Dorsal sepal 1.5–6 × shorter than lateral sepals.  
 2a. Lateral sepals 2.5–6 cm.  
 3a. Leaf 2.5–6.5 × 1–1.5 cm; flowers white ..... 44. *B. caudatum*  
 3b. Leaf 8–25 × 2.2–6 cm; flowers purple, deep yellow, or yellowish white striped with reddish brown or tinged with purplish red.  
 4a. Stelidia distally widened, tip obtuse, erose or bidenticulate.  
 5a. Petals truncate to emarginate and mucronate; lateral sepals ca. 60 mm ..... 45. *B. delitescens*  
 5b. Petals rounded and mucronate; lateral sepals 25–37 mm ..... 46. *B. macraei*  
 4b. Stelidia distally tapering, acute.  
 6a. Median sepal shortly mucronate; petals truncate and mucronate, 5–7-veined ..... 47. *B. funingense*  
 6b. Median sepal caudate with a thread ca. 3 mm; petals tapering, caudate, 3-veined ..... 48. *B. tianguii*  
 2b. Lateral sepals less than 2.5 cm.  
 7a. Scape nearly as long as or sometimes slightly longer than pseudobulb.  
 8a. Rhizomes suberect or ascending; lateral sepals forming a conic tube ..... 49. *B. unciniferum*  
 8b. Rhizomes creeping; lateral sepals forming a slipper-shaped synsepal ..... 50. *B. spathulatum*  
 7b. Scape 3–7 × as long as pseudobulb.  
 9a. Lip densely hirsute on margin and abaxial surface ..... 62. *B. gongshanense* (*B.* “Section 13”)  
 9b. Lip margin and abaxial surface glabrous.  
 10a. Lip narrowed, drawn-out and somewhat thinly cylindrical in apical half.  
 11a. Lip hooked-revolute at apex; anther cap entire apically ..... 51. *B. japonicum*  
 11b. Lip not hooked-revolute at apex; anther cap with comblike teeth apically ..... 52. *B. fordii*  
 10b. Lip not thinly cylindrical in apical half.  
 12a. Lateral sepals free.  
 13a. Petals acute ..... 53. *B. elatum*  
 13b. Petals rounded to obtuse.  
 14a. Column without wings along lower margins ..... 54. *B. rolfei*  
 14b. Column with deltoid to triangular, rounded to acute wings along lower margins, near base.  
 15a. Column with acute wings along lower margins ..... 55. *B. guttulatum*  
 15b. Column with rounded wings along lower margins ..... 56. *B. umbellatum*  
 12b. Lateral sepals adhering or connate along their upper and/or lower edges.  
 16a. Pseudobulbs globose; leaves elliptic-oblong, ca. 1 cm ..... 57. *B. sphaericum*  
 16b. Pseudobulbs ovoid-conic to narrowly ovoid; leaves oblong or ovate-lanceolate, 1.6–8 cm.  
 17a. Lateral sepals papillose abaxially.  
 18a. Lateral sepals ca. 7 mm; scape ca. 2 cm ..... 58. *B. bomiense*  
 18b. Lateral sepals 14–27 mm; scape 3–7 cm ..... 59. *B. farreri*  
 17b. Lateral sepals glabrous.  
 19a. Lateral sepals 11–21 mm; flowers yellow, ± with purple-red veins or becoming reddish ..... 60. *B. retusiusculum*

- 19b. Lateral sepals 5–10 mm; flowers deep or dark red, usually  
± with deep-colored spots or veins ..... 61. *B. tigrinum*

**43. *Bulbophyllum violaceolabellum*** Seidenfaden, Nordic J. Bot. 1: 210. 1981.

等萼卷瓣兰 deng e juan ban lan

Rhizome stout, creeping, 4–6 mm in diam., rooting. Pseudobulbs 4–9 cm apart on rhizome, ovoid, 1.5–3.4 cm, 1–1.3 cm in diam., with a terminal leaf. Petiole conduplicate, 1.5–2 cm; leaf blade oblong to obovate-oblong, 10–20 × 2.2–4.3 cm, slightly fleshy or leathery, apex obtuse. Scape from base of pseudobulb, erect, 19–26 cm; raceme shortened, umbel-like, often 3–5-flowered; peduncle 2–3 mm in diam., with 3 or 4 tubular sheaths 8–13 mm; floral bracts lanceolate, ca. 5 mm, apex acuminate. Pedicel and ovary ca. 2.2 mm. Flowers widely opening, with yellow and purplish spotted sepals and petals and purple lip. Dorsal sepal broadly ovate, 6–8 × ca. 6.2 mm, margin slightly undulate, apex obtuse; lateral sepals ovate-triangular, 8–9 × ca. 8 mm, base adnate to column foot, apex mucronate. Petals ovate-lanceolate, 4–5 × ca. 3 mm, entire, aristate; lip strongly recurved, ligulate, ca. 5 × 3 mm, fleshy, base attached to end of column foot by a mobile joint, apex truncate. Column yellow, ca. 2 mm, base ca. 3 mm in diam., with wings decurrent to foot; foot purple, ca. 5.5 mm, with free part ca. 2.5 mm; stielidia subulate, ca. 2.5 mm. Fl. Apr.

Trees or rocks in open forests in limestone areas; ca. 700 m. S Yunnan [Laos].

**44. *Bulbophyllum caudatum*** Lindley, Gen. Sp. Orchid. Pl. 56. 1830.

尾萼卷瓣兰 wei e juan ban lan

*Cirrhopetalum caudatum* (Lindley) King & Pantling.

Rhizome slender, 1–2 mm in diam., branched, rooting from their nodes. Pseudobulbs 2–8 cm apart from each other, ovoid, 1–2.5 cm, 6–10 mm in diam., with a terminal leaf. Petiole short, 2–3 mm; leaf blade ovate-lanceolate or sometimes oblong, 2.5–6.5 × 1–1.5 cm, leathery, apex acute or obtuse. Scape from base of pseudobulb, erect, usually 1–3 cm; umbel flabellate, many flowered; floral bracts lanceolate, nearly as long as pedicel and ovary. Flowers white. Dorsal sepal ovate-oblong, ca. 5 × 2.5 mm, apex acuminate; lateral sepals free, parallel to each other or slightly divergent, lanceolate, 25–35 mm, apex long caudate. Petals obovate-oblong, short, apex obtuse; lip oblong, ca. as long as petals, clawed at base, basal margins erect, distal margins decurved. Column stout, with nearly suborbicular wings; stielidia slender; anther cap papillate. Fl. unknown.  $2n = 38$ .

Tree trunks in evergreen broad-leaved forests; 800–1000 m. SE Xizang [India (Sikkim), Nepal].

**45. *Bulbophyllum delitescens*** Hance, J. Bot. 14: 44. 1876.

直唇卷瓣兰 zhi chun juan ban lan

*Cirrhopetalum delitescens* (Hance) Rolfe.

Rhizome creeping, stout, ca. 4 mm in diam., often branched, rooting. Pseudobulbs 3–11 cm apart on rhizome, ovoid or subcylindric, 1.7–3.5 cm, 5–10 mm in diam., with a

terminal leaf. Petiole 2–3 cm; leaf blade oblong, elliptic, or obovate-oblong, 16–25 × 3.5–6 cm, leathery, apex obtuse or shortly acute. Scape from base of pseudobulb, erect, 10–22 cm; umbel often 2–4-flowered; peduncle ca. 1.5 mm in diam., sparsely with 3 tubular sheaths ca. 1 cm; floral bracts lanceolate, 4–6 mm, apex aristate. Pedicel and ovary ca. 1 mm. Flowers purple. Dorsal sepal ovate, cymbiform, ca. 10 × 3 mm, apex truncate and emarginate, in sinus with an awn ca. 7 mm; lateral sepals narrowly lanceolate, ca. 60 × 2 mm, base adnate to column foot, twisted near base and connate along their upper and lower edges forming a tube, apex long acuminate. Petals falcate-lanceolate, 5–7 × 1.5–2 mm, apex truncate to emarginate, in sinus with 1 short thread centrally; lip recurved, ligulate, ca. 5 mm, fleshy, base grooved, attached to end of column foot, immobile, apex obtuse. Column ca. 3 mm, with wings dilated at its base; foot ca. 5 mm, with free part ca. 3 mm; stielidia ca. 3 mm, apex sharply bidentate. Fl. Apr–Nov.

Rocks along streamsides or valleys, tree trunks in forests; 1000–2000 m. S Fujian, E and S Guangdong, Hainan, SE Xizang, NE, S, and W Yunnan [NE India, Vietnam].

**46. *Bulbophyllum macraei*** (Lindley) H. G. Reichenbach, Ann. Bot. Syst. 6: 263. 1861.

乌来卷瓣兰 wu lai juan ban lan

*Cirrhopetalum macraei* Lindley, Gen. Sp. Orchid. Pl. 59. 1830; *Bulbophyllum macraei* var. *autumnale* (Fukuyama) S. S. Ying; *B. uraiense* Hayata; *C. autumnale* Fukuyama.

Rhizome creeping, ca. 2 mm in diam. Pseudobulbs close or 1–2 cm apart from each other, ovoid, 1–2.8 cm, 1–1.8 cm in diam., with a terminal leaf. Petiole 1–1.5 cm; leaf blade subelliptic, 8–18 × 2.5–6 cm, thickly leathery, base contracted into petiole, apex obtuse. Scape yellowish green, 10–20 cm, slender; umbel 3–5-flowered; peduncle ca. 1 mm in diam., with 2 or 3 sheaths; floral bracts lanceolate, ca. 5 mm, apex acute. Pedicel and ovary yellowish green or purplish red, ca. 9 mm. Flowers yellowish white, sometimes ± tinged with purplish red on sepals and petals. Dorsal sepal ovate-lanceolate, 15–18 × 3–5 mm, apex acuminate; lateral sepals narrowly lanceolate, 2.5–3.7 cm, twisted near base, their lower edges connate to each other, apex acuminate. Petals falcate, 5–6.5 × 2–2.7 mm, apex rounded and with apical thread; lip recurved, ligulate, 4–6.5 mm, attached to end of column foot, immobile. Column yellowish green, 2–3 mm; foot ca. 4 mm; stielidia ± twisted and thinly clavate, ca. 2 mm; anther cap subglobose, with comblike teeth at apex. Fl. Jul–Oct.  $2n = 38$ .

Tree trunks in forests; 500–1000 m. Taiwan [India, Japan (Ryukyu Islands), Sri Lanka, N Vietnam].

**47. *Bulbophyllum funingense*** Z. H. Tsi & S. C. Chen, Bull. Bot. Res., Harbin 1(1–2): 112. 1981.

富宁卷瓣兰 fu ning juan ban lan

Rhizome creeping, ca. 5 mm in diam., rooting from base of pseudobulbs. Pseudobulbs ca. 6 cm apart from each other,

ovoid, 2–3 cm, ca. 1.3 cm in diam., ribbed, with a terminal leaf. Petiole conduplicate, 1–2 cm; leaf blade narrowly oblong, 11–16 × 2.2–2.5 cm, thickly leathery, apex obtuse and slightly emarginate. Scape from base of pseudobulb, erect, 8–11 cm; umbel 2-flowered; peduncle ca. 2 mm in diam., with 2 tubular sheaths 1.5–2 cm; floral bracts narrowly ovate, 1–1.5 cm. Pedicel and ovary ca. 3 cm. Flowers large, deep yellow with reddish brown veins. Dorsal sepal ovate, ca. 18 × 8 mm, apex shortly mucronate; lateral sepals oblong, ca. 43 × 8 mm, slightly connate to each other on their basal edges and adnate to column foot, twisted near base. Petals subovate-triangular, ca. 10 × 6 mm, entire, truncate and mucronate, 5–8-veined; lip ovate-lanceolate and abruptly contracted above middle, ca. 1.3 cm, attached to end of column foot by a mobile joint, basal margin incurved and ciliate, adaxially with 1 keel centrally, surface densely finely papillate, apex subacute. Column ca. 3 mm, with triangular, rounded wings near base; stelidia triangular, ca. 2 mm, acute; anther cap subglobose, densely finely papillate. Fl. Apr.

Rocks along valleys; ca. 1000 m. SE Yunnan [N Vietnam].

**48. *Bulbophyllum tianguii*** K. Y. Lang & D. Luo, J. Wuhan Bot. Res. 25: 558. 2007.

天贵卷瓣兰 tian gui juan ban lan

Rhizome creeping, ca. 3 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 1–2.5 cm apart from each other, ovoid-conic or narrowly ovoid, 1.5–2.5 cm, 0.7–1.2 cm in diam., ribbed, with a terminal leaf. Petiole conduplicate, 5–10 mm; leaf blade elliptic-oblong, (4–)7–15 × (1–)1.5–2 cm, leathery, apex obtuse and slightly emarginate. Scape from base of pseudobulb, erect, yellowish with reddish purple dots, ca. 6 cm, ca. 1 mm in diam.; umbel 2- or 3-flowered; peduncle ca. 2 mm in diam., below middle with 2 or 3 tubular sheaths; floral bracts narrowly oblong, boat-shaped, ca. 1.1 cm. Pedicel and ovary tenuous, ca. 2.5 cm, densely covered with reddish purple fine dots. Flowers yellowish with purplish brown veins. Dorsal sepal broadly ovate, concave, 13–14 × 8–9 mm, apex acuminate with a thread ca. 3 mm, 7-veined, margin entire; lateral sepals narrowly lanceolate, ca. 30 × 4–4.5 mm, margin entire, connate to each other along their upper edges except near base, adnate to column foot, twisted near base. Petals elliptic-ovate, 6.5–7 × ca. 3.5 mm, tapering and acuminate with a thread ca. 1.5 mm, 3-veined; lip greenish brown, ovate-lanceolate, ca. 6.5 mm, ca. 3.5 mm wide at base, attached to end of column foot by a mobile joint, margins ciliate, above middle abruptly narrowed and curved downward, adaxially with 2 fleshy, ciliate keels, apex subacute. Column ca. 2.5 mm, with obtusely triangular, rounded wings near base, foot ca. 5 mm; stelidia subtriangular, together with thin apex ca. 2 mm, ca. 1 mm wide at base; anther cap subglobose, fimbriate in front, adaxially small papillate. Fl. Mar.

• Rocks in forests; 900–1000 m. NW Guangxi (Leye).

**49. *Bulbophyllum unciniferum*** Seidenfaden, Bot. Tidsskr. 68: 58. 1973.

直立卷瓣兰 zhi li juan ban lan

Rhizome usually ± ascending, ca. 3 mm in diam. Pseudo-

bulbs 2–4 cm apart on rhizome, cylindrical or oblong, 2–3.5 cm, usually 6–9 mm in diam., with a terminal leaf. Leaf blade narrowly oblong, 7–8 × 1–1.9 cm, apex obtuse. Scape from base of pseudobulb, 3–3.5 cm; raceme shortened, umbel-like, 2–4-flowered; peduncle ca. 1.5 mm in diam., with several tubular sheaths at base; floral bracts lanceolate, ca. 7 mm, apex acuminate. Pedicel and ovary white, ca. 1.5 cm. Dorsal sepal pale yellow, with purplish spots; lateral sepals vermilion; lip purplish red. Dorsal sepal subelliptic, concave, ca. 10 × 6 mm, apex obtuse or slightly emarginate; lateral sepals lanceolate, 1.6–2 cm, their upper and lower edges connate forming a narrow conic tube, outer surface densely papillate. Petals broadly ovate, ca. 4 × 2.5 mm, near apex fleshy thickened and with densely papillate hairs, apex slightly recurved; lip recurved, base attached to end of column foot by a slender band, mobile, ciliate below middle, apex slightly emarginate. Column stout, with triangular wings; foot with free part ca. 1 mm; stelidia deltoid, ca. 1 mm, apex aristate and slightly hooked; anther cap subglobose. Fl. Mar.

Tree trunks in forests; 1100–1500 m. S Yunnan [N Thailand].

**50. *Bulbophyllum spathulatum*** (Rolfé ex E. W. Cooper) Seidenfaden, Bot. Tidsskr. 65: 347. 1970.

匙萼卷瓣兰 chi e juan ban lan

*Cirrhopetalum spathulatum* Rolfé ex E. W. Cooper, Orchid Rev. 37: 106. 1929.

Rhizome creeping, stout, ca. 4 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 10–11 cm apart from each other, narrowly ovoid, 3–4 cm, ca. 1 cm in diam., with a terminal leaf. Petiole ca. 1 cm, ± conduplicate; leaf blade oblong, 10–18 × 2–2.4 cm, fleshy, apex obtuse. Scape from base of pseudobulb, 3–4 cm; umbel more than 20-flowered; peduncle with 4 or 5 sheaths ca. 1 cm; floral bracts oblong-ovate, ca. 1 cm, apex subacute. Pedicel and ovary 1.5–2 cm. Flowers purplish red. Dorsal sepal subobovate, ca. 8 × 4 mm, apex subtruncate and slightly mucronate; lateral sepals ca. 18 mm, twisted near base, their upper and lower edges connate to varying degrees forming a slipper-shaped synsepal; synsepal ca. 11 mm wide, outer surface finely papillate, apex rounded. Petals narrowly oblong-lanceolate, ca. 5 × 1.3 mm, entire, obtuse; lip recurved at a right angle, lanceolate, glabrous, ± conduplicate in basal half, apex obtuse. Column ca. 2 mm; foot ca. 3 mm, with free part ca. 1 mm; stelidia deltoid, ca. 1 mm; anther cap ± subspherical. Fl. Oct.

Tree trunks in broad-leaved forests; 800–900 m. S Yunnan [India (Sikkim), Laos, Myanmar, Thailand, Vietnam].

**51. *Bulbophyllum japonicum*** (Makino) Makino, Bot. Mag. (Tokyo) 24: 31. 1910.

瘤唇卷瓣兰 liu chun juan ban lan

*Cirrhopetalum japonicum* Makino, Ill. Fl. Japan 1(7): t. 42. 1891; *Bulbophyllum inabae* Hayata; *C. inabae* (Hayata) Hayata.

Rhizome ca. 1.2 mm in diam., slender. Pseudobulbs 7–18 mm apart from each other, ovoid, 5–10 mm, 3–5 mm in diam., with a terminal leaf. Leaf sessile; blade oblong or obliquely oblong, usually 3–4.5 × 0.5–0.8 cm, leathery, apical margins

finely papillate, apex acute. Scape from base of pseudobulb, 2–3 cm; umbel often 2–4-flowered; peduncle ca. 0.8 mm in diam., with 3 tubular sheaths; floral bracts lanceolate, ca. 2 mm. Pedicel and ovary ca. 4 mm. Flowers purplish red. Dorsal sepal ovate-elliptic, ca.  $3 \times 1.5$  mm, apex acute; lateral sepals lanceolate,  $5\text{--}6 \times$  ca. 2 mm, twisted near base, their upper and lower edges connivent to each other, apical margins incurved, apex acuminate. Petals subspatulate, ca.  $2 \times 1.5$  mm, entire, obtuse-rounded; lip recurved, ligulate, ca. 2 mm, fleshy, narrowed and thinly cylindrical in distal half, apex dilated and hooked-revolute. Column ca. 1.5 mm; foot ca. 1 mm, with free part ca. 0.5 mm; stielidia subulate, ca. 0.7 mm; anther cap subglobose. Fl. Jun. *2n* = 40.

Tree trunks in broad-leaved forests, humid rocks along valleys; 600–1500 m. N Fujian, Guangdong, E and NE Guangxi, SW Hunan, Taiwan [Japan].

**52. *Bulbophyllum fordii*** (Rolfe) J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 8: 24. 1912.

狭唇卷瓣兰 xia chun juan ban lan

*Cirrhopetalum fordii* Rolfe, Bull. Misc. Inform. Kew 1896: 193. 1896.

Rhizome stout. Pseudobulbs 2–9 cm apart from each other, narrowly ovoid, 2–3.5 cm, with a terminal leaf. Petiole ca. 2 cm; leaf blade narrowly oblong, ca.  $8 \times 3$  cm, leathery, base contracted into petiole, apex obtuse and slightly emarginate. Scape from base of pseudobulb, erect, 5–10 cm; umbel many flowered; peduncle ca. 1.2 mm in diam., sparsely with 3 tubular sheaths; floral bracts lanceolate, 3–5 mm, apex acute. Pedicel and ovary 4–7 mm. Flowers pale yellow, tinged with purple. Dorsal sepal ovate-oblong, cymbiform, ca.  $7 \times 4$  mm, apex obtuse; lateral sepals narrowly oblong, ca. 1 cm, base adnate to column foot, twisted near base, with their upper edges connate in apical half. Petals narrowly oblong, ca.  $3.5 \times 1.5$  mm, entire, acute; lip slightly recurved, narrowly lanceolate-cylindrical, ca. 4 mm, fleshy, grooved at adaxial base, margin decurved, entire, apex subacute. Column ca. 2 mm, with suborbicular, enlarged wings at middle; foot ca. 3.5 mm, with free part upcurved; stielidia subulate, ca. 1 mm; anther cap with comblike teeth at apex. Fl. Aug.

• N Guangdong, SW Yunnan.

**53. *Bulbophyllum elatum*** (J. D. Hooker) J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 8: 23. 1912.

高茎卷瓣兰 gao jing juan ban lan

*Cirrhopetalum elatum* J. D. Hooker, Fl. Brit. India 5: 775. 1890.

Pseudobulbs contiguous, cylindrical, ca. 4 cm, ca. 6 mm in diam., with a terminal leaf. Petiole ca. 2 cm; leaf blade oblong, ca.  $16 \times 2.2$  cm, leathery, apex obtuse and slightly emarginate. Scape from base of pseudobulb, erect, 15–18 cm; umbel many flowered; peduncle ca. 2 mm in diam., with 3 or 4 sheaths; floral bracts lanceolate, shorter than pedicel and ovary. Flowers dark yellow. Dorsal sepal ovate, ca.  $13 \times 7$  mm, apex acute; lateral sepals narrowly lanceolate, ca.  $3 \times$  as long as dorsal sepal, abaxially finely papillate, base twisted, their upper edges con-

nate to each other, apex acuminate. Petals obliquely ovate-triangular, ca. 4 mm, entire, acute; lip recurved, ovate-lanceolate, fleshy, grooved at base, apex acute. Column stout, with deltoid, rounded wings along lower margins; foot with free part ca. 5 mm; stielidia slender, slightly hooked. Fl. unknown.

Tree trunks in evergreen broad-leaved forests, rocks along valleys; 2200–2500 m. S Xizang, NW Yunnan [Bhutan, India, Nepal, Vietnam].

**54. *Bulbophyllum rolfei*** (Kuntze) Seidenfaden, Dansk Bot. Ark. 33(3): 149. 1979.

若氏卷瓣兰 ruo shi juan ban lan

*Phyllorkis rolfei* Kuntze, Revis. Gen. Pl. 2: 676. 1891, based on *Cirrhopetalum parvulum* J. D. Hooker, Fl. Brit. India 5: 778. 1890; *Bulbophyllum dyerianum* (King & Pantling) Seidenfaden; *B. parvulum* (J. D. Hooker) J. J. Smith (1912), not Lindley (1830); *C. dyerianum* King & Pantling.

Rhizome creeping, 0.8–1 mm in diam. Pseudobulbs 0.1–2.4 cm apart from each other, ovoid, 0.7–1.5 cm, 3–9 mm in diam., ribbed, with a terminal leaf. Petiole 1–2 cm; leaf blade elliptic-oblong,  $2\text{--}3.5 \times 0.8\text{--}1.2$  cm, leathery, base contracted into petiole 3–5 mm, apex (sub-)acute. Scape from base of pseudobulb, erect, 4–5.5 cm, slender; umbel 2–4-flowered; peduncle ca. 1 mm in diam., with a few tubular sheaths; floral bracts narrowly lanceolate, 6–8 mm, apex acuminate. Pedicel and ovary 4–7 mm. Flowers yellow to red-purple, spotted deep purple; lip deep red-purple. Dorsal sepal elliptic-ovate, concave,  $5\text{--}6 \times 1.5\text{--}2$  mm, apex acute; lateral sepals free, obliquely ovate-triangular,  $10\text{--}16 \times 2\text{--}3$  mm,  $\pm$  narrowed and somewhat twisted near base so that upper edges face one another, apex acute. Petals elliptic-ovate, ca.  $4 \times 1.2$  mm, obtuse, margin entire; lip recurved, ovate in outline,  $3\text{--}4 \times 0.5\text{--}0.8$  mm, adaxially finely papillose toward top, base dilated and attached to end of column foot, apex rounded. Column 1–1.5 mm, without wings along lower margins; foot ca. 2.5 mm, with free part ca. 2 mm, upcurved; stielidia filiform, ca. 1 mm; anther cap subglobose. Fl. Aug.

2400–2500 m. W Yunnan (Fugong) [Bhutan, India, Nepal].

This species was first recorded from China by X. H. Jin, H. Li, and D. Z. Li (Acta Phytotax. Sin. 45: 803. 2007), whose description deviates from *Bulbophyllum rolfei* in having lateral sepals fused along the upper margins and petals arose. Their record could refer to a different species.

**55. *Bulbophyllum guttatum*** (J. D. Hooker) N. P. Balakrishnan, J. Bombay Nat. Hist. Soc. 67(1): 66. 1970.

钻齿卷瓣兰 zuan chi juan ban lan

*Cirrhopetalum guttatum* J. D. Hooker, Fl. Brit. India 5: 776. 1890.

Rhizome creeping, ca. 3 mm in diam. Pseudobulbs ca. 1 cm apart from each other, ovoid-conic or narrowly ovoid, 2–2.5 cm, 7–10 mm in diam., ribbed, with a terminal leaf. Petiole 1–2 cm; leaf blade elliptic-oblong,  $7\text{--}14 \times$  ca. 3 cm, leathery, base contracted into petiole, apex obtuse-rounded. Scape from base of pseudobulb, erect, 10–15 cm, slender; umbel often 2- or 3-flowered; peduncle ca. 1 mm in diam., sparsely with 2 or 3 tubular sheaths; floral bracts ovate-lanceolate, ca. 5 mm, apex acuminate. Pedicel and ovary ca. 2.5 mm. Flowers yellow,

spotted with red. Dorsal sepal broadly ovate, concave, 8–10 × 6–7 mm, apex subtruncate and mucronulate; lateral sepals obliquely ovate-lanceolate, 10–11 × ca. 6 mm, ± narrowed and twisted near base, their lower margin connate to each other toward base, apex obtuse. Petals broadly ovate-triangular, ca. 4.5 × 4 mm, base ca. 1/3 width adnate to column foot, margin entire, apex mucronate; lip recurved, subovate in outline, ca. 5 × 3.4 mm, adaxially with 3 longitudinal keels, base dilated and attached to end of column foot, immobile, apex emarginate. Column ca. 3 mm, with triangular, acute wings along lower margins; foot ca. 5 mm, with free part ca. 2 mm, upcurved; stelia filiform, ca. 2.8 mm; anther cap subglobose, glabrous. Fl. Aug.

Tree trunks in broad-leaved forests; 800–1800 m. SE Xizang [Bhutan, NE India, Nepal, Vietnam].

**56. *Bulbophyllum umbellatum*** Lindley, Gen. Sp. Orchid. Pl. 56. 1830.

伞花卷瓣兰 san hua juan ban lan

*Bulbophyllum saruwatarii* Hayata; *B. tibeticum* Rolfe; *Cirrhopetalum saruwatarii* (Hayata) Hayata; *Phyllorkis umbellata* (Lindley) Kuntze.

Rhizome creeping and rooting, 3–4 mm in diam. Pseudobulbs often 1–2 cm apart on rhizome, ovoid or ovoid-conic, 1.3–3.5 cm, 1–2 cm in diam., with a terminal leaf. Petiole 1–2 cm; leaf blade oblong, 8–19 × 1.3–2.8 cm, leathery, apex obtuse and emarginate. Scape from base of pseudobulb, erect, 8–12 cm; umbel often 2–4-flowered; peduncle 1.5–2 mm in diam., with 2 tubular sheaths ca. 1 cm; floral bracts lanceolate, ca. 9 mm, concave. Pedicel and ovary ca. 2 cm. Flowers dark greenish yellow or dark brown with purplish apex except whitish lip. Dorsal sepal ovate, concave, ca. 9 × 5 mm, apex acute; lateral sepals falcate-lanceolate, ca. 15 × 5 mm, base adnate to column foot, twisted near base, their lower edges of basal part connate, apex obtuse. Petals ovate, ca. 7 × 5 mm, entire, obtuse-rounded; lip recurved, ligulate, ca. 5 mm, fleshy, base subcordate, apex obtuse. Column ca. 2 mm, stout, with deltoid, rounded wings along lower margins; foot ca. 5 mm, with free part ca. 1.5 mm; stelia deltoid, ca. 1 mm; anther cap subglobose. Fl. Apr–Jun.  $2n = 38$ .

Tree trunks in forests; 1000–2200 m. SW Guizhou, SW Sichuan, Taiwan, SE Xizang, S and W Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

**57. *Bulbophyllum sphaericum*** Z. H. Tsi & H. Li, Bull. Bot. Res., Harbin 1(1–2): 117. 1981.

球茎卷瓣兰 qiu jing juan ban lan

*Rhytionanthos sphaericus* (Z. H. Tsi & H. Li) Garay, Hamer & Siegerist.

Rhizome creeping, ca. 1.5 mm in diam., branched, rooting from base of pseudobulbs. Pseudobulbs ca. 1 cm apart from each other, globose, 7–8 mm in diam., with 1 leaf at apex. Leaf sessile; blade abaxially purplish red, adaxially pale green, elliptic-oblong, ca. 10 × 6–8 mm, thickly leathery, margin slightly recurved, apex retuse. Scape from base of pseudobulb, erect, much longer than leaf; umbel 4- or 5-flowered; floral bracts ca.

1.5 mm. Pedicel and ovary ca. 3 mm. Flowers purplish red. Dorsal sepal ovate-lanceolate, ca. 5 × 2 mm, abaxially papillate below middle, apex emarginate; lateral sepals narrowly lanceolate, ca. 2.5 × 3 mm, abaxially densely papillate in basal half, base twisted, their upper and lower edges connate to each other, margins incurved, apex cuspidate. Petals elliptic, ca. 3 × 2 mm, entire, obtuse-rounded; lip recurved, lanceolate, ca. 3.5 mm, fleshy, base grooved, attached to end of column foot by a mobile joint. Column ca. 2 mm; stelia subsquare, ca. 0.5 mm; foot upcurved, with free part ca. 1 mm. Fl. Sep–Dec.

• Tree trunks in evergreen broad-leaved forests. Sichuan, SW Yunnan.

**58. *Bulbophyllum bomiense*** Z. H. Tsi, Acta Phytotax. Sin. 16(4): 128. 1978 [*“bomiensis”*].

波密卷瓣兰 bo mi juan ban lan

Rhizome creeping, ca. 1 mm in diam., sheathing when young. Pseudobulbs 1–2 cm apart from each other, ovoid-conic, 7–10 mm, ca. 5 mm in diam., with a terminal leaf. Leaf subsessile; blade oblong, 1.7–3.5 × 0.5–0.7 cm, leathery, margin slightly undulate, apex obtuse and slightly emarginate. Scape from base of pseudobulb, erect, ca. 2 cm, slender; umbel 2–4-flowered; peduncle with 3 tubular sheaths ca. 7 mm; floral bracts ovate-lanceolate, ca. 3 mm. Pedicel and ovary ca. 4 mm. Flowers deep red or purplish, spotted with deep purple on petals, thickly textured. Dorsal sepal oblong, concave, ca. 7 × 2.5 mm, distal margins densely finely papillate, abaxially sparsely papillate; lateral sepals nearly falcate-lanceolate, ca. 7 mm, abaxially densely papillate especially in apical half, base adnate to column foot, apical margins incurved, twisted near base, their upper and lower edges connate to each other, apex obtuse. Petals subelliptic, ca. 4 × 2.5 mm, margins densely finely papillate, apex rounded; lip slightly recurved, subligulate, ca. 3 mm, fleshy, base grooved, attached to end of column foot by a mobile joint, laterally with 2 longitudinal lamellae close to both margins. Column ca. 1.2 mm, winged; foot ca. 1.5 mm, with free part ca. 0.8 mm; stelia sharply dentate, ca. 0.5 mm; anther cap densely finely papillate, apex with 1 small globose projection. Fl. Jul.

• Rocks in evergreen broad-leaved forests; 2000–2100 m. SE Xizang, NW Yunnan.

**59. *Bulbophyllum farreri*** (W. W. Smith) Seidenfaden, Dansk Bot. Ark. 29(1): 212. 1974.

麻栗坡卷瓣兰 ma li po juan ban lan

*Cirrhopetalum farreri* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 196. 1921; *Bulbophyllum malipoense* Z. J. Liu, S. C. Chen & S. P. Lei.

Rhizome creeping, rooting below pseudobulbs. Pseudobulbs clustered, ovoid-globose, 9–12 mm, 6–8 mm in diam., with 1 leaf at apex. Leaf subsessile; blade 20–70 × 6–22 mm, thickly leathery, apex obtuse and emarginate. Scapes at base of pseudobulbs, spreading, ca. as long as leaves; umbel 5–9-flowered; floral bracts lanceolate, 5–6 mm. Pedicel and ovary 5.5–6.5 mm. Dorsal sepal and petals yellowish with 3 dark purple veins, lateral sepals yellowish with purplish spots and veins. Dorsal sepal ovate, 3.8–5 × 1.6–3 mm, margin entire, apex ob-

tuse; lateral sepals twisted so that upper margins meet, fused along upper margins, lanceolate, 14–27 mm, abaxially densely papillose-hirsute, apex acute-acuminate. Petals obliquely elliptic, 2.5–4.5 × 1.5–2.2 mm, margins entire, apex obtuse; lip recurved, ovate-lanceolate, 1.8–2.8 × 1–1.5 mm, fleshy, adaxially channeled near base, apex obtuse. Column ca. 1 mm, foot ca. 2 mm. Fl. Apr–May.

Rocks and trees in broad-leaved forests; ca. 1000 m. Yunnan [Myanmar, Vietnam].

The type of *Bulbophyllum malipoense* is smaller in all parts than that of *B. farreri*, but otherwise the two are not different.

**60. *Bulbophyllum retusiusculum*** H. G. Reichenbach, Gard. Chron. 1869: 1182. 1869.

蕨叶卷瓣兰 xian ye juan ban lan

*Bulbophyllum flavisepalum* Hayata; *B. oreogenes* (W. W. Smith) Seidenfaden; *B. retusiusculum* var. *oreogenes* (W. W. Smith) Z. H. Tsi; *Cirrhopetalum flavisepalum* (Hayata) Hayata; *C. oreogenes* W. W. Smith; *C. retusiusculum* (H. G. Reichenbach) Hemsley; *Phyllorkis retusiuscula* (H. G. Reichenbach) Kuntze.

Rhizome creeping, ca. 2 mm in diam., rooting from base of pseudobulbs. Pseudobulbs often 1–3 cm apart from each other, rarely close, ovoid-conic or narrowly ovoid, 5–25 mm, 4–13 mm in diam., with a terminal leaf. Petiole short; leaf blade oblong or ovate-lanceolate, 1.6–8 × 0.4–1.8 cm, leathery, base contracted into petiole, apex obtuse and slightly emarginate. Scape from base of pseudobulb, suberect, to 14 cm, slender; umbel many flowered; peduncle ca. 1 mm in diam., sparsely with 3 tubular sheaths; floral bracts narrowly lanceolate, cymbiform, 3–6 mm, apex acuminate. Pedicel and ovary 5–10 mm, slender. Flowers yellow with reddish veins or becoming reddish. Dorsal sepal oblong-ovate or suboblong, 3–3.5 × 1.5–2 mm, abaxially sometimes sparsely papillate in basal half, mar-

gin entire or scabrid, apex subtruncate and emarginate; lateral sepals narrowly lanceolate or linear, 11–21 × 1.5–3 mm, abaxially sometimes sparsely papillate, twisted near base, their upper and lower edges connate to each other forming an ellipsoid or horn-shaped synsepal. Petals nearly oblong or ovate, 2.5–3 × ca. 1.8 mm, base ca. 2/5 width adnate to column foot, margins entire or scabrid, apex obtuse-rounded; lip recurved, ligulate, ca. 3 mm, fleshy, base grooved, attached to end of column foot by a mobile joint, apex obtuse. Column 1.5–2 mm, with wings slightly dilated at base; foot ca. 2.5 mm, with free part ca. 1 mm, upcurved; stelidia subtriangular, ca. 0.8 mm; anther cap slightly finely papillate. Fl. Sep–Dec.  $2n = 38$ .

Tree trunks or rocks in forests; 500–2800 m. S Gansu, Guizhou, Hainan, Hubei, S Hunan, Sichuan, Taiwan, S and SE Xizang, W to SE Yunnan [Bhutan, NE India, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**61. *Bulbophyllum tigrinum*** Hance, J. Bot. 21: 232. 1883.

虎斑卷瓣兰 hu ban juan ban lan

*Bulbophyllum retusiusculum* H. G. Reichenbach var. *tigrinum* (Hance) Z. H. Tsi; *Cirrhopetalum tigrinum* (Hance) Rolfe.

Rhizome stout. Pseudobulbs 1–3 cm apart from each other, ovoid, usually 10–20 mm, 6–7 mm in diam., with a terminal leaf. Leaf shortly petiolate; blade oblong, varying in size, usually 22–25 × 4–5 mm, leathery. Scape from base of pseudobulb, erect, filiform, 10–14 cm, much longer than leaf; umbel 5–8-flowered; floral bracts small, 3–5 mm. Pedicel and ovary 3–7 mm, slender. Flowers small, dark red with purple-red veins. Dorsal sepal ovate, 3–3.5 × 1.5–2 mm, apex obtuse; lateral sepals lanceolate or linear, 5–7 × ca. 2 mm, abaxially glabrous, their upper and lower edges connate to each other forming a horn-shaped tube; lip recurved, ligulate, fleshy, attached to end of column foot by a mobile joint. Column 1–1.5 mm; foot ca. 2 mm, with free part ca. 0.8 mm. Fl. Sep.

• S Guangdong.

### 13. *Bulbophyllum* “Section 13”

中华组 zhong hua zu

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescences arising near pseudobulbs, solitary, 1-flowered or a ± subumbellate raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Sepals 3–7-veined; dorsal sepal with margins glabrous to erose or denticulate (with glandular appendages in *Bulbophyllum chondriophorum*, ciliate in *B. bicolor*), lateral sepals twisted inward near base, with upper margins approaching or meeting and connate, with margins glabrous. Petals: margins glabrous, erose to denticulate (with glandular appendages in *B. chondriophorum*), 1–3-veined; lip: margins without auricles or lateral lobes, margins otherwise ± glabrous (ciliate in *B. gongshanense*), adaxially ± glabrous (hirsute in *B. gongshanense*). Column: stigma not protruding at its base, foot distinct; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 4, inner ca. 1/2 as long as outer or longer, all without appendages.

Twenty-six provisionally accepted species: India to Indochina, Java to the Philippines; ten species (five endemic) in China.

- 1a. Lip densely hirsute on margin and abaxial surface ..... 62. *B. gongshanense*  
 1b. Lip glabrous.  
 2a. Either dorsal sepal or petals entire.  
 3a. Margin of dorsal sepal red ciliate; petals entire along margin, 5-veined ..... 63. *B. bicolor*  
 3b. Margin of dorsal sepal glabrous; petals erose to denticulate along margin, 3-veined.  
 4a. Front margin of anther cap ciliate; lateral sepals free ..... 64. *B. omerandrum*  
 4b. Front margin of anther cap entire to denticulate; lateral sepals fused along upper margin.

- 5a. Pseudobulbs distant, 1–10 cm apart; petiole 2–7 cm ..... 65. *B. forrestii*  
 5b. Pseudobulbs contiguous, less than 1 cm apart from each other; petiole less than 1.3 cm ..... 66. *B. taeniophyllum*  
 2b. Both dorsal sepal and petals toothed, ciliate, fimbriate, or with glandular, wartlike appendages on margins.  
 6a. Margins of dorsal sepal and petals with glandular-papillate or clavate-glandular, wartlike appendages ..... 67. *B. chondriophorum*  
 6b. Margins of dorsal sepal and petals erose to denticulate.  
 7a. Scape nearly as long as pseudobulb ..... 68. *B. emarginatum*  
 7b. Scape much longer than pseudobulb.  
 8a. Petals 5-veined, 7–8 mm ..... 69. *B. chinense*  
 8b. Petals 3-veined, ca. 3 mm.  
 9a. Lateral sepals connate along upper and lower margins ..... 70. *B. helenae*  
 9b. Lateral sepals connate along upper margins only ..... 71. *B. andersonii*

**62. *Bulbophyllum gongshanense*** Z. H. Tsi, Bull. Bot. Res., Harbin 1(1–2): 111. 1981.

贡山卷瓣兰 *gong shan juan ban lan*

*Cirrhopetalum gongshanense* (Z. H. Tsi) Garay, Hamer & Siegerist.

Rhizome creeping, ca. 2 mm in diam. Pseudobulbs 5–10 mm apart on rhizome, narrowly ovoid or bottle-shaped, 6–17 mm, ca. 5 mm in diam., with a terminal leaf. Leaf subsessile; blade oblong, 3.7–4.7 × 0.9–1.1 cm, leathery, apex obtuse. Scape from base of pseudobulbs, suberect, 5.5–9.5 cm; umbel often 4- or 5-flowered; peduncle ca. 0.7 mm in diam., sparsely with 3 tubular sheaths ca. 5 mm; floral bracts narrowly lanceolate, 3–4 mm, apex acuminate. Pedicel and ovary ca. 7 mm. Flowers red. Dorsal sepal suboblong, ca. 4.2 × 2 mm, distal margins finely papillate, apex subtruncate and emarginate; lateral sepals oblong, ca. 14 × 3.5 mm, twisted near base, their upper edges connate to each other forming an elliptic synsepal except their apices. Petals subelliptic, ca. 4 × 2 mm, base clawed and ca. 1/3 of its width adnate to column foot, margin entire, apex obtuse-rounded; lip recurved, ligulate, ca. 3 mm, fleshy, ± conduplicate in basal half, base attached to end of column foot by a mobile joint, margins and abaxial surface densely hirsute. Column ca. 1 mm, with wings dilated toward base; foot ca. 3 mm, with free part ca. 2 mm, upcurved; stelidia subulate, ca. 0.8 mm; anther cap subglobose, apex slightly thickened. Fl. Oct.

- Tree trunks in forests; ca. 2000 m. NW Yunnan.

**63. *Bulbophyllum bicolor*** Lindley, Gen. Sp. Orchid. Pl. 49. 1830.

二色卷瓣兰 *er se juan ban lan*

*Cirrhopetalum bicolor* (Lindley) Rolfe; *Phyllorkis bicolor* (Lindley) Kuntze.

Rhizome stout, 3–4 mm in diam. Pseudobulbs 3–4 cm apart from each other, ovoid, 1.5–2 cm, 8–13 mm in diam., with a terminal leaf. Petiole ca. 1.5 cm; leaf blade oblong, 10.4–14 × 1.8–2.3 cm, leathery, base contracted into petiole, apex obtuse and retuse. Scape from base of pseudobulb, ca. 5 cm; umbel 1–3-flowered; peduncle with 1 or 2 sheaths; floral bracts lanceolate, ca. 6 mm. Pedicel and ovary ca. 1.5 cm. Sepals and petals pale yellow, with purple spots at adaxial base and purplish red at apex; lip olive-green or turning to tangerine. Dorsal sepal oblong, ca. 15 × 10 mm, margin red ciliate, apex acuminate; lat-

eral sepals obliquely ovate-lanceolate, ca. 20 × 7.5 mm, twisted near base, with their lower edges connate at basal part to each other, apex obtuse. Petals oblong, ca. 10 × 6 mm, entire, mucronate; lip recurved, ovate, attached to end of column foot by a mobile joint, apex obtuse. Column short, with 2 narrowly dentate stelidia on both upper sides and triangular, enlarged wings at middle. Fl. May.

- Rocks and cliffs along streams; 100–500 m. Hong Kong.

**64. *Bulbophyllum omerandrum*** Hayata, Icon. Pl. Formosan. 4: 50. 1914.

毛药卷瓣兰 *mao yao juan ban lan*

*Cirrhopetalum omerandrum* (Hayata) Hayata.

Rhizome creeping, ca. 2 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 1.5–4 cm apart on rhizome, ovoid-globose, 1–2 cm, 5–8 mm in diam., with a terminal leaf. Leaf subsessile; blade oblong, 1.5–8.5 × 0.8–1.4 cm, thickly leathery, base cuneate, apex obtuse and retuse. Scape from base of pseudobulb, erect, usually 5–6 cm; umbel or condensed raceme 1–3-flowered; peduncle slender, ca. 1 mm in diam., sparsely with 2 or 3 tubular sheaths; floral bracts ovate, cymbiform, 7–8 mm. Pedicel and ovary 1.5–2 cm. Flowers yellow. Dorsal sepal ovate, 10–14 × 7–8 mm, apex obtuse and slightly hairy; lateral sepals usually free, lanceolate, 20–33 × 4–5 mm, base adnate to column foot, margin entire, twisted near base and divergent, apex obtuse. Petals ovate-triangular, 5–7 × 4–5 mm, apical margins fimbriate-ciliate, apex purplish brown, obtuse and apiculate; lip recurved, ligulate, ca. 7 mm, fleshy, base attached to end of column foot by a mobile joint, apex obtuse, ± ciliate, sparsely finely papillate on both apical sides. Column ca. 4 mm, with crescent-shaped wings at middle; foot curved, ca. 5 mm, with free part ca. 2 mm; stelidia deltoid, ca. 1 mm; anther cap shortly fimbriate margined. Fl. Mar–Apr.

- Tree trunks in forests, rocks along valleys; 1000–2000 m. N Fujian, N Guangdong, Guangxi, W Hubei, N Hunan, C and S Taiwan, Zhejiang.

**65. *Bulbophyllum forrestii*** Seidenfaden, Dansk Bot. Ark. 29(1): 120. 1974 [*“forrestii”*].

尖角卷瓣兰 *jian jiao juan ban lan*

*Cirrhopetalum aemulum* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 195. 1921, not *Bulbophyllum aemulum* Schlechter (1905); *Rhytionanthos aemulus* (W. W. Smith) Garay, Hamer & Siegerist.

Rhizome creeping, ca. 4 mm in diam. Pseudobulbs 1–2 cm apart on rhizome, ovoid, 2–3 cm, 1–2 cm in diam., with a terminal leaf. Petiole 2–3 cm; leaf blade oblong, 15–25 × 1.3–2.8 cm, thickly leathery, base contracted into petiole, apex obtuse and slightly emarginate. Scape from base of pseudobulb, yellowish green, densely spotted with purple, erect, to 15 cm, slender; raceme shortened, umbel-like, 10-flowered; peduncle sparsely with 3 or 4 membranous sheaths; floral bracts narrowly lanceolate, ca. 1 cm. Pedicel and ovary yellow, 1–1.8 cm. Flowers yellow, with purplish red spots on lip. Dorsal sepal ovate, concave, 7–10 × ca. 4 mm, apex subobtuse; lateral sepals lanceolate, 1.5–2.5 cm, outer surface minutely papillate, base adnate to column foot and twisted above it, their upper and lower edges connate to each other forming a lanceolate tube, apex acuminate. Petals ovate-triangular, 2–3 × 1.5–2 mm, margins irregularly denticulate, apex acute; lip recurved, lanceolate, ca. 5 mm, strongly narrowed above middle, base attached to end of column foot by a mobile joint, margin decurved and ± minutely papillate, apex obtuse. Column short; column foot curved, with free part ca. 2 mm; stelidia shortly subulate, ca. 0.5 mm; anther cap with irregularly incised margin. Fl. May–Jun.

Tree trunks in forests; 1800–2000 m. S and W Yunnan [Myanmar, Thailand].

**66. *Bulbophyllum taeniophyllum*** E. C. Parish & H. G. Reichenbach, *J. Bot.* 12: 198. 1874.

带叶卷瓣兰 dai ye juan ban lan

*Cirrhopetalum taeniophyllum* (E. C. Parish & H. G. Reichenbach) J. D. Hooker; *Phyllorkis taeniophylla* (E. C. Parish & H. G. Reichenbach) Kuntze.

Rhizome stout. Pseudobulbs contiguous, subcylindric, 3.5–3.8 cm, 7–9 mm in diam., with a terminal leaf. Leaf subsessile; blade narrowly oblong, 16.5–19 × 1.5–2 cm, leathery, apex obtuse. Scape from base of pseudobulb, erect, cylindric, 13–14 cm; umbel several flowered; peduncle ca. 1.5 mm in diam., with 2 or 3 tubular sheaths ca. 5 mm; floral bracts ovate-lanceolate, ca. 4 mm, shorter than pedicel and ovary; ovary ± covered with papillate hairs. Flowers whitish to greenish, densely with small purple spots, sometimes with yellowish brown lip. Dorsal sepal ovate, concave, ca. 7.5 × 5 mm, margin ± dentate toward apex, apex acute; lateral sepals narrowly lanceolate, ca. 20 × 4 mm, base adnate to column foot and twisted (180°), with their upper edges connate and lower edges incurved, apex acuminate. Petals narrowly ovate, ca. 4.2 × 2.2 mm, margins toothed, apex subacute; lip recurved, lanceolate, ca. 5 × 1 mm, fleshy, adaxially with 2 keels and a channel between them, base attached to end of column foot, immobile, apex subacute. Column ca. 1.5 mm, with triangular, enlarged wings at middle; foot ca. 2 mm, with free part ca. 1 mm; stelidia shortly subulate; anther cap glabrous, apex slightly 3-lobed. Fl. Jun.

Tree trunks in dense forests; ca. 800 m. S Yunnan [Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**67. *Bulbophyllum chondriophorum*** (Gagnepain) Seidenfaden, *Dansk Bot. Ark.* 29(1): 53. 1974.

城口卷瓣兰 cheng kou juan ban lan

*Cirrhopetalum chondriophorum* Gagnepain, *Bull. Soc. Bot. France* 78: 4. 1931; *Bulbophyllum quadrangulum* Z. H. Tsi.

Rhizome creeping, ca. 1.2 mm in diam., covered with membranous cupular sheaths, rooting from base of pseudobulbs. Pseudobulbs ca. 1 cm apart from each other, ovoid, 6–8 mm, ca. 4 mm in diam., with a terminal leaf. Leaf subsessile; blade oblong or obovate-oblong, 1.5–3.5 × 0.5–0.8 cm, leathery, apex obtuse and retuse. Scape from base of pseudobulb, erect, 2–3 cm; raceme shortened, umbel-like, often 2–4-flowered; peduncle ca. 0.8 mm in diam., with 2 spathe-like sheaths ca. 2.5 mm; floral bracts lanceolate, ca. 3 mm, apex acute. Pedicel and ovary 5–7 mm. Flowers yellow. Dorsal sepal ovate-oblong, concave, 4–5.5 × 2–3 mm, margins except base with densely glandular-papillate appendages, apex subobtuse; lateral sepals obliquely ovate, 7–25 × 2–2.2 mm, base adnate to column foot, their lower edges connate, apex acute. Petals ovate-oblong, 3–4 × 1.2–2 mm, margins densely with glandular-papillate appendages, apex subobtuse; lip recurved, ligulate, ca. 2.5 mm, fleshy, grooved at base, basal margins decurved, apex obtuse. Column 1.5–1.8 mm; foot 2–3 mm, with free part ca. 1 mm; stelidia deltoid, 0.3–0.8 mm, apex acute and narrowly dentate; anther cap rounded at apex. Fl. Jun.

• Tree trunks in open forests; 700–1200 m. Chongqing, N Fujian, S Shaanxi, NE Sichuan, Zhejiang.

**68. *Bulbophyllum emarginatum*** (Finet) J. J. Smith, *Bull. Jard. Bot. Buitenzorg, sér. 2*, 8: 24. 1912.

匍茎卷瓣兰 pu jing juan ban lan

*Cirrhopetalum emarginatum* Finet, *Bull. Soc. Bot. France* 44: 269. 1897; *Bulbophyllum yoksunense* J. J. Smith.

Rhizome creeping, ca. 3 mm in diam., rigid, branched, with internodes 2–5 cm, rooting mainly from base of pseudobulbs. Pseudobulbs 9–18 cm apart from each other, narrowly ovoid or subcylindric, 2–4 cm, 5–10 mm in diam., narrowed toward apex, with a terminal leaf. Petiole ca. 5 mm; leaf blade oblong or ligulate, 4–10 × 1.5–3.5 cm, thickly leathery, apex obtuse and retuse. Scape from base of pseudobulb, 2–4 cm; raceme shortened, umbel-like, 2–4-flowered; floral bracts lanceolate, ca. 8 mm, apex acute. Pedicel and ovary ca. 1.5 cm. Flowers purplish red. Dorsal sepal ovate-oblong, ca. 10 × 8 mm, apex truncate and emarginate, ciliate; lateral sepals falcate-lanceolate, 2–4.2 cm, abaxially papillate, base adnate to column foot, twisted near base, their upper and lower edges connate to each other forming a conic-cylindric synsepal, apex caudate. Petals suborbicular, ca. 9 × 9 mm, ciliate; lip ovate, ca. 8 × 4 mm, base attached to end of column foot by a mobile joint, with 2 lamellae extending from base to near apex, apex obtuse-rounded. Column ca. 3 mm; foot ca. 5 mm, with free part ca. 2 mm; stelidia ca. 0.2 mm; anther cap irregularly denticulate margined, centrally carinate-ridged. Fl. Oct.

Tree trunks in forests; 800–2200 m. SE Xizang, SE to NW Yunnan [Bhutan, NE India, Myanmar, Nepal, Vietnam].

**69. *Bulbophyllum chinense*** (Lindley) H. G. Reichenbach, *Ann. Bot. Syst.* 6: 260. 1861.

中华卷瓣兰 zhong hua juan ban lan

*Cirrhopetalum chinense* Lindley, Edwards's Bot. Reg. 28(Misc.): 37. 1842; *Phyllorkis chinensis* (Lindley) Kuntze.

Pseudobulbs spaced, oblong-ovoid, 1.5–2 cm, 1–1.2 cm in diam., with a solitary leaf at apex. Leaf subsessile; blade lanceolate, 6.5–8.5 × 1.6–1.8 cm. Scape ca. 12 cm; peduncle with 2 sheaths; umbel 9- or 10-flowered; floral bracts lanceolate, ca. 5 mm. Pedicel and ovary 1.5–2 cm. Dorsal sepal and petals purplish; lateral sepals yellowish green. Dorsal sepal oblong, 10–15 × 5–8 mm, margin denticulate, apex aristate; lateral sepals ovate-lanceolate, 24–32 × 6–7 mm, twisted near base, with their lower edges shortly connate at base. Petals suboblong, 7–8 × 3.5–4.5 mm, adaxially shortly hairy toward apex, margins serrulate-ciliate, apex obtuse, mucronate; lip recurved, ligulate, fleshy, glabrous, base attached to end of column foot by a mobile joint, apex obtuse. Column dilated and subrounded at base, 1.5–1.8 mm; column foot ca. 6 mm, with free part ca. 2 mm; stelidia narrowly subulate, ca. 3 mm. Fl. Jul.

- Habitat and locality unknown. "China."

This species is known only from the type at K.

**70. *Bulbophyllum helenae*** (Kuntze) J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 8: 24. 1912.

角萼卷瓣兰 jiao e juan ban lan

*Phyllorkis helenae* Kuntze, Revis. Gen. Pl. 2: 676. 1891.

Rhizome stout, 6–7 mm in diam. Pseudobulbs 3–6 cm apart from each other, narrowly ovoid, 3–6 cm, 1.1–1.5 cm in diam., with a terminal leaf. Petiole 5–6 cm, conduplicate; leaf blade oblong, 27–30 × 2.8–4 cm, leathery, apex obtuse. Scapes 1 or 2, from base of pseudobulbs, erect, 14–18 cm; umbel 6–10-flowered; peduncle with 3 or 4 sheaths 12–15 mm; floral bracts lanceolate, ca. 6 mm, apex acuminate. Pedicel and ovary ca. 11 mm. Flowers yellowish green with red spots. Dorsal sepal ovate, concave, ca. 6 × 3.2 mm, margin irregularly toothed or slightly erose, apex obtuse; lateral sepals lanceolate, ca. 32 × 3 mm, 5-veined, base finely papillate abaxially, twisted near base, their upper and lower edges connate to each other forming a horn-shaped synsepal. Petals ovate-triangular, ca. 3 × 3 mm, base ca. 1/3 width adnate to column foot, margins fimbriate, apex aristate; lip subovate-lanceolate, ca. 3 × 0.7 mm, fleshy, grooved at

base, apex acuminate. Column ca. 2 mm, stout, with slightly enlarged wings; foot ca. 3 mm, with free part ca. 2 mm; stelidia ca. 0.5 mm; anther cap ± finely papillate. Fl. Aug.

Tree trunks in forests; 600–2300 m. S and SW Yunnan [Bhutan, NE India, Myanmar, Nepal].

**71. *Bulbophyllum andersonii*** (J. D. Hooker) J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 8: 22. 1912.

梳帽卷瓣兰 shu mao juan ban lan

*Cirrhopetalum andersonii* J. D. Hooker, Fl. Brit. India 5: 777. 1890; *Bulbophyllum henryi* (Rolfe) J. J. Smith; *C. henryi* Rolfe; *Phyllorkis andersonii* (J. D. Hooker) Kuntze.

Rhizome creeping, 3–5 mm in diam. Pseudobulbs 3–11 cm apart on rhizome, ovoid-conic or narrowly ovoid, 2–5 cm, 6–15 mm in diam., with a terminal leaf. Petiole 1–2.5 cm; leaf blade oblong, 7–21 × 1.6–4.3 cm, leathery, apex obtuse and retuse. Scape from base of pseudobulb, erect, yellowish green with purplish red stripes, ca. 17 cm; umbel several flowered; peduncle slender, 1–2 mm in diam., with several tubular sheaths; floral bracts pale yellow, spotted with purple, lanceolate, ca. 5 mm, apex acute. Pedicel and ovary ca. 1 cm, slender. Sepals and petals whitish, densely spotted with purplish red; lip purple. Dorsal sepal ovate-oblong, concave, ca. 5 × 3 mm, with 5 veins spotted with purplish red, adaxially slightly scabrous or finely papillate, apical margins toothed, apex with a long awn ca. 3 mm; lateral sepals oblong, 15–20 mm, base adnate to column foot, twisted near base, connate along upper margin, apex obtuse. Petals oblong or falcate-oblong, ca. 3 × 1 mm, with 3 thickened veins spotted with purplish red, both surfaces densely minute-papillate, margins purplish red and with comblike or irregular teeth, apex with an awn ca. 0.8 mm; lip recurved, ovate-triangular, fleshy, centrally with 1 white longitudinal band, base grooved, attached to end of column foot by a mobile joint, apex obtuse. Column yellowish green, 1–2 mm, with wings at middle; foot white, spotted with purplish red, upcurved, ca. 3 mm, with free part ca. 1.5 mm; stelidia deltoid, ca. 1 mm, apex acute; anther cap yellow, apical margins ciliate. Fl. Feb–Nov. *2n* = 38.

Tree trunks or rocks in forests; 400–2000 m. Guangxi, SW Guizhou, SW Sichuan, SE to NW Yunnan [NE India, Myanmar, Vietnam].

**14. *Bulbophyllum* sect. *Cirrhopetalum*** (Lindley) H. G. Reichenbach, Ann. Bot. Syst. 6: 259. 1861.

单叶卷瓣兰组 dan ye juan ban lan zu

*Cirrhopetalum* Lindley, Gen. Sp. Orchid. Pl. 45, 58. 1830, nom. cons.

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, arising near pseudobulbs, 1-flowered or a ± subumbellate raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Sepals 3–5-veined; dorsal sepal with margins ciliate, fimbriate, or with paleaceous appendages (with a single apical thread in *Bulbophyllum amplifolium*); lateral sepals twisted inward near base, with upper margins approaching or meeting and connate, margins glabrous to ciliate. Petals: margins fimbriate or with paleaceous appendages, 1–3-veined; lip: margins with or without auricles above base, margins usually ± glabrous, adaxially ± glabrous. Column: stigma not protruding at its base, foot distinct; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 4, inner ca. 1/2 as long as outer or longer, all without appendages.

Fifty-seven provisionally accepted species: India to W Pacific, also Africa and Madagascar; 17 species (ten endemic) in China.

1a. Dorsal sepal entire, with a terminal thread only.

- 2a. Lip with small auricles well above base; stelidia straight or slightly curved downward, triangular ..... 72. *B. picturatum*  
 2b. Lip without auricles; stelidia strongly curved downward, hook-shaped and fusiform ..... 73. *B. amplifolium*  
 1b. Dorsal sepal ciliate to fimbriate, or with other appendages along margins.  
 3a. Lateral sepals 15–19 cm ..... 74. *B. rothschildianum*  
 3b. Lateral sepals less than 6 cm.  
 4a. Scape ca. as long as pseudobulb.  
 5a. Lateral sepals 5–7 mm, ca. 2 × as long as dorsal sepal or shorter ..... 75. *B. brevipedunculatum*  
 5b. Lateral sepals ca. 10 mm, ca. 2.5 × as long as dorsal sepal or longer ..... 76. *B. henanense*  
 4b. Scape much longer than pseudobulb.  
 6a. Lateral sepals 0.7–1.4 cm.  
 7a. Adaxial surface of lip glabrous; lateral sepals 0.7–1.1 cm ..... 77. *B. albociliatum*  
 7b. Adaxial surface of lip partly papillose; lateral sepals 1.2–1.4 cm ..... 78. *B. kuanwuense*  
 6b. Lateral sepals 1.5–3.5 cm or longer.  
 8a. Lateral sepals long caudate at apex ..... 79. *B. pecten-veneris*  
 8b. Lateral sepals obtuse to acute at apex.  
 9a. Stelidia of column narrowly lanceolate, ca. 5 mm ..... 80. *B. longibrachiatum*  
 9b. Stelidia of column toothlike, filiform, or subulate, less than 1.5 mm.  
 10a. Lateral sepals free, with or without upper and lower margin inrolled; or lateral sepals partly connate and with upper and lower margin inrolled.  
 11a. Lateral sepals without inrolled margins, free ..... 81. *B. taiwanense*  
 11b. Lateral sepals with inrolled margins, free or partly connate.  
 12a. Lateral sepals ca. 3.4 cm; lip with 2 keels adaxially ..... 82. *B. setaceum*  
 12b. Lateral sepals 1.2–1.5 cm; lip without keels adaxially ..... 83. *B. melanoglossum*  
 10b. Lateral sepals connate along upper margin, without inrolled margins (lateral sepals may be folded over midvein).  
 13a. Floral bracts 7–8 mm; column ca. 6 mm ..... 84. *B. pingtungense*  
 13b. Floral bracts 3–5 mm; column 1–3 mm.  
 14a. Lip with 2 longitudinal grooves and between them a keel adaxially ..... 85. *B. tseanum*  
 14b. Lip without grooves and keel as above.  
 15a. Stelidia suborbicular ..... 86. *B. lepidum*  
 15b. Stelidia subulate.  
 16a. Dorsal sepal acuminate ..... 87. *B. hirundinis*  
 16b. Dorsal sepal rounded to obtuse ..... 88. *B. fimbriperianthium*

**72. *Bulbophyllum picturatum*** (Loddiges) H. G. Reichenbach, Ann. Bot. Syst. 6: 262. 1861.

彩色卷瓣兰 *cai se juan ban lan*

*Cirrhopetalum picturatum* Loddiges, Edwards's Bot. Reg. 26(Misc.): 49. 1840.

Rhizome creeping, 6–10 mm in diam., densely covered with membranous sheaths. Pseudobulbs 2–6 cm apart from each other, ovoid-cylindric, 3–9 cm, 1.5–3 cm in diam., with a terminal leaf. Petiole 4–5 cm; leaf blade elliptic or elliptic-oblong, 15–25 × 3–6 cm, leathery, base subrounded, apex obtuse. Scapes 1 or 2, from base of pseudobulbs, erect, 15–18 cm; umbel 5–13-flowered; peduncle with 3–5 tubular sheaths; floral bracts lanceolate or oblong-lanceolate, 7–8 mm. Pedicel and ovary 1.6–1.8 cm. Flowers large, yellowish, median sepal and petals spotted with purple distally, lateral sepals finely spotted with purple proximally; lip yellowish spotted with purple. Dorsal sepal elliptic, concave, 6–6.5 × 5.5–6 mm, apex rounded to emarginate, with a (clavate-tipped) thread 5–7 mm; lateral sepals ovate-triangular, 23–35 × 5–6 mm, base adnate to column foot and twisted above it, their upper edges connate to each other except in basal part. Petals elliptic to ovate, ca. 4 × 2.5 mm, tip caudate with a thread 1–1.5 mm, margins finely erose to deeply lacerate distally; lip recurved, with rounded, patent auricles well above base, ovate-oblong, 3.5–5 × 1.5–3 mm,

fleshy, adaxially with 2 rounded ridges, base hardly concave, apex obtuse. Column ca. 3 mm; foot ca. 3 mm, with free part ca. 1.5 mm; stelidia porrect or slightly curved downward, triangular, acute, with a small tooth along upper margin, ca. 1.5 mm; anther cap toothed at apex. Fl. Mar.

Tree trunks in limestone forests; ca. 1100 m. SW Yunnan (Menglian) [India, Myanmar, Thailand, Vietnam].

This species was first recorded from China by X. H. Jin and S. C. Chen (Acta Bot. Yunnan. 29: 169. 2007).

**73. *Bulbophyllum amplifolium*** (Rolfe) N. P. Balakrishnan & Sud. Chowdhury, Bull. Bot. Surv. India 9: 89. 1967.

大叶卷瓣兰 *da ye juan ban lan*

*Cirrhopetalum amplifolium* Rolfe, Notes Roy. Bot. Gard. Edinburgh 8: 21. 1913.

Rhizome creeping, 6–10 mm in diam., densely covered with membranous sheaths. Pseudobulbs ca. 10 cm apart from each other, ovoid-cylindric, 5–8 cm, ca. 1.5 cm in diam., with a terminal leaf. Petiole 4–7 cm; leaf blade elliptic or elliptic-oblong, (8–)10–21 × ca. 8.5 cm, leathery, base subrounded, apex obtuse. Scapes 1 or 2, from base of pseudobulbs, erect, 15–30 cm; umbel 4–8-flowered; peduncle 3–4 mm in diam., sparsely with 3–5 tubular sheaths; floral bracts lanceolate or

oblong-lanceolate, 8–13 mm. Pedicel and ovary 1.5–2 cm. Flowers large, yellowish brownish. Dorsal sepal suborbicular, concave, ca. 1 × 1 cm, densely finely papillate, apical margins slightly denticulate, apex with a clavate-tipped awn ca. 8 mm; lateral sepals lanceolate, 4.5–5.5 cm, base adnate to column foot and twisted above it, their upper and lower edges connate to each other except apices. Petals ovate-triangular, ca. 4 × 3 mm, margins comblike, apex with a long clavate-tipped awn; lip recurved, without auricles, ovate-oblong, ca. 6 mm, fleshy, base subcordate, apex obtuse. Column ca. 3 mm; foot ca. 4 mm, with free part ca. 3 mm; stielia strongly curved downward, hook-shaped and fusiform, ca. 5 mm; anther cap toothed at apex. Fl. Oct–Nov.

Rocks at broad-leaved forest margins; 1700–2000 m. S Guizhou, SE Xizang, W Yunnan [Bhutan, NE India, Myanmar].

**74. *Bulbophyllum rothschildianum*** (O'Brien) J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 8: 27. 1912.

美花卷瓣兰 mei hua juan ban lan

*Cirrhopetalum rothschildianum* O'Brien, Gard. Chron., ser. 3, 18: 608. 1895.

Rhizome stout, 5–7 mm in diam., densely with short tubular sheaths. Pseudobulbs well spaced, ovoid, ca. 3 cm in diam., with 1 leaf at apex. Petiole ca. 1 cm; leaf blade subelliptic, usually 9–10 × 2–2.5 cm, thickly leathery, apex obtuse and retuse. Scape from base of pseudobulb, erect, 20–24 cm, stout; umbel 4–6-flowered; peduncle ca. 4 mm in diam., sparsely with 3 tubular sheaths, ca. 1 cm; floral bracts lanceolate, ca. 1 cm, apex acuminate. Pedicel and ovary ca. 2 cm. Flowers large, purplish red. Dorsal sepal ovate, cymbiform, ca. 15 × 7 mm, abaxially sparsely papillate, margins fimbriate, apex caudate; fringes narrowly oblong, to 7 mm, easily falling away; lateral sepals lanceolate, 15–19 cm, abaxially densely papillate below middle, twisted near base, their upper edges connate forming a synsepal ca. 2 cm wide, apex long caudate. Petals ovate-triangular, ca. 10 × 4 mm, abruptly contracted above middle and caudate, margins fimbriate; lip ligulate-elliptic, ca. 1 cm, fleshy, ± conduplicate in basal half, base attached to end of column foot by a mobile joint, margins and adaxial surface densely fimbriate-hairy, apex obtuse. Column ca. 5 mm, with triangular, enlarged wings at middle; foot ca. 7 mm, with free part ca. 3 mm; stielia suboblong, ca. 2 mm. Fl. unknown.

Tree trunks in dense forests; 1500–1600 m. S Yunnan [NE India].

**75. *Bulbophyllum brevipedunculatum*** T. C. Hsu & S. W. Chung, Taiwania 53: 23. 2008.

短葶卷瓣兰 duan ting juan ban lan

Rhizome long creeping, 0.6–0.8 mm in diam. Pseudobulbs 1–2 cm apart on rhizome, often ascending, narrowly ovoid, 0.7–1 cm, 3–5 mm in diam., with a terminal leaf. Leaf ± sessile; blade oblong to linear-oblong, 1–7 × 0.7–0.8 cm, apex obtuse to retuse. Scape from base of pseudobulb, 0.5–0.7 cm; umbel 2- or 3-flowered, rarely 1-flowered; peduncle stout, with 3 scalelike sheaths. Pedicel and ovary 2–3 mm. Flowers reddish, lateral sepals sometimes tinged yellow. Dorsal sepal concave, elliptic, ca. 3.5 × 2 mm, margins shortly white ciliate, apex rounded; lat-

eral sepals rhombic, 5–7 × 2–3 mm, upper margins incurved, free or loosely adhering near apex over a short distance, glabrous, apex obtuse-mucronate. Petals elliptic, ca. 2 × 1.2 mm, margin white ciliate, apex rounded; lip recurved, ovate-triangular, ca. 2 mm, adaxially slightly and finely papillose. Column subterete, with a distinct foot, conspicuously winged; stielia triangular, slender; anther cap subglobose. Fl. Feb–Apr.

• Epiphytic on tree trunks in broad-leaved evergreen forests; 1800–2100 m. Taiwan.

Further research is needed to compare this to *Bulbophyllum inconspicuum* Maximowicz from Japan.

**76. *Bulbophyllum henanense*** J. L. Lu, Bull. Bot. Res., Harbin 12: 331. 1992.

河南卷瓣兰 he nan juan ban lan

Rhizome creeping, slender. Pseudobulbs 4–10 mm apart on rhizome, ovoid, ca. 5 mm, 2–4 mm in diam., ribbed, with a terminal leaf. Leaf shortly petiolate; blade ovate-oblong, 8–12 × 5–8 mm, leathery, apex obtuse or retuse. Scape from base of pseudobulb, ascending, ca. 4 mm; umbel 2-flowered. Flowers small, with yellow sepals and purplish red lip. Dorsal sepal ovate, concave, ca. 3.5 × 2.5 mm, abaxial base and margin villos, apex obtuse; lateral sepals narrowly oblong, ca. 10 × 1.5 mm, base adnate to column foot, twisted near base, their lower edges connate except apices, apex obtuse. Petals obovate-oblong, ca. 2 × 1 mm, margins long ciliate, apex obtuse; lip triangular-lanceolate, ca. 3.5 × 1.5 mm, fleshy, ± conduplicate toward base, base attached to end of column foot, immobile, apex acuminate. Column ca. 1.2 mm, stout, with triangular, enlarged wings at middle; foot ca. 2 mm; stielia narrow; anther cap nearly subspherical. Fl. May–Jun.

• Tree trunks in forests; 800–1100 m. Henan.

**77. *Bulbophyllum albociliatum*** (T. S. Liu & H. J. Su) K. Nakajima, Biol. Mag. Okinawa 10: 36. 1973.

白毛卷瓣兰 bai mao juan ban lan

*Cirrhopetalum albociliatum* T. S. Liu & H. J. Su, Quart. J. Taiwan Mus. 24: 173. 1971; *Bulbophyllum albociliatum* var. *weiminianum* T. P. Lin & Kuo Huang; *B. taichungianum* S. S. Ying.

Rhizome creeping, slender, ca. 1 mm in diam. Pseudobulbs ca. 2 cm apart on rhizome, ± ascending, narrowly ovoid, 1–1.3 cm, 5–7 mm in diam., with a terminal leaf. Leaf sessile; blade oblanceolate or obovate, 2.5–4 × 0.8–1 cm, apex obtuse or sometimes retuse. Scape from base of pseudobulb, 5–6 cm; umbel 5- or 6-flowered; peduncle slender, with 2 scalelike sheaths; floral bracts narrowly triangular, ca. 3 mm. Pedicel and ovary ca. 5 mm. Flowers reddening, with reddish yellow lateral sepals. Dorsal sepal concave, elliptic, ca. 3 × 2 mm, base subtruncate, margin long white ciliate, apex rounded; lateral sepals lanceolate, 7–11 × ca. 2 mm, twisted near base, with their upper edges ± connate, apex acute. Petals elliptic, ca. 2 × 1.2 mm, base truncate, margins long white ciliate, apex rounded; lip recurved, hornlike, 1.5–2 mm. Column yellow, subterete, ca. 1.5 mm, with a distinct foot, conspicuously winged; stielia slender; anther cap subglobose. Fl. Apr–May.

- Tree trunks in forests; 1300–1800 m. C and S Taiwan.

**78. *Bulbophyllum kuanwuense*** S. W. Chung & T. C. Hsu, *Taiwania* 51: 139. 2006 [*“kuanwuensis”*].

台南卷瓣兰 tai nan juan ban lan

Rhizome long creeping, ca. 2 mm in diam. Pseudobulbs 1–2 cm apart on rhizome, globose to ovoid, 0.7–1 cm, 6–9 mm in diam., with a terminal leaf. Leaf ± sessile; blade elliptic to obovate, 1.8–4 × 1–1.5 cm, apex rounded to slightly retuse. Scape from base of pseudobulb, 2–3 cm; umbel 3–7-flowered; peduncle stout, with 2 scalelike sheaths. Pedicel and ovary 4–5 mm. Flowers with dorsal sepal reddish orange, tinged white near base and with red-brown veins, lateral sepals reddish to orange, petals reddish, lip orange. Dorsal sepal concave, ovate, 6–7 × 3–3.5 mm, margins white ciliate, apex acute; lateral sepals linear-oblong, 12–14 × 2–3 mm, slightly twisted near base, with their upper and lower edges often loosely adhering, margins ciliolate, apex obtuse. Petals ovate, ca. 3.5 × 1.5–2 mm, margins long white ciliate, apex acute; lip recurved, ovate-triangular, 2–2.5 mm, adaxially deeply grooved and papillose near apex and base. Column subterete, with a distinct foot, conspicuously winged; stelidia slender; anther cap subglobose. Fl. Apr.

- *Chamaecyparis* forests on mountain ridges; ca. 2000 m. S Taiwan.

This species is close to *Bulbophyllum albociliatum*.

**79. *Bulbophyllum pecten-veneris*** (Gagnepain) Seidenfaden, *Dansk Bot. Ark.* 29(1): 37. 1974 [*“pectenveneris”*].

斑唇卷瓣兰 ban chun juan ban lan

*Cirrhopetalum pecten-veneris* Gagnepain, *Bull. Soc. Bot. France* 78: 6. 1931; *Bulbophyllum flaviflorum* (T. S. Liu & H. J. Su) Seidenfaden; *C. flaviflorum* T. S. Liu & H. J. Su; *C. minutum* Rolfe.

Rhizome creeping, 1–2 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 5–10 mm apart on rhizome, ovoid, 5–12 mm, 5–10 mm in diam., with a terminal leaf. Leaf subsessile; blade elliptic, oblong-lanceolate, or ovate, 1–6 × 0.7–1.8 cm, thickly leathery, apex obtuse or sometimes retuse. Scape from base of pseudobulb, erect, ca. 10 cm; umbel 3–9-flowered; peduncle slender, sparsely with 2 or 3 tubular sheaths; floral bracts lanceolate, small, 3–4 mm. Pedicel and ovary 7–10 mm, slender. Flowers yellowish green or yellow slightly tinged with brown. Dorsal sepal ovate, concave, ca. 5 × 2.5 mm, margin fimbriate-ciliate, apex long caudate; lateral sepals narrowly lanceolate, 35–50 × ca. 2.5 mm, twisted near base, their upper and lower edges connate to each other forming a long-cuspidate tube, with their apices separate, apex long cuspidate. Petals obliquely ovate, 2.5–3 × ca. 1.5 mm, base ca. 2/5 width adnate to column foot, margins fimbriate-ciliate especially in apical half, apex acute; lip recurved, ligulate, ca. 2.5 mm, fleshy, nearly glabrous, subacute. Column ca. 2 mm; stelidia subulate, ca. 1 mm; foot upcurved, ca. 1.5 mm, with free part ca. 0.5 mm; anther cap papillate margined. Fl. Apr–Sep.

- Tree trunks or rocks in forests; below 1600 m. S Anhui, N Fujian, Guangxi, Hainan, Hong Kong, W Hubei, C and S Taiwan [Laos, Vietnam].

**80. *Bulbophyllum longibrachiatum*** Z. H. Tsi, *Bull. Bot. Res., Harbin* 1(1–2): 115. 1981.

长臂卷瓣兰 chang bi juan ban lan

*Bulbophyllum purpureifolium* Averyanov; *Cirrhopetalum longibrachiatum* (Z. H. Tsi) Garay, Hamer & Siegerist.

Rhizome stout, ca. 6 mm in diam., often branched, rooting from base of pseudobulbs. Pseudobulbs well spaced, erect, narrowly ovoid, 4–4.3 cm, ca. 1 cm in diam., with a terminal leaf. Petiole 2–3 cm; leaf blade elliptic, large, 12.5–15.5 × 3.5–5 cm, thickly leathery, base contracted into petiole, apex obtuse. Scape from base of pseudobulb, erect, 15–28 cm; umbel 3- or 4-flowered; peduncle 2–3.5 mm in diam., sparsely with 3 or 4 sheaths ca. 1 cm; floral bracts lanceolate, ca. 9 mm, apex acuminate. Pedicel and ovary ca. 2 cm. Flowers pale green, tinged with purple. Dorsal sepal ovate, concave, ca. 15 × 9 mm, margin fimbriate in apical half, apex acuminate; lateral sepals narrowly lanceolate, ca. 35 × 6 mm, twisted near base, their upper and lower edges connate to each other forming a tube, with their apices separate, apex acuminate. Petals falcate-lanceolate, ca. 10 × 4 mm, margins densely fimbriate, apex with a long awn ca. 0.8 mm; lip strongly reflexed, lanceolate, ca. 1 cm, base ± conduplicate, base attached to end of column foot by a mobile joint, slightly ciliate, apex acute. Column ca. 5 mm, with triangular, enlarged wings above; foot ca. 10 mm, with free part upcurved, ca. 5 mm; stelidia horizontally spreading, narrowly lanceolate, ca. 5 mm, base slightly twisted; anther cap comblike on apical margin. Fl. Nov.

- Tree trunks in forests; 1300–1600 m. SE Yunnan [N Vietnam].

**81. *Bulbophyllum taiwanense*** (Fukuyama) K. Nakajima, *Biol. Mag. Okinawa* 10: 36. 1973.

台湾卷瓣兰 tai wan juan ban lan

*Cirrhopetalum taiwanense* Fukuyama, *Bot. Mag. (Tokyo)* 49: 761. 1935.

Rhizome creeping, 1–2 mm in diam., rigid, rooting from base of pseudobulbs. Pseudobulbs 5–15 mm apart on rhizome, usually ovoid, 6–12 mm, 4–8 mm in diam., ± longitudinally striped, with a terminal leaf. Leaf shortly petiolate; blade narrowly oblong, 3–5 × 1–2 cm, fleshy, apex obtuse and retuse. Scape from base of pseudobulb, 6–10 cm; raceme shortened, umbel-like, 6–10 mm, densely 5–8-flowered; peduncle yellowish green, slender, longitudinally striped, sparsely with several brown sheaths ca. 5 mm; floral bracts lanceolate, ca. 3 mm, apex acuminate. Pedicel and ovary ca. 1 cm. Flowers not widely opening, yellowish red. Dorsal sepal ovate-lanceolate, concave, 6–8 × ca. 3 mm, apex acuminate, ciliate; lateral sepals free, divergent, obliquely lanceolate, 13–15 × ca. 2 mm, margins incurved in apical half, apex obtuse, sometimes ciliate. Petals ovate, ca. 5 × 2 mm, membranous, apex acute, ciliate; lip slightly reflexed, hornlike, ca. 3 mm, fleshy, adaxially with 1 longitudinal groove, base dilated and attached to end of column foot, apex obtuse. Column subcylindric, ca. 1.5 mm; foot curved, ca. 1.5 mm; stelidia linear. Fl. Apr–May.

- Tree trunks in forests; below 1000 m. S Taiwan.

**82. *Bulbophyllum setaceum*** T. P. Lin, Native Orchids Taiwan 1: 55. 1975.

鹤冠卷瓣兰 guan guan juan ban lan

*Bulbophyllum ciliisepalum* T. C. Hsu & S. W. Chung; *B. taitungianum* Ying.

Rhizome short. Pseudobulbs close or ca. 1 cm apart from each other, ovoid to narrowly cylindrical, 1–1.3 cm, 5–10 mm in diam., with a terminal leaf. Leaf blade elliptic to oblong-elliptic, 3–6 × 1.2–2 cm, thickly leathery, apex obtuse and retuse. Scape green, erect, 14–16 cm; umbel 12–16-flowered; floral bracts ovate-lanceolate, ca. 5 mm. Pedicel and ovary ca. 11 mm. Flowers yellow, tinged with brown, with tangerine lip. Dorsal sepal ovate, concave, ca. 5.5 × 3 mm, brown veined, white ciliate, apex shortly cuspidate; lateral sepals lanceolate or linear, ca. 3.4 × 2 mm, brown tipped, slightly red at base, basal margins usually sparsely ciliate, their upper and lower edges connate in basal half and separate but inrolled margined in apical half forming a fork-shaped synsepal. Petals obliquely elliptic, ca. 3 × 2 mm, with 5 reddish brown veins, acute, long ciliate; lip recurved, ligulate, ca. 2.5 mm, with 2 keels adaxially, grooved at base, apex obtuse. Column ca. 1.5 mm; stelidia broadly subulate; anther cap lacerate margined. Fl. Mar–May.

- Tree trunks in forests; 1500–2400 m. C Taiwan.

**83. *Bulbophyllum melanoglossum*** Hayata, Icon. Pl. Formosan. 4: 49. 1919.

紫纹卷瓣兰 zi wen juan ban lan

*Bulbophyllum linchianum* S. S. Ying; *B. melanoglossum* var. *rubropunctatum* (S. S. Ying) S. S. Ying; *B. rubropunctatum* S. S. Ying; *Cirrhopetalum melanoglossum* (Hayata) Hayata; *C. striatum* T. S. Liu & H. J. Su.

Rhizome creeping, 1–2 mm in diam. Pseudobulbs 1–6 cm apart on rhizome, ovoid, usually 1–1.5 cm, 5–7 mm in diam., with a terminal leaf. Leaf subsessile; blade obovate-lanceolate or oblong, 4–8 × 0.8–1.5 cm, leathery, apex obtuse and retuse or apiculate. Scape from base of pseudobulb, yellowish green, with purplish red spots, 7–12 cm; umbel several to 10-flowered; peduncle slender, ca. 0.6 mm in diam., sparsely with 2 or 3 sheaths; floral bracts narrowly lanceolate, ca. 3 mm. Pedicel and ovary 6–12 mm. Sepals and petals pale yellow, usually densely with purplish red stripes or spots; lip reddish adaxially, yellow abaxially. Dorsal sepal ovate, 4.5–5 × 2.5–3 mm, 3-veined, margin fimbriate-ciliate, apex acute; lateral sepals narrowly lanceolate, 12–20 × ca. 3 mm, 5-veined, twisted near base, their upper and lower edges ± connate forming a somewhat tubular synsepal, base broad and adnate to column foot, margin entire, apex acute. Petals ovate-elliptic, 3–3.5 × 1.5–1.8 mm, apex acute and with a black blotch, ciliate; lip recurved, ligulate, ca. 2.5 mm, fleshy, base attached to end of column foot, immobile. Column suberect, yellow, ca. 1.5 mm; foot ca. 1.5 mm, with many purplish red spots; stelidia subulate, ca. 1 mm; anther cap yellow, finely papillate. Fl. May–Jul.

- Tree trunks in forests, on rocks along valleys; 400–1800 m. C and S Fujian, Hainan, Taiwan.

**84. *Bulbophyllum pingtungense*** S. S. Ying & C. Chen, Coloured Ill. Fl. Taiwan 1: 499. 1985 [*“pingtungensis”*].

屏东卷瓣兰 ping dong juan ban lan

Rhizome 2–3 mm in diam. Pseudobulbs 5–10 cm apart on rhizome, ovoid or narrowly ovoid, 1–4 cm, 0.8–2 cm in diam., 3–5 ribbed, with a terminal leaf. Leaf subsessile; blade elliptic to narrowly oblong, 3–15 × 1–2.5 cm, leathery, base contracted, apex obtuse and retuse. Scape erect, 5–15 cm, stout; umbels 2–4-flowered; peduncle with 2 sheaths; floral bracts lanceolate, 7–8 mm, apex acute. Flowers erect, orange-yellow to pale red, marked with red or deep purplish red stripes and spots. Dorsal sepal ovate, concave, 1.5–2.4 × 1.1–1.5 cm, adaxially hairy, ciliate, apex cuspidate; lateral sepals obliquely lanceolate, 2.5–4 × 0.7–1 cm, base adnate to column foot, apex acute. Petals narrowly triangular, 1–1.2 cm, base broad and adnate to column foot, ciliate, apex acute; lip recurved, ligulate, ca. 1 cm, fleshy, hairy on both basal sides. Column ca. 0.6 cm, with triangular, enlarged wings at base; foot ca. 1.2 cm; stelidia conspicuous. Fl. Jan–Apr.

- Tree trunks in broad-leaved forests; 100–400 m. S Taiwan.

Chinese records of *Bulbophyllum wightii* H. G. Reichenbach (e.g., in FRPS 19: 240. 1999) are referable to *B. pingtungense*.

**85. *Bulbophyllum tseanum*** (S. Y. Hu & Barretto) Z. H. Tsi, Fl. Reipubl. Popularis Sin. 19: 239. 1999.

香港卷瓣兰 xiang gang juan ban lan

*Cirrhopetalum tseanum* S. Y. Hu & Barretto, Chung Chi J. 13(2): 30. 1976.

Rhizome creeping, ca. 3 mm in diam., with straw-yellow sheaths. Pseudobulbs ovoid, 1–1.5 cm, 6–8 mm in diam., with a terminal leaf. Petiole 3–7 mm; leaf blade oblong, 4–7 × 1.7–2.5 cm, thickly leathery, apex rounded and retuse. Scape from base of pseudobulb, 8–12 cm; umbel 4- or 5-flowered; peduncle pale purplish red, slender, ca. 1 mm in diam., with 2 sheaths; floral bracts subulate, ca. 3 mm, apex acuminate or apiculate. Pedicel and ovary ca. 4 mm, deep red. Flowers yellow, with dark red margins on dorsal sepal and petals, densely spotted with dark purple-red on lateral sepals and tinged with orange on lip. Dorsal sepal subovate, concave, ca. 5 × 4 mm, margins with dark red fimbriate cilia, apex long caudate; lateral sepals obliquely lanceolate, twisted near base, their upper edges connate to each other forming an elliptic synsepal 1.8–2 × 0.7–0.8 cm. Petals obliquely ovate, ca. 4 × 2.5 mm, margins fimbriate-ciliate, apex long caudate; lip recurved, ligulate, fleshy, base attached to end of column foot by a mobile joint, adaxially with 2 grooves and 1 longitudinal keel between them. Column ca. 3 mm, with triangular, enlarged wings at base; foot distinct; stelidia very short; anther cap glabrous. Fl. Apr. 2n = 38\*.

- Rocks. Hong Kong.

**86. *Bulbophyllum lepidum*** (Blume) J. J. Smith, Orch. Java, 471. 1905.

南方卷瓣兰 nan fang juan ban lan

*Ephippium lepidum* Blume, Bijdr. 310. 1825; *Bulbophyllum obtusiangulum* Z. H. Tsi.

Rhizome creeping, ca. 3 mm in diam., rooting from base of pseudobulbs. Pseudobulbs 2–3 cm apart on rhizome, ovoid, 1.5–1.8 cm, ca. 1.3 cm in diam., with a terminal leaf. Petiole ca. 1.5 cm; leaf blade obovate-lanceolate or suboblong, 7–11 × 1.7–2.4 cm, leathery, apex obtuse and retuse. Scape from base of pseudobulb, to 17 cm; umbel 10-flowered; peduncle ca. 1.5 mm in diam., with 2 or 3 sheaths; floral bracts narrowly lanceolate, ca. 3.5 mm, apex acuminate. Pedicel and ovary ca. 6 mm. Flowers yellow. Dorsal sepal broadly ovate, cymbiform, ca. 3.5 × 3 mm, margin fimbriate-ciliate, apex acute; lateral sepals suboblong, ca. 15 × 3 mm, base adnate to column foot, twisted near base, their upper edges connate except apices, apex obtuse. Petals obliquely ovate, ca. 3 × 2 mm, margins fimbriate-ciliate, apex cuspidate; lip recurved, ligulate, ca. 2.5 mm, base attached to end of column foot by a mobile joint, apex acute. Column ca. 2 mm, with suborbicular, enlarged wings at middle; foot ca. 3.5 mm, with free part ca. 1.5 mm. Fl. Apr–May.

Tree trunks in dense forests; ca. 900 m. S Hainan [Cambodia, Indonesia, Laos, Malaysia, Thailand, Vietnam].

**87. *Bulbophyllum hirundinis*** (Gagnepain) Seidenfaden, Dansk Bot. Ark. 29(1): 76. 1974.

莲花卷瓣兰 *lian hua juan ban lan*

*Cirrhopetalum hirundinis* Gagnepain, Bull. Soc. Bot. France 78: 5. 1931; *Bulbophyllum electrinum* Seidenfaden; *B. hirundinis* var. *electrinum* (Seidenfaden) S. S. Ying; *C. aurantiacum* W. W. Smith; *C. melinanthum* Schlechter; *C. remotifolium* Fukuyama.

Rhizome creeping, 1–2 mm in diam., branched. Pseudobulbs close or 5–20 mm apart from each other, ovoid, 7–15 mm, 5–10 mm in diam., with a terminal leaf. Leaf subsessile; blade narrowly elliptic, oblong, or ovate-ligulate, 1.3–5 × 0.6–2 cm, thickly leathery or fleshy, apex obtuse or acute, sometimes retuse. Scape from base of pseudobulb, erect, 3.5–13 cm; peduncle slender, base with a few sheaths; umbel 3–5-flowered; floral bracts lanceolate, ca. 3 mm, apex acuminate. Pedicel and ovary 6–7 mm. Flowers yellow, tinged with purplish red. Dorsal sepal ovate, concave, ca. 5 × 3 mm, margin fimbriate-ciliate,

apex acute to subcaudate; lateral sepals linear, (16–)20–30 × 2–3 mm, twisted near base, their lower edges ± connate to each other forming an elliptic synsepal, free and divergent toward apex, entire or shortly ciliate. Petals obliquely ovate-triangular, 3–4 × 1.5–2.5 mm, margins usually fimbriate-ciliate, sometimes densely finely papillate on both surfaces, 3-veined, apex acute; lip slightly recurved, ligulate, ca. 2.5 mm, fleshy, glabrous, obtuse. Column ca. 1.5 mm; foot ca. 1.5 mm, with free part ca. 0.5 mm; stelidia subulate, ca. 0.8 mm; anther cap with many dentate projections. Fl. unknown.

Tree trunks in forests; 500–3000 m. S Anhui, Guangxi, Hainan, Taiwan, S Yunnan [Vietnam].

**88. *Bulbophyllum fimbriperianthium*** W. M. Lin, Kuo Huang & T. P. Lin, Taiwania 51: 162. 2006.

钝萼卷瓣兰 *dun e juan ban lan*

Rhizome long creeping, 1.8–3 mm in diam. Pseudobulbs 0.5–1.5 cm apart on rhizome, often ± ascending, ovoid-conic, 1–1.6 cm, 6–10 mm in diam., with a terminal leaf. Leaf shortly petiolate; blade oblong to oblong-oblong, 4–8.5 × 1.2–2 cm, apex slightly retuse. Scape from base of pseudobulb, 6–8 cm; umbel 4–8-flowered; peduncle slender, with 2 scalelike sheaths; floral bracts narrowly triangular, 3–4 mm. Pedicel and ovary 5–8 mm. Flowers with dorsal sepal and petals white with red veins, tip red, lateral sepals apple-green toward base, yellow elsewhere, lip whitish yellow tinged with orange red toward base. Dorsal sepal oblong, 6–9 × 4–6 mm, margin white ciliate, apex rounded to obtuse; lateral sepals lanceolate, 23–33 × 4–5 mm, twisted near base, with their upper edges loosely touching, margins sparsely ciliolate, apex obtuse. Petals obliquely elliptic, 4–5 × 2.5–3 mm, margins long white ciliate, apex rounded to obtuse; lip recurved, ovate, 2.5–3 mm, adaxially shallowly grooved, deeper so abaxially. Column subterete, ca. 2 mm, with a distinct foot, conspicuously winged; stelidia slender; anther cap subglobose. Fl. Sep–Oct.

• Trunks and branches of conifers; 1300–1400 m. S Taiwan.

This species mainly differs from *Bulbophyllum hirundinis* in having a rounded to obtuse dorsal sepal.

**15. *Bulbophyllum* sect. *Brachystachya*** Bentham & J. D. Hooker, Gen. Pl. 3: 504. 1883 [*“Brachystachyae”*].

微球组 *wei qiu zu*

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs inconspicuous compared to size of plant, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, mostly arising near pseudobulbs, an elongate or contracted raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Sepals: margins glabrous, 3-veined; lateral sepals ca. as long as dorsal sepal or somewhat longer, approaching or partly fused along their lower margins. Petals: margins glabrous to erose or denticulate, 1-veined; lip: margins without auricles or lateral lobes, margins ± glabrous to papillose, adaxially glabrous to papillose. Column: stigma not or only slightly protruding at its base, foot very short, often inconspicuous; anther: front margin not or slightly projecting, abaxially with or without a low, rounded crest; pollinia 4, inner slightly less than 1/2 as long as outer or longer, all without appendages.

Sixty-five provisionally accepted species: India to W Pacific; three species in China.

- 1a. Raceme with a large spathe-like basal bract ca. 25 mm ..... 89. *B. cylindraceum*  
 1b. Raceme with a small basal bract ca. 8 mm, or with several small bracts lower down on peduncle.  
 2a. Petals acute; raceme cylindrical-ellipsoid ..... 90. *B. khasyanum*  
 2b. Petals truncate to rounded; raceme globose to ovoid ..... 91. *B. repens*

**89. *Bulbophyllum cylindraceum*** Lindley, Gen. Sp. Orchid. Pl. 53. 1830.

大苞石豆兰 da bao shi dou lan

*Phyllorkis cylindracea* (Lindley) Kuntze.

Rhizome creeping, stout, 5–6 mm in diam. Pseudobulbs spaced, 5–7 mm apart from each other, very small, 3–5 mm, 3–4 mm in diam., rigid, with a terminal leaf. Petiole 4–7 cm; leaf blade erect, elliptic-oblong or obovate-lanceolate, 15–25 × 2–4 cm, fleshy or leathery, apex obtuse and apiculate. Scape from base of pseudobulb, erect, 15–25 cm; raceme pendulous, to 6.5 cm, densely many flowered, with an involucre at base; involucre spathe-like, large, ca. 25 × 7 mm; peduncle with 2 or 3 tubular sheaths 2–2.5 cm; floral bracts ovate, small, ca. 4 mm. Pedicel and ovary ca. 3 mm. Flowers pale purple, thickly textured, not widely opening. Dorsal sepal ovate-triangular, ca. 5 × 2.2 mm, abaxially ± scaly, apex acute; lateral sepals obliquely ovate, ca. 5 × 3 mm, abaxially ± scaly, their lower edges connate to each other except apices, apex obtuse. Petals oblong-lanceolate, 2–4.4 × ca. 1.5 mm, thinly textured, entire, acute or obtuse; lip recurved, ligulate, ca. 3.5 × 2 mm, fleshy, grooved at base, adaxially with 3 keels, densely papillate, apex obtuse. Column ca. 0.6 mm, stout; foot very short, without conspicuous free part; stelia narrowly fusiform, ca. 1 mm; anther cap truncate and slightly apiculate at apex. Fl. Nov.  $2n = 38, 40, 42$ .

Tree trunks or rocks in forests; 1400–2400 m. W to SE Yunnan [Bhutan, NE India, Nepal].

**90. *Bulbophyllum khasyanum*** Griffith, Not. Pl. Asiat. 3: 284. 1851.

卷苞石豆兰 juan bao shi dou lan

*Bulbophyllum cylindraceum* Lindley var. *khasyanum* (Griffith) J. D. Hooker.

Rhizome creeping, stout, 4–5 mm in diam. Pseudobulbs 4–6 mm apart from each other, ovoid-subglobose, very small, 3–5 mm, 3–4 mm in diam., with a terminal leaf. Petiole 3–4 cm; leaf blade elliptic-oblong or suboblong, 12–20 × 3–4 cm, apex obtuse. Scape from base of pseudobulb, 15–25 cm; ra-

ceme nodding, 5.5–6 cm, densely many flowered, with several involucre at base; involucre scale-shaped, ca. 8 × 2 mm, apex aristate; floral bracts lanceolate, ca. 7 mm, much longer than pedicel and ovary, apex curled-aristate. Flowers dark purple, lip even darker. Dorsal sepal ovate, ca. 5 × 2 mm; lateral sepals obliquely ovate, ca. 5 × 3 mm, abaxially slightly scaly, their lower edges connate to each other. Petals lanceolate, ca. 4 × 1.5 mm, apex long acuminate; lip ligulate, fleshy, grooved at base, adaxially with 3 keels and densely papillate. Column short, with a short but distinct foot. Fl. Nov.

About 2000 m. C Yunnan [Bhutan, NE India, Malaysia, Thailand, Vietnam].

**91. *Bulbophyllum repens*** Griffith, Not. Pl. Asiat. 3: 293. 1851.

球花石豆兰 qiu hua shi dou lan

*Bulbophyllum poilanei* Gagnepain.

Pseudobulbs close, subovoid, very small, ca. 5 mm, ca. 7 mm in diam., with a terminal leaf. Leaf blade obovate-lanceolate, 11–12 × 0.7–1.7 cm, nearly fleshy, narrowed toward base, base with a few tubular sheaths, apex obtuse. Scape from base of pseudobulb, short; raceme shortened, globose, 4–5 mm, densely many flowered; floral bracts ovate-triangular, very small, ca. 1 mm, apex acute. Pedicel and ovary ca. 2 mm. Flowers purple. Dorsal sepal ovate, ca. 3.5 × 2 mm, 3-veined, entire, obtuse; lateral sepals subequal in size to dorsal sepal, obliquely ovate, 3-veined, their lower edges connate to each other, apex obtuse. Petals truncate to rounded, ca. 2.2 × 1.2 mm, 1-veined, margins glabrous to erose, apex obtuse; lip reflexed, ligulate, fleshy, with a basal groove, adaxially ± papillate, base attached to end of column foot by a mobile joint, apex obtuse. Column stout; stelia subfalcate; anther cap ± mucronate at apex. Fl. Mar.

Tree trunks in dense forests; 500–600 m. Hainan [India, Vietnam].

“*Bulbophyllum cylindricoides* W. H. Chen & Y. M. Shui” (Seed Pl. Karst Region China 1: 217. 2006) belongs here but was not validly published because no Latin description or diagnosis was provided and no type was indicated (*Vienna Code*, Art. 36.1 and 37.1).

**16. *Bulbophyllum* sect. *Stachysanthes*** (Blume) Averyanov, Oprel. Orkhid. Vietnam, 276. 1994.

少花微球组 shao hua wei qiu zu

*Diphyes* sect. *Stachysanthes* Blume, Bijdr. 312. 1825.

Rhizome creeping or straggling; roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs inconspicuous compared to size of plant, apex with 1 leaf. Leaves persistent, thick. Inflorescence solitary, mostly arising near pseudobulbs, 1-flowered, or an elongate or contracted 2- or 3-flowered raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Sepals free, ± equally long, margins glabrous, 3-veined. Petals: margins glabrous, to erose or denticulate, 1-veined; lip: margins without auricles or lateral lobes, margins ± glabrous to papillose, adaxially glabrous. Column: stigma protruding at its base or not, foot very distinct to short; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 2 or 4, inner ca. 1/2 as long as outer or smaller, all usually without appendages.

Seventy-two provisionally accepted species: India to W Pacific; five species (three endemic) in China.

- 1a. Inflorescence with 5 or more flowers ..... 92. *B. apodum*  
 1b. Inflorescence with 1–3 flowers.  
 2a. Rhizome very short, nearly invisible; leaves 3–5, in clusters ..... 93. *B. pauciflorum*  
 2b. Rhizome elongate; leaf solitary, well spaced.  
 3a. Lip adaxially with 2 calli ..... 94. *B. hainanense*

3b. Lip adaxially without calli

4a. Sepals 6–16 mm ..... 95. *B. drymoglossum*

4b. Sepals 2.5–4 mm ..... 96. *B. tokioi*

**92. *Bulbophyllum apodum*** J. D. Hooker, Fl. Brit. India 5: 766. 1890.

柄叶石豆兰 bing ye shi dou lan

*Bulbophyllum ebulbum* King & Pantling; *B. spathaceum* Rolfe.

Rhizome creeping, 4–5 mm in diam., rooting at nodes of rhizome. Pseudobulb minute. Leaves arising from nodes of rhizome, 2–11 cm apart from each other. Petiole 4–8 cm; leaf blade oblong, 8–24 × 3–3.2 cm, fleshy, apex obtuse and retuse. Scape arising from base of pseudobulb, ascending, to 22 cm, with 2 or 3 sheaths at base; raceme 8–10 cm, densely with many small flowers; floral bracts narrowly lanceolate, ca. 3.5 mm. Pedicel and ovary 2.5–4 mm. Flowers pale yellow, thickly textured. Dorsal sepal oblong, 4.5–5 × 1.7–2 mm, 3-veined, entire, acute to acuminate; lateral sepals falcate-lanceolate, 5.2–6 × 2–2.6 mm, 3-veined, apex acute to acuminate. Petals elliptic, 2.5–3 × 1–1.1 mm, 1-veined, entire, obtuse; lip recurved, lanceolate, 3.3–4 × ca. 2 mm, 3-veined, slightly conduplicate toward base, apex obtuse. Column 1–1.5 mm; foot ca. 2 mm, slightly curved, adaxial base with a callus; stelidia erect, subtriangular, very short; anther cap finely papillate. Fl. Aug–Sep.  $2n = 38$ .

Tree trunks in broad-leaved forests; ca. 1000 m. SE Yunnan [India, Indonesia, Laos, Malaysia, Myanmar, ?New Guinea, Philippines, Thailand, Vietnam; ?Pacific islands].

**93. *Bulbophyllum pauciflorum*** Ames, Philipp. J. Sci., C, 7: 132. 1912.

白花石豆兰 bai hua shi dou lan

*Bulbophyllum riyuanum* Fukuyama.

Rhizome very short, nearly invisible, covered with several membranous scalelike sheaths; roots fascicular, slender. Pseudobulb absent. Leaves often 3–5 in clusters, nearly secund on rhizome, subsessile; blade elliptic or oblong, 20–35 × 5–8 mm, apex obtuse and retuse. Scapes several, erect, 15–25 mm, slender; raceme often 2-flowered; peduncle slender, base with 2 minute sheaths; floral bracts ovate-lanceolate, 2–3 mm. Pedicel and ovary ca. 5 mm. Flowers erect, pale yellow or whitish, with yellow lip, not fully opening. Dorsal sepal oblong, concave, 4–5.5 × 1.5–2 mm, 3-veined, apex acute; lateral sepals obliquely triangular, 5–6 × ca. 3 mm, base adnate to column foot forming a short mentum, apex acute. Petals oblong-spatulate, very small, 2–3 × 0.6–0.7 mm, 1-veined, entire, obtuse; lip erect, slightly reflexed, narrowly elliptic, ca. 2.5 mm, thinly textured, both surfaces glabrous, 3-veined, base attached to end of column foot, margin entire, apex acute. Column very short, with a foot ca. 2.6 mm; stelidia triangular-acute. Capsule fusiform, ca. 1.1 cm, ca. 3.5 mm in diam. Fl. May–Oct.

• Tree trunks in dense forests; 300–1400 m. E Hainan, E and N Taiwan.

**94. *Bulbophyllum hainanense*** Z. H. Tsi, Bull. Bot. Res., Harbin 1(1–2): 118. 1981.

海南石豆兰 hai nan shi dou lan

Rhizome slender, ca. 0.8 mm in diam., rigid, bearing 1 leaf and 2 or 3 slender roots at nodes. Pseudobulb absent. Leaves 1–1.5 cm apart from each other, subsessile; blade elliptic, 8–15 × 6–8 mm, fleshy, apex obtuse. Scapes several, usually arising from leaf-bearing nodes, erect, 2–3.5 cm, slender; umbel 2-flowered; peduncle ca. 0.4 mm in diam., with 3 or 4 tubular sheaths ca. 2.5 mm; floral bracts ovate-lanceolate, ca. 1.5 mm, apex acute. Pedicel and ovary ca. 3 mm. Flowers slightly nodding, pure yellow, thickly textured. Sepals free; dorsal sepal ovate-lanceolate, 5–7 × ca. 2.5 mm, apex acute; lateral sepals obliquely ovate-triangular, 4.5–6.5 × ca. 3.2 mm, base adnate to column foot, apex acute. Petals oblong, ca. 3 × 1.2 mm, entire, obtuse; lip broadly ovate in outline, ca. 3.2 mm, base attached to end of column foot by a mobile joint, apex obtuse; disk with a pair of calli adaxially. Column ca. 2 mm; foot upcurved, ca. 2.5 mm, with free part ca. 1 mm; anther cap glabrous. Fl. Nov.

• Tree trunks in mixed forests; ca. 500 m. E Hainan.

**95. *Bulbophyllum drymoglossum*** Maximowicz ex Okubo, Bot. Mag. (Tokyo) 1: 14. 1884.

圆叶石豆兰 yuan ye shi dou lan

*Bulbophyllum aureolabellum* T. P. Lin; *B. gracillimum* Hayata (1912), not Rolfe (1907); *B. somae* Hayata.

Rhizome creeping, slender, 0.5–1 mm in diam., noded, with internodes 1–2 cm, each node bearing 1 leaf and 1–3 roots. Pseudobulb absent. Leaf subsessile; blade subelliptic or orbicular, 5–30 × 5–10 mm, fleshy-thickened, apex obtuse. Scape arising from base of petiole, erect, 7–40 mm; peduncle slender, ca. 0.3 mm in diam., with 2 or 3 sheaths, terminating in a solitary flower; floral bracts ovate, 1.3–3 mm, membranous, apex acute. Pedicel and ovary 2–5 mm. Flowers pale yellow, with purplish brown stripes on sepals and petals and usually heavily tinged with purplish brown on lip. Sepals free, similar, ovate-lanceolate, 6–16 × 2–4 mm, apex long acuminate; lateral sepals slightly larger. Petals oblong, subelliptic, or linear, 1.5–4 × 1–2 mm, entire, obtuse; lip recurved, ovate-elliptic, 1.5–5 × 0.3–3 mm, 3-veined, base attached to end of column foot by an immobile joint, basal margins ± undulate, apex obtuse. Column 1–2 mm, stout; foot purplish brown, 1.3–4 mm, with free part 0.8–1.8 mm; stelidia deltoid, inconspicuous; anther cap glabrous. Fl. May.  $2n = 40$ .

Tree trunks in forests; 300–2400 m. N Guangdong, E Guangxi, Taiwan, SE and SW Yunnan [Japan, Korea].

**96. *Bulbophyllum tokioi*** Fukuyama, Bot. Mag. (Tokyo) 49: 439. 1935.

小叶石豆兰 xiao ye shi dou lan

*Bulbophyllum tokioi* f. *alboviride* Fukuyama.

Rhizome creeping, ca. 0.5 mm in diam., with tubular sheaths. Pseudobulb absent. Leaves small, well spaced, sessile; leaf blade elliptic or elliptic-orbicular, 5–6 × 3–4.5 mm, fleshy, with a few very small membranous sheaths at base, apex

rounded and mucronate. Scapes 1 or 2, axillary, erect, ca. 10 mm; raceme 2-flowered; peduncle slender; floral bracts elliptic, shorter than pedicel and ovary. Pedicel and ovary ca. 1 mm. Flowers yellowish white, tinged with purple on lip. Sepals membranous, glabrous, 3-veined; dorsal sepal oblong, ca. 2.5 × 1 mm, apex obtuse; lateral sepals obliquely ovate-triangular, 2.6–4 × 1.5–2 mm, apex acute. Petals oblong, 1.3–2.4 × 0.6–1

mm, 1-veined, entire, acute; lip ovate-triangular, 1.5–2.4 × ca. 1 mm, 3-veined, base attached to end of column foot by an immobile joint, margin entire, apex obtuse-rounded. Column 0.7–1 mm, base with a foot 1–2 mm; stelia delatoid, very small. Fl. Apr.

• Tree trunks in dense forests; 600–800 m. C and N Taiwan.

**17. *Bulbophyllum* sect. *Tripudianthes*** Seidenfaden, Dansk Bot. Ark. 33(3): 188. 1979.

双叶卷瓣兰组 *shuang ye juan ban lan zu*

*Tripudianthes* (Seidenfaden) Szlachetko & Kras.

Rhizome creeping, roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb. Pseudobulbs distinct, apex with 2 leaves. Leaves deciduous, thin. Inflorescences solitary, mostly arising near pseudobulbs, an elongate or somewhat contracted 2- to several-flowered raceme. Pedicel with basal node ± coinciding with attachment of subtending bract. Dorsal sepal with margins ± glabrous to erose or fimbriate, 3-veined; lateral sepals fused along their lower margins, 2–5 × as long as dorsal sepal, margins glabrous, 3–7-veined. Petals: margins fimbriate, 1-veined; lip: margins without auricles or distinct lateral lobes, margins glabrous to papillose or ciliate, adaxially partly papillose and hirsute. Column: stigma protruding at its base or not, foot short; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 4, inner less than 1/2 as long as outer or longer, all without appendages.

Eleven provisionally accepted species: India to Indochina, Thailand, Java; two species in China.

- 1a. Margins of dorsal sepal irregularly fimbriate ..... 97. *B. wallichii*  
 1b. Margins of dorsal sepal glabrous ..... 98. *B. khaoyaiense*

**97. *Bulbophyllum wallichii*** (Lindley) H. G. Reichenbach, Ann. Bot. Syst. 6: 259. 1861.

双叶卷瓣兰 *shuang ye juan ban lan*

*Cirrhopetalum wallichii* Lindley, Gen. Sp. Orchid. Pl. 59. 1830; *Bulbophyllum refractoides* Seidenfaden; *Phyllorkis wallichii* (Lindley) Kuntze; *Tripudianthes wallichii* (Lindley) Szlachetko & Kras.

Pseudobulbs close, ovoid, ca. 1 cm in diam., with 2 leaves at apex. Leaf deciduous at anthesis, sessile; blade narrowly oblong, usually ca. 5 × 1 cm, apex acute. Scape from base of leafless pseudobulb, erect, 10–15 cm, sparsely with 2 tubular sheaths; raceme usually nodding, ca. 4 cm, few to many flowered; floral bracts yellowish green, ovate-lanceolate, ca. 4 mm, apex acuminate. Sepals and petals yellowish brown, with dense purple spots, usually turning tangerine; lip purplish black adaxially and pale tangerine abaxially. Dorsal sepal lanceolate, ca. 5 × 1.7 mm, 1-veined, margins irregularly fimbriate, apex long acuminate and hooked; lateral sepals narrowly oblong, 3.7–4.0 × 2–2.5 mm, base adnate to column foot, twisted near base, sparsely ciliate, their lower edges connate to each other, apex acute and ± curved. Petals obliquely ovate-triangular, ca. 3 × 1.5 mm, margins irregularly fimbriate-ciliate, 1-veined, apex acuminate and ± hooked; lip reflexed, subglabrate, ca. 3.5 mm, fleshy, margins and abaxial surface ± hairy, base attached to end of column foot by a mobile joint, apex obtuse. Column white, ca. 1.5 mm, base with a distinct foot; stelia narrowly cylindrical, ca. 1.5 mm; anther cap purple, subglobose, finely papillate. Fl. Mar–Apr.  $2n = 38$ .

Tree trunks in forests; 1400–1500 m. S and W Yunnan [Bhutan, NE and NW India, Myanmar, Nepal, Thailand, Vietnam].

**98. *Bulbophyllum khaoyaiense*** Seidenfaden, Bot. Tidsskr. 65: 342. 1970.

白花卷瓣兰 *bai hua juan ban lan*

*Bulbophyllum tripudians* E. C. Parish & H. G. Reichenbach var. *pumilum* Seidenfaden & Smitinand.

Pseudobulbs close, subovoid, 1.3–2 cm, 7–8 mm in diam., with 2 leaves at apex. Leaves deciduous at anthesis. Scape from base of pseudobulb, erect, 14–15.5 cm; raceme nodding, 5–6 cm, usually with more than 10 secund flowers; peduncle stout, ca. 2 mm in diam., with 2 or 3 membranous sheaths; floral bracts lanceolate, ca. 3 mm, apex acuminate. Pedicel and ovary ca. 2 mm. Flowers thinly textured, white, with purplish red lip. Dorsal sepal narrowly ovate-triangular, ca. 8 × 2 mm, adaxially sparsely with short hairs, margin entire, apex long acuminate; lateral sepals lanceolate, ca. 20 × 2.5 mm, abaxial base densely papillate, base adnate to column foot, twisted near base, with their lower edges connate to each other, margin entire, apex acuminate. Petals narrowly triangular, ca. 4 × 1.2 mm, margins sparsely fimbriate-ciliate, apex long acuminate; lip ca. 2 × 1 mm, fleshy, fleshy-thickened in apical half, with papillate hairs adaxially, base attached to end of column foot by a mobile joint. Column ca. 1.5 mm, base with a foot ca. 1 mm; stelia subulate, ca. 1 mm, ± hooked; anther cap subglobose, apex densely papillate. Fl. Mar.

Tree trunks in forests; ca. 1400 m. S Yunnan [Thailand].

**18. *Bulbophyllum* sect. *Pleiophylla*** J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 13: 34. 1914 [*“Pleiophyllus”*].

双叶石豆兰组 *shuang ye shi dou lan zu*

Rhizome creeping, roots sprouting mainly below pseudobulbs, spreading; new shoots arising from basal node of pseudobulb.

Pseudobulbs distinct, apex with 2 leaves. Leaves deciduous, thin. Inflorescence solitary, mostly arising near pseudobulbs, an elongate or somewhat contracted several- to many-flowered raceme. Pedicel with basal node  $\pm$  coinciding with attachment of subtending bract. Sepals: margins glabrous to ciliate, surface glabrous to hirsute, 3-veined; lateral sepals free (fused along their lower margins in *Bulbophyllum cariniflorum* and *B. triste*), ca. as long as dorsal sepal or slightly longer. Petals: margins glabrous, 1-veined; lip: margins without auricles or distinct lateral lobes, margins glabrous to papillose, adaxially glabrous to papillose. Column: stigma protruding at its base or not, foot short; anther: front margin projecting or not, abaxially with or without a low, rounded crest; pollinia 2 or 4, with inner ca. 1/2 as long as outer or shorter, all without appendages.

Nineteen provisionally accepted species: India to Indochina, Thailand, Sumatra; five species in China.

1a. Flowers and leaves appearing at same time.

2a. Lateral sepals distinctly keeled; leaves 12–15  $\times$  2.7–4 cm, apex acute; scape shorter than leaves ..... 99. *B. cariniflorum*

2b. Lateral sepals not keeled; leaves 3–7  $\times$  1–2.1 cm, apex rounded and emarginate; scape much longer than leaves ..... 100. *B. shanicum*

1b. Flowers and leaves not appearing at same time.

3a. Lateral sepals connate along lower margins; pseudobulbs subglobose, broader than long ..... 101. *B. triste*

3b. Lateral sepals free; pseudobulbs ovoid or ovoid-conic, longer than broad.

4a. Sepals abaxially hirsute; rachis pubescent ..... 102. *B. hirtum*

4b. Sepals abaxially glabrous; rachis glabrous ..... 103. *B. suavissimum*

**99. *Bulbophyllum cariniflorum*** H. G. Reichenbach, Ann. Bot. Syst. 6: 253. 1861.

尖叶石豆兰 *jian ye shi dou lan*

*Bulbophyllum densiflorum* Rolfe.

Rhizome stout, ca. 3 mm in diam., rooting from base of pseudobulbs. Pseudobulbs close, ovoid, 1–1.5 in diam., with 2 leaves at apex. Leaves deciduous at anthesis; petiole 5–10 mm; leaf blade oblong, 12–15  $\times$  2.7–4 cm, leathery, base contracted into petiole, apex acute. Scape from base of pseudobulb, ca. 8 cm; panicle nodding, 2–3 cm, densely many flowered; peduncle ca. 1.2 mm in diam., with 3 or 4 sheaths; floral bracts narrowly lanceolate, 3–4 mm, apex acuminate. Pedicel and ovary 2–3 mm. Flowers yellow, not widely opening, thickly textured. Sepals similar, ovate-oblong, ca. 6  $\times$  3 mm, apex obtuse; dorsal sepal concave; lateral sepals with lower edges connate to each other, base ca. 1/2 width adnate to column foot, apex hooded. Petals lanceolate, ca. 3.5  $\times$  1.5 mm, entire, acute; lip recurved,  $\pm$  conduplicate, ligulate, ca. 3  $\times$  1.3 mm, fleshy, entire, obtuse. Column ca. 2 mm; foot ca. 2 mm, with free part ca. 1 mm; stelidia deltoid, ca. 1 mm; anther cap finely papillate margined. Fl. Jul.  $2n = 38$ .

Rocks in mixed forests; 2100–2200 m. S Xizang [Bhutan, NE India, Nepal, Thailand].

**100. *Bulbophyllum shanicum*** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 587. 1897.

二叶石豆兰 *er ye shi dou lan*

Rhizome creeping, ca. 3 mm in diam., densely with tubular sheaths, rooting from base of pseudobulbs. Pseudobulbs 1–2 cm apart from each other, ovoid, 7–14 mm in diam., with 2 leaves at apex. Leaves deciduous at anthesis, subsessile; leaf blade obovate-lanceolate, 3–7  $\times$  1–2.1 cm, leathery, apex rounded and emarginate. Scape from base of leafless pseudobulb, erect, 11–17 cm; raceme 6–10 cm, densely with many secund flowers, peduncle ca. 1.5 mm in diam., glabrous, with 5 tubular sheaths; floral bracts lanceolate, small, ca. 3 mm, apex acuminate. Pedicel and ovary 4–5 mm. Flowers pale yellow. Sepals free, ovate-lanceolate, 3-veined, apex obtuse; dorsal sepal ca. 4.5  $\times$  1.6 mm; lateral sepals ca. 5.5  $\times$  3 mm, base ca.

1/2 width adnate to column foot. Petals ovate-lanceolate, ca. 4  $\times$  1.3 mm, entire, acute or mucronate; lip reflexed,  $\pm$  conduplicate, ca. 3 mm, fleshy, adaxially with 1 longitudinal keel, apex obtuse, ciliate. Column ca. 1.8 mm; foot ca. 1.5 mm, with free part ca. 0.3 mm; stelidia deltoid, ca. 0.8 mm; anther cap densely finely papillate, centrally with 1 globose projection. Fl. Oct.

Rocks in forests; 1800–1900 m. SW Yunnan [Myanmar].

**101. *Bulbophyllum triste*** H. G. Reichenbach, Ann. Bot. Syst. 6: 253. 1861.

球茎石豆兰 *qiu jing shi dou lan*

*Phyllorkis tristis* (H. G. Reichenbach) Kuntze.

Rhizome stout, 2–3 mm in diam. Pseudobulbs ca. 5 mm apart on rhizome, subglobose, broader than long, 13–20 mm in diam., apex with 2 leaves. Leaf deciduous at anthesis, subsessile; blade pale green,  $\pm$  lanceolate, ca. 10  $\times$  2 cm, apex acute. Scape arising from base of leafless pseudobulb, 2–4 cm; raceme sometimes nodding, 1–1.5 cm, densely many flowered; peduncle ca. 1 mm in diam., with 2 or 3 sheaths 5–6 mm; floral bracts 2–3 mm, apex acute. Pedicel and ovary ca. 2 mm. Flowers pale purplish red, marked with purple spots. Dorsal sepal ovate, concave, ca. 4  $\times$  2.2 mm, glabrous, entire, acute; lateral sepals adnate to column foot, ovate, ca. 5  $\times$  2.2 mm, glabrous, their lower edges connate to each other, entire, acute. Petals triangular, ca. 2.2  $\times$  1.2 mm, base ca. 1/2 width adnate to column foot, margin entire, apex acute; lip ligulate, ca. 3.2 mm,  $\pm$  fleshy, base grooved, attached to end of column foot by an immobile joint, margin decurved. Column ca. 2 mm; foot ca. 1.5 mm, with free part ca. 1 mm; stelidia narrowly lanceolate, ca. 0.6 mm; anther cap slightly and minutely papillate. Fl. Jan–Feb.  $2n = 38$ .

Tree trunks in forests; 800–1800 m. S Yunnan [India, Myanmar, Nepal, Thailand].

**102. *Bulbophyllum hirtum*** (Smith) Lindley, Gen. Sp. Orchid. Pl. 51. 1830.

落叶石豆兰 *luo ye shi dou lan*

*Stelis hirta* Smith in Rees, Cycl. 34: Stelis no. 11. 1816;

*Phyllorkis hirta* (Smith) Kuntze; *Tribrachia hirta* (Smith) Lindley.

Rhizome creeping and rooting, 3–4 mm in diam. Pseudobulbs 5–10 mm apart from each other, ovoid-conic, 1.5–3 cm, ca. 1 cm in diam., with 2 leaves at apex. Leaves deciduous at anthesis; petiole ca. 5 mm; blade elliptic or oblong, ca. 12 × 2.5–3 cm, leathery, apex obtuse. Scape arising from base of leafless pseudobulb, to 15 cm; raceme pendulous, ca. 5 cm, with pubescent rachis, densely with many small flowers; peduncle ca. 3 mm in diam., with 2 or 3 tubular sheaths; floral bracts ovate, ca. 0.7 mm, apex acute, ciliate. Pedicel and ovary pubescent, ca. 1 mm. Flowers greenish white. Sepals free; dorsal sepal lanceolate, ca. 4.5 × 2 mm, abaxially densely pubescent, apex acute and slightly curved; lateral sepals slightly larger than dorsal sepal, obliquely ovate-lanceolate, abaxially densely pubescent, base adnate to column foot, apex acute. Petals oblanceolate, ca. 2 × 1.5 mm, membranous, margins fimbriate-ciliate; lip recurved, ± conduplicate, narrowly oblong, fleshy, ciliate, base attached to end of column foot by an immobile joint, apex retuse. Column ca. 1.5 mm; stelidia subulate, nearly as high as anther, ca. 0.5 mm; foot ca. 2.7 mm, with free part ca. 0.7 mm; anther cap papillate. Fl. Jul.

Tree trunks in evergreen broad-leaved forests; ca. 1800 m. S Yunnan [NE India, Myanmar, Nepal, Thailand, Vietnam].

**103. *Bulbophyllum suavissimum*** Rolfe, Gard. Chron., ser. 3, 5: 297. 1889.

直葶石豆兰 zhi ting shi dou lan

Rhizome creeping, ca. 1.5 mm in diam. Pseudobulbs ca. 1 cm apart on rhizome, ovoid, ca. 8 mm, ca. 5 mm in diam., with 2 leaves at apex. Leaves deciduous at anthesis, not seen. Scape from base of leafless pseudobulb, erect, ca. 8 cm; peduncle slender, with 2 or 3 sheaths ca. 4 mm; raceme sparsely with several secund flowers; rachis glabrous; floral bracts ovate, 1.5–2 mm, apex acute. Pedicel and ovary ca. 4 mm. Flowers thinly textured, pale yellow. Dorsal sepal ovate, ca. 4 × 2.2 mm, entire, acute; lateral sepals ovate-lanceolate, ca. 6 × 2 mm, base adnate to column foot, margin entire, apex acute. Petals ovate-lanceolate, ca. 2.8 × 1.2 mm, base ca. 1/2 width adnate to column foot, apical margin ± denticulate, apex obtuse; lip recurved, narrowly oblong, ca. 3.5 × 0.7 mm, fleshy, centrally channeled at base, adaxially densely finely papillate, apex obtuse. Column ca. 1.5 mm; foot ca. 1.5 mm, with free part ca. 0.5 mm; stelidia dentate, apex subulate; anther cap subglobose, finely papillate. Fl. Mar.

Tree trunks in evergreen broad-leaved forests; ca. 900 m. S Yunnan [Myanmar, N Thailand].

### 143. **MONOMERIA** Lindley, Gen. Sp. Orchid. Pl. 61. 1830.

短瓣兰属 duan ban lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jaap J. Vermeulen

Herbs, epiphytic. Rhizome creeping, stout, rooting from nodes of rhizomes. Pseudobulbs often spaced on rhizome, with a leaf at apex. Leaf long petiolate; blade thickly textured, base contracted into petiole. Scape arising laterally from base of pseudobulb; raceme sparsely many flowered; floral bracts persistent, shorter than pedicel and ovary. Flowers medium-sized. Dorsal sepal usually smaller than lateral sepals; lateral sepals adnate at base to distal half of column foot, their lower edges connate at base or apex to each other. Petals smaller than sepals, base decurrent and adnate to basal half of column foot, margins denticulate or erose; lip 3-lobed, usually pandurate, base attached to end of column foot by a mobile joint, with 2 small auricles on both basal sides; disk with 2 lamellae adaxially. Column stout, both sides winged, with distinct stelidia; foot rather long, upcurved; pollinia waxy, 4, unequal in size, in 2 pairs, subglobose, with a common stipe and a viscidium.

About three species: Nepal to Myanmar, Thailand, and Vietnam; one species in China.

**1. *Monomeria barbata*** Lindley, Gen. Sp. Orchid. Pl. 61. 1830.

短瓣兰 duan ban lan

*Epicranthes barbata* (Lindley) H. G. Reichenbach.

Rhizome creeping, ca. 5 mm in diam. Pseudobulbs ca. 6 cm apart on rhizome, ovoid, ca. 4 cm, ca. 1.5 cm in diam. Petiole 9–10 cm; leaf blade oblong, 21–22 × ca. 4 cm, thickly leathery, base contracted into petiole, apex obtuse and retuse. Scape ascending, 16–28 cm; raceme 5–10 cm, sparsely 4–7-flowered; peduncle 11–18 cm, stout, 3–4 mm in diam., sparsely with 3–5 sheaths 6–10 mm; floral bracts ovate, ca. 7 mm, apex obtuse. Pedicel and ovary ca. 1.8 cm. Flowers widely opening,

yellow, tinged with reddish. Dorsal sepal erect, ovate, concave, ca. 15 × 5 mm, 6-veined, apex acute; lateral sepals lanceolate, ca. 20 × 7 mm, adaxially densely hispid, 6-veined, apex acuminate. Petals obliquely triangular, ca. 3 × 2.5 mm, margins erose or slightly fimbriate, 1-veined, apex acute; lip 3-lobed; lateral lobes nearly suborbicular; mid-lobe somewhat larger, apex obtuse; basal auricles narrowly falcate; disk with 2 membranous lamellae. Column ca. 6 mm, base with a foot ca. 8 mm, with wings dilated at middle; stelidia deltoid. Fl. Jan.

Tree trunks or rocks in forests; 1000–2000 m. SW Guizhou, SE Xizang, W to SE Yunnan [NE India, Myanmar, Nepal, Thailand, N Vietnam].

### 144. **SUNIPIA** Lindley, Orchid. Scelet. 14, 21, 25. 1826.

大苞兰属 da bao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jaap J. Vermeulen

*Ione* Lindley.

Herbs, epiphytic. Rhizome creeping, elongate. Pseudobulbs usually well spaced on rhizome, with 1 leaf at apex. Scape arising laterally from base of pseudobulb; raceme usually several to many flowered, rarely reduced to a solitary flower; floral bracts large or small. Flowers small. Sepals similar; lateral sepals usually  $\pm$  connate at base along lower margins just below lip. Petals smaller than sepals; lip unlobed or inconspicuously 3-lobed, often ligulate, base usually adnate to column foot, immobile. Column short; foot very short or inconspicuous; rostellum 2-lobed, reflexed; anther terminal, 2-locular, with conspicuous connective; pollinia waxy, 4, subglobose, equal in size, in 2 pairs, with a common Y-shaped stipe and a single viscidium or each pair with a stipe and a viscidium.

About 20 species: Nepal to Myanmar, Thailand, and Vietnam; 11 species (one endemic) in China.

- 1a. Inflorescence many flowered.  
 2a. Flowers distichous; floral bracts ca. 7 mm, partly covering flowers; stipes with a single, shared viscidium ..... 1. *S. scariosa*  
 2b. Flowers spirally arranged; floral bracts 2–3.5 mm, not or hardly covering flowers; stipes each with a viscidium ..... 2. *S. thailandica*
- 1b. Inflorescence 1–10-flowered.  
 3a. Scape 2–3 cm.  
 4a. Dorsal sepal 4.5–5 mm; lip ca. 2.5 mm ..... 3. *S. intermedia*  
 4b. Dorsal sepal 7–10 mm; lip 5–6 mm ..... 4. *S. andersonii*
- 3b. Scape 4.5–40 cm.  
 5a. Peduncle 10–35 cm.  
 6a. Lip adaxially with 2 distinct lamellae starting as thick knobs near base, then lower and diverging ..... 5. *S. cirrhata*  
 6b. Lip adaxially  $\pm$  without lamellae or with a single median one.  
 7a. Median sepal more than 1.5  $\times$  as long as wide ..... 6. *S. soidaoensis*  
 7b. Median sepal less than 1.5  $\times$  as long as wide ..... 7. *S. annamensis*
- 5b. Peduncle shorter than 10 cm.  
 8a. Petals suborbicular, ca. as long as wide ..... 8. *S. rimannii*  
 8b. Petals elliptic or ovate to obovate, much longer than wide.  
 9a. Lip margins entire to slightly and minutely crenulate.  
 10a. Dorsal sepal ca. 7 mm; petals ca. 4 mm; lip gradually contracted into a thickened top ..... 6. *S. soidaoensis*  
 10b. Dorsal sepal ca. 4.5 mm; petals ca. 1.2 mm; lip abruptly contracted into a thickened top .... 9. *S. hainanensis*  
 9b. Lip margins partly distinctly erose-lacerate.  
 11a. Lip (excluding thickened top part) obovate to pandurate ..... 10. *S. bicolor*  
 11b. Lip (excluding thickened top part) ovate to lanceolate ..... 11. *S. candida*

**1. *Sunipia scariosa*** Lindley, Gen. Sp. Orchid. Pl. 179. 1833.

大苞兰 da bao lan

*Ione racemosa* (Smith) Seidenfaden; *I. scariosa* (Lindley) King & Pantling; *Stelis racemosa* Smith; *Sunipia racemosa* (Smith) Tang & F. T. Wang; *Tribrachia racemosa* (Smith) Lindley.

Rhizome creeping, stout, ca. 4 mm in diam. Pseudobulbs ca. 4 cm apart on rhizome, ovoid or obliquely ovoid, 2–3 cm, ca. 1.5 cm in diam., with 1 leaf at apex. Petiole ca. 1.5 cm; leaf blade oblong, 12–16.5  $\times$  ca. 2 cm, leathery, base contracted into petiole, apex obtuse and retuse. Scape to 33 cm; raceme  $\pm$  nodding, more than 10-flowered; peduncle 8–23 cm, 2–3 mm in diam., sparsely with 3–5 tubular sheaths; floral bracts regularly distichous, broadly ovate, cymbiform, ca. 7  $\times$  6 mm, membranous, apex acute. Pedicel and ovary ca. 2 mm. Flowers small, enclosed in floral bracts, pale yellow. Dorsal sepal ovate, concave, ca. 4.5  $\times$  3 mm, apex acute; lateral sepals obliquely ovate,  $\pm$  V-shaped-conduplicate, ca. 6.5  $\times$  2.5 mm, with 1 vein, their lower edges connate to each other, apex acute. Petals obliquely ovate, ca. 3  $\times$  2.2 mm, 1-veined, abaxial base with 1 fleshy ligulate appendage, margins denticulate, apex obtuse; lip ligulate, ca. 4.5  $\times$  2 mm, fleshy, adaxial base with a channel and a keel in it, apex obtuse. Column ca. 2 mm; foot inconspicuous; 2 pairs of pollinia with 1 common Y-shaped stipe and a single viscidium. Fl. Mar–Apr.

Tree trunks in open forests; 800–2500 m. S and W Yunnan [NE India, Myanmar, Nepal, N Thailand, N Vietnam].

**2. *Sunipia thailandica*** (Seidenfaden & Smitinand) P. F. Hunt, Kew Bull. 26: 184. 1971.

光花大苞兰 guang hua da bao lan

*Ione thailandica* Seidenfaden & Smitinand, Orchids Thailand 4(2): 813. 1965.

Pseudobulbs close, conic, 7–11 mm, ca. 1 cm in diam., with 1 leaf at apex. Scape ascending, ca. 7.5 mm; peduncle ca. 1 mm in diam., with 3 or 4 tubular sheaths; raceme ca. 4.5 cm, more than 10-flowered; floral bracts narrowly lanceolate, 2–3.5 mm, apex acute. Pedicel and ovary ca. 2 mm. Flowers purplish red, with pale yellow lip. Dorsal sepal ovate, concave, ca. 4  $\times$  2.5 mm, 3-veined, apex obtuse; lateral sepals oblong, ca. 4.2  $\times$  1.5 mm, base adnate to column foot, their lower edges connate to each other except apices, apex obtuse. Petals broadly oblong or subsquare, ca. 2.2  $\times$  1.5 mm, membranous, 1-veined, abaxial base with 1 appendage, margin entire, apex subtruncate and retuse; basal appendage deltoid, ca. 0.2 mm, fleshy, apex obtuse; lip ligulate or subsagittate, ca. 3.8  $\times$  2.5 mm, adaxially  $\pm$  scaly on basal half, with 2 round calli at base and 3 longitudinal stripes from base to middle or near apex. Column ca. 1 mm; foot ca. 0.5 mm; 2 pairs of pollinia with 1 common Y-shaped stipe and a single viscidium. Fl. Apr.

*Quercus* trees in mixed forests; 1400–1700 m. S and SW Yunnan [N Thailand].

**3. *Sunipia intermedia*** (King & Pantling) P. F. Hunt, Kew Bull. 26: 184. 1971.

少花大苞兰 shao hua da bao lan

*Ione intermedia* King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 120. 1896.

Rhizome creeping, ca. 1.5 cm in diam. Pseudobulbs ca. 3 cm apart on rhizome, ovoid-conic, 5–10 mm, 5–6 mm in diam., with 1 leaf at apex. Leaf shortly petiolate; blade erect, narrowly oblong, 3–4 × 0.4–0.5 cm, leathery, base contracted, apex obtuse and retuse. Scapes solitary or in pairs, erect, 2–3 cm; peduncle slender, with 3 sheaths ca. 8 mm; raceme 7–10 mm, 2- or 3-flowered; floral bracts ovate, ca. 5 × 2 mm, apex shortly acuminate. Flowers pale green. Dorsal sepal lanceolate, 4.5–5 × ca. 1.2 mm, apex acuminate; lateral sepals similar to dorsal sepal, inconspicuously 3-veined, their lower edges connate forming an ovate-elliptic synsepal. Petals linear-lanceolate, 3.5–4 × ca. 0.5 mm, fleshy, basal half ciliate, both surfaces densely papillate, apex obtuse; lip similar to petals, with an orbicular disk ca. 1 mm wide and a linear-cuspidate, involute-margined limb ca. 2.5 × 0.3 mm, both surfaces densely papillate, basal margins sparsely denticulate, apex acute. Column ca. 1.5 mm, base with a foot ca. 0.4 mm; 2 pairs of pollinia with 1 common Y-shaped stipe and a single viscidium. Fl. Aug.

Tree trunks in evergreen broad-leaved forests; ca. 2000 m. SE Xizang [India (Sikkim)].

**4. *Sunipia andersonii*** (King & Pantling) P. F. Hunt, Kew Bull. 26: 183. 1971.

黄花大苞兰 huang hua da bao lan

*Ione andersonii* King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 159. 1898; *I. andersonii* var. *flavescens* (Rolfe) Tang & F. T. Wang; *I. bifurcatoflorens* Fukuyama; *I. flavescens* Rolfe; *I. sasakii* Hayata; *Sunipia bifurcatoflorens* (Fukuyama) P. F. Hunt; *S. sasakii* (Hayata) P. F. Hunt.

Rhizome creeping, ca. 1.5 mm in diam. Pseudobulbs 1–4 cm apart on rhizome, ovoid, 1–1.5 cm, 3–10 mm in diam., 1-leaved at apex. Leaf subsessile; blade narrowly oblong, 5–10 × 0.7–1 cm, leathery, base cuneate, apex obtuse and retuse. Scape ca. 3 cm; raceme few flowered; floral bracts ovate-lanceolate, ca. 10 × 5 mm. Pedicel and ovary ca. 1 cm. Flowers pale yellow or yellowish green, with deep yellow lip. Sepals free, similar, ovate-lanceolate, 7–10 × 3–5 mm, apical margins ± incurved, apex acute and recurved. Petals narrowly ovate-lanceolate, 5–6 × 2–2.5 mm, abruptly contracted above middle and cylindrical-thickened, inconspicuously 3-veined, basal margins fimbriate, apex obtuse; lip ovate, 5–6 × ca. 2.5 mm, base with 1 fleshy transverse callus, incised margined in basal half, apex obtuse. Column 1–1.5 mm, with a foot 1(–5) mm; rostellum horseshoe-shaped; each pair of pollinia with a stipe and a viscidium. Fl. Sep–Oct.

Tree trunks in forests; 700–1800 m. Taiwan, S and W Yunnan [Bhutan, NE India, Myanmar, N Thailand, N Vietnam].

**5. *Sunipia cirrhata*** (Lindley) P. F. Hunt, Kew Bull. 26: 184. 1971.

云南大苞兰 yun nan da bao lan

*Ione cirrhata* Lindley, Fol. Orchid. 2(Ione): [1]. 1853.

Rhizome creeping, 3–4 mm in diam. Pseudobulbs 1–3.5 cm apart on rhizome, ovoid-conic, cylindrical to obpyriform, 2–3.5 cm, 10–15 mm in diam., with a terminal leaf. Petiole 1.4–4 cm; leaf blade elliptic to oblong to obovate, 9–16 × 2–3.1 cm, apex obtuse. Scape from base of pseudobulb, 21–40 cm; raceme to 5.5 cm, laxly 4–8-flowered; peduncle 15–35 cm, slender, with 6 scalelike sheaths; floral bracts 1.9–2.5 mm. Pedicel and ovary 10–15 mm. Flowers (off-)white with purple veins, lip purple. Dorsal sepal lanceolate, 12–24 × 3–5 mm, margin glabrous, apex acuminate; lateral sepals similar, 14–26 × 6–8 mm, with their lower edges connate except near apex, apex acuminate. Petals broadly ovate, 4–5 × 1–1.5 mm, margins entire to erose, apex obtuse; lip lanceolate, 1.5–2 × 0.35–0.7 mm, adaxially with 2 lamellae starting as thick knobs near base, then lower and diverging. Column stout, 2–3 × 1.1–1.3 mm; foot short, attenuate, anther cap in front with 2 distinct projections. Fl. Oct–Dec.

Evergreen forests; 800–1800 m. Yunnan [Bhutan, India, Myanmar].

**6. *Sunipia soidaensis*** (Seidenfaden) P. F. Hunt, Kew Bull. 26: 184. 1971.

苏瓣大苞兰 su ban da bao lan

*Ione soidaensis* Seidenfaden, Bot. Tidsskr. 64: 220. 1969.

Rhizome creeping, ca. 2 mm in diam. Pseudobulbs ca. 1 cm apart on rhizome, ovoid, 1.3–1.5 cm, 7–10 mm in diam., with 1 leaf at apex. Petiole ca. 7 mm; leaf blade erect, oblong, 5.5–7.5 × 0.9–1.2 cm, thickly leathery, base contracted into petiole, apex obtuse and retuse. Scape erect, 11–22 cm; raceme slightly nodding, 3- or 4-flowered; peduncle 6–17 cm, 1.5–2 mm in diam., sparsely with 3 sheaths ca. 1.5 cm; floral bracts ovate, 8–12 mm, membranous, apex acuminate. Pedicel and ovary ca. 12 mm. Flowers slightly thickly textured. Dorsal sepal ovate-lanceolate, ca. 7 × 4 mm, 6-veined, apex subacute; lateral sepals lanceolate, ca. 11 × 3 mm, their lower edges connate to each other in basal half, apex acute. Petals ovate-triangular, ca. 4 × 2.5 mm, 3-veined, abaxial base with 1 fleshy triangular appendage, margins fimbriate, apex acuminate; lip ovate-triangular, ca. 6 × 4.5 mm, narrowed and thickened in apical half, apex obtuse. Column ca. 2.5 mm, stout, base with a foot ca. 1 mm; each pair of pollinia with a stipe and a viscidium. Fl. Sep–Oct.

Tree trunks in forests; 1900–2000 m. SW Yunnan [SE Thailand].

**7. *Sunipia annamensis*** (Ridley) P. F. Hunt, Kew Bull. 26: 183. 1971.

绿花大苞兰 lü hua da bao lan

*Ione annamensis* Ridley, J. Nat. Hist. Soc. Siam 4: 115. 1921.

Rhizome creeping, ca. 2 mm in diam. Pseudobulbs ca. 1.5 cm apart on rhizome, ovoid, 1.7–2.5 cm, ca. 13 mm in diam.,

with 1 leaf at apex. Petiole ca. 15 mm; leaf blade erect, oblong, 8.5–11 × 2–2.5 cm, thickly leathery, base contracted into petiole, apex obtuse and retuse. Scape erect, 15–35 cm; raceme erect, 4–6-flowered; peduncle 12–30 cm, 1.5–2 mm in diam., with 6 sheaths 1.5–2 cm; floral bracts ovate to triangular, 10–12 mm, membranous, apex acuminate. Pedicel and ovary 10–13 mm. Dorsal sepal ovate, ca. 10 × 6–7 mm, 7-veined, apex rounded to obtuse; lateral sepals ovate, 11–14 × ca. 5 mm, lower edges free or ± connate (see note below) to each other in basal half, apex acute. Petals ovate-triangular, 5.5–6 × 5.5–6 mm, 3-veined, margins erose-denticulate, apex obtuse; lip ± cordate to rhombiform, 7–9 × 7–10 mm, slightly narrowed and thickened in apical half, apex obtuse. Column ca. 2 mm, stout, base with a foot ca. 1 mm; each pair of pollinia with a stipe and a viscidium. Fl. Oct.

Tree trunks in forests; ca. 2400 m. S Yunnan (Lüchun) [Thailand, Vietnam].

X. H. Jin et al. (Acta Bot. Yunnan. 29: 394. 2007) reported *Sunipia annamensis* from the locality given above. Their description may well refer to this species, although they described the lateral sepals as connate. We have not seen the specimen (X. H. Jin 8545, PE). The Chinese record needs confirmation.

**8. *Sunipia rimannii*** (H. G. Reichenbach) Seidenfaden, Nat. Hist. Bull. Siam Soc. 28: 8. 1980.

圆瓣大苞兰 yuan ban da bao lan

*Acrochaene rimannii* H. G. Reichenbach, Gard. Chron., n.s., 17: 796. 1882; *Ione rimannii* (H. G. Reichenbach) Seidenfaden; *I. salweenensis* Phillimore & W. W. Smith; *Monomeria rimannii* (H. G. Reichenbach) Schlechter; *Sunipia salweenensis* (Phillimore & W. W. Smith) P. F. Hunt.

Rhizome ca. 2 mm in diam. Pseudobulbs ca. 1.5 cm apart on rhizome, ovoid, ca. 2 cm, ca. 8 mm in diam., with 1 leaf at apex. Petiole ca. 7 mm; leaf blade erect, oblong, 7–10 × 1.1–1.7 cm, leathery, base contracted into petiole, apex obtuse and retuse. Scape erect, 5–8 cm; raceme 2- or 3-flowered; peduncle 4–6 cm, slender, with 2 or 3 sheaths; floral bracts ovate-lanceolate, ca. 6 mm, membranous, apex acute. Pedicel and ovary ca. 5 mm. Flowers thinly textured, yellow. Dorsal sepal lanceolate, ca. 8 × 3 mm, apex acuminate, ± incurved; lateral sepals lanceolate, ca. 10 × 2.5 mm, their lower edges connate to each other except apices, apex acuminate. Petals suborbicular, ca. 3 × 2.5–3 mm, margins erose-toothed; lip elliptic-oblong to subrhombic, ca. 7 × 3.5 mm, centrally with a thickened longitudinal band from base to apex and stretching out to form an oblong-conic mucro at apex, margin denticulate. Column ca. 2 mm; each pair of pollinia with a stipe and a viscidium. Fl. Nov.

Tree trunks in forests; ca. 1600 m. W to SE Yunnan [Myanmar, Thailand].

**9. *Sunipia hainanensis*** Z. H. Tsi, Acta Phytotax. Sin. 33: 590. 1995.

海南大苞兰 hai nan da bao lan

Pseudobulbs ca. 5 mm apart on rhizome, ovoid, 1–1.5 cm, 5–7 mm in diam., with 1 leaf at apex. Leaf subsessile; blade narrowly oblong, 4.5–5.5 × 0.5–0.6 cm, leathery, apex obtuse. Scape erect, ca. 5 cm; peduncle with 2 sheaths; raceme ca. 1.5 cm, 6–8-flowered; floral bracts narrowly lanceolate, ca. 4.2

mm, apex acuminate. Pedicel and ovary 3–3.5 mm. Flowers small. Dorsal sepal ovate-lanceolate, ca. 4.5 × 0.6 mm, margin incurved in apical half, apex long acuminate; lateral sepals similar to dorsal sepal, upper edges incurved, lower edges connate to each other except apices. Petals subobovate, ca. 1.2 × 0.5 mm, 1-veined, apex obtuse-rounded; lip ovate-lanceolate, ca. 2.5 mm, abruptly contracted and thickened in apical half, apex obtuse. Column very short; foot inconspicuous; each pair of pollinia with a stipe and a viscidium. Fl. Mar–Apr.

• Tree trunks in forests; ca. 900 m. Hainan.

**10. *Sunipia bicolor*** Lindley, Gen. Sp. Orchid. Pl. 179. 1833.

二色大苞兰 er se da bao lan

*Bulbophyllum bicolor* (Lindley) J. D. Hooker (1890), not Lindley (1830); *Ione bicolor* (Lindley) Lindley.

Rhizome creeping, elongate, usually branched, ca. 2 mm in diam. Pseudobulbs 2–3 cm apart on rhizome, nearly pyriform, 1–2 cm, ca. 1 cm in diam., 1-leaved at apex. Petiole 3–5 mm; leaf blade oblong, 3–9 × 0.6–1.6 cm, leathery, base contracted into petiole, apex obtuse and retuse. Scapes 1–3, suberect, 4.5–8 cm; peduncle 1.5–4 cm, slender, with 3 or 4 membranous sheaths to 0.6–1 cm; raceme 3–4 cm, usually 3–10-flowered; floral bracts ovate-lanceolate, 7–9 × ca. 2.5 mm, membranous, apex acute. Pedicel and ovary 2–3 mm. Flowers thinly textured; sepals and petals whitish with purplish red stripes; lip purple-red. Dorsal sepal ovate-lanceolate, 8–10 × ca. 2.5 mm, 3-veined, apex acute-acuminate; lateral sepals similar to dorsal sepal, base adnate to column foot, lower edges connate to each other with free apices. Petals ovate or ovate-oblong, ca. 3 × 2 mm, 1-veined, margins denticulate, apex obtuse-rounded; lip pandurate, ca. 6 × 3.5 mm, adaxially with 1 thickened ridge from base to apex and swollen at both ends, base subrounded-auriculate on both sides, margin erose-lacerate, apex obtuse. Column stout, ca. 1 mm long and wide; foot ca. 0.5 mm; each pair of pollinia with a stipe and a viscidium. Capsule ovoid, ca. 5 mm, ca. 3 mm in diam. Fl. and fr. Jul–Nov.  $2n = 40$ .

Tree trunks in forests, rocks along valleys; 1900–2800 m. SE Xizang, SE to W Yunnan [Bangladesh, Bhutan, India, Myanmar, Nepal, N Thailand].

**11. *Sunipia candida*** (Lindley) P. F. Hunt, Kew Bull. 26: 183. 1971.

白花大苞兰 bai hua da bao lan

*Ione candida* Lindley, Fol. Orchid. 2(Ione): 3. 1853; *Bulbophyllum candidum* (Lindley) J. D. Hooker.

Rhizome creeping, ca. 1.5 mm in diam. Pseudobulbs 1.5–2 cm apart on rhizome, ovoid, 1–1.5 cm, 5–7 mm in diam., with 1 leaf at apex. Leaf shortly petiolate; blade erect, narrowly oblong, 3–6 × 0.4–0.7 cm, leathery, apex obtuse and retuse. Scapes solitary or in pairs, erect, 5–9 cm; peduncle yellowish green, 2–4 cm, slender, with 2 or 3 tubular sheaths ca. 6 mm; raceme 3–4 cm, usually 7- or 8-flowered; floral bracts narrowly lanceolate, 5–7 mm, membranous, apex acuminate. Pedicel and ovary 4–7 mm. Flowers thinly textured; sepals and petals greenish white; lip yellow in apical half and white in basal half. Dorsal sepal ovate-lanceolate, ca. 6 × 1.5 mm, apex acuminate;

lateral sepals similar to dorsal sepal, their lower edges connate to each other except apices. Petals ovate, ca.  $3 \times 1.5\text{--}1.7$  mm, membranous, 1-veined, margins erose, apex acute; lip ovate-lanceolate, abruptly contracted near middle,  $5.6\text{--}6 \times 1.6\text{--}2$  mm, adaxially with 1 thickened keel from base to apex, margins

erose-lacerate in basal half, apex obtuse. Column white, ca. 1 mm; foot ca. 1 mm; each pair of pollinia with a stipe and a viscidium. Fl. Jul–Aug.  $2n = 40$ .

Tree trunks in forests; 1900–2900 m. S and SE Xizang, NW to S Yunnan [Bhutan, NE India].

### 145. TAENIOPHYLLUM Blume, Bijdr. 355. 1825.

带叶兰属 dai ye lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic, monopodial, small. Roots radiate, appressed to tree trunk or branch, green and photosynthetic in rainy season, whitish or grayish in dry season, flattened or terete, rather long and stout. Stems short, nearly invisible. Leaves absent or reduced to tiny brown scales. Inflorescences lateral, short; rachis slowly elongating, with flowers opening in succession 1 or 2 at a time; floral bracts persistent, alternate. Flowers usually lasting only a day, small. Sepals and petals free and widely spreading or connate at base or below middle into a tube. Lip entire or 3-lobed, attached to base of column, spurred or saccate, often with an apical reflexed tooth or bristle; spur globose to cylindrical. Column short, stout, footless; rostellar projection variable; anther cap terminal, often beaked; pollinia 4, waxy, subglobose, equal, separate from each other, with a common stipe and an oblong or elliptic viscidium.

Between 120 and 180 species: tropical Africa through tropical Asia to Australia and the Pacific islands; three species (one endemic) in China.

- 1a. Sepals and petals free; lip white ..... 3. *T. pusillum*  
 1b. Sepals and petals  $\pm$  connate in basal half forming a tube; lip green or yellow-green.  
 2a. Roots subterete or slightly flattened; spur pouch-shaped ..... 1. *T. glandulosum*  
 2b. Roots strongly flattened; spur subglobose ..... 2. *T. complanatum*

#### 1. *Taeniophyllum glandulosum* Blume, Bijdr. 356. 1825.

带叶兰 dai ye lan

*Sarcophilus aphyllus* Makino; *Taeniophyllum aphyllum* (Makino) Makino; *T. chitouense* S. S. Ying.

Roots spreading and spiderlike on substrate, well developed, subterete or slightly flattened, 2–10 cm or longer, 1–1.5 mm in diam. Inflorescences 1–4, erect, 5–10(–20) mm; peduncle and rachis yellowish green, 0.2–0.3 mm in diam.; rachis 1–4-flowered; floral bracts distichous, ovate-lanceolate, 0.7–1 mm, thickly textured. Flowers yellowish green, very small; pedicel and ovary 1.5–2 mm. Sepals and petals connate below middle forming a tube 1–1.5 mm; apical lobes of sepals slightly recurved, ovate-lanceolate,  $1.5\text{--}2 \times$  ca. 1.2 mm, dorsally slightly carinate, acute. Petals ovate,  $1.2\text{--}1.8 \times$  ca. 1.1 mm, acute; lip ovate-navicular,  $1.7\text{--}2.5 \times 0.6\text{--}0.9$  mm, margin incurved, apex acuminate, with a retrorse elongate spinelike appendage, base with a fleshy septum at entrance of spur; spur pouch-shaped,  $1\text{--}1.5 \times$  ca. 1 mm, rounded. Column ca. 0.5 mm, stielidia ca. 0.5 mm. Capsule ellipsoid-cylindric, ca.  $4 \times 2$  mm. Fl. and fr. Apr–Aug.  $2n = 38$ .

Epiphytic on tree trunks in forests; 400–1100 m. N Fujian, Guangdong, Hainan, Hunan, NE Sichuan, C and S Taiwan, S Yunnan [India (Sikkim), Indonesia, Japan, Korea, Malaysia, New Guinea, Thailand, Vietnam; Australia].

#### 2. *Taeniophyllum complanatum* Fukuyama, Bot. Mag. (Tokyo) 49: 443. 1935.

扁根带叶兰 bian gen dai ye lan

*Taeniophyllum crassipes* Fukuyama.

Roots strongly flattened, 3–10 cm, 2–5 mm wide. Inflorescence suberect, 1–4 cm; peduncle and rachis green, slender; rachis 3–10-flowered; floral bracts triangular, very small. Flowers green; pedicel and ovary ca. 3 mm. Sepals and petals con-

nate at base forming a tube 0.8–1 mm; lobes of sepals oblong-ovate,  $2\text{--}2.2 \times$  ca. 0.5 mm, slightly reflexed at apex. Petals smaller, base clawed; lip ovate-triangular, 2–3 mm, entire, with a small introrse apical linear appendage, base with retrorse square septum over spur entrance; spur subglobose, ca. 1 mm. Column short, stielidia rounded. Capsule cylindrical, ca.  $1 \text{ cm} \times 1.5$  mm. Fl. and fr. unknown.

• C and S Taiwan.

#### 3. *Taeniophyllum pusillum* (Willdenow) Seidenfaden & Ormerod in Seidenfaden, Descr. Epidendrorum J. G. König 1791, 23. 1995.

兜唇带叶兰 dou chun dai ye lan

*Limodorum pusillum* Willdenow, Sp. Pl. 4: 126. 1805; *Chiloschista pusilla* (Willdenow) Schlechter; *Taeniophyllum obtusum* Blume.

Roots spreading, flat, to 20 cm, 2–3 mm in diam. Inflorescence suberect, 4–10 mm; peduncle and rachis ca. 0.4 mm in diam.; rachis 1–3-flowered; floral bracts distichous, broadly ovate-triangular, ca. 1.5 mm, abaxially scabrous, apex acute. Flowers opening widely, slightly fleshy; sepals and petals yellow, lip white, spur apex pale yellow; pedicel and ovary 0.5–0.6 mm. Sepals free, ovate,  $2.9\text{--}3 \times 1.2\text{--}1.3$  mm, without distinct veins, apex obtuse; lateral sepals dorsally carinate. Petals oblong, ca.  $2.5 \times 0.6$  mm, 1-veined, margin sometimes slightly irregularly incised, apex subacute; lip cymbiform, broadly ovate-triangular, ca.  $2.5 \times 2$  mm, very fleshy, adaxially with sparse papillate hairs at base, apex obtuse; spur cylindrical, slightly dorsiventrally compressed, ca.  $2 \times 1$  mm, obtuse. Column ca. 1 mm. Capsule cylindrical, ca.  $10 \times 3$  mm. Fl. and fr. Mar–May.

Epiphytic on tree trunks at forest margins; 700–1200 m. S Yunnan [Cambodia, Indonesia, Malaysia, Singapore, Thailand, Vietnam].

**146. SARCOPHYTON** Garay, Bot. Mus. Leafl. 23: 201. 1972.

肉兰属 rou lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems erect, elongate, stout, with many leaves. Leaves distichous, sessile, with sheathing bases; leaf blade flat, thickly leathery to fleshy, jointed to sheath. Inflorescence racemose or paniculate, lateral, axillary, laxly many flowered. Flowers small to medium-sized. Sepals similar, free. Petals smaller; lip adnate at base to column, 3-lobed; lateral lobes erect; mid-lobe recurved, adaxially usually conspicuously wrinkled, base with 2 calli at entrance of spur; spur cylindrical. Column small, foot absent; stigma large and round; rostellum short, bilobed; pollinia 4, separate from each other, waxy, subglobose, almost equal in size, with a linear stipe and a small viscidium.

Three species: discontinuously distributed in China, Myanmar, and the Philippines; one species (endemic) in China.

**1. Sarcophyton taiwanianum** (Hayata) Garay, Bot. Mus. Leafl. 23: 202. 1972.

肉兰 rou lan

*Sarcanthus taiwanianus* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 337. 1911; *Acampe hayatae* Szlachetko; *Cleisostoma taiwanianum* (Hayata) Hayata; *Saccolabium taiwanianum* (Hayata) Tang & F. T. Wang.

Stem 25–100 cm. Leaves many, distichous; leaf blade lorate, 20–35 × 3–4.5 cm, leathery, ± unequally obtusely bilobed; basal sheaths long, amplexicaul. Inflorescences often sev-

eral, ascending, racemose, shorter than leaves, many flowered; rachis rather fleshy; floral bracts subtriangular, 4–5 mm. Flowers slightly fragrant, yellowish green, adaxially with purplish brown transverse stripes or spots, slightly fleshy; pedicel and ovary 1–1.5 cm. Sepals obovate-oblong to obovate, ca. 10 × 5 mm, obtuse; lateral sepals slightly oblique. Petals ± falcate-elliptic, ca. as long as sepals but narrower, obtuse-rounded; lip with a short spur at base, slightly 3-lobed; lateral lobes erect; mid-lobe recurved, nearly suborbicular; disk with 2 calli at entrance of spur. Column short. Fl. Apr.

• Epiphytic on tree trunks in forests or on cliffs along valleys; 200–800 m. S Taiwan.

**147. MICROPERA** Lindley, Edwards's Bot. Reg. 18: ad t. 1522. 1832.

小囊兰属 xiao nang lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Camarotis* Lindley.

Herbs, clambering, monopodial. Stems long, with many long roots and leaves. Leaves many, flat, fleshy, oblong to linear, with sheathing base, jointed. Inflorescence often borne opposite leaves, rather long, racemose, many flowered. Flowers small or medium-sized, not resupinate. Sepals and petals free, similar; lip conspicuously spurred or saccate, 3-lobed; lateral lobes broad, erect; mid-lobe smaller, fleshy; spur often ornamented at its entrance, commonly with a longitudinal septum inside. Column short, lacking a foot; rostellum projection prominent, beaked; pollinia 4, in 2 subequal pairs on a common long stipe; viscidium very small.

About 15 species: ranging from the Himalayas to SE Asia, New Guinea, Australia, and the Solomon Islands; one species in China.

**1. Micropera poilanei** (Guillaumin) Garay, Bot. Mus. Leafl. 23: 186. 1972.

小囊兰 xiao nang lan

*Sarcanthus poilanei* Guillaumin, Bull. Soc. Bot. France 77: 330. 1930; *Camarotis poilanei* (Guillaumin) Seidenfaden & Smitinand.

Stems to 1 m, climbing, with internodes ca. 2.5 cm, many leaved. Leaf blade linear, 15–20 × 1.5–1.8 cm, leathery, apex

obtuse. Inflorescence racemose, with 20–25 flowers; rachis to 24 cm; floral bracts tiny, ca. 1 × 1 mm. Flowers white to green-white; pedicel and ovary ca. 6 mm. Dorsal sepal linear, 7–8 × ca. 1.5 mm, distinctly 3-veined; lateral sepals linear, ca. 6 × 1.5 mm, joined together and adnate to claw of lip. Petals linear, 7–8 × 1.2–1.5 mm; lip spurred, with a basal claw 3–4 mm; spur conic-cylindrical, 2–3 mm. Column slender, ca. 6 mm; rostellum beak ca. 2 mm; stipe ca. 2 mm. Fl. Mar.

Epiphytic on trees or lithophytic on rocks in mixed forests; 200–500 m. Hainan [Vietnam].

**148. DORITIS** Lindley, Gen. Sp. Orchid. Pl. 178. 1833.

五唇兰属 wu chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, terrestrial or lithophytic, monopodial. Stems erect, short, rooting at base. Leaves several, subbasal, distichous, flat, fleshy, base articulate and sheathing. Inflorescence arising laterally from base of stem, erect, racemose, laxly several to many flowered.

Flowers medium-sized. Sepals and petals free; lateral sepals rather broad, base broadly adnate to column foot forming a distinct mentum. Lip attached at base to end of column foot, 3-lobed, long clawed, with 2 small basal lobes on both sides of claw and an appendage between them; lateral lobes erect; mid-lobe rather thick. Column short, narrowly winged, with a long foot at base; stigma concave, large; rostellum rather long, narrow; anther cap subglobose; pollinia 4, separate from each other, waxy, subglobose, with a common long, linear stipe; viscidium ovate.

Two species: from NE India to China, south to Indochina, Thailand, Malaysia, and Indonesia; one species in China.

**1. *Doritis pulcherrima*** Lindley, Gen. Sp. Orchid. Pl. 178. 1833.

五唇兰 *wu chun lan*

*Phalaenopsis buyssoniana* H. G. Reichenbach; *P. esmeralda* H. G. Reichenbach; *P. pulcherrima* (Lindley) J. J. Smith.

Leaves 3–6, nearly basal; leaf blade oblong, 5–7.5 × 1.5–2 cm, base with equitant sheaths, apex obtuse or acute. Inflorescence erect; peduncle to 38 cm, 2.5–3 mm in diam., with 3 or 4 sheaths 3–5 mm; rachis 10–13 cm, laxly several flowered; floral bracts ovate, ca. 3 mm. Flowers often fragrant, opening widely, usually with pink sepals and petals and purple lip;

pedicel and ovary 1.3–2 cm. Dorsal sepal oblong, ca. 8 × 5 mm, obtuse; lateral sepals slightly oblique, ovate-triangular, ca. 8 × 7 mm; mentum ± conic. Petals subobovate, slightly smaller than dorsal sepal; lip attached at a right angle to end of column foot, 3-lobed, recurved; claw ca. 4 mm, with a square callus adaxially; basal lobes erect on both sides of claw, rectangular, ca. 4 mm; lateral lobes erect, somewhat suborbicular or broadly elliptic, ca. 6 × 6 mm; mid-lobe ligulate, ca. 5 × 2 mm, adaxially with 3 or 4 fleshy lamellae, apex acute. Column ca. 7 mm, foot ca. 6 mm. Fl. Jul–Aug.  $2n = 38$ .

Rocky places or soil-covered rocks in dense forests or thickets. Hainan [Cambodia, NE India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

## 149. *NOTHODORITIS* Z. H. Tsi, Acta Phytotax. Sin. 27: 58. 1989.

象鼻兰属 *xiang bi lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Roots many, slightly flattened. Stems very short, enclosed in basal leaf sheaths. Leaves several, basal, purple spotted abaxially, articulate and sheathing at base. Inflorescence lateral, arising from base of stem, ascending or pendulous, racemose, many small flowered; floral bracts narrowly lanceolate, small. Flowers thinly textured. Sepals and petals free; dorsal sepal concave, slightly embracing column; lateral sepals oblique, clawed at base. Petals obovate, slightly smaller than sepals, clawed at base; lip 3-lobed; lateral lobes narrow, sulcuslike except for separate upper parts; mid-lobe perpendicular to lateral lobes, narrowly cymbiform, saccate at base; sac nearly subglobose, small, with an erect appendage at its mouth. Column subterete, short, with a subulate appendage near front at base, foot short; stigma near base of column; rostellum elongate, narrow; pollinia 4, separate, waxy, subglobose, subequal in size, attached by a long stipe to a suborbicular small viscidium.

• One species: China.

**1. *Nothodoritis zhejiangensis*** Z. H. Tsi, Acta Phytotax. Sin. 27: 59. 1989.

象鼻兰 *xiang bi lan*

*Doritis zhejiangensis* (Z. H. Tsi) T. Yukawa & K. Kita.

Plants pendulous. Stems ca. 3 mm. Roots borne from base of stem, many, slightly compressed, 1.2–1.5 mm in diam. Leaves 1–3; leaf blade abaxially or margin often with dense fine dark purple spots, obovate or obovate-oblong, 2–6.8 × 1.2–2.1 cm, thinly textured, obtuse or slightly hooked. Peduncle pale green, 3–5 cm, ca. 1 mm in diam.; rachis 5–8 cm, 8–19-flowered; floral bracts yellowish green, narrowly lanceolate, 2–3 mm. Flowers white, with purple transverse bands on sepals and petals, and purple markings on lip, column yellow, rostellum whitish above, purplish below; pedicel and ovary ca. 1 cm, slender. Dorsal sepal ovate-elliptic, ca. 6 × 3 mm, concave, base slightly contracted, apex obtuse; lateral sepals oblique, broadly obovate, ca. 6 × 6 mm, base shortly clawed, apex obliquely truncate. Petals oblanceolate, ca. 5 × 2.5 mm, clawed at base, apex obtuse; lip 3-lobed; lateral lobes comprised of erect upper parts ca. 1.5 mm and a sulcus ca. 7 mm; mid-lobe ca. 8 × 1.2 mm, saccate at base, apex slightly recurved; sac ± subglobose, ca. 2 mm; appendage erect, ca. 2.5 × 1.2 mm. Column ca. 5 × 1.2 mm, near base with an appendage ca. 1.2 mm; rostellum spreading, ca. 5.5 mm, narrow, apex hooked and slightly bilobed; stipe ca. 5.5 × 0.5 mm; viscidium ca. 0.7 mm wide, subrounded. Capsule ellipsoid, ca. 8 × 4 mm. Fl. Jun, fr. Jul–Aug.

• Epiphytic on tree branches in forests or at forest margins; 300–900 m. E and N Zhejiang.

## 150. *VANDOPSIS* Pfitzer in Engler & Prantl, Nat. Pflanzenfam. 2(6): 210. 1889.

拟万代兰属 *ni wan dai lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

*Fieldia* Gaudichaud, Voy. Uranie, Bot. 424. 1829, not A. Cunningham (1825).

Herbs, epiphytic, lithophytic, or terrestrial, monopodial. Stems decumbent or pendulous, elongate, stout, rigid, sometimes branched, many leaved. Leaves distichous, flat, leathery, jointed. Inflorescences axillary, suberect or pendulous, racemose, long or short, rarely shortly branched, many flowered. Flowers resupinate, flat, medium-sized to large, fleshy. Sepals and petals similar, spreading; lip smaller than petals, firmly adnate to column, geniculate bent,  $\pm$  channeled or gibbous at base, 3-lobed; lateral lobes often small; mid-lobe laterally flattened, rather long, fleshy, adaxially usually longitudinally ridged or keeled. Column short, stout, foot absent; rostellum inconspicuous; pollinia waxy, 2, in unequal pairs, deeply grooved, sessile; stipe broadly oblong; viscidium transverse, prominent.

About five species: India, China, mainland SE Asia, the Philippines, the Malay Archipelago to New Guinea; two species in China.

- 1a. Stems branching, less than 1 cm in diam.; leaves ca. 12 cm, leathery, basal sheaths verrucose; flowers thinly textured ..... 1. *V. undulata*  
 1b. Stems unbranched, more than 2 cm in diam.; leaves more than 40 cm, fleshy or thickly leathery, basal sheaths glabrous; flowers thickly textured ..... 2. *V. gigantea*

**1. *Vandopsis undulata*** (Lindley) J. J. Smith, *Natuurk. Tijdschr. Ned.-Indië* 72: 77. 1912.

白花拟万代兰 bai hua ni wan dai lan

*Vanda undulata* Lindley, *J. Proc. Linn. Soc., Bot.* 3: 42. 1858; *Stauroopsis polyantha* W. W. Smith; *S. undulatus* (Lindley) Bentham ex J. D. Hooker.

Stems ascending or pendulous, cylindrical, to 1 m, 6–8 mm in diam., rigid, branching, many noded, internodes 2.5–4 cm. Leaves oblong, 9–12  $\times$  1.5–2.5 cm, leathery, obtuse, unequally bilobed; basal sheaths persistent and amplexicaul, verrucose. Inflorescence to 50 cm, usually with a few branches, laxly few flowered; peduncle and rachis stout; floral bracts green, broadly ovate, 6–8 mm, obtuse. Flowers fragrant, 3–3.6 cm in diam.; sepals and petals white, lip yellow to white at apex, lemon-yellow with purple-red basal striations, anther cap yellow; pedicel and ovary ca. 2.7 cm, white. Dorsal sepal subobovate, 2.5–4  $\times$  0.8–1.2 cm, base clawed, margin crisped, apex obtuse; lateral sepals slightly recurved, ovate-lanceolate, 2.4–4  $\times$  1.2–1.4 cm, margin crisped, apex subacuminate. Petals slightly recurved, similar to sepals but smaller, margin undulate, apex obtuse; lip shorter than petals, 3-lobed; lateral lobes erect,  $\pm$  embracing column, subovate-triangular, ca. 5 mm, acute; mid-lobe laterally compressed, spatulate, ca. 6  $\times$  5 mm, concave, truncate; disk with 2 ridges from base. Column ca. 4 mm; anther cap subglobose; stipe sublanceolate, ca. 2 mm; viscidium subsensiform, wider than stipe, thick. Fl. May–Jun.  $2n = 38$ .

Epiphytic on tree trunks in forests or lithophytic on rocks on shrubby slopes; 1500–2300 m. SE Xizang, S and W Yunnan [Bhutan, NE and NW India, Nepal].

**2. *Vandopsis gigantea*** (Lindley) Pfitzer in Engler & Prantl, *Nat. Pflanzenfam.* 2(6): 210. 1889.

拟万代兰 ni wan dai lan

*Vanda gigantea* Lindley, *Gen. Sp. Orchid. Pl.* 215. 1833; *Fieldia gigantea* (Lindley) H. G. Reichenbach; *Stauroopsis chinensis* Rolfe; *S. gigantea* (Lindley) Bentham ex Pfitzer; *Vandopsis chinensis* (Rolfe) Schlechter.

Plants large. Stems 30 cm or longer, to 5 cm in diam., stout, many leaved. Leaves recurved, broadly lorate, 40–50  $\times$  5.5–7.5 cm, fleshy, obtuse, unequally bilobed; basal sheaths persistent and amplexicaul. Inflorescences often 1 or 2, to 33 cm; peduncle and rachis 8–10 mm in diam., slightly fleshy, with 2 or 3 broadly ovate-triangular sheaths; raceme nodding, densely many flowered; floral bracts broadly ovate, 5–8 mm, rather fleshy. Flowers fleshy, opening widely, golden yellow, spotted with reddish brown, column white, with 2 purple spots on both apical sides, anther cap pale yellow; pedicel and ovary yellowish green, 1.5–2 cm, stout. Dorsal sepal obovate-oblong, 2.5–3  $\times$  ca. 1 cm, obtuse; lateral sepals subelliptic-rhombic, ca. as large as dorsal sepal, abaxially thickened and swollen toward apical midvein. Petals obovate-oblong, smaller than dorsal sepal, obtuse; lip 1.6–1.9 cm, 3-lobed; lateral lobes subobovate, ca. 5  $\times$  3 mm, obtuse; mid-lobe spreading, slightly laterally flattened, long and narrow, ca. 1.3 cm, adaxially with a central longitudinal keel thickened and triangular in basal half, crescent-shaped in apical half. Column ca. 4 mm, stout. Fl. Mar–Apr.  $2n = 38$ .

Epiphytic on tree trunks in open forests or at forest margins; 800–1700 m. S Guangxi, S Yunnan [Laos, Malaysia (Peninsular), Myanmar, Thailand, Vietnam].

## 151. DIPLOPRORA J. D. Hooker, *Fl. Brit. India* 6: 26. 1890.

蛇舌兰属 she she lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems pendulous, terete or slightly flattened, sometimes branched, with many nodes. Leaves distichous, with sheathing bases; leaf blade narrowly ovate to falcate-lanceolate, jointed to amplexicaul sheath. Inflorescence lateral, racemose, laxly few flowered. Flowers not resupinate, appearing a few at a time, opening widely, slightly fleshy. Sepals and petals similar, free, spreading, sepals carinate abaxially. Petals narrower than sepals; lip superior, spurless, fleshy, broadly attached to column base, immovable; hypochile boat-shaped, with raised lateral lobes; epichile narrowed, long drawn-out, apex  $\pm$  forked into 2 tails, or truncate. Column lacking a foot, short, stout; stigma large; pollinia 4, unequal, globose; stipe narrowed from a broad base; viscidium ovate.

Two species: China, India (including Andaman Islands), Myanmar, Sri Lanka, Thailand, Vietnam; one species in China.

**1. *Diploprora championii*** (Lindley ex Benth) J. D. Hooker, Fl. Brit. India 6: 26. 1890.

蛇舌兰 she she lan

*Cottonia championii* Lindley ex Benth, Hooker's J. Bot. Kew Gard. Misc. 7: 35. 1855; *Diploprora bicaudata* (Thwaites) Schlechter; *D. championii* var. *uraiensis* (Hayata) S. S. Ying; *D. kusukusensis* Hayata; *D. uraiensis* Hayata; *Luisia bicaudata* Thwaites; *Stauroopsis championii* (Lindley ex Benth) Tang & F. T. Wang; *S. kusukusensis* (Hayata) Tang & F. T. Wang.

Stems often pendulous, 3–15 cm or longer, ca. 4 mm in diam., rigid, usually unbranched, internodes 1–1.5 cm. Leaf sessile, falcate-lanceolate or obliquely oblong, 5–12 × 1.6–2.7 cm, papery, jointed, margin sometimes slightly undulate, apex acute

to apiculate. Inflorescences laxly 4–8-flowered; peduncle 1.5–2.8 cm, sheathed at base, glabrous; rachis ca. 3.5 cm, winged, weakly zigzag; floral bracts ovate-triangular, 3–4 mm, acute. Flowers fragrant, pale yellow, with white-rosy lip, ca. 1 cm in diam., slightly fleshy; pedicel and ovary ca. 8 mm. Sepals oblong or elliptic, ca. 9 × 4 mm, dorsally carinate, apex obtuse. Petals linear-oblong, ca. 8 × 2 mm, acute; lip sigmoidally curved, 5–8 × 3–4 mm, adnate to base and sides of column; hypochile erect, cymbiform, ca. 5 × 4 mm, edges recurved; epichile broadly triangular at base, narrowed abruptly to a bicaudate apex; disk with an erect keel. Column ca. 3 mm, broad, foot absent. Capsule cylindric, ca. 4 cm × 8–10 mm. Fl. and fr. Feb–Sep.  $2n = 16, 38$ .

Epiphytic on tree trunks in forests or lithophytic on rocks along valleys; 200–1500 m. S Fujian, Guangxi, Hong Kong, Taiwan, S and SE Yunnan [India, Myanmar, Sri Lanka, Thailand, Vietnam].

## 152. **ORNITHOCHILUS** (Wallich ex Lindley) Benth & J. D. Hooker, Gen. Pl. 3: 478, 581. 1883.

羽唇兰属 yu chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Aerides* sect. *Ornithochilus* Wallich ex Lindley, Gen. Sp. Orchid. Pl. 242. 1833.

Herbs, epiphytic, monopodial, small. Stems short, unbranched, rigid, enclosed in persistent leaf sheaths, base with many flat aerial roots. Leaves distichous, flat, fleshy, base jointed and shortly sheathed. Inflorescences axillary, paniculate, many flowered, equaling or exceeding leaves; floral bracts small, narrow. Flowers small to medium-sized. Sepals and petals free. Petals smaller and narrower than sepals; lip spurred from distal part of hypochile; epichile 3-lobed, margin ciliate or crenulate; disk with a pilose callus at spur entrance. Column small, fleshy, lacking a foot; rostellar projection elongate, fleshy, obtuse; anther cap truncate; stipe obovate-cuneiform; viscidium obtriangular; pollinia 4, as 2 pollen masses.

Three species: SE Asia and the Indian Himalayas; two species (one endemic) in China.

- 1a. Mid-lobe of lip with fimbriate margin; column ± hairy ..... 1. *O. difformis*  
 1b. Mid-lobe of lip with crisped, crenulate margin; column glabrous ..... 2. *O. yingjiangensis*

**1. *Ornithochilus difformis*** (Wallich ex Lindley) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 277. 1919.

羽唇兰 yu chun lan

*Aerides difformis* Wallich ex Lindley, Gen. Sp. Orchid. Pl. 242. 1833; *Ornithochilus delavayi* Finet; *O. eublepharon* Hance; *Sarcochilus difformis* (Wallich ex Lindley) Tang & F. T. Wang.

Stems 2–4 cm, ca. 1 cm in diam. Leaves nearly basal, usually 2 or 3; leaf blade oblong-elliptic or obovate-elliptic, obovate, or oblong, falcate, 7–19 × ca. 5.5 cm, apex obtuse, acute, or acuminate; basal sheaths ca. 1 cm, embracing stem. Inflorescences laxly many flowered; branches spreading, to ca. 21 cm, base sheathed; sheaths overlapping, tubular, 3–6 mm; rachis 9–25 cm, glabrous; floral bracts pale brown, triangular, ca. 2 mm, acute. Flowers opening widely, 0.7–1 cm in diam.; sepals and petals yellow to green with several longitudinal red-brown striations, lip dark maroon with yellow markings at base and margin, spur maroon and green, column purplish brown; pedicel and ovary ca. 1 cm. Sepals and petals slightly recurved; dorsal sepal oblong, ca. 5 × 2 mm, obtuse; lateral sepals obliquely ovate-oblong, ca. as long as and wider than dorsal sepal, obtuse. Petals narrowly oblong, ca. 4 × 1.2 mm, entire or

scabrous, obtuse; lip shortly clawed at base, 3-lobed; lateral lobes suberect, subovate; mid-lobe slightly incurved, anchor-shaped, clawed at base, 3-lobulate; lateral lobules large, margins fimbriate; apical lobule smaller, abaxially slightly beaked, margin entire and incurved, apex obtuse; disk with 1 purplish red, fleshy callus centrally, a pilose callus at front of and a callus on back of spur entrance; spur slightly curved, ca. 4 mm. Column ca. 2 mm, both front sides hairy. Fl. May–Jul.  $2n = 38$ .

Epiphytic on tree trunks in open forests or at forest margins; 500–2100 m. S Guangdong, Guangxi, SW Sichuan, S and SW Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

*Ornithochilus difformis* is represented in China by var. *difformis*; *O. difformis* var. *kinabaluensis* J. J. Wood, A. L. Lamb & Shim, from Borneo, is distinguished by having greenish yellow sepals and petals and a pure white lip with shorter fimbriate processes on the mid-lobe; more distinct, narrowly winglike lateral lobes; a smaller keel-like callus; and a shorter, usually less curved spur.

**2. *Ornithochilus yingjiangensis*** Z. H. Tsi, Acta Phytotax. Sin. 22: 479. 1984.

盈江羽唇兰 ying jiang yu chun lan

Stems ca. 2 cm. Leaves nearly basal, several, distichous;

leaf blade obliquely oblong, 8–13 × 3–4 cm, base sheathing, apex acute. Inflorescences often 2 or 3, pendulous, much longer than leaves, unbranched or with a short branch, laxly many flowered; floral bracts lanceolate, ca. 2 mm, acute. Flowers opening widely, pale yellow with reddish brown stripes; pedicel and ovary ca. 1 cm. Dorsal sepal ovate, ca. 6 × 3.5 mm, 3-veined, obtuse; lateral sepals obliquely ovate, ca. 6 × 4 mm, 4-veined, obtuse. Petals oblong, ca. 4.5 × 1.5 mm, 1-veined, entire, obtuse; lip shortly clawed at base, 3-lobed; lateral lobes

auriculate, margins ± scabrous; mid-lobe reniform-cordate, ca. 5 × 6 mm, entire, margin ± crisped and crenulate, apex subtruncate and broadly emarginate; disk with a longitudinal triangular thickened central ridge, a pilose callus at front of and a thickened callus on back of spur entrance; spur straight, tubular, ca. 5 mm. Column short, stout, glabrous. Fl. Jul–Aug.

• Epiphytic on tree trunks in evergreen broad-leaved forests; 1300–1400 m. SW Yunnan.

### 153. *ACAMPE* Lindley, *Fol. Orchid.* 4(Acampe): 1. 1853, nom. cons.

脆兰属 *cui lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

*Sarcanthus* Lindley (1824), not Lindley (1826).

Herbs, epiphytic or lithophytic, monopodial. Stems simple or branched, stout, leafy. Leaves distichous, conduplicate, leathery, sometimes somewhat fleshy, apex emarginate or bilobed. Inflorescence axillary, racemose, corymbose, or paniculate; floral bracts persistent, inconspicuous, scalelike. Flowers fragile, not resupinate, small, fleshy. Sepals and petals similar, flat to curved; lateral sepals adnate to spur (when present). Lip saccate or with a short spur, adnate to column, immovable, rigid, variously lobed, fleshy, papillose, tuberculate, sometimes dentate; spur lacking any internal tongue or median septum. Column short, fleshy, glabrous or papillose; stelia 2, toothlike; foot absent; anther cap ovoid, apiculate; pollinia 4, united in 2 pairs, globose; caudicle linear, thick; viscidium oval, small; stigma transverse, concave; rostellum short, emarginate.

About ten species (possibly fewer): from tropical Himalayan regions to Indochina, and SE Asia, tropical and subtropical Africa, Madagascar, and the islands of the W Indian Ocean; three species in China.

- 1a. Leaves 3.5–5 cm wide; lip epichile rugose, margin not wavy; inflorescence often unbranched; peduncle and rachis 5–8 mm in diam. .... 1. *A. rigida*  
 1b. Leaves less than 2.5 cm wide; lip epichile coarsely warty, margin wavy; inflorescence with short branches; peduncle and rachis ca. 3 mm in diam.  
 2a. Inflorescence paniculate, 5–14 cm, equaling or exceeding leaves; lateral lobes of lip protruding; column with 2 short, distinct horns ..... 2. *A. ochracea*  
 2b. Inflorescence subumbellate, 1–4 cm, shorter than leaves; lateral lobes of lip not protruding; column lacking distinct horns ..... 3. *A. papillosa*

**1. *Acampe rigida*** (Buchanan-Hamilton ex Smith) P. F. Hunt, *Kew Bull.* 24: 98. 1970.

多花脆兰 *duo hua cui lan*

*Aerides rigida* Buchanan-Hamilton ex Smith in Rees, *Cycl.* 39: *Aerides* no. 12. 1819; *Acampe intermedia* H. G. Reichenbach; *A. longifolia* (Lindley) Lindley; *A. multiflora* (Lindley) Lindley; *A. taiwaniana* S. S. Ying; *Gastrochilus longifolius* (Lindley) Kuntze; *Saccolabium longifolium* (Lindley) J. D. Hooker; *Vanda longifolia* Lindley; *V. multiflora* Lindley.

Stems to 1 m, stout, 8–20 mm in diam., unbranched, internodes 2–3 cm, with many distichous leaves. Leaf blade ascending, lorate, 17–40 × 3.5–5 cm, rather fleshy, amplexicaul-sheathing at base, apex obtuse and unequally bilobed. Inflorescence axillary or opposite to leaf, usually from upper part of stem, suberect, 7–30 cm, unbranched or sometimes shortly branched, many flowered; peduncle 5–11 cm, 5–8 mm in diam., with 2 or 3 triangular sheaths; floral bracts broadly triangular, 3–5 mm, fleshy, obtuse. Flowers somewhat fragrant, not opening widely, yellow with purplish brown transverse stripes, lip white, with purplish brown longitudinal stripes above; pedicel and ovary yellowish green, ca. 1 cm, fleshy. Sepals similar,

oblong, 10–12 × 5–6 mm, obtuse. Petals narrowly obovate, 8–9 × 3–4 mm, obtuse; lip thickly fleshy, 3-lobed; lateral lobes subquadrate; mid-lobe suberect, ovate-ligulate, 5–6 mm, margin slightly undulate and irregularly incised, apex obtuse, slightly recurved; spur conic, ca. 3 mm, inside densely hairy, apex obtuse. Column ca. 2.5 mm, stout; anther cap subspherical; caudicle oblanceolate, ca. 1.2 mm; viscidium subovate. Capsule suberect, cylindrical or narrowly fusiform, ca. 6 cm × 8–15 mm. Fl. Aug–Sep, fr. Oct–Nov. *2n* = 38.

Epiphytic on tree trunks or lithophytic on rocks in forests; 300–1800 m. S Guangdong, SW Guangxi, S Guizhou, Hainan, Taiwan, E, SE, and SW Yunnan [Bhutan, Cambodia, NE India, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; Africa].

**2. *Acampe ochracea*** (Lindley) Hochreutiner, *Bull. New York Bot. Gard.* 6: 270. 1910.

窄果脆兰 *zhai guo cui lan*

*Saccolabium ochraceum* Lindley, *Edwards's Bot. Reg.* 28(Misc.): 2. 1842; *Acampe dentata* Lindley; *A. griffithii* H. G. Reichenbach; *S. lineolatum* Thwaites.

Stem ascending, to 1 m, stout, 1–1.3 cm in diam., internodes 2–3.5 cm. Leaves many, well spaced, distichous, ±

spreading horizontally; leaf blade narrowly oblong, 13–20 × 2.5–3.4 cm, base amplexicaul-sheathing, apex obtuse and unequally bilobed. Inflorescences several, opposite to leaves, ascending, paniculate, 5–14 cm, with many short branches; each branch with 1 raceme and 2–6 flowers; peduncle 1–2 cm, 2–3 mm in diam.; floral bracts broadly triangular, ca. 1 mm, fleshy, acute. Flowers slightly fragrant; sepals and petals yellowish green with reddish brown transverse stripes and spots, lip white, spotted with purple-red, spur and anther cap yellow; pedicel and ovary yellowish green, ca. 4 mm, sparsely shortly hairy. Dorsal sepal obovate, ca. 6 × 3 mm, obtuse; lateral sepals slightly oblique, obovate-oblong, slightly smaller than dorsal sepal, obtuse. Petals oblanceolate, ca. 5 × 2.3 mm, obtuse; lip slightly 3-lobed; lateral lobes erect, deltoid, very small; mid-lobe reflexed, deltoid, ca. 2 × 2 mm, obtuse, with a short conic projection abaxially, adaxially with many small warts, margin slightly undulate; spur straight, ca. 3 × 2 mm, inside with dense white hairs. Column ca. 1.5 mm, stout, with short hairs; anther cap subspherical; caudicle oblanceolate, ca. 1 mm; viscidium oblong. Capsule cylindrical or narrowly fusiform, 4–4.5 cm × 5–6 mm. Fl. Nov, fr. next Mar–Apr.  $2n = 38$ .

Epiphytic on tree trunks in open forests or at forest margins; 700–1200 m. S Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Sri Lanka, Thailand, Vietnam].

**3. *Acampe papillosa* (Lindley) Lindley, Fol. Orchid. 4(Acampe): 2. 1853.**

短序脆兰 duan xu cui lan

*Saccolabium papillosum* Lindley, Edwards's Bot. Reg. 18:

ad t. 1552. 1832; *Acampe carinata* (Griffith) Panigrahi; *Gastrochilus carinatus* (Griffith) Schlechter; *G. papillosus* (Lindley) Kuntze; *S. carinatum* Griffith; *Sarcanthus papillosus* (Lindley) Tixier.

Stems 5–20 cm or longer, 7–9 mm in diam., internodes 1–2 cm, laxly clothed with many distichous leaves. Leaf blade oblong, 7–14.5 × 1.4–2.3 cm, amplexicaul-sheathing at base, apex obtuse and slightly unequally bilobed. Inflorescences often several, opposite to leaves or axillary, 1–4 cm, subumbellate, with many short branches, densely few to many flowered; peduncle 3–10 mm, ca. 3 mm in diam.; floral bracts broadly triangular, 1–2 mm, fleshy, acute. Flowers slightly fragrant, opening widely; sepals and petals yellow with reddish brown transverse stripes, lip creamy white, slightly spotted with purple-red, spur yellow; pedicel and ovary ca. 5 mm, pale yellow. Dorsal sepal oblong, ca. 5 × 1.8 mm, obtuse; lateral sepals falcate-oblong, ca. 5 × 2 mm, obtuse. Petals oblong, ca. as long as dorsal sepal and narrower; lip inconspicuously 3-lobed, divided into hypochile and epichile; hypochile a narrow margin around entrance of spur; epichile ovate, ca. 3.5 × 3 mm, adaxially with dense warts, base with a transverse septum separating it from hypochile, margin crisped-corrugate, apex obtuse; spur straight, cylindrical, ca. 3 × 2 mm, inside with dense white hairs. Column ca. 1.5 mm, stout, slightly shortly hairy; anther cap subglobose. Capsule erect or ascending, fusiform, 2–3 cm × 4–8 mm. Fl. Nov, fr. Dec–Jan.  $2n = 36, 38, 72$ .

Epiphytic on tree trunks in forests; ca. 500 m. Hainan, SW Yunnan [Bangladesh, Bhutan, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

## 154. SMITINANDIA Holttum, Gard. Bull. Singapore 25: 105. 1969.

盖喉兰属 gai hou lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial, medium-sized. Stems elongate, with many nodes, often rooting at nodes. Leaves distichous, usually well spaced; leaf blade flat, rather narrow, slightly fleshy, with sheathing base, jointed to sheath. Inflorescences lateral, piercing sheath, racemose, many flowered. Flowers small, somewhat fleshy. Sepals conspicuously larger than petals. Lip attached to base of column, immovable, with a distinct spur without inner appendages, but its entrance ± closed by a high fleshy transverse appendage at base of mid-lobe. Column cylindrical, short, base slightly dilated, without a foot; rostellum short; pollinia waxy, 4, each completely divided into 2 unequal pairs, flat, subglobose; viscidium ovate; stipe short, widening toward apex.

About three species: India, Bhutan, Myanmar, SE Asia east to Borneo and Sulawesi; one species in China.

**1. *Smitinandia micrantha* (Lindley) Holttum, Gard. Bull. Singapore 25: 106. 1969.**

盖喉兰 gai hou lan

*Saccolabium micranthum* Lindley, Gen. Sp. Orchid. Pl. 220. 1833; *Cleisostoma micranthum* (Lindley) King & Pantling; *C. poilanei* Gagnepain; *Pomatocalpa poilanei* (Gagnepain) Tang & F. T. Wang.

Stems suberect, terete, slightly flattened, 4–6 cm, ca. 6 mm in diam., internodes 1–1.3 cm. Leaf blade narrowly oblong, 9.5–11 × 1.4–2 cm, slightly fleshy, base subrounded, apex obtuse and unequally bilobed. Racemes 1–2, opposite leaves, 9–11 cm, densely many flowered; floral bracts ovate-triangular, ca. 1 mm, acute. Flowers opening widely, white, tinged with

purple-red, 3–4 mm in diam., anther cap white with yellowish brown midvein; pedicel and ovary ca. 4 mm. Dorsal sepal subobovate, ca. 3.5 × 1.5 mm, 3-veined, obtuse; lateral sepals slightly oblique, ovate-triangular, ca. 2.5 × 2 mm, 3-veined, acute. Petals narrowly oblong, ca. 2 × 1 mm, 1-veined, margin ± scabrous, apex obtuse; lip 3-lobed; lateral lobes erect, subquadrate, ca. 1 mm; mid-lobe obovate-spatulate, ca. 2.2 × 1.5 mm, base with a fleshy transverse appendage ± covering spur entrance, with 2 central ridges fused at apex, apex subacute; spur oblong-conic, slightly laterally compressed, ca. 2 × 1.5 mm, obtuse. Column ca. 1 mm; rostellum very short; anther cap beaked. Fl. Apr.  $2n = 38$ .

Epiphytic on tree trunks in forests; ca. 600 m. SW Yunnan [Bhutan, Cambodia, NE India, Laos, Malay Archipelago (Borneo), Malaysia, Myanmar, Nepal, Thailand, Vietnam].

**155. RENANTHERA** Loureiro, Fl. Cochinch. 2: 516, 521. 1790.火焰兰属 *huo yan lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Herbs, epiphytic or lithophytic (rarely terrestrial), robust, monopodial. Stem long, often up to several meters, climbing, sometimes branched, with many nodes and long internodes. Leaves many, distichous, often oblong, flat, thickly leathery, unequally bilobed, with a sheathing base, and blade jointed to sheath. Inflorescence lateral, relatively long, paniculate, occasionally racemose, laxly many flowered. Flowers resupinate, opening widely, predominantly red or orange, sometimes yellow, flat, medium-sized or large. Sepals and petals free; dorsal sepal and petals similar, spreading; lateral sepals usually broader than dorsal sepal and petals, margins subparallel, undulate. Lip attached to column base, immovable, much smaller than petals and sepals, saccate or spurred, 3-lobed; lateral lobes erect, adaxially with 1 callus at base; mid-lobe often ligulate and recurved, small, with lamellate basal calli; spur conic. Column short and stout, without a foot; rostellar projection short; pollinia 4, in 2 pairs, waxy, reniform, slightly unequal in size, each pair with an elastic thread at base, attached by a common linear stipe to a transversely elliptic viscidium.

About 19 species: E India through China to the Philippines and south to Malaysia, Indonesia, New Guinea, and the Solomon Islands; three species in China.

Reviewer L. Averyanov notes that *Renanthera vietnamensis* Averyanov & R. Rice (Oasis 2(3): 3. 2002), described from N Vietnam, also occurs in S China. However, the present authors could not substantiate this record because they found no relevant specimens.

- 1a. Inflorescences borne opposite leaves; flowers deep red or scarlet; lateral lobes of lip subquadrate to orbicular; mid-lobe without basal calli ..... 1. *R. coccinea*
- 1b. Inflorescences axillary; flowers reddish or yellowish; lateral lobes of lip ovate-lanceolate; mid-lobe with basal calli.
- 2a. Leaves 13–25 mm wide; pedicel and ovary reddish; lateral sepals ca. 10 mm wide, reddish; mid-lobe of lip not saccate ..... 2. *R. imschootiana*
- 2b. Leaves 9–11 mm wide; pedicel and ovary yellowish; lateral sepals 4.5–5.5 mm wide, yellowish, sparsely spotted with purple-red; mid-lobe of lip subglobose to saccate in apical half ..... 3. *R. citrina*

**1. Renanthera coccinea** Loureiro, Fl. Cochinch. 2: 521. 1790.火焰兰 *huo yan lan*

Stems climbing, terete, more than 1 m, stout, ca. 1.5 cm in diam., usually unbranched, internodes 3–4 cm. Leaf blade ligulate or oblong, 7–8 × 1.5–3.3 cm, somewhat unequally obtusely bilobed. Inflorescences opposite to leaves, often 3 or 4, to 1 m, stout and rigid, often with several branches, laxly many flowered; floral bracts broadly ovate-triangular, ca. 3 mm. Flowers flame-red, sepals and petals with orange spots adaxially especially at margins; pedicel and ovary 2.5–3 cm. Dorsal sepal narrowly spatulate, 20–30 × 4.5–6 mm, margin slightly undulate, apex obtuse; lateral sepals oblong, 25–35 × 8–12 mm, base contracted into a claw, margin conspicuously undulate, apex obtuse. Petals similar to dorsal sepal but smaller, rounded; lip 3-lobed; lateral lobes erect, nearly suborbicular or square, ca. 3 × 4 mm, base with a pair of fleshy, suborbicular calli, apex rounded; mid-lobe ovate, ca. 5 × 2.5 mm, recurved from middle, acute; spur conic, ca. 4 mm. Column ca. 5 mm; stipe ca. 2 mm, ± geniculate-curved at middle. Fl. Apr–Jun.  $2n = 38, 114$ .

Epiphytic on tree trunks or lithophytic on rocks in open forests or at forest margins along valleys; 200–1400 m. SW Guangxi, Hainan, SE Yunnan [Laos, Myanmar, Thailand, Vietnam].

**2. Renanthera imschootiana** Rolfe, Bull. Misc. Inform. Kew 1891: 200. 1891.云南火焰兰 *yun nan huo yan lan*

Stems to 1 m, with many rather contiguous and distichous leaves. Leaf blade oblong, 6–8 × 1.3–2.5 cm, leathery, somewhat obliquely rounded-bilobed. Inflorescence axillary, to 1 m,

usually branched, many flowered; peduncle and rachis slender; floral bracts broadly ovate, ca. 2 mm, apex obtuse. Flowers: sepals and petals dull yellow, spotted with red on apical half of petals and tinged with red on lateral sepals, lip red with whitish markings, spur yellow with red tip, column deep red; pedicel and ovary reddish, 2–2.3 cm. Dorsal sepal subspatulate-oblan-ceolate, ca. 24 × 5 mm, ± acute; lateral sepals obliquely elliptic-ovate, ca. 30 × 10 mm, base contracted into a claw ca. 6 mm, margin undulate, apex obtuse. Petals narrowly spatulate, ca. 20 × 4 mm, obtuse and thickened; lip 3-lobed; lateral lobes erect, deltoid, ca. 3 mm, exceeding column, base with 2 membranous lamellae, apex acute; mid-lobe ovate, ca. 4.5 × 3 mm, acute, strongly recurved, base with 3 fleshy calli; spur ca. 2 mm, obtuse. Column cylindric, ca. 4 mm. Fl. May.  $2n = 38$ .

Epiphytic on tree trunks in forests along valleys; below 500 m. S Yunnan [NE India (Manipur), ?Myanmar, Vietnam].

**3. Renanthera citrina** Averyanov, Orchids 66: 1287. 1997.中华火焰兰 *zhong hua huo yan lan*

*Renanthera citrina* var. *sinica* (Z. J. Liu & S. C. Chen) R. Rice; *R. sinica* Z. J. Liu & S. C. Chen.

Stems suberect or ± scrambling, 20–40(–80) cm, distichously many leaved. Leaf blade narrowly oblong, 7–10 × 0.9–1.1 cm, thickly leathery, unequally obtusely bilobed. Inflorescence solitary, axillary, from upper part of stem, racemose, 12–26 cm, 5–10-flowered; floral bracts ca. 1 mm, membranous. Flowers yellowish, sparsely spotted with purple-red; pedicel and ovary 1.6–2.7 cm. Dorsal sepal narrowly oblong-spatulate, 18–22 × 3–4 mm, obtuse-acute; lateral sepals similar to dorsal

sepal, usually somewhat twisted, 26–31 × 4.5–5.5 mm, base with a claw 5–6 mm, margin strongly undulate, recurved. Petals linear, 13–17 × 1.5–2.5 mm, obtuse; lip much smaller, 3-lobed; lateral lobes erect, ovate-lanceolate, 1.5–2 mm; mid-lobe suborbicular, subglobose-saccate in apical half, ca. 2 mm, with 3 ridges near base, with a shortly conic basal sac ca. 2 × 2 mm

and a pair of subquadrate lamellate calli between its base and distal edges of lateral lobes, extending downward into sac. Column 3.5–4 mm. Fl. Apr–May.

Epiphytic on tree trunks or lithophytic on rocks along valleys; 500–800 m. SE Yunnan [Vietnam].

## 156. *SCHOENORCHIS* Blume, Bijdr. 361. 1825.

匙唇兰属 *chi chun lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Herbs, epiphytic, monopodial, small. Stems pendulous or ascending, with condensed or elongated internodes, to 30 cm, sometimes branched, with several to many nodes. Leaves flat to subterete, fleshy, with sheathing base, blade jointed to sheath. Inflorescence axillary, racemose or paniculate, many flowered. Flowers usually not opening widely, white or red-purple, small, fleshy. Sepals similar, free, often dorsally carinate. Petals free, smaller than sepals; lip thickly fleshy, adnate to base of column, immovable, longer than petals, spurred at base, 3-lobed; lateral lobes erect; mid-lobe slightly larger, often spatulate; spur large, usually parallel to ovary, lacking interior calli. Column very short, stout, foot absent; stigma at base of column; anther and rostellum, pointed, geniculate; pollinia 4, appearing as 2 unequal masses, waxy, flat-globose or subglobose, attached by a common stipe to a narrowly elliptic to ovate viscidium.

About 24 species: from the Himalayan region, S India, and Sri Lanka to SE China and the Philippines, south to Indonesia and east to New Guinea, Australia, and the Pacific islands; three species in China.

- 1a. Stems very short, inconspicuous; leaves 1–2 cm; inflorescence racemose ..... 1. *S. tixieri*  
 1b. Stem 5–20 cm; leaves 4–13 cm; inflorescence paniculate.  
 2a. Flowers purple-red except for mid-lobe of lip; leaves linear-terete, conduplicate ..... 2. *S. gemmata*  
 2b. Flowers white; leaves linear-lanceolate, flat, not conduplicate ..... 3. *S. vanoverberghii*

1. *Schoenorchis tixieri* (Guillaumin) Seidenfaden, Contr. Revis. Orchid Fl. Cambodia, Laos & Vietnam, 102. 1975.

圆叶匙唇兰 *yuan ye chi chun lan*

*Saccolabium tixieri* Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 30: 462. 1958.

Plants 1–3 cm tall. Stem very short, inconspicuous, enclosed in leaf sheaths. Leaves nearly basal, many; leaf blade dark green, oblong or elliptic, flat, 1–2 × 0.6–0.9 cm, thickly textured, wrinkled, obtuse and unequally bilobed. Inflorescences pendulous, racemose, 1–2 cm, densely many flowered; rachis fleshy, ribbed; floral bracts yellowish green, lanceolate, 1.5–2.5 mm, acute. Flowers not opening widely, deep red, slightly fleshy; petals tinged white, lip tinged yellow, column and anther cap yellow; pedicel and ovary purplish brown, 4–5 mm. Dorsal sepal ovate, ca. 2.5 × 1.5 mm, obtuse; lateral sepals obliquely obovate, ca. 2.5 × 2.5 mm, dorsally ± carinate, apex obtuse. Petals ovate, ca. 2 × 1.2 mm, obtuse; lip 3-lobed; lateral lobes erect, suborbicular, ca. 2 × 2 mm; mid-lobe ca. 2 mm, thickly fleshy, adaxially convex-thickened and broadly conic centrally; spur ca. 3 mm, slightly constricted at base, obtuse; disk with a subglobose callus near base of mid-lobe. Column ca. 1 mm, stout; rostellum ca. 0.4 mm; anther cap apex with 3 sharp teeth; stipe flat, ca. 1 × 0.3 mm; viscidium scalelike, ca. 2 × 0.5 mm. Fl. May.

Epiphytic on tree trunks at forest margins; 900–1400 m. S Yunnan [Vietnam].

2. *Schoenorchis gemmata* (Lindley) J. J. Smith, Natuurk. Tijdschr. Ned.-Indië 72: 100. 1912.

匙唇兰 *chi chun lan*

*Saccolabium gemmatum* Lindley, Edwards's Bot. Reg. 24 (Misc.): 50. 1838; *Cleisostoma gemmatum* (Lindley) King & Pantling; *Gastrochilus gemmatus* (Lindley) Kuntze; *S. hainanense* Rolfe; *Schoenorchis hainanensis* (Rolfe) Schlechter.

Stems usually pendulous, ± compressed cylindric, 5–20 cm, 5–8 mm in diam., somewhat rigid, unbranched, internodes 7–15 mm. Leaves many, cauline; leaf blade linear-terete, 4–13 × 0.5–1.3(–1.7) cm, obtuse and shallowly 2- or 3-lobed. Inflorescences paniculate, arising from near apex of stem, 8–15 cm, densely many flowered; peduncle purplish brown, slender, sheathed; floral bracts ovate-triangular, ca. 1 mm. Flowers 3–4 mm; sepals white or bright purple with white apices, petals bright purple, lip white with purple on spur and lateral lobes, column and anther cap yellowish brown; pedicel and ovary purplish red, ca. 3 mm. Dorsal sepal ovate, 1.5–2.2 × 1–1.2 mm, 1-veined, obtuse; lateral sepals slightly obliquely ovate, 2–2.5 × 1.1–1.4 mm, dorsally slightly carinate, apex obtuse. Petals obovate-cuneate, 1.1–1.5 × ca. 1 mm, 1-veined, apex truncate and emarginate; lip spatulate, 3-lobed; lateral lobes erect, subovate, ca. 1.5 × 1 mm; mid-lobe obovate-spatulate, 2–2.5 × 1.7–2.1 mm, thickly fleshy, shortly clawed at base, apex obtuse; spur parallel to ovary, conic, ca. 2 × 1.5 mm, obtuse. Column ca. 0.8 mm. Capsule subovoid, ca. 6 × 3 mm. Fl. Mar–Jun, fr. Apr–Jul. 2*n* = 36.

Epiphytic on tree trunks in forests; 200–2000 m. S Fujian, Guangxi, Hainan, Hong Kong, SE Xizang, W to SE Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Nepal, Thailand, Vietnam].

3. *Schoenorchis vanoverberghii* Ames, Orchidaceae 5: 242. 1915.

台湾匙唇兰 *tai wan chi chun lan*

*Schoenorchis paniculata* Blume var. *vanoverberghii* (Ames) S. S. Ying.

Stems 5–15 cm, rooting at base, internodes ca. 5 mm. Leaves many, distichous; leaf blade flat, narrowly oblong or linear-lanceolate, 5–6 × 0.4–0.7 cm, obtuse or unequally bilobed. Inflorescence paniculate, borne from near apex of stem, 6–7 cm, branched, densely many flowered; floral bracts deltoid, ca. 3 mm. Flowers white, not opening widely; pedicel and

ovary ca. 2 mm. Dorsal sepal elliptic, 2–2.3 × 1–1.2 mm, rounded; lateral sepals obliquely ovate, 2.3–2.5 × 1.2–1.5 mm, obtuse. Petals obovate or elliptic, ca. 2 × 0.9–1 mm, rounded; lip spatulate, ca. 2.5 × 1.3 mm, fleshy, 3-lobed; lateral lobes erect, nearly suborbicular; mid-lobe hornlike, rather thick; spur subellipsoid, ca. 1.3 mm, with a ligulate appendage on front wall of entrance. Column ca. 0.6 mm. Fl. Mar–May.

Epiphytic in forests; ca. 1000 m. Taiwan [Philippines].

### 157. CLEISOSTOMOPSIS Seidenfaden, Opera Bot. 114: 370, 372. 1992.

拟隔距兰属 ni ge ju lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems elongate, slender, enclosed in leaf sheaths of leaves, laxly many leaved. Leaves terete, with sheathing base, jointed. Inflorescences racemose, lateral, piercing sheaths; floral bracts small; pedicel and ovary longer than floral bracts. Flowers small. Sepals free, lateral sepals slightly larger than dorsal sepal. Petals smaller than sepals; lip adnate at base to column, spurred, 3-lobed; spur much longer than sepals, inside with a Y-shaped callus on back wall, but without septum. Column short, stout, without a foot; rostellum large; stigma concave; pollinia 4 in 2 pairs, waxy, subglobose, each pair with a caudicle, attached by a common stipe to a large viscidium.

One species: China, Vietnam.

1. *Cleisostomopsis eberhardtii* (Finet) Seidenfaden, Opera Bot. 114: 372. 1992.

拟隔距兰 ni ge ju lan

*Saccolabium eberhardtii* Finet, Notul. Syst. (Paris) 1: 258. 1910; *Sarcanthus eberhardtii* (Finet) Tang & F. T. Wang; *Schoenorchis eberhardtii* (Finet) Averyanov.

Stems arching, to 50 cm, 2–3 mm in diam., laxly many leaved. Leaf blade terete, 5–15 cm × ca. 2 mm, fleshy, obtuse. Inflorescences usually 1 or 2, 5–10 cm, unbranched, laxly many flowered; floral bracts triangular, ca. 2 mm. Flowers white,

small; lip mid-lobe lilac; pedicel and ovary 4–5 mm. Sepals broadly ovate-elliptic, ca. 2.2 × 1.6 mm, obtuse; lateral sepals slightly larger than dorsal sepal. Petals ovate, ca. 2 × 1 mm, rounded; lip spurred at base, 3-lobed; lateral lobes erect, broadly ovate, ca. 0.3 mm, rounded; mid-lobe ovate, cymbiform, ca. 1 mm, fleshy, acute and incurved; spur cylindrical-clavate, 3–3.5 mm, dilated toward apex, inside with a Y-shaped callus on its back wall. Column ca. 0.8 mm; stipe lanceolate, ca. 0.5 mm; viscidium ± oblong, ca. 0.5 × 0.4 mm. Fl. May–Jun.  $2n = 38, 40$ .

Epiphytic on tree trunks in forests; ca. 600 m. SW Guangxi [Vietnam].

### 158. TRICHOGLOTTIS Blume, Bijdr. 359. 1825.

毛舌兰属 mao she lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, climbing, monopodial. Stems pendulous or climbing, short or long, slender, internodes elongated, with few to many nodes. Leaves many, distichous, linear to elliptic, slightly fleshy or leathery, base sheathing and jointed, apex usually unequally bilobed. Inflorescences lateral, axillary, several to many or rarely solitary, peduncle very short, 1- to several flowered, often more than 1 per node. Flowers lasting ca. 1 week, resupinate, opening widely, usually yellowish with light brown or purple markings, rather small. Sepals and petals free. Petals slightly smaller than sepals; lip immovable, spurred or saccate at base, 3-lobed; lateral lobes erect; mid-lobe sometimes 3-lobed, often hairy or papillate; sac or spur often thickened, with a hairy ligulate appendage on back wall just below base of column. Column short and stout, without a foot, often with small roughly hairy stelia; rostellum short; pollinia waxy, 4, appearing as 2 unequal masses, attached by a common linear-oblong stipe to a small, ovate or elliptic viscidium.

About 55–60 species: India (Nicobar Islands) and Sri Lanka east to New Guinea, Australia and the Solomon Islands, north to S China, with the center of diversity in Indonesia and the Philippines; two species (one endemic) in China.

1a. Stems erect, 0.5–1.5 cm; raceme 2- or 3-flowered ..... 1. *T. triflora*  
1b. Stems pendulous, to 50 cm; raceme 3–6-flowered ..... 2. *T. rosea*

1. *Trichoglottis triflora* (Guillaumin) Garay & Seidenfaden, Bot. Mus. Leaflet 23: 209. 1972.

毛舌兰 mao she lan

*Saccolabium triflorum* Guillaumin, Bull. Mus. Natl. Hist.

Nat., sér. 2, 28: 239. 1956.

Plants small. Roots slightly flattened. Stem erect, 5–15 mm, enclosed in leaf sheaths. Leaves 6 or 7, distichous-equitant, recurved, often V-shaped-conduplicate, 2–3.5 × 0.5–0.6 cm, apex obtuse and unequally bilobed. Inflorescences 1–3,

axillary, 5–10 mm, 1–3-flowered; peduncle ca. 1 mm in diam., with 1 or 2 sheaths at base; floral bracts ovate-triangular, ca. 1 mm, obtuse. Flowers not opening widely, yellowish green, with white and purple-red spotted lip, slightly fleshy; pedicel and ovary 2.5–3 mm. Sepals oblong-elliptic or oblong, ca. 3 × 1.2 mm, dorsally ± carinate, apex obtuse; lateral sepals slightly oblique. Petals narrowly falcate-oblong, ca. 2.8 × 7 mm, dorsally carinate, apex obtuse; lip ca. 2.5 mm, 3-lobed; lateral lobes erect, suborbicular; mid-lobe ca. 1.5 × 2.5 mm, with 3 lobules nearly equal in size; lateral lobules subovate-triangular, large, obtuse; mid-lobule ovate-triangular, adaxially densely minutely papillate; spur parallel to ovary, tubular, ca. 2 × 1.2 mm, obtuse, with a ca. 0.3 mm ligulate appendage on its back wall, densely villous from upper inner wall to its entrance. Column ca. 8 mm; stipe ca. 0.7 mm, narrow. Fl. Aug.  $2n = 38, 40$ .

Epiphytic on tree trunks in forests; 1100–1200 m. S Yunnan [Thailand, Vietnam].

**2. *Trichoglottis rosea*** (Lindley) Ames in E. D. Merrill, Enum. Philipp. Fl. Pl. 1: 440. 1925.

短穗毛舌兰 duan sui mao she lan

*Cleisostoma roseum* Lindley, Edwards's Bot. Reg. 24

(Misc.): 80. 1838; *C. breviracemum* Hayata; *C. oblongisepalum* Hayata; *Pomatocalpa breviracemum* (Hayata) Hayata; *Trichoglottis breviracema* (Hayata) Schlechter; *T. oblongisepala* (Hayata) Schlechter; *T. rosea* var. *breviracema* (Hayata) T. S. Liu & H. J. Su.

Stems clustered, pendulous, to 50 cm, internodes 1.5–2 cm. Leaves many, distichous; blade narrowly lanceolate, 7–10 × 1.2–1.5 cm, slightly fleshy, with amplexicaul-sheathing base, apex acute. Inflorescences several, borne opposite leaves, very short, 3–6-flowered; peduncle 3–6 mm; floral bracts broadly triangular, ca. 2 mm. Flowers white, sometimes tinged with pale yellow or purple; pedicel and ovary ca. 5.5 mm. Dorsal sepal oblong, 7–9 × 2.5–3.5 mm, acute; lateral sepals obliquely ovate, 6–8 × 4–5 mm, acute. Petals falcate-oblong, 7–9 × 2–3 mm, acute; lip somewhat fleshy, shortly spurred; lateral lobes erect, deltoid, ca. 1 mm, obtuse; mid-lobe broadly ovate, 2–3 × 2.5–3.5 mm, apex obtuse, base thickened, forming a fleshy appendage almost covering spur entrance; spur obconic, ca. 2.5 mm, with a ligulate appendage on upper back wall. Fl. Apr–May.  $2n = 38^*$ .

• Epiphytic on tree trunks in forests at low elevations. S Taiwan.

## 159. STAUROCHILUS Ridley ex Pfitzer in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 2: 16. 1900.

掌唇兰属 zhang chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Sarothrochilus* Schlechter.

Herbs, epiphytic, monopodial, large. Stems ascending, climbing or pendulous, long or short, with many nodes. Leaves many, distichous, usually lorate, with nodes, base amplexicaul-sheathing, sessile, jointed. Inflorescences axillary, paniculate, often opposite to leaves, laxly several to many flowered. Flowers usually opening widely, small to medium-sized. Sepals free, similar. Petals slightly smaller; lip fleshy, adnate at base to column, immovable, base shortly spurred or slightly saccate, 3- or 5-lobed; lateral lobes erect; mid-lobe usually ± hairy on adaxial surface; spur, if present, with a hairy ligulate appendage on its back wall. Column short, stout, often hairy, foot indistinct; pollinia 4 in unequal pairs, waxy, subglobose, unequal in size, with a common narrow stipe and a solitary ovate viscidium.

About 14 species: from India through SE Asia to Indonesia and the Philippines; three species in China.

1a. Inflorescences shorter than leaves; peduncle and rachis 1–1.5 mm in diam. .... 2. *S. loratus*

1b. Inflorescences longer than leaves; peduncle and rachis stout, ca. 3 mm in diam.

2a. Lip 5-lobed ..... 1. *S. dawsonianus*

2b. Lip 3-lobed ..... 3. *S. luchuensis*

**1. *Staurochilus dawsonianus*** (H. G. Reichenbach) Schlechter, Orchideen, 577. 1914.

掌唇兰 zhang chun lan

*Cleisostoma dawsonianum* H. G. Reichenbach, Gard. Chron. 1868: 815. 1868; *Sarothrochilus dawsonianus* (H. G. Reichenbach) Schlechter; *Trichoglottis dawsoniana* (H. G. Reichenbach) H. G. Reichenbach.

Stems ascending, terete, to more than 50 cm, 6–7 mm in diam., rigid, sometimes branching, with many nodes, internodes 1.5–2.5 cm. Leaves many, distichous, narrowly oblong, 11–15 × 1.5–2 cm, obtuse and unequally bilobed. Inflorescence opposite to leaf, paniculate, to 45 cm, laxly many flowered; peduncle

3–4 mm in diam.; rachis yellowish green, slightly compressed or ± trigonous, narrowly winged; floral bracts ovate-triangular, 5–7 mm, obtuse. Flowers opening widely, fleshy, sepals and petals pale yellow, adaxially with chestnut transverse stripes, lip orange-yellow, disk with a central red band; pedicel and ovary 1.5–2 cm. Dorsal sepal subspatulate, ca. 15 × 5 mm, dorsally carinate, mucronate; lateral sepals slightly oblique, oblong, ca. 15 × 5 mm, rostrate. Petals spatulate, ca. 14 × 4 mm, retuse and shortly rostrate; lip ca. 7 mm, 5-lobed; basal lobes oblong, ca. 4.8 × 1.7 mm; lateral lobes narrowly oblong, ca. 4 × 1.5 mm, obtuse; apical lobes narrowly obovate, ca. 2.5 mm, thickly fleshy, obtuse and emarginate at apex; disk densely hirsute; spur conic, ca. 1 mm, thickly fleshy, with a broadly ovate-triangular appendage on its back wall. Column ca. 3 mm, stout, steldia

hirsute; stigma large, at base of column; anther cap subglobose, densely minutely papillate-hairy. Capsule narrowly ellipsoid, ca. 4 × 1 cm. Fl. May–Jul, fr. Sep–Oct.  $2n = 38$ .

Epiphytic on tree trunks at forest margins; 500–800 m. S Yunnan [Laos, Myanmar, Thailand].

**2. *Staurochilus loratus*** (Rolfe ex Downie) Seidenfaden, *Opera Bot.* 95: 95. 1988.

小掌唇兰 xiao zhang chun lan

*Ascochilus loratus* Rolfe ex Downie, *Bull. Misc. Inform. Kew* 1925: 407. 1925; *Pteroceras loratum* (Rolfe ex Downie) Seidenfaden & Smitinand.

Stems ascending, 3–16 cm, 5–7 mm in diam., rigid, sometimes branching, internodes 5–7 mm. Leaves many, distichous; leaf blade narrowly oblong, 10–16 × 0.9–1.8 cm, leathery, obtuse and slightly unequally bilobed. Inflorescences ascending, racemose, 1–5, 5–8 cm, laxly 3–6-flowered; peduncle slender, 1–1.5 mm in diam.; floral bracts triangular, ca. 2 mm, acute. Flowers opening widely, small, slightly fleshy, sepals and petals yellow with purplish brown spots, lip white; pedicel and ovary ca. 6 mm. Dorsal sepal subspatulate, ca. 5 × 2.5 mm, acute; lateral sepals obliquely obovate, ca. 5 × 3 mm, obtuse. Petals obliquely obovate, ca. 4.5 × 2.5 mm, obtuse; lip ca. 6 mm, fleshy, 3-lobed, base with a channeled, densely hairy claw ca. 2 mm; lateral lobes suboblong, ca. 2 × 1.5 mm; mid-lobe subquadrate, ca. 2 × 3 mm, fleshy, adaxially ± papillate, subtruncate; disk deeply concave at center; spur cylindrical, ca. 2.5 × 1.5 mm, apex obtuse, interior with a densely hairy ligulate appendage on back wall. Column ca. 2 mm, with dense minutely papillate hairs; stipe spatulate, ca. 1.5 mm; viscidium elliptic, very thick. Capsule cylindrical, 4–5 cm × ca. 5 mm. Fl. Jan–Mar, fr. Jun.

Epiphytic on tree trunks in forests; 700–1500 m. S Yunnan [Thailand].

**3. *Staurochilus luchuensis*** (Rolfe) Fukuyama, *Trans. Nat. Hist. Soc. Formosa* 32: 270. 1942.

豹纹掌唇兰 bao wen zhang chun lan

*Staurochilus luchuensis* Rolfe, *Bull. Misc. Inform. Kew* 1907: 131. 1907; *Cleisostoma ionosmum* Lindley f. *lutschuense* Makino; *Pomatocalpa luchuense* (Rolfe) Tang & F. T. Wang; *Trichoglottis ionosma* (Lindley) J. J. Smith var. *luchuensis* (Rolfe) S. S. Ying; *T. luchuensis* (Rolfe) Garay & H. R. Sweet; *Vandopsis luchuensis* (Rolfe) Schlechter.

Stems terete, to 1 m, stout, ca. 1.5 cm, internodes 2–3 cm. Leaves many, distichous; leaf blade linear-lorate, 20–25 × 2.5–3.5 cm, leathery, unequally laterally bilobed. Inflorescences arising from upper stem, several, ascending, racemose or paniculate, to 40 cm, many flowered; floral bracts broadly triangular, ca. 4 mm. Flowers yellowish white with many brownish red spots, opening widely, fleshy; pedicel and ovary ca. 1.5 cm. Dorsal sepal spatulate, ca. 18 × 7 mm, obtuse; lateral sepals slightly oblique, spatulate, shorter and wider than dorsal sepal. Petals falcate-obovate, ca. 17 × 7 mm, clawed at base; lip 3-lobed, including spur ca. 1.5 cm; lateral lobes erect, suborbicular, both surfaces shortly hairy; mid-lobe fleshy, abruptly narrowed near middle to a hairy cuspidate tip; spur subconic, ca. 5 mm, interior with a ca. 4 mm appendage almost covering entrance; stelia hairy; clinandrium and anther cap hairy. Fl. Mar–May.  $2n = 38$ .

Epiphytic on trees in broad-leaved forests. Taiwan [Japan (Ryukyu Islands), Philippines].

## 160. POMATOCALPA Breda, Gen. Sp. Orchid. *Asclep.* [fasc. 3: text p. 1, t. 1]. 1829.

鹿角兰属 lu jiao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial, small to medium-sized. Stems pendulous or ascending, sometimes climbing, short or elongate, with a few to many nodes. Leaves several to many, distichous, narrowly oblong, flat, leathery, with sheathing base, usually unequally bilobed or retuse. Inflorescences lateral, paniculate or racemose, pendulous or ascending, many flowered; peduncle long. Flowers resupinate or not, usually opening widely, small. Sepals and petals free, similar, spreading. Lip firmly attached to column, immovable, fleshy, shortly spurred or saccate, 3-lobed; lateral lobes erect, deltoid, small; mid-lobe often recurved, usually suborbicular or ovate-triangular, fleshy; front wall fleshy, thickened, back wall with a projecting, erect, bifurcate, ligulate appendage reaching or exerted beyond entrance. Column short, stout, foot absent; anther cap shortly beaked; rostellum large, hamulate, ± bifid, shorter than diam. of column; pollinia 4, as 2 discrete unequal pollen masses, waxy, subglobose, with a long common stipe and a solitary small, usually concave viscidium.

Thirteen species: from India through Malesia and N Australia to Fiji, north to NE Himalayas and Taiwan; two species in China.

See the treatment by Wathana (*Harvard Pap. Bot.* 11: 207–256. 2007).

1a. Floral bracts acuminate; lip mid-lobe narrower than spur; inflorescence usually longer than 4 cm ..... 1. *P. spicatum*  
1b. Floral bracts acute; lip mid-lobe equal to or wider than spur; inflorescence shorter than 4 cm ..... 2. *P. undulatum*

**1. *Pomatocalpa spicatum*** Breda, Gen. Sp. Orchid. *Asclep.* [fasc. 3: text p. 1, t. 1]. 1829.

鹿角兰 lu jiao lan

*Cleisostoma uteriferum* J. D. Hooker; *C. wendlandorum*

H. G. Reichenbach; *Pomatocalpa wendlandorum* (H. G. Reichenbach) J. J. Smith; *Saccolabium uteriferum* (J. D. Hooker) Ridley; *S. wendlandorum* (H. G. Reichenbach) Kraenzlin.

Stems erect, 2–3 cm, stout. Leaves 5 or 6; leaf blade dark green, broadly lorate or falcate-oblong, 20–31 × 2.5–3.5 cm,

leathery, margin  $\pm$  undulate, apex unequally bilobed. Inflorescences 2 or 3, lateral, pendulous, 3.5–6 cm, unbranched and racemose or occasionally with 1 or 2 branches; rachis fleshy, ribbed, densely many flowered; floral bracts reflexed, broadly ovate-triangular, ca. 1 mm, acute, often adnate to rachis. Flowers waxy yellow, rather fleshy, dorsal sepal with 2 brown bands at base, lateral sepals with U-shaped brown spots at base and with 2 brown bands above middle, petals with 2 brown bands at base; pedicel and ovary ca. 2.5 mm. Dorsal sepal obovate, ca. 5  $\times$  2 mm, apex rounded; lateral sepals incurved, slightly obliquely obovate, ca. 4.5  $\times$  2.5 mm, obtuse-rounded. Petals obovate-elliptic, ca. 3  $\times$  1.8 mm, obtuse; lip spurred at base, 3-lobed; lateral lobes erect, ovate; mid-lobe reniform-triangular or subrhombic, ca. 1.5  $\times$  1.5 mm, fleshy, apex obtuse; spur subglobose, ca. 2  $\times$  2 mm, inside with a ligulate bilobed-tipped appendage on back wall and a pair of calli near base of disk. Column ca. 2 mm; rostellum ovate-triangular, ca. 0.4 mm; stipe ca. 1.2 mm, narrow; viscidium ca. 0.5 mm, subelliptic, one end broadly emarginate. Fl. Apr.  $2n = 38$ .

Epiphytic on tree trunks in forests. S and W Hainan [Bhutan, India (including Andaman Islands), Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

**2. *Pomatocalpa undulatum*** (Lindley) J. J. Smith subsp. ***acuminatum*** (Rolfe) S. Watthana & S. W. Chung, Harvard Pap. Bot. 11: 249. 2007.

台湾鹿角兰 tai wan lu jiao lan

*Cleisostoma acuminatum* Rolfe, Bull. Misc. Inform. Kew 1913: 144. 1913; *C. brachybotryum* Hayata; *Pomatocalpa acuminatum* (Rolfe) Schlechter; *P. brachybotryum* (Hayata) Schlechter.

Stems 2–3 cm, 3–7-leaved. Leaf blade linear-lorate, 11–21  $\times$  1.3–2.4 cm, leathery, conduplicate toward base, unequally bilobed. Inflorescences lateral, condensed-racemose, globose in outline, 1.3–4 cm, densely many flowered; floral bracts broadly triangular, 1.8–2.7 mm. Flowers ca. 8 mm in diam., fleshy, sepals and petals brownish yellow, sepals with 2 reddish brown transverse bands, petals with reddish brown patches near base, lip lateral lobes yellow, mid-lobe white, spur yellow; pedicel and ovary 4–8 mm. Sepals similar, suboblong, obtuse; dorsal sepal 3.7–4.5  $\times$  1.5–2 mm; lateral sepals 3.5–4.2  $\times$  2.1–2.4 mm. Petals incurved, falcate-oblong, 3.2–3.9  $\times$  ca. 1.3 mm, base contracted, apex obtuse; lip spurred at base, 3-lobed; lateral lobes erect, deltoid, 1.2–1.3  $\times$  0.4–0.5 mm; mid-lobe broadly triangular or suborbicular, 2.2–3  $\times$  2.2–3.3 mm, base with 2 keels, apex subacute; spur saccate, dorsiventrally compressed, 3.3–4  $\times$  2–3 mm, inside with an appendage on back wall covering its entrance. Column 0.9–1.2 mm; anther cap beaked at apex. Fl. Mar–Apr.

• Epiphytic on tree trunks in forests; ca. 800 m. S Taiwan.

*Pomatocalpa undulatum* subsp. *undulatum*, from Bangladesh and NE India, is distinguished by the floral bracts, which are 0.4–0.5 mm, and the relatively small flowers with dorsal sepal ca. 3.5 mm and spur 1.8–2.3 mm.

## 161. PELATANThERIA Ridley, J. Linn. Soc., Bot. 32: 371. 1896.

钻柱兰属 zuan zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic, monopodial. Stems rather long climbing, rooting from nodes, usually slightly compressed trigonous, many noded, rigid, enclosed in persistent leaf sheaths, sometimes branched. Leaves many, usually densely distichous, flat, rarely subcylindric, leathery or slightly fleshy, base sheathing, jointed, apex bilobulate, rarely obtuse. Inflorescence racemose, axillary, usually very short, few flowered. Flowers small or medium-sized, fleshy. Sepals free, similar. Petals smaller; lip spurred at base, 3-lobed; lateral lobes erect, small; mid-lobe large, adaxially thickened and cushionlike centrally; spur narrowly conic, with a longitudinal septum or ridge on inner surface, and with a tough appendage on back wall. Column stout, apex with 2 long and incurved stelia; rostellum small, short; pollinia 4 in 2 pairs, waxy, subglobose; stipe irregular, much broader than long; viscidium  $\pm$  crescent-shaped.

About five species: tropical Himalayas south to Sumatra, north to Korea and Japan; four species in China.

Reviewer L. Averyanov notes that *Pelatantheria insectifera* (H. G. Reichenbach) Ridley (J. Linn. Soc., Bot. 32: 373. 1896; *Sarcanthus insectifer* H. G. Reichenbach, Bot. Zeitung (Berlin) 15: 159. 1857) should occur in S China. However, the present authors could not substantiate this assertion because they found no relevant specimens.

- 1a. Leaves 0.5–0.8  $\times$  ca. 0.15 cm, subcylindric, obtuse ..... 1. *P. scolopendrifolia*  
 1b. Leaves much broader, flat, bilobed.  
 2a. Mid-lobe of lip pink, apex obtuse ..... 2. *P. rivesii*  
 2b. Mid-lobe of lip waxy yellow, apex shortly cuspidate.  
 3a. Apical tail of mid-lobe 2- or 3-lobed, margin not fimbriate ..... 3. *P. bicuspidata*  
 3b. Apical tail of mid-lobe entire, margin irregularly fimbriate ..... 4. *P. ctenoglossa*

**1. *Pelatantheria scolopendrifolia*** (Makino) Averyanov, Bot. Zhurn. (Moscow & Leningrad) 73: 432. 1988.

蜈蚣兰 wu gong lan

*Sarcanthus scolopendrifolius* Makino, Ill. Fl. Japan 1(7): t.

40. 1891; *Cleisostoma scolopendrifolium* (Makino) Garay.

Plants creeping. Stems slender, ca. 1.5 mm in diam., many noded, branched. Leaves distichous, rather close; blade  $\pm$  conduplicate, subcylindric, 5–8  $\times$  ca. 1.5 mm, leathery, apex ob-

tuse; basal sheaths ca. 5 mm. Inflorescence a raceme, lateral, often shorter than leaves; raceme 1- or 2-flowered; peduncle 2–4 mm, slender; floral bracts ovate, ca. 0.5 mm. Flowers opening widely, thinly textured; sepals and petals pale flesh-colored; lip white spotted with yellow; pedicel and ovary ca. 3 mm. Dorsal sepal ovate-oblong, ca. 3 × 1.5 mm, apex obtuse; lateral sepals obliquely ovate-oblong, ca. 3 × 2 mm. Petals suboblong, smaller than dorsal sepal; lip spurred at base, 3-lobed; lateral lobes erect, subtriangular, obtuse; mid-lobe ligulate-triangular or sagittate-triangular, ca. 3 mm, ± fleshy, apex long acute, base with 1 ridge running into spur; spur subglobose, ca. 0.8 mm in diam., apex emarginate; callus on its back wall 3-lobed; lateral lobules horn-shaped; mid-lobule U-shaped, basal half densely minutely papillate-hairy; septum inside spur inconspicuous. Column ca. 1.5 mm, base with a short foot; anther cap truncate and emarginate at apex; stipe broadly ovate, base folded; viscidium saddle-shaped. Fl. Apr.

On rocks or tree trunks in forests or shaded places; 100–1000 m. Anhui, W Fujian, Jiangsu, Shandong, NE Sichuan, E Zhejiang [Japan, Korea].

**2. *Pelatantheria rivesii*** (Guillaumin) Tang & F. T. Wang, Acta Phytotax. Sin. 1: 101. 1951.

钻柱兰 zuan zhu lan

*Sarcanthus rivesii* Guillaumin, Bull. Soc. Bot. France 77: 330. 1930.

Stems to 1 m, ca. 7 mm in diam., often branched. Leaves elliptic, 3–4 × 1–1.5 cm, obtuse and unequally bilobed. Inflorescence 5–10 mm, 2–7-flowered; peduncle very short, with 2 or 3 papery short sheaths; floral bracts ovate-triangular, ca. 1.5 mm, obtuse. Flowers thickly textured, sepals and petals pale yellow with 2 or 3 brown stripes, lip pink; pedicel and ovary ca. 8 mm. Dorsal sepal subelliptic, ca. 4 × 2.2 mm, obtuse; lateral sepals ovate-oblong, broader, obtuse. Petals oblong, ca. 4 × 1.5 mm, obtuse; lip larger than sepals and petals, 3-lobed; lateral lobes erect, ovate-triangular, small, obtuse; mid-lobe broadly ovate-triangular, ca. 6 × 6 mm, base with a papillate callus on either side, apex slightly narrowed and obtuse; spur ca. 3 × 2.5 mm, interior with a longitudinal ridge on front wall gradually broader from entrance down to end, and with an elliptic appendage on back wall. Column ca. 2 mm, with dense white glandular long hairs on front sides. Fl. Oct.

Epiphytic on tree trunks or lithophytic on rocks in broad-leaved evergreen forests; 700–1100 m. W Guangxi, S and SW Yunnan [Laos, Vietnam].

**3. *Pelatantheria bicuspidata*** Tang & F. T. Wang, Acta Phytotax. Sin. 1: 101. 1951.

尾丝钻柱兰 wei si zuan zhu lan

*Sarcanthus bicuspidatus* Rolfe ex Downie, Bull. Misc. Inform. Kew 1925: 391. 1925, not (J. D. Hooker) J. J. Smith (1912).

Stems elongate, branched. Leaves elliptic-oblong, often V-shaped-conduplicate, falcate in side view, 3–4 × ca. 1.4 cm, obtuse and unequally bilobed. Inflorescence ca. 5 mm, usually 2- or 3-flowered; peduncle ca. 5 mm, with 2 or 3 short sheaths; floral bracts ovate-triangular, 3–4 mm, acute. Flowers opening widely, whitish, with purplish red veins on sepals and petals, lip waxy yellow on disk, spur yellowish green, column white; pedicel and ovary yellowish green, 8–12 mm. Sepals similar, broadly elliptic, slightly concave, ca. 5 × 3 mm, acute. Petals oblong, ca. 4 × 2 mm, acute; lip spurred at base, 3-lobed; lateral lobes erect, ovate-triangular, small; mid-lobe subcordate, large, ca. 5 × 4 mm, shortly caudate and shallowly 2- or 3-lobed; spur ca. 5 × 3.5 mm, stout, with a longitudinal groove on front surface, interior with a longitudinal broad ridge almost dividing spur into 2 halves, and with an appendage on back wall. Column ca. 2 mm, with a cluster of short white glandular hairs on either side below middle. Fl. Jun–Oct.

Epiphytic on tree trunks or lithophytic on rocks in open forests; 800–1400 m. SW Guizhou, S and SE Yunnan [Thailand].

**4. *Pelatantheria ctenoglossa*** Ridley, J. Linn. Soc., Bot. 32: 372. 1896.

锯尾钻柱兰 ju wei zuan zhu lan

Stems elongate, 6–7 mm in diam. Leaves elliptic-oblong, 3–4 × 1–1.5 cm, obtuse, unequally bilobed. Inflorescence short, 2–6-flowered; floral bracts ovate-triangular, ca. 1.5 mm. Flowers pale yellow, sepals with purplish red veins, disk yellow and spotted purplish red, spur white, apex tinged pale yellow; pedicel and ovary 7–8 mm. Dorsal sepal broadly elliptic, concave, ca. 6.5 × 4.5 mm, with 5 purplish red veins, obtuse; lateral sepals similar to dorsal sepal, 7-veined. Petals oblong, ca. 5 × 3 mm, apical margin ± irregularly denticulate; lip fleshy, 3-lobed; lateral lobes erect, subovate-triangular, obtuse; mid-lobe subcordate, ca. 4 × 5 mm, margin white ciliate, apex shortly cuspidate; disk thickened and cushionlike centrally, waxy; spur ca. 4 × 2 mm, interior with a longitudinal broad ridge almost dividing spur into 2 halves, and with an elliptic appendage on back wall. Column ca. 2 mm, with tufted white hairs on both sides at base. Fl. Aug.  $2n = 38$ .

Lithophytic on rocks and epiphytic on tree trunks in broad-leaved evergreen forests; ca. 700 m. S Yunnan [Cambodia, Laos, Thailand, Vietnam].

## 162. SARCOGLYPHIS Garay, Bot. Mus. Leaflet. 23: 200. 1972.

大喙兰属 da hui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial, small. Stems short, with many leaves. Leaves distichous, ligulate, flat, slightly fleshy, base sheathing, jointed. Inflorescence arising from lower portion of stem, axillary, pendulous, branched or unbranched, laxly many flowered. Flowers small. Sepals and petals free, similar. Lip adnate at base to column, spurred, 3-lobed; lateral lobes suberect; mid-lobe slightly fleshy; spur subconic, inside ± septate and with a callus on back wall. Column short, stout, without a foot; stigma

suborbicular; rostellum large, raised, laterally compressed, fleshy, with a longitudinal furrow along its edge into which stipe and dorsally placed pollinia recline; anther cap subglobose, apex beaked; pollinia 4, as 2 unequal pollen masses, waxy, compressed globose, separate, each with a short caudicle, attached to a common long stipe and a small, ovate viscidium.

About 11 species: from China and India to Indonesia; two species (one endemic) in China.

- 1a. Inflorescence longer than leaves; anther cap ca. 3 mm, longer than wide, apex narrowed and long beaked ..... 1. *S. smithiana*  
 1b. Inflorescence shorter than leaves; anther cap ca. 1.5 mm, wider than long, apex not long beaked ..... 2. *S. magnirostris*

**1. *Sarcoglyphis smithiana*** (Kerr) Seidenfaden, Opera Bot. 114: 383. 1992 [*"smithianus"*].

大喙兰 da hui lan

*Sarcanthus smithianus* Kerr, J. Siam Soc., Nat. Hist. Suppl. 9: 239. 1933; *Sarcoglyphis yunnanensis* Z. H. Tsi.

Stems 2–5 cm, enclosed in persistent leaf sheaths. Leaves narrowly oblong or slightly falcate-oblong, 11–19 × 1.5–2 cm, obtuse and unequally bilobed. Inflorescence racemose, rarely paniculate, pendulous, longer than leaves, many flowered; peduncle with 3 or 4 bractlike sheaths; rachis slender; floral bracts ovate, small, ca. 1 mm, acute. Flowers small, white, tinged with purple, lip purple; pedicel and ovary 5–8 mm. Dorsal sepal oblong, cymbiform, ca. 4.5 × 3 mm, obtuse; lateral sepals obliquely ovate, ca. 4.5 × 3.5 mm, obtuse. Petals oblong, ca. 4 × 1.2 mm, obtuse; lip spurred, 3-lobed; lateral lobes erect, subtriangular, apex rounded; mid-lobe slightly fleshy, middle dilated and transversely oblong, beaked toward apex; spur subconic, ca. 3 mm, apex obtuse, interior slightly septate, with a laterally compressed callus on back wall; callus deeply grooved centrally, with 2 small hornlike projections, base densely minutely papillate. Column ca. 1.5 mm; rostellum ± oblong, ca. 1.5 mm. Fl. Apr.

Epiphytic on tree trunks in evergreen broad-leaved forests; 500–700 m. S Yunnan [Laos, Thailand, N Vietnam].

**2. *Sarcoglyphis magnirostris*** Z. H. Tsi, Acta Phytotax. Sin. 23: 387. 1985 [*"Sarcoglyphia"*].

短帽大喙兰 duan mao da hui lan

Stems ascending, 1–4 cm, ca. 1 cm in diam., usually 3–5-leaved. Leaves oblong, usually 14–16 × 1.8–2 cm, unequally bilobed. Inflorescence pendulous, racemose, shorter than leaves, unbranched, sparsely many flowered; rachis purplish black; floral bracts ovate-triangular, ca. 1 mm, acute. Flowers whitish, tinged with purplish red or purple, spur white, rostellum yellowish white, apex of anther cap yellowish brown with 2 purple stripes; pedicel and ovary pale purple, ca. 1 cm. Dorsal sepal ovate-elliptic, 4–5 × 3–3.5 mm, rounded; lateral sepals obliquely ovate, slightly larger than dorsal sepal, obtuse. Petals oblong, ca. 4 × 2 mm, obtuse; lip slightly fleshy, 3-lobed; lateral lobes erect, nearly suborbicular; mid-lobe broadly ligulate, ca. 3 × 3.2 mm, concave at center above, apex subtruncate; spur subconic, ca. 3 mm, apex rounded, inside slightly septate, with a callus on back wall; callus subquadrate, grooved centrally. Column stout; rostellum suborbicular, much higher than clinandrium; anther cap nearly triangular, ca. 1.5 mm. Fl. May.

• Epiphytic on tree trunks in forests along valleys; ca. 800 m. S Yunnan.

### 163. CLEISOSTOMA Blume, Bijdr. 362. 1825.

隔距兰属 ge ju lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Sarcanthus* Lindley (1826), not Lindley (1824).

Herbs, epiphytic or rarely lithophytic, monopodial, small to medium-sized. Stems erect or pendulous, rarely creeping, long or short, rigid, branched or unbranched, many noded. Leaves few to many, distichous, dorsiventrally flattened or terete, base usually jointed and sheathing, apex bilobed or acute. Inflorescence racemose or paniculate, lateral, axillary or opposite leaves, erect, horizontal, or pendulous, few to many flowered; floral bracts small, much shorter than pedicel and ovary. Flowers small, ± fleshy. Sepals free, usually spreading. Petals free, often smaller than sepals; lip adnate to column by its base or back margins of lateral lobes, immovable, spurred at base, 3-lobed; disk often with longitudinal lamellae or ridges; spur conic, cylindrical, or saccate, often longitudinally septate inside, rarely septum reduced to a narrow keel, usually with a callus on back wall and often with outgrowths on front wall closing entrance. Column short, stout, foot short; rostellum small; pollinia 4, appearing as 2 unequal masses, waxy, subglobose, with a common stipe and a solitary small and subglobose to broad and horseshoe-shaped viscidium.

About 100 species: Sri Lanka, India, mainland SE Asia, Malaysia, and Indonesia to the Philippines, New Guinea, Pacific islands, and Australia; 16 species (four endemic) in China.

- 1a. Leaves cylindrical or subcylindrical, terete, 2–3 mm in diam.  
 2a. Leaves 6–11 cm.  
 3a. Column with apical stelidia, glabrous; stipe broadly ovate-triangular or miter-shaped; viscidium crescent-shaped ..... 12. *C. williamsonii*  
 3b. Column without stelidia, densely hairy at base in front; stipe nearly suborbicular; viscidium U-shaped ..... 15. *C. simondii*  
 2b. Leaves 17–33 cm.

- 4a. Stipe nearly square; viscidium large, wider than stipe, U-shaped ..... 16. *C. nangongense*  
 4b. Stipe ovate-lanceolate; viscidium small, nearly as wide as stipe, suborbicular.  
     5a. Back wall callus inside spur bilobed ..... 13. *C. fuerstenbergianum*  
     5b. Back wall callus inside spur stellate, with thickened ridges adaxially ..... 14. *C. filiforme*
- 1b. Leaves dorsiventrally flattened, more than 4 mm wide.  
 6a. Stipe not linear, base geniculate-folded; viscidium large, crescent-shaped, U-shaped, or saddle-shaped.  
     7a. Mid-lobe of lip obtuse, entire, without apical bristles or tails ..... 11. *C. paniculatum*  
     7b. Mid-lobe of lip acuminate or acute, with 2 apical bristles or 2 tails.  
        8a. Inflorescence longer than leaves, branched; sepals and petals ca. 1 cm ..... 9. *C. birmanicum*  
        8b. Inflorescence shorter than leaves, unbranched; sepals or petals ca. 6 mm ..... 10. *C. striatum*
- 6b. Stipe linear or slightly clavate, base not folded; viscidium very small, suborbicular.  
 9a. Leaves acute and unlobed at apex.  
     10a. Stems more than 20 cm; anther cap beaked at apex ..... 6. *C. rostratum*  
     10b. Stems 1–3 cm; anther cap not beaked at apex.  
        11a. Back wall callus inside spur T-shaped, almost as long as wide (apical part) ..... 7. *C. longioperculatum*  
        11b. Back wall callus inside spur not T-shaped, conspicuously longer than wide ..... 8. *C. menghaiense*
- 9b. Leaves obtuse and unequally bilobed at apex.  
 12a. Stems stout, 2–2.5 cm in diam.; leaves 3–4 cm wide ..... 1. *C. racemiferum*  
 12b. Stems ca. 1.5 cm in diam.; leaves 1.3–2.4 cm wide.  
     13a. Stipe slightly clavate.  
        14a. Flowers yellow; lateral lobes of lip subquadrate, nearly as long as mid-lobe; anther cap long beaked at apex ..... 2. *C. medogense*  
        14b. Flowers purplish red; lateral lobes of lip triangular, shorter than mid-lobe; anther cap not beaked at apex ..... 3. *C. linearilobatum*
- 13b. Stipe linear.  
 15a. Stems less than 10 cm; flowers golden yellow with red stripes ..... 4. *C. parishii*  
 15b. Stems more than 20 cm; flowers yellowish green ..... 5. *C. uraiense*

**1. *Cleisostoma racemiferum*** (Lindley) Garay, Bot. Mus. Leaf. 23: 173. 1972.

大叶隔距兰 da ye ge ju lan

*Saccolabium racemiferum* Lindley, Gen. Sp. Orchid. Pl. 224. 1833; *Aerides racemifera* (Lindley) Wallich ex J. D. Hooker; *Gastrochilus racemifer* (Lindley) Kuntze; *Sarcanthus pallidus* Lindley; *S. racemifer* (Lindley) H. G. Reichenbach; *S. yunnanensis* Schlechter.

Stems erect, 5–20 cm, stout, 2–2.5 cm in diam., branching. Leaves distichous, flat, lorate, ca. 29 × 3–4 cm, obtuse and unequally bilobed. Inflorescence axillary, longer than leaves, many branched, laxly many flowered; floral bracts ovate-lanceolate, small, 1–2 mm. Flowers: sepals and petals yellow with brownish red spots, lip white; pedicel and ovary ca. 4 mm. Dorsal sepal suboblong, concave, ca. 3.5 × 2.5 mm, obtuse; lateral sepals slightly obliquely oblong, ca. 3.5 × 3 mm, base adnate to column foot, apex rounded. Petals oblong, ca. 3 × 2 mm, obtuse; lip lateral lobes erect, deltoid; mid-lobe spreading, deltoid, obtuse, with a keel running down to spur linking to rudimentary septum; spur conic, 2–2.5 mm; back wall callus inside spur ovate-triangular, base with papillate hairs, slightly bilobed. Column ca. 2.5 mm, winged; rostellum triangular; stipe narrowly lorate, margin inflexed; viscidium suborbicular, small; anther cap beaked at apex. Fl. Jun.  $2n = 38$ .

Epiphytic on tree trunks in open forests; 600–1800 m. S and W Yunnan [Bhutan, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**2. *Cleisostoma medogense*** Z. H. Tsi, Acta Phytotax. Sin. 23: 387. 1985.

西藏隔距兰 xi zang ge ju lan

Stems erect, ca. 2 cm, ca. 5 mm in diam. Leaves twisted, flat, narrowly oblong, ca. 15 × 1.3–1.5 cm, acutely bilobed. Inflorescences 1 or 2, arising from base of stem, shorter than or nearly as long as leaves, branched or unbranched, many flowered; peduncle with 2 or 3 tubular sheaths; floral bracts ovate-triangular, ca. 1 mm, acute. Flowers yellow; pedicel and ovary ca. 4 mm. Sepals similar, ovate-elliptic, concave, ca. 3.2 × 2.5 mm, obtuse. Petals slightly falcate-oblong, narrower than sepals, obtuse; lip lateral lobes erect, subquadrate, apical margin irregularly incised; mid-lobe subtriangular, obtuse; spur straight, narrowly conic, ca. 3 mm, rounded, interior with a subtriangular, glabrous callus on back wall, without a distinct septum; anther cap long beaked at apex; stipe ± clavate, margin inflexed; viscidium suborbicular, small. Fl. May.

• Epiphytic on tree trunks in broad-leaved evergreen forests; 800–900 m. SE Xizang.

**3. *Cleisostoma linearilobatum*** (Seidenfaden & Smitinand) Garay, Bot. Mus. Leaf. 23: 172. 1972.

隔距兰 ge ju lan

*Sarcanthus linearilobatus* Seidenfaden & Smitinand, Orchids Thailand 4(2): 684. 1965; *Cleisostoma sagittiforme* Garay; *Ormerodia linearilobata* (Seidenfaden & Smitinand) Szlachetko; *O. sagittata* (King & Pantling) Szlachetko; *S. sagittatus* King & Pantling.

Stems erect, 2–4 cm. Leaves flat, narrowly oblong, 5–18 × 1–2 cm, leathery, obtuse and unequally bilobed. Inflorescence

pendulous, longer than leaves, branching, laxly many flowered; peduncle ca. 1.5 mm in diam., with 3 or 4 short sheaths below middle; floral bracts ovate-triangular, small, ca. 1 mm, acute. Flowers purplish red, small; pedicel and ovary ca. 5 mm. Dorsal sepal oblong, cymbiform, ca.  $3 \times 1.5$  mm, obtuse; lateral sepals slightly obliquely ovate, ca.  $3 \times 1.5$  mm, obtuse. Petals  $\pm$  falcate-oblong, ca.  $2.5 \times 1.5$  mm, obtuse; lip lateral lobes erect, deltoid, acute; mid-lobe sagittate-triangular, apex obtuse, with 2 backward triangular basal lobules on either side, with a longitudinal ridge; spur horn-shaped, ca. 5 mm, apex obtuse, inside longitudinally septate; back wall callus in interior of spur well spaced from septum, 3-lobed; lateral lobules small; mid-lobule laterally compressed, oblong, center slightly concave, base slightly bilobed; anther cap broadly emarginate; stipe ca. 0.8 mm, narrowly cuneate; viscidium suborbicular. Fl. May–Sep.

Epiphytic on tree trunks in broad-leaved evergreen forests or in open forests along valleys; 900–1600 m. S Yunnan [Bhutan, NE India, Thailand].

**4. *Cleisostoma parishii*** (J. D. Hooker) Garay, Bot. Mus. Leaflet 23: 173. 1972.

短茎隔距兰 duan jing ge ju lan

*Sarcanthus parishii* J. D. Hooker, Bot. Mag. 86: ad t. 5217. 1860.

Stems 1–6 cm, stout. Leaves twisted, distichous, rather close, flat, linear-lorate,  $6\text{--}20 \times 0.6\text{--}2.4$  cm, slightly fleshy or thickly leathery, unequally bilobed. Inflorescence racemose or paniculate, borne from middle or lower part of stem, much longer than leaves, laxly many flowered; peduncle purplish brown; floral bracts ovate-triangular, small, 1–2 mm, acute. Flowers opening widely, whitish, tinged with purple, column pale purple; pedicel and ovary purplish brown, ca. 1 cm. Dorsal sepal suboblong, ca.  $4 \times 1.5\text{--}2$  mm, obtuse; lateral sepals slightly oblique ovate, ca.  $4 \times 2$  mm, base adnate to column foot. Petals similar to dorsal sepal, smaller, obtuse; lip lateral lobes erect, suborbicular, bilobed; mid-lobe deltoid,  $\pm$  fleshy, acute, with 2 basal backward lobules; spur horn-shaped, ca. 3 mm, apex obtuse, inside longitudinally septate; back wall callus 3-lobed, T-shaped; lateral lobules short, stout; mid-lobule narrowed toward base, with a central longitudinal groove, base slightly bilobed and densely papillate-hairy. Column ca. 2 mm; anther cap not narrowed toward apex; stipe threadlike; viscidium suborbicular, very small. Fl. Apr–May.

Epiphytic on tree trunks in broad-leaved evergreen forests; ca. 1000 m. N Guangdong, SW Guangxi, Hainan [Myanmar].

**5. *Cleisostoma uraiense*** (Hayata) Garay & H. R. Sweet, Orchids S. Ryukyu Islands, 156. 1974.

绿花隔距兰 lü hua ge ju lan

*Sarcanthus uraiensis* Hayata, Icon. Pl. Formosan. 8: 130. 1919; *Cleisostoma viridescens* (Fukuyama) Garay; *S. viridescens* Fukuyama.

Stems erect or pendulous, 20–40 cm, 4–6 mm in diam., many leaved. Leaves distichous, linear or narrowly oblong,  $10\text{--}20 \times 1.2\text{--}2$  cm, obtuse and unequally bilobed. Inflorescence lateral, opposite to leaves, longer or shorter than leaves,

unbranched or with short branches, many flowered; floral bracts deltoid, small, ca. 1 mm. Flowers yellowish green, slightly fleshy; pedicel and ovary 3–5 mm. Dorsal sepal subelliptic or obovate-oblong, concave, ca.  $4 \times 2.5$  mm, obtuse; lateral sepals similar to dorsal sepal, concave. Petals obliquely oblong,  $2.5\text{--}3.5 \times$  ca. 1.2 mm, obtuse; lip thickly fleshy, base spurred, 3-lobed; lateral lobes erect, falcate-triangular, small; mid-lobe suborbicular, ca. 1 mm; spur ca. 2 mm, front wall callus large, glabrous, slightly septate. Column ca. 2 mm; anther cap slightly narrowed toward apex; stipe slender; viscidium suborbicular. Fl. Apr–Sep.

Epiphytic on tree trunks in forests; ca. 200 m. S Taiwan [Japan (Ryukyu Islands), Philippines].

**6. *Cleisostoma rostratum*** (Loddiges ex Lindley) Garay, Bot. Mus. Leaflet 23: 174. 1972.

尖喙隔距兰 jian hui ge ju lan

*Sarcanthus rostratus* Loddiges ex Lindley, Coll. Bot. ad t. 39B. 1826; *Cleisostoma fordii* Hance; *S. fordii* (Hance) Rolfe.

Stems subterete, 20–45 cm, ca. 5 mm in diam., sometimes branched, with many nodes, internodes 2–3 cm. Leaves distichous, flat, narrowly lanceolate,  $9\text{--}15 \times 7\text{--}13$  mm, leathery, acute. Inflorescences several, opposite to leaves, arising from upper part of stem, ascending, shorter than leaves, unbranched, laxly many flowered; floral bracts ovate-triangular, ca. 1 mm. Flowers opening widely, sepals and petals yellowish green with purplish red stripes, lip purple-red; pedicel and ovary ca. 5 mm. Dorsal sepal subelliptic, cymbiform,  $5\text{--}5.5 \times 2\text{--}2.5$  mm, acute; lateral sepals slightly obliquely obovate,  $5\text{--}5.5 \times 2.5\text{--}3$  mm, obtuse. Petals suboblong, ca.  $4 \times 2$  mm, obtuse; lip lateral lobes erect, subtriangular, apex abruptly contracted and subulate; mid-lobe narrowly ovate-lanceolate, slightly fleshy, acuminate; spur somewhat funnel-shaped, straight, ca. 5 mm, attenuate toward end, obtuse, slightly septate; back wall callus oblong, central part longitudinally concave, base shallowly bilobed and glabrous. Column ca. 2 mm; rostellum ca. 1.3 mm; anther cap beak ca. 1.5 mm; stipe slender, apical part slightly enlarged; viscidium suborbicular, very small. Fl. Jul–Aug.  $2n = 38$ .

Epiphytic on tree trunks in broad-leaved evergreen forests or on branches in thickets, lithophytic on rocks in limestone areas; 300–1800 m. Guangxi, S Guizhou, Hainan, Hong Kong, S and SE Yunnan [Cambodia, Laos, Thailand, Vietnam].

“*Vanda rostrata*” (Loddiges, Bot. Cab. 11: ad t. 1008. 1825) is a nomen nudum and was therefore not validly published.

**7. *Cleisostoma longioperculatum*** Z. H. Tsi, Guihaia 15: 108. 1995.

长帽隔距兰 chang mao ge ju lan

Stems erect, ca. 2 cm, unbranched. Leaves 4 or 5, sub-basal, distichous, flat, linear or narrowly oblong,  $\pm$  V-shaped-conductuplicate, ca.  $7 \times 0.5$  cm, fleshy, subacute. Inflorescence lateral, arching, racemose, laxly several flowered; floral bracts ovate-triangular, ca. 1.5 mm, acute. Flowers opening widely, slightly fleshy; pedicel and ovary ca. 6 mm. Dorsal sepal subspatulate or obliquely obovate, ca.  $4 \times 2$  mm, acute; lateral sepals similar to dorsal sepal, obtuse. Petals oblong, ca.  $3.5 \times$

1.3 mm, obtuse; lip lateral lobes suberect, deltoid, apical margin  $\pm$  incurved; mid-lobe slightly thickened, deltoid, concave, obtuse; spur somewhat horn-shaped, ca. 4 mm, obtuse, interior longitudinally septate, with a back wall callus; callus T-shaped, base slightly bilobed and densely minutely papillate-hairy. Column ca. 1.5 mm; anther cap ca. 2 mm, truncate; pollinia pyriform, with clavate stipe and suborbicular small viscidium. Fl. Jun.

- Epiphytic on tree trunks in mixed forests; ca. 700 m. S Yunnan.

**8. *Cleisostoma menghaiense*** Z. H. Tsi, Bull. Bot. Res., Harbin 3(4): 76. 1983.

勐海隔距兰 meng hai ge ju lan

Stems erect, 2–3 cm, unbranched. Leaves 5 or 6, distichous, subbasal, flat, linear or narrowly oblong, basal half V-shaped-conuplicate, 8–14  $\times$  0.4–0.8 cm, fleshy, acute. Inflorescence arising from near base of stem, pendulous, longer than leaves, branched or unbranched, laxly many flowered; floral bracts ovate-triangular, ca. 1 mm, acute. Flowers opening widely, pale yellow, thickly textured, lateral lobes of lip lilac; pedicel and ovary ca. 5 mm. Dorsal sepal elliptic, cymbiform, ca. 3.5  $\times$  2 mm, subrounded; lateral sepals slightly oblique, obovate, ca. as large as dorsal sepal, obtuse. Petals obliquely suboblong, ca. 3  $\times$  1.5 mm, obtuse; lip lateral lobes erect, deltoid; mid-lobe deltoid, ca. 2.5 mm, slightly fleshy, acute; spur somewhat horn-shaped, ca. 4 mm, apex obtuse, interior longitudinally septate, with a back wall callus; callus 3-lobed, laterally compressed, base shallowly bilobed and slightly papillate-hairy; mid-lobule oblong and concave in center. Column ca. 2 mm; rostellum small; anther cap ca. 2 mm; stipe slightly clavate, short, narrow; viscidium suborbicular. Fl. Jul–Oct.

- Epiphytic on tree trunks at forest margins; 700–1200 m. S and SE Yunnan.

**9. *Cleisostoma birmanicum*** (Schlechter) Garay, Bot. Mus. Leaf. 23: 170. 1972.

美花隔距兰 mei hua ge ju lan

*Echioglossum birmanicum* Schlechter, Notizbl. Bot. Gart. Berlin-Dahlem 8: 125. 1922; *Sarcanthus birmanicus* (Schlechter) Seidenfaden & Smitinand; *S. ophioglossa* Guillaumin.

Stems erect, elongate, 8–9 cm, stout, ca. 6 mm in diam., unbranched, with many leaves and verrucose roots. Leaves narrowly lanceolate, ca. 15  $\times$  1.5 cm, thickly fleshy, obtuse and unequally bilobed. Inflorescence lateral, arching, longer than leaves, branching, many flowered; floral bracts ovate-triangular, 2–3 mm, thickly textured, obtuse. Flowers widely opening, fleshy, sepals and petals purplish brown with yellowish green margins and midvein, lip white, column purple; pedicel and ovary purplish brown, ca. 1 cm. Dorsal sepal elliptic, ca. 12  $\times$  5 mm, obtuse; lateral sepals obliquely ovate, ca. 9  $\times$  6 mm, obtuse. Petals subfalcate-oblong, ca. 10  $\times$  4.5 mm, obtuse; lip lateral lobes erect, falcate-lanceolate, acute; mid-lobe triangular, ca. 6 mm wide, acute and deeply divided into 2 tails; spur subconic, straight, ca. 5  $\times$  2 mm, apex obtuse, interior longitudinally septate, with a back wall callus; callus hollow, subtriangular, base slightly bilobed and densely minutely papillate.

Column ca. 4 mm, stout; anther cap truncate and broadly emarginate; stipe deltoid, small; viscidium crescent-shaped or saddle-shaped, large. Fl. Apr–May.

Hainan [Myanmar, Thailand, Vietnam].

**10. *Cleisostoma striatum*** (H. G. Reichenbach) N. E. Brown, Suppl. Johnson's Gard. Dict. 901. 1882.

短序隔距兰 duan xu ge ju lan

*Echioglossum striatum* H. G. Reichenbach, Gard. Chron., n.s., 12: 390. 1879; *Cleisostoma brevipes* J. D. Hooker; *Raciborskanthos striatus* (H. G. Reichenbach) Szlachetko; *Sarcanthus brevipes* (J. D. Hooker) J. J. Smith; *S. striatus* (H. G. Reichenbach) J. J. Smith.

Stems cylindrical, to 30 cm, ca. 7 mm in diam., internodes ca. 2 cm, many leaved. Leaves flat, narrowly oblong-lanceolate, usually 7–11  $\times$  ca. 1.5 cm, fleshy, acute. Inflorescence arising from middle or above on stem, pendulous, axillary, 2–6 cm, unbranched, densely many flowered; peduncle with several, fleshy, scalelike sheaths; floral bracts broadly ovate, 2–3 mm, fleshy. Flowers opening widely, fleshy; sepals and petals orange-yellow with purple stripes, lip yellowish, mid-lobe purple; pedicel and ovary longer than floral bracts. Dorsal sepal suboblong, cymbiform, ca. 6  $\times$  3 mm, obtuse; lateral sepals slightly oblique, ovate, ca. as large as dorsal sepal. Petals suboblong, ca. 5  $\times$  2.5 mm, obtuse; lip lateral lobes falcate-triangular, acute; mid-lobe sagittate-triangular, fleshy, narrowed and deeply divided into 2 tails, with 2 backward triangular basal lobules, adaxially with a longitudinal fleshy lamella; spur perpendicular to ovary, short, interior longitudinally septate, with a back wall callus; callus entire, laterally compressed, basal half triangular and papillate. Column ca. 3 mm; rostellum ligulate, fleshy, extending beyond column wing; anther cap elongate, broadly emarginate; stipe oblanceolate, geniculate-folded at base, margin revolute; viscidium crescent-shaped, large. Fl. Jun. 2n = 38.

Epiphytic on tree trunks in broad-leaved evergreen forests; 500–1600 m. SW Guangxi, Hainan, SE to W Yunnan [NE India, Malaysia (Peninsular), Thailand, Vietnam].

**11. *Cleisostoma paniculatum*** (Ker Gawler) Garay, Bot. Mus. Leaf. 23: 173. 1972.

大序隔距兰 da xu ge ju lan

*Aerides paniculata* Ker Gawler, Bot. Reg. 3: ad t. 220. 1817; *Cleisostoma cerinum* Hance; *C. formosanum* Hance; *C. fuscomaculatum* (Hayata) Garay; *C. unciferum* (Schlechter) Garay; *Garayanthus fuscomaculatus* (Hayata) Szlachetko; *G. paniculatus* (Ker Gawler) Szlachetko; *Sarcanthus cerinus* (Hance) Rolfe; *S. formosanus* (Hance) Rolfe; *S. fuscomaculatus* Hayata; *S. paniculatus* (Ker Gawler) Lindley; *S. uncifer* Schlechter; *Vanda paniculata* (Ker Gawler) R. Brown.

Stems erect, compressed terete, elongate, more than 20 cm, usually 5–8 mm in diam., sometimes branching, many leaved. Leaves distichous, flat, narrowly oblong or linear, 10–25  $\times$  0.8–2 cm, leathery,  $\pm$  conduplicate at base, unequally bilobed, sometimes mucronate in sinus. Inflorescence axillary, much longer than leaves, many branched, many flowered; floral

bracts ovate, ca. 2 mm. Flowers opening widely; sepals and petals yellowish green abaxially, purplish brown adaxially, margins and midvein yellow, lip yellow; pedicel and ovary ca. 1 cm. Dorsal sepal suboblong, concave, ca.  $4.5 \times 2$  mm, obtuse; lateral sepals obliquely oblong, ca.  $4.5 \times 2.5$  mm, base adnate to column foot. Petals slightly smaller than sepals; lip with lateral lobes erect, deltoid, relatively small, apex obtuse, proximal margin sometimes  $\pm$  thickened-callose; mid-lobe fleshy, apex upcurved and incurved-beaked, with 2 basal backward subulate lobules, adaxially with a ridge highly raised at apex; spur straight, ca. 4.5 mm, apex obtuse, interior usually septate, with a back wall callus; callus rectangular, longitudinally concave at center, base slightly bilobed and densely papillate-hairy. Column stout; anther cap truncate, incised; stipe short, broad, geniculate-folded at base; viscidium crescent-shaped or saddlelike, large. Fl. May–Jun.  $2n = 38, 42$ .

Epiphytic on tree trunks in broad-leaved evergreen forests, lithophytic on rocks along wooded valleys; 200–1300 m. N Fujian, S Guangdong, Guangxi, Hainan, E Jiangxi, S and SW Sichuan, Taiwan, SE Xizang [Vietnam].

**12. *Cleisostoma williamsonii*** (H. G. Reichenbach) Garay, Bot. Mus. Leaflet 23: 176. 1972.

红花隔距兰 hong hua ge ju lan

*Sarcanthus williamsonii* H. G. Reichenbach, Gard. Chron. 1865: 674. 1865; *Cleisostoma elongatum* (Rolfe) Garay; *C. hongkongense* (Rolfe) Garay; *Echioglossum williamsonii* (H. G. Reichenbach) Szlachetko; *S. elongatum* Rolfe; *S. hongkongensis* Rolfe.

Plants often pendulous. Stems to 70 cm, rather slender, 3–4 mm in diam., branched or unbranched, many leaved, internodes 1–2.5 cm. Leaves straight or slightly arching, terete, usually  $6\text{--}10$  cm  $\times$   $2\text{--}3$  mm, obtuse. Inflorescence lateral, ascending, longer than leaves, usually branched, densely many flowered; floral bracts ovate-lanceolate, ca. 2 mm. Flowers opening widely, pink, lip deep purple-red; pedicel and ovary ca. 5 mm, slender. Dorsal sepal ovate-elliptic, cymbiform, ca.  $2.2 \times 1.5$  mm, rounded; lateral sepals obliquely ovate-elliptic, ca.  $2.5 \times 1.5$  mm, base adnate to column foot, obtuse. Petals oblong, ca.  $2.2 \times 1$  mm, obtuse; lip lateral lobes erect, ligulate-oblong, obtuse,  $\pm$  incurved; mid-lobe narrowly ovate-triangular, fleshy, adaxially with a ridge raised and triangular near spur entrance; spur globose, ca. 2 mm in diam., slightly laterally compressed, concave, interior inconspicuously septate, with a back wall callus; callus 3-lobed, T-shaped; lateral lobules nearly horn-shaped, slightly recurved; mid-lobule shallowly bilobed at base and densely papillate-hairy. Column ca. 2 mm; anther cap truncate, broadly emarginate; stipe broadly ovate-triangular or miter-shaped; viscidium nearly crescent-shaped. Fl. Apr–Jun.  $2n = 38$ .

Epiphytic on tree trunks in forests, lithophytic on rocks along wooded valleys; 300–2200 m. Guangdong, Guangxi, SW Guizhou, Hainan, SE to W Yunnan [Bhutan, NE India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

**13. *Cleisostoma fuerstenbergianum*** Kraenzlin, Repert. Spec. Nov. Regni Veg. 7: 39. 1909.

长叶隔距兰 chang ye ge ju lan

*Cleisostoma flagellare* (Schlechter) Garay; *C. flagelliforme* (Rolfe ex Downie) Garay; *Sarcanthus flagellaris* Schlechter; *S. flagelliformis* Rolfe ex Downie; *S. fuerstenbergianus* (Kraenzlin) J. J. Smith.

Stems erect or arching, more than 50 cm, rather slender, 4–5 mm in diam., branched or unbranched, laxly many leaved, internodes 3–4 cm. Leaves secund, terete, ca.  $25$  cm  $\times$   $2\text{--}3$  mm, fleshy, obtuse. Inflorescence lateral, ascending, to 20–24 cm, usually shorter than leaves, unbranched or rarely branched, laxly many flowered; peduncle 2–4 cm; floral bracts narrowly ovate-lanceolate, ca. 2 mm, membranous. Flowers: sepals and petals yellow with purplish brown stripes, lip white, proximal margin of lateral lobes purple; pedicel and ovary ca. 1 cm. Dorsal sepal ovate-elliptic, cymbiform,  $4.5\text{--}5 \times$  ca. 2 mm, obtuse; lateral sepals suboblong,  $4.5\text{--}5 \times$  ca. 2.5 mm, base adnate to column foot. Petals narrowly oblong, ca.  $4 \times 1.5$  mm, obtuse; lip lateral lobes erect, deltoid, falcate, incurved, proximal margin inflexed; mid-lobe sagittate-triangular, subfleshy, with an adaxial ridge; spur subglobose, concave, 2–3 mm in diam., interior septate, with a 3-lobed back wall callus; lateral lobules triangular, slightly recurved; mid-lobule nearly as long as lateral lobules, slightly concave at center, base densely papillate-hairy. Column ca. 3 mm; rostellum small; anther cap truncate; stipe ovate-lanceolate; viscidium suborbicular, wider than stipe. Fl. May–Jun.  $2n = 38$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; 700–2000 m. SW Guizhou, S and W Yunnan [Cambodia, Laos, Thailand, Vietnam].

**14. *Cleisostoma filiforme*** (Lindley) Garay, Bot. Mus. Leaflet 23: 171. 1972.

金塔隔距兰 jin ta ge ju lan

*Sarcanthus filiformis* Lindley, Edwards's Bot. Reg. 28 (Misc.): 61. 1842.

Plants pendulous. Stems more than 60 cm, rather slender, 3–4 mm in diam., branched or unbranched, laxly many leaved, internodes 4–6 cm. Leaves terete, to  $33$  cm  $\times$   $2\text{--}2.5$  mm, slender, fleshy, obtuse. Inflorescences 1 or 2, lateral, usually opposite to leaves, shorter than or sometimes nearly as long as leaves, branched or unbranched, densely many flowered; floral bracts narrowly ovate-lanceolate, ca. 2 mm. Flowers opening widely, sepals and petals yellowish green, with purplish brown stripes, lip with white lateral lobes and purple-red mid-lobe, column yellow; pedicel and ovary 4–5 mm, slender. Dorsal sepal ovate-elliptic, cymbiform, ca.  $4 \times 2$  mm, obtuse; lateral sepals suboblong, ca.  $4 \times 2.5$  mm, base adnate to column foot. Petals suboblong, much smaller than sepals, obtuse; lip lateral lobes erect, deltoid, obtuse and incurved, proximal margin inflexed; inflexed part square; mid-lobe sagittate-triangular, ca. 2 mm, with 2 basal backward narrow lobules, adaxially with longitudinal ridges triangularly thickened halfway; spur broadly conic, dorsiventrally compressed, concave, ca.  $3 \times 2$  mm, interior inconspicuously septate, with a back wall callus; callus nearly stellate, triangularly thickened at center, base densely papillate-hairy. Column ca. 2 mm; anther cap elongate and triangular toward apex; stipe ovate-lanceolate, apical margin revolute; viscidium suborbicular, small. Fl. Sep–Oct.  $2n = 38$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; 400–1000 m. SW Guangxi, Hainan, S Yunnan [NE India, Myanmar, Nepal, Thailand, Vietnam].

**15. *Cleisostoma simondii*** (Gagnepain) Seidenfaden, Dansk Bot. Ark. 29(3): 66. 1975.

毛柱隔距兰 mao zhu ge ju lan

Plants often ascending. Stems to 50 cm, rather slender, ca. 4 mm in diam., usually branched, many leaved, internodes 1–2.5 cm. Leaves terete, 7–11 cm × ca. 3 mm, slender, fleshy, obtuse. Inflorescence lateral, ascending, longer than leaves, unbranched or sometimes shortly branched, many flowered; floral bracts ovate, ca. 2 mm, membranous. Flowers yellowish green with purplish red veins, subfleshy; lip mid-lobe purple-red or yellowish white; pedicel and ovary 7–10 mm. Sepals oblong, 6–7 × 3–4 mm, rounded; lateral sepals slightly oblique, basally with 1/2 width adnate to column foot. Petals similar to sepals and smaller, obtuse; lip lateral lobes erect, deltoid; mid-lobe ovate-triangular, thickly fleshy, apex acute, base with a central triangular projection; spur subglobose, laterally compressed, ca. 4 mm in diam., apex concave, interior distinctly septate, with a back wall callus; callus either 3-lobed and T-shaped or subquadrate; mid-lobe subcuneate, centrally slightly concave, base shallowly bilobed and densely papillate-hairy. Column ca. 3 mm, densely white hairy at base in front; rostellum broadly triangular; anther cap slightly elongate and subtruncate at apex; stipe nearly suborbicular, base folded; viscidium saddlelike, large. Fl. Sep.

Epiphytic on tree trunks or lithophytic on rocks in forests or in open forests along rivers; 500–1200 m. Fujian, S Guangdong, Hainan, S Yunnan [NE India, Laos, Thailand, Vietnam].

- 1a. Mid-lobe of lip purple-red; back wall callus inside spur T-shaped ..... 15a. var. *simondii*  
 1b. Mid-lobe of lip yellowish white; back wall callus inside spur subquadrate ..... 15b. var. *guangdongense*

**15a. *Cleisostoma simondii* var. *simondii***

毛柱隔距兰(原变种) mao zhu ge ju lan (yuan bian zhong)

*Vanda simondii* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 628. 1951; *Cleisostoma teres* Garay; *Echioglossum simondii* (Gagnepain) Szlachetko; *Sarcanthus teretifolius* (Lindley) Lindley; *V. teretifolia* Lindley.

Mid-lobe of lip purple-red; spur with a T-shaped back wall callus.

Epiphytic on tree trunks in open forests along rivers; ca. 1000 m. S Yunnan [NE India, Laos, Thailand, Vietnam].

**15b. *Cleisostoma simondii* var. *guangdongense*** Z. H. Tsi, Bull. Bot. Res., Harbin 3(4): 84. 1983.

广东隔距兰 guang dong ge ju lan

Mid-lobe of lip yellowish white; spur with a subquadrate back wall callus.

• Epiphytic on tree trunks or lithophytic on rocks in broad-leaved evergreen forests; 500–600 m. Fujian, S Guangdong, Hainan.

**16. *Cleisostoma nangongense*** Z. H. Tsi, Bull. Bot. Res., Harbin 9(2): 26. 1989.

南贡隔距兰 nan gong ge ju lan

Plants pendulous. Stems more than 40 cm, slender, ca. 3 mm in diam., branched or unbranched, many leaved, internodes ca. 2 cm. Leaves subterete, to 17 cm × ca. 3 mm, slender, channeled adaxially, fleshy, apex acuminate. Inflorescence lateral, usually unbranched, many flowered; peduncle ca. 4 cm; rachis pale purple, ca. 6 cm, slender; floral bracts ovate, ca. 1 mm, membranous, obtuse. Flowers opening widely, ± fleshy; sepals and petals yellowish green, tinged with purple, lip, column, and anther cap yellowish white; pedicel and ovary yellowish green, tinged with purple, 6–7 mm. Dorsal sepal ovate-elliptic, concave, ca. 5 × 3.5 mm, margin irregularly denticulate, apex obtuse; lateral sepals slightly oblique, oblong, ca. 5 × 4 mm, margin often sparsely denticulate, apex obtuse. Petals obliquely ovate-oblong, ca. 4.5 × 2 mm, margin irregularly denticulate, apex obtuse; lip lateral lobes subtriangular, apex incurved, proximal margin inflexed and square in shape, with a horn-shaped appendage near apex; mid-lobe sagittate-triangular, thickly fleshy, obtuse, with a circular basal callus; spur dorsiventrally compressed, subtruncate, ca. 4 × 3 mm, front surface with a channel, interior conspicuously septate, back wall callus 3-lobed; callus T-shaped; lateral lobules adnate to wall; mid-lobe slightly concave centrally, with 2 recurved basal lobules. Column ca. 3 mm; rostellum short; anther cap slightly elongate, truncate; stipe nearly suborbicular; viscidium saddlelike, large. Fl. Jun.

• Epiphytic on tree trunks in broad-leaved evergreen forests; ca. 1700 m. S Yunnan.

## 164. STEREOCHILUS Lindley, J. Proc. Linn. Soc., Bot. 3: 38. 1858.

坚唇兰属 jian chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems suberect, short or rather long, noded. Leaves several to many, distichous, flat, sometimes ± conduplicate, leathery, jointed, sessile, often sheathing at base. Inflorescence 1–3, axillary, racemose, lax, often pendulous, many flowered; floral bracts very small, much shorter than pedicel and ovary. Flowers small, often opening widely; lateral sepals adnate to base of lip. Petals smaller than sepals; lip adnate to column base, immovable, saccately spurred at base, indistinctly 3-lobed; lateral lobes erect, small; mid-lobe larger; spur with longitudinal septum inside and often 1 or 2 calli on back wall. Column rather stout, without a foot; rostellum subulate-lanceolate, rather long; pollinia 4, in 2 pairs, equal, ellipsoid-oblong to ovoid, waxy, with short but distinct caudicles, attached by a long, slender, somewhat clavate stipe to a small, ovate viscidium.

Six described species: Bhutan, China, NE India, Myanmar, Thailand, Vietnam; two species in China, plus one undescribed species (see note below).

A third, as yet undescribed, apparently endemic species has been identified from S Yunnan, where it seems to be rather more common than either *Stereochilus brevirachis* or *S. dalatensis* (Perner, pers. comm.). It has the short inflorescence of *S. brevirachis* but has flowers with pink lip lateral lobes and a glabrous pedicel and ovary.

- 1a. Inflorescences shorter than leaves; pedicel and ovary pubescent ..... 1. *S. brevirachis*  
 1b. Inflorescences longer than leaves; inflorescence and ovary glabrous ..... 2. *S. dalatensis*

**1. *Stereochilus brevirachis*** Christenson, Orchid Digest 62: 123. 1998.

短轴竖唇兰 duan zhou jian chun lan

Stems to 1.5 cm. Leaves 4–6, arcuate, linear, to 4.8 × 0.8 cm, dorsally carinate, apex obliquely minutely bilobed. Inflorescences laxly pendulous, somewhat zigzag, dark green, mottled purple, to 4.5 cm; floral bracts lanceolate, much shorter than ovary, acute. Flowers 2–5 per inflorescence; sepals, petals, and spur pale yellow to pale pink, lip mid-lobe magenta, lateral lobes yellow-orange, anther cap white with a central purple stripe; pedicel and ovary terete, to 12 mm, pubescent. Dorsal sepal elliptic, to 5 × 3 mm, concave, obtuse-rounded; lateral sepals obovate, to 5 × 4 mm, concave, obtuse-rounded. Petals oblong, to 6 × 2 mm, obtuse; lip 3-lobed; lateral lobes erect, transverse, abruptly narrowed and strongly incurved at apex; mid-lobe ovate, to 5 × 4 mm, obtuse, anterior callus a low transverse ridge at base, posterior callus a low keel from apex to spur to base of column surmounted by a large, reniform, bilaterally compressed callus; spur subparallel to ovary, ca. 4 mm, flattened on top and bottom, minutely bilobed at apex. Column ca. 3 mm; pollinarium to 4 mm. Fl. Jun.

Yunnan (without precise locality) [S Vietnam].

**2. *Stereochilus dalatensis*** (Guillaumin) Garay, Bot. Mus. Leaflet 23: 205. 1972.

竖唇兰 jian chun lan

*Sarcanthus dalatensis* Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 27: 397. 1955.

Stems to 10 cm. Leaves to 12, distichous, dark green, often spotted purple, oblong-elliptic, ca. 5 × 0.5 cm, distinctly V-shaped in cross section, fleshy, apex rounded. Inflorescence axillary, borne from upper part of stem, 3–4 cm, laxly up to ca. 8-flowered; floral bracts ovate, minute, rounded. Flowers ca. 1 cm in diam.; sepals and petals white, lip light purple, hypochile yellow inside, anther cap deep purple; pedicel and ovary ca. 1 cm, glabrous. Sepals glabrous; dorsal sepal oblong-elliptic, ca. 5 × 3 mm, rounded; lateral sepals almost rhomboid, subspatulate, ca. 5 × 4 mm, 3-veined, rounded. Petals spatulate, ca. 5 × 4 mm, 1-veined, rounded; lip ligulate, ca. 5 mm, fleshy; lateral lobes obscure, rounded; mid-lobe ovate; spur pendulous, cylindrical, ca. 5 mm; posterior callus papillose, sulcate in middle. Column ca. 4 mm; rostellum pendulous, long; anther cap narrowly triangular.

Yunnan (without precise locality) [Thailand, S Vietnam].

## 165. **ESMERALDA** H. G. Reichenbach, Xenia Orchid. 2: 38. 1862.

花蜘蛛兰属 hua zhi zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial, erect or pendulous, large. Roots aerial, piercing through leaf sheaths along stem. Stem scandent, terete, stout, with many nodes. Leaves distichous, flat, usually oblong, twisted (to lie in one plane), thickly leathery, base sheathing, jointed, apex unequally bilobed. Inflorescence lateral, erect, racemose, few flowered; floral bracts persistent, scarious, sheathing. Flowers large, showy, thickly textured. Sepals and petals free, similar, spreading, overlapping, ovate to oblong. Petals slightly smaller; lip free, pendulous, movable, 3-lobed; lateral lobes small; mid-lobe reniform, clawed, margin crenate; disk 2-callose. Column short, stout, both sides winged, foot absent; anther cap terminal; pollinia 4, in 2 pairs, waxy, dorsally compressed, subglobose, unequal in size, attached by a triangular stipe to a large, saddle-shaped viscidium.

Three species: China, Himalayas, Myanmar, Thailand; two species in China.

- 1a. Lateral lobes of lip subovate or nearly suborbicular; disk without a lidlike appendage at base; sac ca. 5 mm ..... 1. *E. clarkei*  
 1b. Lateral lobes of lip subsquare; disk with a movable lidlike appendage at base; sac ca. 3 mm ..... 2. *E. bella*

**1. *Esmeralda clarkei*** H. G. Reichenbach, Gard. Chron., n.s., 26: 552. 1886.

花蜘蛛兰 hua zhi zhu lan

*Arachnanthe clarkei* (H. G. Reichenbach) Rolfe; *Arachnis clarkei* (H. G. Reichenbach) J. J. Smith; *Vanda clarkei* (H. G. Reichenbach) N. E. Brown.

Stems rigid, to 1 m tall, stout, 7–10 mm in diam., internodes 2–3 cm, branched, covered by leaf sheaths. Leaves dis-

tichous; leaf blade narrowly oblong, 13–25 × 1.7–3 cm, leathery, obtuse and slightly unequally bilobed. Inflorescence to 32 cm, unbranched, 3- or 4-flowered; peduncle 3–5 cm, stout, with 2 or 3 sheaths; rachis 12–15 cm, weakly zigzag; floral bracts broadly ovate, 1–1.7 cm. Flowers slightly fragrant, opening widely, pale yellow with reddish brown transverse stripes, 5.5–7.5 cm in diam., thickly textured; pedicel and ovary ca. 3 cm. Dorsal sepal oblanceolate-elliptic, ca. 3.5 × 1–1.2 cm, obtuse; lateral sepals obovate-elliptic, falcate, 3–3.2 × 0.9–1.2 cm. Petals subspatulate, falcate, 2.8–3.1 × 0.9–1.1 cm, obtuse;

lip pendulous, ca. 1.7 cm, 3-lobed; claw ca. 2 mm; hypochile 6–8 × 5–6 mm, with 2 auriculate lateral lobes; mesochile 4–5 × 1–1.5 mm, narrow; epichile reniform, 8–9 × 5–6 mm, margin crenulate; disk with 7–9 radiating keels and 2 raised calli in center of lip. Column clavate, 1.2–1.4 cm, stout; stipe horse-shoe-shaped, ca. 4 × 2 mm. Capsule ellipsoid-cylindric, 3.5–5.5 × 1.5–2 cm. Fl. Oct, fr. Nov–Dec.

Lithophytic on rocks along valleys, epiphytic on tree trunks in open forests; 500–2100 m. Hainan, SW Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, NW Vietnam].

**2. *Esmeralda bella*** H. G. Reichenbach, Gard. Chron., ser. 3, 3: 136. 1888.

口盖花蜘蛛兰 kou gai hua zhi zhu lan

*Arachnis bella* (H. G. Reichenbach) J. J. Smith.

Stems usually 20–30 cm, ca. 1 cm in diam., stout, rigid, with many nodes. Leaves many, sparsely distichous; leaf blade

narrowly oblong, 13–16 × 2.5–3 cm, leathery, obtuse and unequally bilobed. Inflorescences often 2 or 3, ascending, racemose, 12–18 cm, sparsely 2- or 3-flowered; peduncle 5–12 cm, with 3–6 tubular sheaths; floral bracts broadly ovate, 1–1.7 cm. Flowers large, opening widely, yellow, densely marked with reddish brown transverse stripes; pedicel and ovary ca. 3 cm. Dorsal sepal ± obovate-oblong, ca. 3 × 1 cm, obtuse; lateral sepals obovate-oblong, ca. 2.7 × 0.8 cm, obtuse. Petals narrowly oblong, ca. 2.7 × 0.7 cm, obtuse; lip somewhat pandurate, ca. 14 mm, 3-lobed; claw ca. 2 mm; lateral lobes erect, subsquare, ca. 4 × 4 mm, obliquely truncate; mid-lobe nearly obovate-cuneate, ca. 8 × 9 mm, base contracted, apex emarginate, with a recurved, calluslike appendage in sinus, margin irregularly denticulate, with a thickened keel from base to apex; disk with a bilobed callus and a movable lidlike appendage covering it; sac small, ca. 3 × 2 mm. Column ca. 8 mm, stout. Fl. Nov.

Epiphytic on tree trunks in open forests; 1700–1800 m. SE Xizang, S and SW Yunnan [India, Myanmar, Nepal, Thailand].

## 166. *HYGROCHILUS* Pfitzer in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 1: 112. 1897.

湿唇兰属 shi chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems rather short, 3–5-leaved. Leaves distichous, flat, rather large, base sheathing, jointed. Inflorescences lateral, arching or nearly spreading horizontally, unbranched, laxly few to many flowered. Flowers large, showy, opening widely. Sepals and petals free, similar, usually ± dorsally carinate. Petals slightly shorter and wider; lip thickly textured, adnate at base to column by a movable joint, 3-lobed; lateral lobes erect, small; mid-lobe larger, abaxial midvein thickened and beaklike at apex; disk saccate between 2 lateral lobes, with a keel extending from base to apex. Column arcuate, rather long, footless, with stielidia; rostellum long and narrow; pollinia 4 in 2 pairs, waxy, subglobose, unequal, attached by a common spatulate stipe to a suborbicular viscidium.

One species: China, NE India, Laos, Myanmar, Thailand, Vietnam.

**1. *Hygrochilus parishii*** (H. G. Reichenbach) Pfitzer in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 1: 112. 1897.

湿唇兰 shi chun lan

*Vanda parishii* H. G. Reichenbach, Xenia Orchid. 2: 138. 1868; *Stauropsis parishii* (H. G. Reichenbach) Rolfe; *Vandopsis parishii* (H. G. Reichenbach) Schlechter.

Stems 5–10(–20) cm, 8–15 mm in diam., stout, enclosed in persistent leaf sheaths. Leaf blade oblong or obovate-oblong, 17–29 × 3.5–5.5 cm, unequally bilobed. Inflorescences 1–6, to 35 cm, laxly 5–8-flowered; peduncle 5–17 cm, 4–6 mm in diam., with 3 or 4 sheaths; floral bracts broadly ovate, 1.2–1.5

cm. Flowers 4–5 cm in diam.; sepals and petals yellow with deep purple spots, lip white, tinged with lilac on mid-lobe; pedicel and ovary 3–4 cm. Sepals broadly ovate, 2–2.6 × 1.2–1.5 cm, dorsally carinate, 10-veined, obtuse. Petals broadly ovate, 1.5–2.2 × 1.4–1.7 cm, 10-veined, obtuse; lip 1–1.3 cm, fleshy, 3-lobed; lateral lobes suborbicular, small; mid-lobe cuneate-flabellate, ca. 1.2 × 1 cm, obtuse, with a central longitudinal keel and an erect appendage at base near entrance of sac; sac ca. 3 mm. Column ca. 1 cm, winged; stielidia deltoid; rostellum with ligulate lobules ca. 2.5 mm; anther cap beaked at apex. Fl. Jun–Jul.  $2n = 38$ .

Epiphytic on tree trunks in open forests; 700–1300 m. S and SW Yunnan [NE India, Laos, Myanmar, Thailand, Vietnam].

## 167. *ARACHNIS* Blume, Bijdr. 365. 1825.

蜘蛛兰属 zhi zhu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Arachnanthe* Blume; *Arhynchium* Lindley & Paxton.

Herbs, epiphytic, robust, monopodial. Stems scrambling, elongate, often to several meters, branched, leafy. Leaves oblong, rigid, somewhat fleshy or leathery, base sheathing, apex bilobed. Inflorescence lateral, ascending or pendulous, rigid, often long and branched, few to many flowered; peduncle and rachis slender. Flowers fragrant, resupinate, often large and showy, usually widely opening, often spiderlike. Sepals and petals similar, spreading, narrowly oblong to linear, usually widened toward apex; lateral sepals and petals often falcate-curved. Lip short, 3-lobed, jointed to column foot by a short movable strap, base saccate or spurred; mid-lobe

with a raised, central ridge or callus; column short, stout; stipe short, broad; viscidium broadly ovate; pollinia 4, appearing as 2 unequal masses, waxy.

About 13 species: from NE India and mainland Asia to Indonesia, New Guinea, and the Pacific islands; one species in China.

**1. *Arachnis labrosa*** (Lindley & Paxton) H. G. Reichenbach, Bot. Centralbl. 28: 343. 1886.

窄唇蜘蛛兰 zhai chun zhi zhu lan

Stems to 50 cm, 7–10 mm in diam., rigid, with many nodes and leaves. Leaves distichous; leaf blade lorate or linear, 15–30 × 1.6–2.2 cm, leathery, obtusely unequally bilobed. Inflorescence arising from within leaf sheath, ascending, racemose, to 1 m, occasionally branched, laxly many flowered; floral bracts reddish brown, broadly ovate, 5–8 mm, obtuse. Flowers pale yellow with reddish brown spots or markings mostly along margins and at apex, or greenish yellow without red-brown markings; pedicel and ovary brown, ca. 2 cm, slender. Sepals oblanceolate, ca. 18 × 3 mm, obtuse. Petals oblong, 9–11 × 2–5 mm, subacute; lip ca. 1 cm, fleshy, 3-lobed; lateral lobes erect, subtriangular, small, ca. 2 mm wide at base, obtuse; mid-lobe ligulate, fleshy, acute or obtuse, with a thickened appendage abaxially near apex, base with 2 retrorse calli on both sides, spurred; spur saccate-conic, 4–5 mm, thickly fleshy, its entrance ± covered by calli. Column ca. 6 × 4 mm, stout, base with an inconspicuous foot; rostellum triangular, apex widely emarginate; stipe subovate-triangular, ca. 1 mm; viscidium nearly suborbicular. Fl. Aug–Sep.  $2n = 38$ .

Epiphytic on tree trunks at forest margins, lithophytic on rocks in valleys; 600–1200 m. Guangxi, Hainan, C and S Taiwan, S Yunnan [Bhutan, NE India, ?Japan (Ryukyu Islands), Myanmar, S Vietnam].

- 1a. Flowers pale yellow with reddish brown spots or markings mostly along margins and at apex; petals ca. 2 mm wide ..... 1a. var. *labrosa*

- 1b. Flowers greenish yellow, without red-brown markings; petals 4–5 mm wide ..... 1b. var. *zhaoi*

**1a. *Arachnis labrosa* var. *labrosa***

窄唇蜘蛛兰(原变种) zhai chun zhi zhu lan (yuan bian zhong)

*Arhynchium labrosum* Lindley & Paxton, Paxt. Fl. Gard. 1: 142. 1850; *Arachnanthe bilinguis* (H. G. Reichenbach) Benth.; *Armodorium labrosum* (Lindley & Paxton) Schlechter; *Renanthera bilinguis* H. G. Reichenbach; *R. labrosa* (Lindley & Paxton) H. G. Reichenbach.

Flowers pale yellow with reddish brown spots or markings mostly along margins and at apex. Petals ca. 2 mm wide.

Epiphytic on tree trunks at forest margins, lithophytic on rocks in valleys; 800–1200 m. Guangxi, Hainan, C and S Taiwan, S Yunnan [Bhutan, NE India, ?Japan (Ryukyu Islands), Myanmar, S Vietnam].

**1b. *Arachnis labrosa* var. *zhaoi*** (Z. J. Liu, S. C. Chen & S. P. Lei) S. C. Chen & J. J. Wood, **comb. et stat. nov.**

赵氏蜘蛛兰 zhao shi zhi zhu lan

Basionym: *Arachnis zhaoi* Z. J. Liu, S. C. Chen & S. P. Lei, Acta Bot. Yunnan. 30: 529. 2008.

Flowers greenish yellow, without red-brown markings. Petals 4–5 mm wide.

- Epiphytic on trees; ca. 600 m. Hainan (Changjiang).

**168. THRIXSPERMUM** Loureiro, Fl. Cochinch. 2: 516, 519. 1790.

白点兰属 bai dian lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, lithophytic, or rarely terrestrial, monopodial, medium-sized. Stems ascending, climbing, or pendulous, either short with several closely spaced leaves, or long with many, well-spaced leaves. Leaves flat, never terete or laterally compressed, sometimes fleshy, base sheathing, jointed. Inflorescence lateral, axillary, racemose, long or short, few to many flowered, a few flowers opening at a time, flowering of many lowland species initiated by a sudden afternoon rainstorm; floral bracts either distichous and persistent on a flattened rachis or facing all directions on terete rachis. Flowers usually ephemeral, often fully open for only half a day, small to medium-sized, very variable, from a few millimeters to several centimeters in diam. Sepals and petals subsimilar; lip adnate at base to end of column foot, immovable, saccate but not truly spurred, usually with a partly hairy or papillose front wall callus, 3-lobed; lateral lobes erect; mid-lobe rather thick and fleshy. Column short, stout, sometimes winged, with a long foot; pollinia waxy, 4, appearing as 2 unequal masses, subglobose, attached by a common short and broad stipe to a solitary viscidium. Capsule long, slender.

About 100 species: Sri Lanka and the Himalayan region east to the Pacific islands, with an apparent center of distribution in Sumatra; 14 species (two endemic) in China.

- 1a. Floral bracts distichous on a ± flattened rachis.  
 2a. Floral bracts ca. 5 mm apart from each other; rachis slender, shorter than 5 cm ..... 12. *T. japonicum*  
 2b. Floral bracts close, 1–3 mm apart from each other; rachis stout, longer than 5 cm.  
 3a. Leaves ovate-lanceolate, base cordate, 2–2.5(–5) cm ..... 13. *T. amplexicaule*  
 3b. Leaves oblong, base narrowed, 6–24 cm ..... 14. *T. centipeda*  
 1b. Floral bracts facing all directions (quaquaversal) on a terete rachis.

- 4a. Plants pendulous or arcuate; stems 30–90 cm; inflorescence 1–2 cm.  
 5a. Leaves linear-lanceolate or lorate, abruptly narrowed some distance from apex, acute; stems often branching ..... 1. *T. subulatum*  
 5b. Leaves oblong or elliptic, apex obtusely unequally bilobed or acute; stems simple.  
 6a. Stems flaccid; leaves elliptic, only narrowed a slight distance from apex, acute, dorsally carinate, 5–7 × 2–2.7 cm ..... 2. *T. pensile*  
 6b. Stems not flaccid, stout; leaves oblong, obtusely unequally bilobed, 6–12 × 1.9–2.2 cm ..... 3. *T. tsii*  
 4b. Plants ascending; stems 2–3(–7) cm; inflorescence 3–8 cm.  
 7a. Flowers well spaced, opening simultaneously, lasting several days.  
 8a. Flowers white, often tinged with purplish or yellowish; lip with a basal callus; callus with a tuft of brownish yellowish hairs ..... 4. *T. saruwatarii*  
 8b. Flowers creamy yellow; lip without a basal callus, base with a tuft of purple hairs ..... 5. *T. laurisilvaticum*  
 7b. Flowers close, opening successively, lasting less than a day.  
 9a. Sac of lip cylindrical, ca. 6 mm ..... 6. *T. formosanum*  
 9b. Sac of lip saccate or pouch-shaped, less than 4 mm.  
 10a. Lip nearly triangular or rhombic in outline; mid-lobe with 2 or 3 tufts of white hairs.  
 11a. Flowers yellow; mid-lobe of lip truncate at apex; disk with 2 conic calli and 3 tufts of white hairs ..... 7. *T. merguense*  
 11b. Flowers white; mid-lobe of lip slightly bilobed at apex; disk with a longitudinal hairy callus ..... 8. *T. annamense*  
 10b. Lip not triangular nor rhombic in outline; mid-lobe lacking hairs.  
 12a. Lip with dense minute papillae adaxially; lateral lobes with white clavate cilia along apical margin; mid-lobe small, entire ..... 9. *T. trichoglottis*  
 12b. Lip (except fleshy ridges) glabrous adaxially; lateral lobes entire or denticulate at margins; mid-lobe irregularly dentate at margin.  
 13a. Lateral lobes of lip entire; disk with a Y-shaped callus ..... 10. *T. eximium*  
 13b. Lateral lobes of lip denticulate at apical margin; disk with 2 tubelike calli ..... 11. *T. fantasticum*

**1. *Thrixspermum subulatum*** (Blume) H. G. Reichenbach, *Xenia Orchid.* 2: 122. 1868.

厚叶白点兰 *hou ye bai dian lan*

*Dendrocolla subulata* Blume, *Bijdr.* 291. 1825; *Aerides subulata* (Blume) Lindley; *Sarcochilus subulatus* (Blume) H. G. Reichenbach; *Thrixspermum falcilobum* Schlechter.

Stems pendulous, compressed, 30–50 cm, branching or unbranched. Leaves many, linear-lanceolate or lorate, 8–15 × 1–2 cm, leathery, thick, often conduplicate and V-shaped especially near base. Inflorescence ca. 1.5 cm, 1–3-flowered; rachis thickened toward apex; floral bracts not distichous, ovate-triangular, very small. Flowers lasting nearly a day, pale yellow, ca. 1.5 cm in diam.; lip white, usually tinged or marked with orange, disk golden yellow; pedicel and ovary green, 1–1.5 cm. Dorsal sepal subelliptic, 8–10 × 4–5 mm, obtuse or acute; lateral sepals slightly oblique, slightly wider. Petals oblong-obovate, ca. 9 × 4 mm, base contracted, apex obtuse; lip 6–7 × 7–9 mm, 3-lobed; lateral lobes erect, falcate, acute and recurved; mid-lobe fleshy, slightly retuse; disk with a long, furcate-tipped, white hairy, central callus. Column ca. 2 mm, foot 3–4 mm. Fl. Apr–May.

Epiphytic on tree trunks along streams; below 700 m. C and S Taiwan [Indonesia, Philippines].

**2. *Thrixspermum pensile*** Schlechter, *Bot. Jahrb. Syst.* 45(Beibl. 104): 59. 1911.

垂枝白点兰 *chui zhi bai dian lan*

*Aporum pendulicaule* (Hayata) Rauschert; *Dendrobium*

*pendulicaule* Hayata; *Thrixspermum pendulicaule* (Hayata) Schlechter.

Stems pendulous, compressed, 30–90(–200) cm, leafy throughout, internodes ca. 2 cm. Leaves elliptic, 5–7 × 2–2.7 cm, thick, slightly fleshy, conduplicate toward base, apex acute. Inflorescence 1–2 cm, few flowered; floral bracts persistent, not distichous, ovate-triangular, 2–3 mm. Flowers lasting only half a day, white, ca. 1.3 cm in diam.; sepals and petals often tinged with yellowish or greenish abaxially, lip spotted orange-yellow; pedicel and ovary 8–9 mm. Dorsal sepal elliptic-ovate, ca. 9 × 4–5 mm, concave, obtuse; lateral sepals slightly wider than dorsal sepal. Petals elliptic, ca. 9 × 3.5 mm; lip deltoid, saccate, ca. 6 × 9 mm, concave, 3-lobed; lateral lobes erect, triangular-falcate; mid-lobe very small, slightly fleshy, with a bilobed callus; disk with a linear callus near base. Column ca. 3 mm, foot ca. 3 mm. Capsule cylindrical, to 10 cm × ca. 5 mm. Fl. and fr. throughout year.

Epiphytic on tree trunks in lowland forests. S Taiwan [Indonesia, Malaysia (Sabah), Thailand].

**3. *Thrixspermum tsii*** W. H. Chen & Y. M. Shui, *Brittonia* 57: 55. 2005.

吉氏白点兰 *ji shi bai dian lan*

Stems arching or pendulous, stout, terete, slightly flattened, 30–40 cm, 5–6 mm wide; internodes 1.5–2.5 cm. Leaves distichous, thick and fleshy, oblong, 6–12 × 1.9–2.2 cm, unequally obtusely bilobed, sheathing and amplexicaul at base. Inflorescence racemose, extra-axillary, arching, 1–3-flowered; rachis flattened, 1.5–2.5 cm; floral bracts broadly triangular, 2.5–3 × 3.5–4 mm, lax and distichous, conduplicate-concave,

acute, fleshy, persistent. Flowers lasting only 1 day, not opening widely, white, becoming yellowish, lip with a golden yellow disk, anther cap whitish yellow, glabrous; pedicel and ovary greenish, ca. 1.5 cm. Dorsal sepal elliptic, ca.  $15 \times 6$  mm, 5-veined, obtuse; lateral sepals somewhat obliquely elliptic,  $14-15 \times$  ca. 6 mm, 5-veined, obtuse with a short tip. Petals oblong-ovate,  $11-12 \times$  ca. 6 mm, 5-veined, acute; lip slightly pouched, widely ellipsoid, ca.  $8 \times 12$  mm; lateral lobes abruptly narrowed to an acute apex, slightly curved forward; mid-lobe elongating into a broadly ligulate blade, ca. 3 mm, ca. 1.5 mm high, fleshy, densely hairy, apex truncate, mucronate; disk with a single, narrow horizontal callus. Column short, foot ca. 3 mm; anther cap ca. 1.8 mm wide. Fl. May–Jun.

• Epiphytic on tree trunks and branches, lithophytic on rocks, in shrublands and secondary forests on limestone; 700–1500 m. Yunnan.

**4. *Thrixspermum saruwatarii*** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 275. 1919.

长轴白点兰 chang zhou bai dian lan

*Sarcochilus saruwatarii* Hayata, Icon. Pl. Formosan. 6: 84. 1916.

Stems erect or ascending, ca. 2 cm. Leaves nearly basal, narrowly oblong or linear-oblong,  $4-8 \times 0.5-2$  cm, leathery, acute, sometimes unequally bilobed. Inflorescence usually pendulous, 5–8 cm, laxly 3–8-flowered; rachis slightly flexuous and slightly thickened; floral bracts not distichous, ovate-triangular, 2–3 mm, acute. Flowers opening simultaneously, lasting ca. 1 week, well spaced, white or rarely yellowish, sometimes tinged with purple, lip lateral lobes brownish striped, mid-lobe brownish orange, adaxially column foot with brown blotches; pedicel and ovary 4–6 mm. Dorsal sepal oblong,  $7-8 \times 3-5$  mm, obtuse; lateral sepals slightly oblique, obovate,  $7-8 \times 3-5$  mm, acute. Petals linear, falcate,  $5-6 \times$  ca. 2 mm, obtuse; lip small, base shallowly saccate, 3-lobed; lateral lobes erect, falcate, ca. 3 mm; mid-lobe triangular, very small, fleshy; disk with a basal callus; callus with a tuft of brownish yellowish hairs. Column less than 2 mm, foot ca. 1.5 mm. Fl. Mar–Apr.

• Epiphytic on tree trunks in forests; below 1200 m. C and S Taiwan.

**5. *Thrixspermum laurisilvaticum*** (Fukuyama) Garay, Bot. Mus. Leaflet. 23: 207. 1972.

黄花白点兰 huang hua bai dian lan

*Sarcochilus laurisilvaticus* Fukuyama, Bot. Mag. (Tokyo) 52: 246. 1938.

Stems ascending, usually less than 3 cm. Leaves nearly basal, elliptic to linear-oblong, sometimes falcate,  $2-8 \times 0.7-1.5$  cm, acute. Inflorescence ascending to pendulous, 2–4 cm, laxly 2–4-flowered; peduncle and rachis  $\pm$  flexuous, slender; floral bracts ovate, 2–3 mm. Flowers opening simultaneously, lasting several days, well spaced, creamy yellow or yellowish, sometimes with red spots on lip, lip mid-lobe reddish; pedicel and ovary 7–10 mm. Dorsal sepal elliptic,  $6-8 \times 4-5$  mm, obtuse; lateral sepals obliquely ovate,  $6-7 \times 4-5$  mm, obtuse or acute. Petals suboblong-spatulate,  $6-7 \times 2-3$  mm, obtuse; lip

saccate at base, margin 3-lobed; lateral lobes erect, oblong, falcate, 6–7 mm; mid-lobe fleshy, small, mucronate; disk without a callus, with a tuft of purple hairs. Column ca. 3 mm, foot ca. 4 mm. Fl. Apr–May.

Epiphytic on tree trunks in moist forests; 600–1200 m. N Fujian, W Hunan, E and N Taiwan [Japan, N Vietnam].

**6. *Thrixspermum formosanum*** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 273. 1919.

台湾白点兰 tai wan bai dian lan

*Sarcochilus formosanus* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 336. 1911; *Dendrocolla pricei* Rolfe; *Pteroceras pricei* (Rolfe) Averyanov; *Thrixspermum pricei* (Rolfe) Schlechter; *T. sasaoi* Masamune.

Stems ascending, 1–2 cm, with several to many leaves. Leaves nearly basal, abaxially often spotted with purple, linear-lanceolate or narrowly oblong, usually  $3-6 \times 0.4-0.9$  cm, slightly fleshy, acute, sometimes slightly bilobed. Inflorescence 4–6 cm; rachis short, slender; floral bracts dense, not distichous, broadly ovate-triangular, ca. 1 mm. Flowers fragrant, closely spaced, opening successively usually 1 or 2 at a time, lasting half a day, white, with brownish stripes on lip; pedicel and ovary 6–9 mm. Dorsal sepal oblong or elliptic,  $5-7 \times 2-3$  mm, obtuse; lateral sepals obliquely obovate or ovate-elliptic,  $5-7 \times 3-4$  mm, acute or obtuse. Petals falcate-oblong,  $5-7 \times 1.5-2.5$  mm, obtuse or subtruncate; lip 4–5 mm, saccate at base, 3-lobed; lateral lobes erect, subovate, 2–3 mm, obtuse; mid-lobe inconspicuous; disk with long hairs and with a fleshy scalelike appendage; sac cylindrical, ca. 6 mm, shallowly bilobed at apex. Column ca. 2 mm. Fl. Feb–Mar.

Epiphytic on trees or branches in forests; 500–1500 m. C and S Taiwan [N Vietnam].

**7. *Thrixspermum merguense*** (J. D. Hooker) Kuntze, Revis. Gen. Pl. 2: 682. 1891.

三毛白点兰 san mao bai dian lan

*Sarcochilus merguensis* J. D. Hooker, Fl. Brit. India 6: 40. 1890; *S. kusukusensis* Hayata; *Thrixspermum kusukusense* (Hayata) Schlechter.

Stems 2–3 cm, with several leaves. Leaves nearly basal, narrowly oblong,  $2-5 \times 0.5-0.6$  cm, fleshy, base contracted, apex obtuse and slightly bilobed. Inflorescence suberect or ascending, to 5 cm, few flowered; rachis slightly thickened distally; floral bracts not distichous, scalelike, ca. 2 mm. Flowers contiguous, opening successively, lasting nearly half a day, yellow, with red stripes on lateral lobes and orange-yellow on mid-lobe of lip. Dorsal sepal oblong or ovate-oblong, ca.  $5 \times 2-3$  mm, obtuse; lateral sepals slightly oblique, similar to but slightly wider than dorsal sepal, obtuse. Petals obovate-oblong,  $4-5 \times 2-2.5$  mm; lip triangular, ca.  $3 \times 5$  mm, saccate at base, margin 3-lobed; lateral lobes erect, large, obtuse; mid-lobe ca.  $1 \times 1.5$  mm, truncate; disk with 2 conic calli and 3 tufts of white hairs. Column ca. 2 mm, foot short. Fl. Jun–Nov.

Epiphytic on tree trunks in forests; below 700 m. C and S Taiwan [Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**8. *Thrixspermum annamense*** (Guillaumin) Garay, Bot. Mus. Leaflet. 23: 206. 1972.

海台白点兰 hai tai bai dian lan

*Ascochilus annamensis* Guillaumin, Bull. Mus. Natl. Hist. Nat., sér. 2, 33: 333. 1961; *Thrixspermum austrosinense* Tang & F. T. Wang; *T. devolium* T. P. Lin & C. C. Hsu.

Stems 1–2 cm, 4- or 5-leaved. Leaves nearly basal, sometimes tinged with purple, narrowly oblong, 3–5 × 0.6–0.9 cm, leathery, acute and slightly bilobed. Inflorescence 6–9 cm, densely many flowered; peduncle with 2 or 3 sheaths; rachis 7–15 mm, slender, thicker distally; floral bracts persistent, ovate, ca. 1 mm, obtuse. Flowers fragrant, contiguous, opening successively, short-lived, white, small. Sepals similar, elliptic or ovate-elliptic, 5–6 × 3–3.3 mm, obtuse. Petals elliptic, ca. 5 × 3 mm, rounded; lip shallowly saccate, rhombic-triangular, ca. 5 × 6.5 mm, 3-lobed; lateral lobes erect, deltoid, rounded; mid-lobe nearly oblate, fleshy, abaxially carinate, adaxially densely hairy, slightly bilobed; disk with a longitudinal hairy callus. Column ca. 1 mm, foot ca. 1 mm. Fl. Apr–May.

Epiphytic on tree trunks in forests. S Hainan, C Taiwan [Thailand, Vietnam].

**9. *Thrixspermum trichoglottis*** (J. D. Hooker) Kuntze, Revis. Gen. Pl. 2: 682. 1891.

同色白点兰 tong se bai dian lan

*Sarcochilus trichoglottis* J. D. Hooker, Fl. Brit. India 6: 39. 1890.

Stems ascending, 3–7 cm, 3–4 mm in diam., with several nodes, many leaved, internodes 5–6 mm. Leaves 3–5.5 × 0.5–1 cm, leathery, obtuse and slightly unequally bilobed. Inflorescences 2 or 3, borne on lower part of stem, suberect, usually 3–4 cm, densely several flowered; peduncle ca. 1 mm in diam.; rachis 3–5 mm, slightly thickened; floral bracts persistent, densely arranged, ovate-lanceolate, 3–4 mm, acuminate. Flowers yellowish white, opening successively, not opening widely, short-lived; pedicel and ovary ca. 5 mm. Dorsal sepal elliptic, ca. 4 × 2.5 mm, obtuse; lateral sepals obliquely ovate, ca. 4 × 2.5 mm, obtuse. Petals elliptic, ca. 3.5 × 2 mm; lip 3-lobed, base with shallow sac, adaxially densely minutely papillate; lateral lobes erect, suborbicular, ca. 3 × 2 mm, apical margin with long clavate cilia; mid-lobe ca. 1 mm, thickened, ± conic-cucullate; disk with a clavate-linear callus extending from base to middle. Column ca. 2 mm, foot ca. 1 mm; anther cap subglobose, rounded. Fl. Mar.

Epiphytic on tree trunks in open forests; 700–800 m. S Yunnan [India (including Andaman Islands), Indonesia, Laos, Malaysia, Myanmar, Singapore, Thailand, Vietnam].

**10. *Thrixspermum eximium*** L. O. Williams, Bot. Mus. Leaflet. 6: 84. 1938.

异色白点兰 yi se bai dian lan

Stems 1–2 cm, 4–7-leaved. Leaves nearly basal, lorate or narrowly elliptic, 4–7 × 0.8–1.3 cm, base slightly conduplicate, apex acute and unequally bilobed. Inflorescence arising from base of stem, erect, ca. 10 cm, few flowered; peduncle ca. 9 cm,

slender; rachis ca. 1 cm, dilated; floral bracts ca. 1 mm. Flowers white, tinged with pink or brownish, opening successively, lasting only half a day; pedicel and ovary ca. 4 mm. Dorsal sepal elliptic, 5–6 × 3–4 mm, acute; lateral sepals suborbicular, ca. 5 × 5.5 mm. Petals subelliptic, ca. 5 × 4 mm, concave; lip ca. 5 mm, saccate at base, apical margin irregularly denticulate, 3-lobed; lateral lobes erect, nearly suborbicular, entire; mid-lobe wider and shorter, shallowly bilobed; disk with a channeled longitudinal central callus; callus furcate at apex, Y-shaped, with tufts of white hairs, with 2 ligulate smaller calli on either side. Column ca. 2.5 mm, foot short. Fl. Feb–Apr.

Epiphytic in mixed forests; 1000–1100 m. S Taiwan [Philippines].

**11. *Thrixspermum fantasticum*** L. O. Williams, Bot. Mus. Leaflet. 6: 82. 1938.

金唇白点兰 jin chun bai dian lan

*Thrixspermum neglectum* Fukuyama.

Stems 1–4 cm, densely few to many leaved. Leaves narrowly elliptic to oblong, 2–5 × 0.8–1.5 cm, acute or slightly bilobed. Inflorescences several, 5–7 cm, several flowered; peduncle slender; rachis very short; floral bracts ovate-triangular, 1–2 mm. Flowers not opening widely, whitish, lip usually tinged with yellow; pedicel and ovary 2.5–4 mm. Dorsal sepal elliptic or obovate, 4–5.5 × 2.5–3 mm, base cuneate, apex obtuse; lateral sepals slightly oblique, broadly elliptic, ca. 5 × 4 mm, obtuse. Petals similar to lateral sepals and smaller, base contracted, apex rounded; lip ca. 3 × 7 mm, base saccate, margin 3-lobed; lateral lobes erect, ca. 3 mm, apical margin denticulate; mid-lobe suborbicular, ca. 1 × 2 mm, base with 2 small ligulate appendages, margin ± denticulate; disk with 2 revolute tubelike calli ending in a tuft of yellow hairs. Column ca. 1 mm, foot ca. 1.5 mm. Fl. Apr–May.

Epiphytic on tree trunks in forests; 300–700 m. S Taiwan [Japan (Ryukyu Islands), Philippines].

**12. *Thrixspermum japonicum*** (Miquel) H. G. Reichenbach, Bot. Zeitung (Berlin) 36: 75. 1878.

小叶白点兰 xiao ye bai dian lan

*Sarcochilus japonicus* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 206. 1866.

Stems pendulous, 2–13 cm, slender, with many nodes, densely many leaved. Leaves narrowly oblong or oblanceolate, 2–4 × 0.5–0.7 cm, leathery, obtuse and minutely bilobed. Inflorescences often 2 to many, opposite to leaves, 3–5 cm, laxly few flowered; peduncle slender, with 2 sheaths; rachis 3–5 mm, not thickened, floral bracts persistent, well spaced, ca. 5 mm apart from each other, distichous, broadly ovate-triangular, ca. 2.5 mm. Flowers pale yellow; pedicel and ovary ca. 5 mm. Dorsal sepal oblong, 5–7 × 2.5–3 mm, obtuse; lateral sepals ovate-lanceolate, 5–7 × 3–3.5 mm, obtuse. Petals narrowly oblong, 5–6 × 1.5–2 mm, obtuse; lip base with a claw ca. 1 mm, lip 3-lobed; lateral lobes suberect, falcate, narrowly suboblong, ca. 2.5 × 1.2 mm, obtuse-rounded; mid-lobe suborbicular, ca. 0.5 mm wide, fleshy, abaxially ± conic-swollen; disk slightly concave at base, densely hairy. Fl. Sep–Oct.  $2n = 36, 38$ .

Epiphytic on branches at forest margins along rivers or valleys; 900–1000 m. N Fujian, N Guangdong, NE Guizhou, Hunan, Sichuan, N Taiwan [Japan].

**13. *Thrixspermum amplexicaule*** (Blume) H. G. Reichenbach, *Xenia Orchid*. 2: 121. 1868.

抱茎白点兰 bao jing bai dian lan

*Dendrocolla amplexicaulis* Blume, *Bijdr.* 288. 1825.

Stems slightly compressed trigonous, ca. 35 cm, ca. 2 mm in diam., slender, with many nodes, internodes ca. 2 cm, each node bearing an aerial root. Leaves well spaced, ovate-lanceolate, 2–2.5 × ca. 0.7 cm, thinly textured, base cordate and amplexicaul, apex acute and minutely bilobed. Inflorescence 30–35 cm, more than 10 × as long as leaves, slender, many flowered; floral bracts persistent, distichous, 2–3 mm apart from each other, 3–4 mm. Flowers opening 1 or 2 at a time and lasting a day only, white or lilac-pink, to 3.5 cm in diam., column white; pedicel and ovary 7–8 mm. Sepals ovate, ca. 17 × 11 mm, rather concave, obtuse. Petals slightly shorter and narrower; lip saccate, shorter than petals; lateral lobes erect, small, acute; mid-lobe fleshy, obtuse; sac ca. 6 mm deep, with a small yellow callus inside and a band of orange hairs below it. Column very much flattened, ca. 2.7 mm. Capsule cylindric, 7–8 cm × ca. 5 mm, slender.

Lithophytic on rocks near the sea; sea level to 100 m. E Hainan [India (Andaman Islands), Indonesia, Malaysia, New Guinea, Philippines, Thailand, Vietnam; Pacific islands (Solomon Islands)].

**14. *Thrixspermum centipeda*** Loureiro, *Fl. Cochinch.* 2: 520. 1790.

白点兰 bai dian lan

*Aerides arachnites* (Blume) Lindley; *Dendrobium auriferum* Lindley; *Dendrocolla arachnites* Blume; *Sarcochilus arachnites* (Blume) H. G. Reichenbach; *S. aurifer* (Lindley) H. G. Reichenbach; *S. centipeda* (Loureiro) Naves; *S. hainanensis* Rolfe; *Thrixspermum arachnites* (Blume) H. G. Reichenbach; *T. auriferum* (Lindley) H. G. Reichenbach; *T. hainanense* (Rolfe) Schlechter.

Stems ascending or pendulous, ± compressed terete, to 20 cm, stout, rigid, with many nodes, internodes 1–1.5 cm. Leaves many, oblong, 6–24 × 1–2.5 cm, slightly fleshy, base narrowed, apex obtuse and unequally bilobed. Inflorescences often several, solitary or in pairs, opposite to leaves, spreading or ascending, longer or shorter than leaves, few flowered; peduncle compressed, often narrowly winged; floral bracts persistent, densely spaced, 1–2 mm apart from each other, distichous, conduplicate, ca. 6 mm, fleshy. Flowers white or creamy yellow, turning yellow later, not opening widely, lasting almost 3 days, thickly textured; pedicel and ovary white, ca. 7 mm. Sepals narrowly falcate-lanceolate, 3–4.5 × 0.3–0.5 cm, long acuminate; lateral sepals slightly wider at base. Petals narrowly falcate-lanceolate, slightly smaller than sepals; lip shallowly saccate at base, 3-lobed; lateral lobes erect, subovate, 2–3 mm, obtuse; mid-lobe spreading, ca. 5 mm, thickly fleshy, conduplicate and narrowly conic in outline, obtuse; disk with a central callus. Column 1.5–2 mm, stout, foot very short. Fl. Jun–Jul. *2n* = 38.

Epiphytic on tree trunks in forests; 100–1200 m. Guangxi, Hainan, Hong Kong, S and SE Yunnan [Cambodia, NE India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

## 169. **CHILOSCHISTA** Lindley, *Edwards's Bot. Reg.* 18: ad t. 1522. 1832.

异型兰属 yi xing lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic or lithophytic, monopodial, usually stemless and leafless. Roots green, photosynthetic, flat, scabrid. Inflorescence often pendulous, racemose, hairy or glabrous. Flowers ephemeral. Sepals and petals subequal; lateral sepals and petals often adnate to column foot. Lip ± clawed, hinged to apex of column foot, pouched or spurred, 3-lobed; lateral lobes erect, large; mid-lobe small; disk with a fingerlike callus, hirsute-pubescent. Column subterete, short, foot long; clinandrium shallow; stigma deep-set; rostellum deflexed, bifid; anther cap with 2 long filiform setae; pollinia 4, in 2 closely appressed, unequal, sessile pairs; stipe sublinear.

About ten species: from the Indian subcontinent through SE Asia to Australia; three species (all endemic) in China.

- 1a. Sepals and petals densely pubescent abaxially; inflorescences to 26 cm ..... 1. *C. yunnanensis*  
 1b. Sepals and petals nearly glabrous or only sparsely pubescent abaxially; inflorescences 1.5–15 cm.  
 2a. Mid-lobe of lip conspicuous, much longer than lateral lobes ..... 2. *C. guangdongensis*  
 2b. Mid-lobe of lip very small, much shorter than lateral lobes ..... 3. *C. segawae*

**1. *Chiloschista yunnanensis*** Schlechter, *Repert. Spec. Nov. Regni Veg. Beih.* 4: 74. 1919.

异型兰 yi xing lan

Stems inconspicuous, usually leafless at least at anthesis. Inflorescences 1 or 2, pendulous, green and spotted with purple, to 26 cm, unbranched, densely pubescent, sparsely many flowered; floral bracts ovate-lanceolate, 3–4 mm, membranous, abaxially sparsely hairy. Flowers opening widely, yellowish or yellowish greenish, marked with brownish in basal half, column

whitish, anther cap whitish or yellow; pedicel and ovary ca. 4 mm, densely pubescent. Sepals elliptic or ovate-elliptic, 5–7 × 4–5 mm, rounded; mentum small but distinct. Petals suboblong, 5–7 × 3.5–4.5 mm, subtruncate; lip 3-lobed; lateral lobes erect, narrowly oblong, ca. 4 mm, rounded; mid-lobe very short, retuse; disk concave or shallowly saccate, with a spongy appendage; appendage pale brown, V-shaped. Column very short, foot ca. 4 mm; anther cap with 2 filiform appendages on both sides. Capsule arcuate, cylindric, ca. 4 cm × 4–5 mm. Fl. Mar–May, fr. Jul.

• Epiphytic on tree trunks at forest margins and in open forests; 700–2000 m. W Sichuan, S and SW Yunnan.

**2. *Chiloschista guangdongensis*** Z. H. Tsi, Acta Phytotax. Sin. 22: 481. 1984.

广东异型兰 *guang dong yi xing lan*

Stems very short, with many long flattened roots, leafless. Inflorescences 1 or 2, pendulous, racemose, laxly several flowered; rachis and peduncle 1.5–6 cm, ca. 1 mm in diam., densely pubescent; floral bracts 3–3.5 mm, ovate-lanceolate, glabrous, membranous, acute. Flowers yellow, glabrous; pedicel and ovary ca. 5 mm, densely pubescent. Dorsal sepal ovate, ca. 5 × 3 mm, 5-veined, rounded; lateral sepals subelliptic, ca. 5 × 3 mm, 4-veined, rounded. Petals ovate, ca. 4.5 × 2.5 mm, 3-veined; lip 3-lobed; lateral lobes erect, suborbicular; mid-lobe ovate-triangular, nearly as large as lateral lobes, slightly concave centrally, with a spongy appendage adaxially, apex rounded. Column ca. 1.5 mm, foot ca. 3 mm; anther cap shortly beaked at apex, with 2 filiform appendages on both sides. Capsule straight, cylindrical, ca. 2 cm × 4 mm. Fl. Apr, fr. May–Jun.

• Epiphytic on tree trunks in evergreen broad-leaved forests. N Guangdong.

**3. *Chiloschista segawae*** (Masamune) Masamune & Fukuyama, Bot. Mag. (Tokyo) 52: 247. 1938 [“*segawai*”].

台湾异型兰 *tai wan yi xing lan*

*Sarcochilus segawae* Masamune, Trans. Nat. Hist. Soc. Formosa 24: 212. 1934 [“*segawai*”]; *Chiloschista hoi* S. S. Ying; *C. segawae* f. *taiwaniana* (S. S. Ying) S. S. Ying; *C. segawae* var. *taiwaniana* S. S. Ying.

Stems inconspicuous, leafless, with roots to 35 cm. Inflorescence often pendulous, racemose, 5–15 cm, 6–15-flowered; peduncle and rachis densely pubescent; floral bracts ovate-triangular, 3–5 mm, membranous, glabrous or sparsely pubescent. Flowers slightly fleshy, whitish green or yellow, sometimes with brownish red patches near base of sepals and petals, lateral lobes of lip striped brown; pedicel and ovary 4–5 mm, pubescent. Dorsal sepal nearly broadly elliptic, 3–5 × 2.5–4 mm, glabrous or sparsely pubescent abaxially, subobtuse; lateral sepals slightly oblique, broadly ovate or elliptic, 4.5–6 × 3.5–4 mm, sparsely pubescent near abaxial base. Petals elliptic, 4–6 × 3.5–4 mm, obtuse; lip 5–6 mm, base saccate, 3-lobed; lateral lobes erect, falcate-oblong, rounded; mid-lobe very small, thick, retuse, base with a longitudinal callus running into bottom of sac; callus bilobed, pubescent, grooved; sac 2–3 mm. Column ca. 1 mm, foot ca. 3 mm; anther cap with 2 filiform appendages on both sides. Fl. Apr–May.

• Epiphytic on tree trunks in forests; 700–1000 m. S Taiwan.

## 170. *VANDA* Jones ex R. Brown, Bot. Reg. 6: ad t. 506. 1820.

万代兰属 *wan dai lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Alexandra Bell

Herbs, epiphytic, monopodial. Stems ascending or rarely arching, usually rather long, stout, rigid, with short internodes and many distichous leaves, with thick roots in lower part. Leaves distichous, flat, narrow, often closely spaced, linear to lorate, conduplicate toward base, with amplexicaul-sheathing base, jointed. Inflorescences erect or suberect, racemose, axillary, usually ascending, sparsely few to many flowered. Flowers large or medium-sized, usually colorful and long-lasting. Sepals and petals similar or sepals wider, often narrowed toward base, margins ± twisted or wavy, often tessellated; lip attached to an indistinct column foot, immobile, shortly spurred, 3-lobed; lateral lobes erect, small; mid-lobe large, usually with longitudinal keels or swellings adaxially. Column short, stout; rostellum short; anther cap subglobose; pollinia 2, subglobose, waxy, each strongly cleft or porate, attached by a common short stipe to a large viscidium.

About 40 species: tropical Asia to New Guinea and Australia; ten species (one endemic) in China.

*Vanda testacea* (Lindley) H. G. Reichenbach (Gard. Chron., n.s., 8: 166. 1877; *Aerides testacea* Lindley, Gen. Sp. Orchid. Pl. 238. 1830, “*testaceum*”) was noted from China (without precise locality) by Pearce and Cribb (Orchids Bhutan, 577. 2002). However, the present authors found no relevant specimens and therefore could not substantiate the occurrence of this species in China. *Vanda testacea* otherwise occurs in Bhutan, India, Myanmar, Sri Lanka, and Thailand.

1a. Inflorescence taller than leaves, at least 20 cm.

2a. Sepals and petals blue or tinged with blue; mid-lobe of lip oblanceolate or ligulate.

3a. Flowers 1.5–2.5 cm in diam.; sepals and petals not tessellated; sepals 10–17 mm ..... 5. *V. coerulescens*

3b. Flowers 6–9 cm in diam.; sepals and petals tessellated; sepals 35–50 mm ..... 2. *V. coerulea*

2b. Sepals and petals yellowish or greenish, with brown markings; mid-lobe of lip pandurate.

4a. Lip as long as or longer than sepals; lateral lobes of lip ovate or triangular ..... 10. *V. fuscoviridis*

4b. Lip shorter than sepals; lateral lobes of lip suborbicular, apex rounded to truncate ..... 4. *V. lamellata*

1b. Inflorescence shorter than leaves, less than 20 cm.

5a. Inflorescence ca. 8 cm or more in length; sepals and petals distinctly tessellated.

6a. Lip shorter than lateral sepals; calli 2 on lip near entrance to spur ..... 1. *V. brunnea*

6b. Lip as long as or longer than sepals; calli absent on lip.

7a. Bracts 3–5 mm; spur 7–8 mm ..... 3. *V. concolor*

7b. Bracts 2.5–3 mm; spur 2.5–3.5 mm ..... 6. *V. subconcolor*

5b. Inflorescence shorter than 8 cm; sepals and petals not tessellated.

8a. Flowers ca. 2 cm in diam. or less, not widely opening; lip spurless ..... 8. *V. alpina*

8b. Flowers medium-sized, more than 2 cm in diam., widely opening; lip with a spur at least ca. 4 mm.

9a. Petals yellow-green; mid-lobe of lip ca. 10 mm or less, apex cleft; column white ..... 9. *V. cristata*

9b. Petals cream-yellow; mid-lobe of lip longer than 10 mm, apex obtuse to acute; column cream-yellow .... 7. *V. pumila*

**1. *Vanda brunnea*** H. G. Reichenbach, Xenia Orchid. 2: 138. 1868.

白柱万代兰 bai zhu wan dai lan

*Vanda denisoniana* Benson & H. G. Reichenbach var. *hebraica* H. G. Reichenbach; *V. henryi* Schlechter.

Stems ca. 15 cm, 1–1.8 cm in diam. Leaf blade 22–30(–35) × 1.7–3 cm, thick, apex unequally 2-lobed. Inflorescences 1–3, 10–20(–25) cm, sparsely 3–5-flowered; peduncle 7–18 cm; floral bracts broadly ovate, 3–4 × 3–3.5 mm, apex obtuse. Flowers thickly textured, widely opening, 3.5–4 cm in diam.; pedicel and ovary white, 55–90 mm; sepals and petals abaxially white, adaxially yellowish green or yellowish brown tessellated with purplish brown. Sepals subsimilar, lateral sepals slightly wider than dorsal, spatulate, 22–25(–27) × 14–17 mm, base clawed, apex rounded. Petals spatulate, 19–22 × 9–12 mm, base clawed, apex rounded; lip shorter than sepals, fleshy, spurred; lateral lobes erect, white or yellowish white, broadly ovate, 7–9 × 7–8 mm, apex obtuse; mid-lobe yellowish green or pale brown, with white base and 2 brownish red stripes on both basal sides, pandurate, 16–18 × 7–8 mm, base with a pair of calli, apex broadly emarginate; spur white, broadly conic, 6–7 × 0.5–0.6 mm, apex acute-obtuse. Column white and slightly tinged with pale purple, 5–7 mm; anther cap yellowish white, 5–6 mm wide; pollinia ca. 2 mm in diam.; stipe subovate-triangular, ca. 4 mm; viscidium oblate, 4–5 mm wide. Fl. Mar.  $2n = 38, 76$ .

On tree trunks in open forests or at forest margins; 800–2000 m. S Yunnan [Myanmar, Thailand, Vietnam].

**2. *Vanda coerulea*** Griffith ex Lindley, Edwards's Bot. Reg. 33: ad t. 30. 1847.

大花万代兰 da hua wan dai lan

Stems 5–23 cm, 0.8–1.5 cm in diam. Leaf blade (7–)14–18 × 1.3–2(–3) cm, thickly leathery, apex unequally 2-lobed. Inflorescences 1–3, 20–42 cm, sparsely (4–)6–14-flowered; peduncle 16–22 cm; rachis weakly zigzag, 9–28 cm; floral bracts broadly ovate, 8–11 × 5–9 mm, apex obtuse-acute. Flowers thinly textured, widely opening, 6–9 cm in diam.; pedicel and ovary white, tinged blue, 45–60 mm; sepals and petals sky-blue, tessellated. Sepals similar, broadly obovate, 35–50 × 17–35 mm, base contracted into short claw, apex rounded. Petals elliptic-obovate, 30–45 × 18–25 mm, base contracted into a short claw, apex rounded; lip sky-blue, shorter than sepals, fleshy, spurred; lateral lobes erect, narrowly falcate, adaxially white with yellow spots, 3.5–5 × 1–2 mm, apex subacuminate; mid-lobe deep blue, ligulate, 17–25 × 5–8 mm, base with a pair of calli, apex subtruncate and emarginate; disk with 3 longitudinal ridges; spur tubular, slightly conic, 5–7 × 2–3 mm, apex obtuse. Column 4–6 mm; anther cap white, ca. 2 mm wide. Fl. Oct–Nov.  $2n = 38$ .

On tree trunks in open forests or along rivers; 1000–1600 m. S Yunnan [NE India, Myanmar, N Thailand].

**3. *Vanda concolor*** Blume, Rumphia 4: 49. 1849.

琴唇万代兰 qin chun wan dai lan

*Vanda esquirolei* Schlechter.

Stems 4–13 cm, 0.4–1 cm in diam. Leaf blade 15–30 × 1–3 cm, leathery, apex unequally 2-lobed. Inflorescences 1 or 2, 11–17 cm, sparsely 4–8-flowered; peduncle 3–6 cm; rachis not distinctly zigzag, 5–8 cm; floral bracts ovate, 3–5 × 2–3 mm, apex acute. Flowers thickly textured, widely opening, 3–4 cm in diam., fragrant; pedicel and ovary white, 2–4.5 cm; sepals and petals abaxially white, adaxially yellowish brown with yellow stripes, tessellated. Sepals subsimilar, lateral sepals slightly wider than dorsal sepal, oblong-obovate, 16–20 × 6–12 mm, base contracted into a short claw, margin slightly crisped, apex obtuse. Petals subspatulate, 15–19 × 8–10 mm, base clawed, margin slightly crisped, apex rounded; lip ca. as long as or longer than sepals, fleshy, spurred; lateral lobes erect, inner surface white with many purple spots, subfalcate, triangular or lanceolate, 4–5 × 2–3.5 mm, apex obtuse; mid-lobe yellowish brown in apical half, yellow in basal half, pandurate, 12–16 × 5–7 mm, without obvious calli, apex 2-lobed; disk surface with 5 or 6 yellow papillate ridges, base often shortly hairy; spur white, cylindric, 7–8 × 1.3–2 mm, apex subacute. Column white, 6–7 mm; anther cap yellow, 2–3 mm wide; pollinia ca. 1 mm in diam. Fl. Apr–May.  $2n = 38, 76$ .

On tree trunks or rocks at forest margins; 700–1600 m. Guangxi, SW Guizhou, S Yunnan [Vietnam].

**4. *Vanda lamellata*** Lindley, Edwards's Bot. Reg. 24(Misc.): 66. 1838.

雅美万代兰 ya mei wan dai lan

*Vanda amiensis* Masamune & Segawa.

Stems 7–30 cm, 0.5–1.3 cm in diam. Leaf blade 12–27 × 1–2 cm, thickly leathery, apex unequally 2-lobed. Inflorescences 1 or 2, 20–30 cm, 5–15-flowered; peduncle 10–21 cm; rachis not distinctly zigzag, 6–12 cm; floral bracts ovate-triangular, 1–2 × 1–2 mm, apex acute. Flowers thickly textured, widely opening, 2.5–3 cm in diam., fragrant; pedicel and ovary white, occasionally tinged pink, 2–5 cm; sepals and petals yellowish or greenish with brown spots and irregularly longitudinal stripes, not distinctly tessellated. Dorsal sepal obovate to oblanceolate-spatulate, 16–20 × 7–10 mm, base clawed, apex obtuse to acute or sometimes retuse; lateral sepals falcate-obovate, ca. 20 × 13 mm, base clawed, margin slightly undulate, apex rounded. Petals spatulate, 16–20 × 6–8 mm, base clawed, apex obtuse; lip white or yellowish white, shorter than sepals, spurred; lateral lobes erect, inner surface white spotted with purple, suborbicular, 2–4 × 1–2 mm, apex rounded-truncate; mid-lobe yellowish white, with pink stripes, pandurate-ovate, 6–8 × 3–6 mm, sometimes with small indistinct pair of calli near spur, apex obtuse, rounded, or slightly retuse; disk with 3 ridges, 2 lateral keels dilated at narrowest part of mid-lobe; spur conic, 4–5 × 1–1.5 mm, apex subacute. Column 3–4 mm; anther cap yellow-white, 1.5–2 mm wide. Fl. Apr.  $2n = 38$ .

On sunny tree trunks or rocks. S Taiwan [Japan (Ryukyu Islands), Philippines].

**5. *Vanda coerulescens*** Griffith, Not. Pl. Asiat. 3: 352. 1851.

小蓝万代兰 xiao lan wan dai lan

Stems 2–8 cm, 1–1.5 cm in diam. Leaf blade 7–12 × 1–1.3 cm, fleshy, apex praemorse. Inflorescences 1 or 2, 14–36 cm, sparsely 10–16-flowered; peduncle 11–35 cm; rachis not distinctly zigzag, 10–25 cm; floral bracts ovate-triangular, 1.5–3 × 1.5–3 mm, apex acute. Flowers thinly textured, widely opening, 1.5–2.5 cm in diam.; pedicel and ovary white, tinged with pale blue, 1.5–3 cm; sepals and petals pale blue or white tinged with pale blue, not tessellated. Sepals similar, obovate or spatulate, 10–17 × 6–8 mm, base cuneate, apex obtuse. Petals oblanceolate-spatulate, 10–17 × 5–7 mm, base cuneate, apex obtuse; lip deep blue, shorter than sepals, spurred; lateral lobes erect, pale blue, suboblong, 3–4 × 1.5–2.3 mm, apex oblique; mid-lobe dark purple or blue, oblanceolate, 7–9 × 4–6 mm, base with a pair of calli, apex rounded and emarginate; disk centrally often with 3–5 thickened ridges and lateral ones thicker and dilated at apex; spur slightly curved, cylindric, ca. 5 mm, apex obtuse. Column blue, 5–7 mm; anther cap pale yellow, ca. 1.5 mm wide. Fl. Mar–Apr.  $2n = 38, 40$ .

On tree trunks in open forests; 300–1600 m. S and SW Yunnan [NE India, Myanmar, N Thailand].

**6. *Vanda subconcolor*** Tang & F. T. Wang, Acta Phytotax. Sin. 12: 48. 1974.

纯色万代兰 chun se wan dai lan

*Vanda subconcolor* var. *disticha* Tang & F. T. Wang.

Stems 15–18 cm, 0.7–1 cm in diam. Leaf blade 14–26 × 1.2–2 cm, slightly fleshy, apex unequally 2-lobed with deep sinus and often a small point in center. Inflorescences 1 or 2, 12–17 cm, sparsely 3–6-flowered; peduncle 6–9 cm; rachis weakly zigzag, 5–8 cm; floral bracts broadly ovate, 2.5–3 × 1.8–2.1 mm, apex acute. Flowers thickly textured, widely opening, 3–4 cm in diam.; pedicel and ovary white, 3–7 cm; sepals and petals abaxially white, adaxially yellowish brown, conspicuously tessellated. Dorsal sepal obovate-spatulate, 18–28 × 9–12 mm, base contracted into short claw, apex obtuse; lateral sepals rhombic-elliptic, 20–28 × 14–15 mm, base contracted, margin slightly crisped. Petals obovate-spatulate, 16–25 × 9–11 mm, base contracted into a short claw, apex rounded; lip white, shorter than sepals, spurred; lateral lobes erect, densely spotted with purple, ovate-triangular, 7–9 × 6–7 mm, apex obtuse; mid-lobe yellowish brown at apex, adaxially with 4–6 purplish brown stripes, pandurate-obovate, apex emarginate; disk centrally often with 3–5 small ridges; spur conic, 2.5–3.5 × 2–3 mm, apex obtuse. Column white, 6–7 mm, ca. 3 mm wide. Fl. Feb–Mar.  $2n = 38^*$ .

• On tree trunks in open forests; 600–1000 m. Hainan, W Yunnan.

**7. *Vanda pumila*** J. D. Hooker, Fl. Brit. India 6: 53. 1890.

矮万代兰 ai wan dai lan

*Trudelia pumila* (J. D. Hooker) Senghas.

Stems 5–23 cm, 0.5–1 cm in diam. Leaf blade 6–24 × 1–2 cm, slightly fleshy or thickly leathery, apex unequally 2- or 3-

dentate. Inflorescences 1 or 2, 2–7 cm, sparsely 1–3-flowered; peduncle 1.5–3 cm; rachis ± flexuous, 1–3.5 cm; floral bracts broadly ovate, 3–5 × 2.5–4 mm, apex obtuse. Flowers thickly textured, widely opening, (2.5–)4–6.2 cm in diam., fragrant; pedicel and ovary 2–4.5 cm; sepals and petals white to cream-yellow, not tessellated. Dorsal sepal oblanceolate, 14–26 × 6–8 mm, base cuneate, apex obtuse; lateral sepals slightly oblique, ovate, 16–26 × 9–11 mm, base cuneate, apex obtuse. Petals oblong-lanceolate, 15–28 × 3–6 mm, base cuneate, apex acute; lip pale cream-colored, streaked with purple to red, thickly fleshy, ca. as long as or longer than sepals, spurred; lateral lobes erect, abaxially cream-yellow, adaxially purplish red, ovate-triangular, 2.5–4 × 2–3 mm, apex obtuse; mid-lobe adaxially cream-yellow with 8 or 9 purplish red longitudinal stripes, ligulate to broadly ovate, 7–10 × 6–8 mm, apex obtuse-acuminate; disk carinate with 3 small ridges; spur conic-obconic, 4–5 mm, apex obtuse. Column cream-yellow to white, 3–5 mm; anther cap cream-yellow, ca. 3 mm wide. Fl. Mar–May.  $2n = 38, 40, 72, 76$ .

On tree trunks in forests; 500–1800 m. W Guangxi, Hainan, S Yunnan [Bhutan, NE India, Laos, Myanmar, Nepal, N Thailand, Vietnam].

**8. *Vanda alpina*** (Lindley) Lindley, Fol. Orchid. 4(Vanda): 10. 1853.

垂头万代兰 chui tou wan dai lan

*Luisia alpina* Lindley, Edwards's Bot. Reg. 24(Misc.): 56. 1838; *Stauroopsis alpina* (Lindley) Tang & F. T. Wang; *Trudelia alpina* (Lindley) Garay.

Stems 5–18 cm, 0.5–1 cm in diam. Leaf blade 5–16 × 0.7–1.4 cm, slightly fleshy or thickly leathery, apex unequally 2-lobed. Inflorescences 2 or 3, 1.5–2.5 cm, 1–3-flowered; peduncle 1–2 cm; rachis 0.5–1 cm; floral bracts ovate-triangular, 2–3 × 1.5–2 mm, apex obtuse-acute. Flowers thickly textured, not widely opening, 1.5–2 mm in diam., fragrant; pedicel and ovary yellowish green, 1.2–2 cm; sepals and petals green to yellow-green, not tessellated. Dorsal sepal oblong-ovate, 11–15 × 4–6 mm, base cuneate, apex obtuse; lateral sepals ovate-lanceolate, 12–15 × 4–6 mm, base cuneate, apex obtuse-acute. Petals obliquely oblong-lanceolate, 10–13 × 3–5 mm, base clawed, apex obtuse-acute; lip green with a whitish base, basal sac maroon-purple, apical lamina striped violet, shorter than sepals, fleshy, base concave, spurless, deeply gibbous-saccate; lateral lobes suberect, abaxially yellowish green, adaxially reddish purple, suborbicular, 1.5–2.5 × 3–4 mm, apex rounded; mid-lobe abaxially yellowish green, adaxially reddish purple with yellowish stripes, ligulate-ovate, 9–12 × 6–7 mm, apex retuse or obscurely 3-lobed; disk sometimes with a small, short central ridge and 2 smaller central ridges on either side. Column white, 3–4 mm; anther cap white, nearly subglobose, ca. 3 mm wide. Fl. Jun.  $2n = 38$ .

S Yunnan [Bhutan, India, Nepal, N Vietnam].

**9. *Vanda cristata*** Lindley, Gen. Sp. Orchid. Pl. 216. 1833.

叉唇万代兰 cha chun wan dai lan

*Aerides cristata* (Lindley) Wallich ex J. D. Hooker.

Stems 6–18 cm, 0.6–0.8 cm in diam. Leaf blade 7.5–15 ×

0.6–1.8 cm, thickly leathery, apex praemorse. Inflorescences 2 or 3, 3–4.5 cm, 1- or 2-flowered; peduncle 2–3.5 cm; rachis weakly zigzag, 0.5–5 cm; floral bracts broadly ovate, 4–6 × 2–4 mm, apex obtuse-acute. Flowers thickly textured, widely opening, 3.5–5 cm in diam.; pedicel and ribbed ovary yellowish green, 1.5–3 cm; sepals and petals yellowish green, not tessellated. Dorsal sepal oblong-spatulate, 20–30 × 5–9 mm, base cuneate, apex obtuse-acute; lateral sepals lanceolate, 20–30 × 5–10 mm, base cuneate, apex obtuse. Petals falcate-oblong, 18–28 × 2–5 mm, base contracted, apex acute; lip golden yellow to white, striped with violet-purple to red-brown, ca. as long as or longer than sepals, fleshy, spurred; lateral lobes erect, abaxially yellowish green, adaxially with dull purple stripes, ovate-triangular, 2–4 × 2–5 mm, apex obtuse; mid-lobe abaxially yellowish green with dull purple margins, adaxially white with dull purple longitudinal stripes, ovate to subpandurate, 11–20 × 4–5 mm, apex cleft sometimes with short point in sinus; disk rugulose with 2 slender elongated processes on apical margin; spur broadly conic, 6–9 mm. Column white, 4–8 mm; anther cap yellow, 3–3.5 mm wide. Fl. May.  $2n = 28, 38, 76$ .

On tree trunks in evergreen broad-leaved forests; 700–1700 m. SE Xizang, SW Yunnan [Bhutan, India, Nepal, N Vietnam].

**10. *Vanda fuscoviridis*** Lindley, Gard. Chron. 1848: 351. 1848.

广东万代兰 *guang dong wan dai lan*

*Vanda kwangtungensis* S. J. Cheng & C. Z. Tang.

Stems ca. 25 cm. Leaf blade ca. 25 × 2.5 cm, thick, apex unequally 2-lobed and erose. Inflorescences 1 or 2, ca. 23 cm, ca. 9-flowered; peduncle ca. 12 cm; rachis weakly zigzag, ca. 11 cm. Flowers thickly textured, widely opening, 3.4–3.9 cm in diam.; pedicel and ovary yellowish green, 3–4 cm; sepals and petals abaxially white, adaxially yellowish with brown tessellations. Dorsal sepal oblanceolate-spatulate, 16–17 × ca. 8 mm, base contracted into a short claw, apex obtuse; lateral sepals obovate-spatulate, 15–16 × 8–10 mm, base contracted into a short claw, apex obtuse. Petals broadly spatulate, 16–17 × 9–10 mm, base clawed, apex obtuse; lip ca. as long as or longer than sepals, spurred; lateral lobes erect, white tinged pink, ovate-triangular, ca. 4 × 2 mm, apex obtuse; mid-lobe white with purple-brown stripes, pandurate, ca. 15 × 5–7 mm, apex retuse; spur conic, 9–10 × ca. 2 mm. Column ivory-white, ca. 7 mm. Fl. unknown.

Limestone slopes. Guangdong [N Vietnam].

## 171. *RHYNCHOSTYLIS* Blume, Bijdr. 285 [“*Rynchostylis*”], 434. 1825.

钻喙兰属 *zuan hui lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

*Anota* (Lindley) Schlechter; *Vanda* sect. *Anota* Lindley.

Herbs, epiphytic, monopodial. Stems short, stout, with thick roots. Leaves many, often lorate, long and narrow, thickly fleshy, channeled, jointed and sheathing at base, unequally bilobed or toothed. Inflorescences lateral, erect or pendulous, racemose, densely many flowered; peduncle and rachis stout. Flowers resupinate, medium-sized. Sepals and petals similar, spreading; lateral sepals often wider and ± oblique. Petals smaller than sepals; lip adnate to column foot, immovable, entire or slightly 3-lobed, spurred at base; spur laterally compressed and backward-pointing. Column short, with a short foot; anther cap long pointed; rostellum long pointed; pollinia waxy, 2, globose, cleft; stipe long and narrow, apex slightly dilated; viscidium ovate, usually small.

About three or four species: from Sri Lanka, India through mainland SE Asia, China, the Philippines, south through Malaysia and Indonesia; two species in China.

- 1a. Lip apex not 3-lobed; column foot distinct; inflorescence pendulous; spur somewhat transversely compressed; sepals 8–11 mm; lip glabrous ..... 1. *R. retusa*  
 1b. Lip apex distinctly 3-lobed, small central lobe truncate, fleshy, lateral lobes broad, orbicular; column foot very short; sepals 12–14 mm; lip with indistinct, sparsely pilose basal keels, downturned on front wall of spur ..... 2. *R. gigantea*

### 1. *Rhynchostylis retusa* (Linnaeus) Blume, Bijdr. 286. 1825.

钻喙兰 *zuan hui lan*

*Epidendrum retusum* Linnaeus, Sp. Pl. 2: 953. 1753; *Aerides retusa* (Linnaeus) Swartz; *Gastrochilus retusus* (Linnaeus) Kuntze; *Limodorum retusum* (Linnaeus) Swartz; *Saccolabium retusum* (Linnaeus) Voigt.

Stems ascending, usually 3–10 cm, 1–2 cm in diam., enclosed in leaf sheaths. Leaves broadly lorate, 20–40 × 2–4 cm, unequally bilobed. Inflorescences 1–3, pendulous, 30–40 cm, densely many flowered; rachis 20–30 cm, thick; floral bracts reflexed, broadly ovate, 3–4 mm. Flowers unscented, 1.7–2.3 cm in diam., sepals and petals white and spotted with pink or pale purple, lip purplish pink, apex white, spur white; pedicel

and ovary 7–10 mm. Dorsal sepal elliptic, 7–11 × 4.2–5 mm, obtuse; lateral sepals obliquely oblong, 7–11 × 4.5–5.5 mm, base adnate to column foot, apex obtuse. Petals narrowly oblong, 7–7.5 × 2.5–3 mm, obtuse; lip often conduplicate, oblong-spatulate, 8–10 × 5–6 mm, rounded, apiculate, or slightly retuse, spurred; spur laterally compressed, 6–8 mm, rounded. Column ca. 4 mm, foot ca. 2 mm; stipe ca. 2.2 mm, linear, dilated and capitate; viscidium oblanceolate, ca. 1.8 × 0.6 mm. Capsule obovoid or subclavate, ca. 2.5 × 1.3 cm. Fl. May–Jun, fr. Jun–Jul.  $2n = 38$ .

Epiphytic on tree trunks in open forests or at forest margins; 300–1500 m. SW Guizhou, S Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

**2. *Rhynchostylis gigantea*** (Lindley) Ridley, J. Linn. Soc., Bot. 32: 356. 1896.

海南钻喙兰 hai nan zuan hui lan

*Saccolabium giganteum* Lindley, Gen. Sp. Orchid. Pl. 221. 1833; *Anota densiflora* (Lindley) Schlechter; *A. gigantea* (Lindley) Fukuyama; *A. hainanensis* (Rolfe) Schlechter; *Gastrochilus giganteus* (Lindley) Kuntze; *Vanda densiflora* Lindley; *V. hainanensis* Rolfe.

Stems erect, 4–13 cm or longer, stout, ca. 2 cm in diam., many leaved. Leaves broadly lanceolate, 20–40 cm, fleshy, with amplexicaul sheaths at base, apex obtuse and unequally bilobed. Inflorescences 2–4, usually arching, 14–30 cm, densely many flowered; rachis 10–20 cm, thick; floral bracts often reflexed,

broadly ovate, ca. 5 mm. Flowers thickly textured, white spotted with purplish red, lip deep purplish red, column purplish red, anther cap white. Sepals similar, elliptic-oblong, 12–17 × 9–10 mm, obtuse. Petals oblong, smaller than sepals, base contracted, apex obtuse; lip subobovate, ca. 17 × 12 mm, fleshy, base with a pair of ridges, margin 3-lobed; lateral lobes erect, subelliptic; mid-lobe very small, retuse; disk slightly papillate; spur narrowly conic, ca. 5 mm, inside densely white hairy. Column ca. 4 mm, thick, foot very short or indistinct; rostellum suborbicular; stipe linear, ca. 2 mm, apex ± dilated; viscidium lanceolate. Capsule obovoid, ca. 4 cm. Fl. Jan–Apr, fr. Feb–May.  $2n = 38$ .

Epiphytic on tree trunks in open forests; ca. 1000 m. Hainan [Cambodia, Indonesia, Laos, Malaysia, Myanmar, Singapore, Thailand, Vietnam].

## 172. *UNCIFERA* Lindley, J. Proc. Linn. Soc., Bot. 3: 39. 1858.

叉喙兰属 cha hui lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Roots not piercing leaf sheaths. Stems usually pendulous, elongate, slender, leafy. Leaves overlapping, distichous, flat, oblong to lanceolate, slightly fleshy, base amplexicaul, sheathing, jointed, apex unequally bilobed or praemorse. Inflorescence axillary, racemose, densely few to many flowered. Flowers thickly textured. Sepals and petals similar, concave; lateral sepals slightly oblique. Petals slightly smaller than sepals; lip funnel-shaped, spurred, 3-lobed, lateral lobes suberect; mid-lobe very small, fleshy, adaxially ± concave; spur long, hooked or curved, inside unornamented. Column terete, bent down over spur entrance, footless; rostellum conspicuous, thick; anther cap conic, apex elongate and narrowed; pollinia waxy, 2, globose, deeply cleft, separated by a hyaline flange, attached by a common long, linear stipe to a large viscidium; stipe wings borne on a ridge formed by basal part of rostellum.

About six species: from tropical Himalayan regions to Indochina and Thailand; two species in China.

- 1a. Apex of spur strongly curved forward and hooked ..... 1. *U. acuminata*  
1b. Apex of spur curved backward toward ovary ..... 2. *U. thailandica*

**1. *Uncifera acuminata*** Lindley, J. Proc. Linn. Soc., Bot. 3: 40. 1858.

叉喙兰 cha hui lan

*Saccolabium acuminatum* (Lindley) J. D. Hooker.

Stems often arching, terete, 5–27 cm, slender, 3–4 mm in diam., many noded, internodes 1–2 cm. Leaf blade lanceolate or obliquely oblong, 4–10.5 × 0.7–1.5 cm, acute and slightly praemorse. Inflorescence arching, 7–10 cm, densely many flowered; floral bracts ovate, 3–6 mm. Flowers not opening widely, yellowish green, slightly fleshy; pedicel and ovary 5–7 mm. Sepals cymbiform, broadly ovate, 6–7 × ca. 5 mm, obtuse. Petals ovate, ca. 6 × 4 mm, obtuse; lip with a long spur at base, 3-lobed; lateral lobes erect, suborbicular, large, 5–6 mm wide; mid-lobe ovate-triangular, very small, fleshy, adaxially shallowly concave, apex obtuse; spur funnel-shaped, strongly curved forward and hooked, ca. 15 mm. Column ca. 3 mm; rostellum large, fleshy; anther cap subconic; stipe ca. 3 mm; viscidium oblong, ca. 3 mm. Fl. Apr–Jul.

Epiphytic on tree trunks in dense forests; 1300–1900 m. Guizhou, S Yunnan [Bhutan, NE India, Nepal].

**2. *Uncifera thailandica*** Seidenfaden & Smitinand, Orchids Thailand 4(2): 828. 1965.

中泰叉喙兰 zhong tai cha hui lan

Stems short, internodes ca. 10 mm. Leaf blade ligulate, 10–12 × ca. 2 cm, unequally obtusely bilobed. Inflorescence gently curving; peduncle 4–6 cm; rachis 7–10 cm, many flowered. Flowers: sepals light purple edged white, petals light greenish with a purple central spot, lip white with a purple spot near apex of blade; pedicel and ovary 9–10 mm. Dorsal sepal concave, ca. 7 × 4.5 mm; lateral sepals ca. 7 × 5 mm. Petals ca. 6.3 × 5 mm; lip lateral lobes insignificant, triangular with broad base, less than 1 mm high, ca. 1.5 mm wide at base; mid-lobe very fat, with 2 small lobes turned backward; spur sigmoid, apex turned backward toward ovary. Column very short, tip of rostellum hidden in opening of sac.

Epiphytic in evergreen forests; ca. 1400 m. Yunnan (Yingjiang) [Thailand].

## 173. *ROBIQUETIA* Gaudichaud, Voy. Uranie, Bot. 426. 1829.

寄树兰属 ji shu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial, medium-sized. Stem pendulous, long, sometimes branching, leafy. Leaves oblong to elliptic, unequally bilobed. Inflorescence axillary, pendulous, racemose or paniculate, densely many flowered. Flowers small. Sepals and petals similar, spreading; mid-lobe spreading; lip immovable, rather fleshy, 3-lobed; lateral lobes erect, small, sometimes fleshy; spur apical, inflated, with callosities on scales within. Column short, stout, lacking a foot; rostellum large or small; stipe spatulate, often hooklike, long; viscidium small; pollinia 2, grooved.

About 40 species: from the Himalayas to Australia and the SW Pacific islands, with a few species extending to Indochina and China; two species in China.

- 1a. Sepals and petals light yellow with large brown blotches, spur whitish; leaves more than 2.5 cm wide; inflorescence racemose ..... 1. *R. spatulata*  
 1b. Sepals and petals yellow with small red-brown dots, spur dirty yellow; leaves less than 2.5 cm wide; inflorescence paniculate ..... 2. *R. succisa*

**1. *Robiquetia spatulata*** (Blume) J. J. Smith, *Natuurk. Tijdschr. Ned.-Indië* 72: 114. 1912.

大叶寄树兰 da ye ji shu lan

*Cleisostoma spatulatum* Blume, *Bijdr.* 364. 1825 [*“spatulata”*]; *Aerides densiflora* (Lindley) Wallich ex J. D. Hooker; *Gastrochilus densiflorus* (Lindley) Kuntze; *Pomatocalpa densiflorum* (Lindley) Tang & F. T. Wang; *Rhynchosstylis densiflora* (Lindley) L. O. Williams; *Saccolabium densiflorum* Lindley; *Sarcanthus densiflorus* (Lindley) E. C. Parish & H. G. Reichenbach.

Stems often pendulous, slightly compressed terete, to 50 cm or more long, stout, 7–10 mm in diam., internodes 1–3 cm. Leaves oblong, 10–20 × 2.5–5.5 cm, apex unequally bilobed. Inflorescence opposite to leaf, pendulous, racemose, 10–20 cm, densely many small flowered; floral bracts narrowly lanceolate, 4–5 mm. Flowers yellow with purplish brown spots and stripes, spur whitish; pedicel and ovary ca. 5 mm. Dorsal sepal ovate, 4–5 × ca. 2.5 mm, concave, obtuse; lateral sepals obliquely ovate, 4–5 × 2.5–3 mm, obtuse. Petals ovate, ca. 3 × 2 mm, obtuse; lip 3-lobed; lateral lobes erect, subovate-triangular, ca. 2.5 × 3 mm, obtuse; mid-lobe incurved, ± narrowly lanceolate, ca. 3 × 1 mm, fleshy, obtuse, adaxially with 2 lamellae fused with each other; spur perpendicular to ovary, globose, 5–7 mm, contracted at middle, apex dilated, upper adaxial surface inside with a bifid appendage on back wall and a small callus on front wall. Column ca. 3 mm; anther cap narrowed and beaked at apex. Capsule cylindrical, 2–3 cm × 5–8 mm. Fl. Jul–Aug, fr. Sep–Oct.  $2n = 38$ .

Epiphytic on tree trunks in forests, lithophytic on rocks along streamsides; below 1700 m. Hainan [Bhutan, Cambodia, NE India, Indonesia, Laos, Malaysia, Myanmar, Singapore, Thailand, Vietnam].

**2. *Robiquetia succisa*** (Lindley) Seidenfaden & Garay, *Bot. Tidsskr.* 67: 119. 1972.

寄树兰 ji shu lan

*Sarcanthus succisus* Lindley, *Bot. Reg.* 12: ad t. 1014. 1826; *Cleisostoma virginale* Hance; *Oeceoclades paniculata* Lindley; *Pomatocalpa virginale* (Hance) J. J. Smith; *Robiquetia paniculata* (Lindley) J. J. Smith; *Saccolabium buccosum* H. G. Reichenbach; *Sarcanthus henryi* Schlechter; *Uncifera buccosa* (H. G. Reichenbach) Finet ex Guillaumin.

Stems to 1 m, ca. 5 mm in diam., rigid, internodes ca. 2 cm. Leaves oblong, 6–12 × 1.5–2(–2.5) cm, subtruncate and praemorse. Inflorescence paniculate, 8–15 cm, subdensely many flowered; floral bracts subulate, ovate-lanceolate, 2–5 mm. Flowers 7–9 mm in diam., sepals and petals pale yellow or yellowish green, lip whitish, lateral lobes tinged purplish brown, spur yellowish green; pedicel and ovary 6–10 mm. Sepals broadly ovate, 4–5 × ca. 4 mm, concave, obtuse. Petals broadly obovate, 3–4 × ca. 2 mm, obtuse; lip 3-lobed; lateral lobes erect, ca. 4 × 2 mm, margin slightly undulate, apex obtuse; mid-lobe narrowly oblong, ca. 4 × 1 mm, fleshy, obtuse, with 2 high central connate lamellae; spur clavate, 3–4 × ca. 2 mm, cleft, interior with an oblate appendage on back wall and a lamellate appendage on front wall. Column ca. 3 mm; rostellum saddle-shaped, thick; anther cap caudate; stipe linear, ca. 3 mm; viscidium suborbicular. Capsule pendulous, cylindrical, 2.5–3 × 0.7–1 cm, 5- or 6-ribbed. Fl. Jun–Sep, fr. Jul–Nov.

Epiphytic on tree trunks in open forests or on cliffs; 500–1200 m. C and S Fujian, W Guangdong, E Guangxi, Hainan, S and SW Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Thailand, Vietnam].

## 174. *SACCOLABIOPSIS* J. J. Smith, *Bull. Jard. Bot. Buitenzorg, sér. 2*, 26: 93. 1918.

拟囊唇兰属 ni nang chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial, small. Stems short. Leaves few, oblong-lanceolate, obtusely bilobed. Inflorescence lateral, slender, laxly many flowered, racemose, rarely subpaniculate, producing flowers at intervals; peduncle slender, sometimes thickened and angled near apex; floral bracts minute. Flowers minute, thinly textured. Sepals and petals ringent. Lip firmly adnate to base of column, saccate or spurred, with a wide, broad opening, lacking interior ornamentation. Column small, cylindrical, foot absent; stigma large; anther cap cucullate; pollinia 2, each completely divided into very unequal halves on a long, slender stipe.

Fifteen species: from the Himalayas and China south to Thailand, through the Malay Archipelago, east to New Guinea and Australia; two species (both endemic) in China.

- 1a. Lip entire, ca. 0.7 mm wide ..... 1. *S. taiwaniana*  
 1b. Lip shallowly 3-lobed, ca. 1.5 mm wide ..... 2. *S. wulaokenensis*

**1. *Saccolabiopsis taiwaniana*** S. W. Chung & T. C. Hsu, Taiwan Quart. J. Forest Res. 28(3): 27. 2006.

台湾拟囊唇兰 tai wan ni nang chun lan

Stems abbreviated. Roots few, ca. 1 mm in diam. Leaves 3–5, pale green, obliquely lanceolate, 1.3–2 × 0.4–0.7 cm, leathery, obtusely bilobed. Inflorescence racemose, ca. 4 cm, curving, many flowered; peduncle generally shorter than rachis; rachis ca. 1 mm in diam., thickest at middle, 13–19-flowered. Flowers ca. 3 mm in diam., widely opening; sepals and petals slightly incurved, translucent green; lip white; anther cap yellowish. Dorsal sepal oblong-ovate, ca. 2 × 0.8 mm, obtuse; lateral sepals similar to dorsal sepal, slightly oblique. Petals oblong, slightly shorter than sepals, obtuse; lip broadly triangular, ca. 2 × 0.7 mm, margin entire, obtuse, concave. Column ca. 0.7 mm, with narrow apical wings. Seed capsule linear-cylindric, ca. 1.5 cm.

• Epiphytic on *Beilschmiedia tsangii* (Lauraceae) in broad-leaved forests in semishade; 400–500 m. Taiwan.

**2. *Saccolabiopsis wulaokenensis*** W. M. Lin, Kuo Huang & T. P. Lin, Taiwania 51: 165. 2006.

拟囊唇兰 ni nang chun lan

Stems 3–6 cm. Leaves distichous, 3–8, oblong-lanceolate, slightly curved, 2.2–5 × 0.6–1.2 cm. Inflorescence axillary, simple, pendulous; peduncle and rachis 3–7 cm, dilated in middle part, ca. 2 mm in diam., tapering at both ends, sulcate, bearing 10–35 well-spaced flowers; floral bracts triangular, ca. 2 mm. Flowers whitish green, 2.5–3.5 mm in diam.; lip mid-lobe white. Sepals oblong, 2–2.5 mm. Petals subspatulate, ca. 2 mm; lip shallowly 3-lobed, ca. 1.5 mm wide; lateral lobes rounded; mid-lobe subovate or triangular, saccate at base, without interior ornamentation. Column ca. 1 mm, foot absent; stigma deeply set underneath; rostellum conspicuous; pollinia 2 on long stipe. Seed capsule clavate, 1.7–1.9 cm.

• Epiphytic on branches of trees in broad-leaved forests; ca. 300 m. Taiwan.

## 175. PAPHIOPHYTES Schlechter, Orchis 9: 78. 1915.

凤蝶兰属 feng die lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, scrambling, monopodial. Stems erect to pendulous, climbing or pendulous, elongate, terete, branching or unbranched, many noded, laxly many leaved. Leaves terete, fleshy, channeled adaxially, jointed and sheathing at base; sheaths thickly leathery, tightly enclosing stem, persistent. Inflorescence axillary, 1- to several flowered. Flowers flat, large. Sepals and petals subsimilar, free, spreading. Petals usually larger; lip continuous with column foot, immovable, spurred, 3-lobed; lateral lobes ± erect, either parallel to or embracing column; mid-lobe often dilated and 2- or 3-lobed at apex; spur funnel-shaped or conic to long horn-shaped. Column subterete, short, fleshy, foot short; rostellum elongate, slender; pollinia waxy, 2, shortly cleft, attached by a broadly triangular or subquadrate stipe to a large viscidium.

About 12 species: China, India, SE Asia and the Malay Archipelago; four species (one endemic) in China.

- 1a. Lip saccate or shortly spurred at base; spur or sac 2–2.5 mm; petals 7–10 mm wide ..... 3. *P. taiwaniana*  
 1b. Lip spurred at base; spur 20–25 mm; petals 15–17 mm wide.  
 2a. Lateral lobes of lip entire, embracing column, lip deep purplish red; dorsal sepal ca. 2 cm wide ..... 1. *P. teres*  
 2b. Lateral lobes of lip bilobulate, lip color not as above; dorsal sepal 0.8–1.5 cm wide.  
 3a. Lobules of lateral lobes not serrate-denticulate; lip creamy white, sometimes tinged with pale pink ..... 2. *P. biswasiana*  
 3b. Lobules of lateral lobes serrate-denticulate; lip with a purple-flushed base and spur ..... 4. *P. vandarum*

**1. *Paphiophyte teres*** (Roxburgh) Schlechter, Orchis 9: 78. 1915.

凤蝶兰 feng die lan

*Dendrobium teres* Roxburgh, Fl. Ind., ed. 1832, 3: 485. 1832; *Vanda teres* (Roxburgh) Lindley.

Stems scrambling, terete, usually to 1 m, stout, branching. Leaves well spaced, terete, 8–18 cm × 4–5 mm, fleshy, obtuse. Inflorescence slightly longer than leaf, laxly 2–5-flowered; peduncle stout, with 3 or 4 membranous sheaths; floral bracts broadly ovate, 4–6 mm, slightly fleshy, obtuse. Flowers opening widely, 4–10 cm in diam., thinly textured, sepals and petals white, tinged with pink or purplish, lip deep purple-red, spur yellowish brown; pedicel and ovary white, 2–3 cm. Dorsal sepal broadly elliptic, ca. 2.5 × 2 cm, obtuse-rounded; lateral sepals obliquely ovate-oblong, ca. 3 × 2 cm, base adnate to column foot, apex obtuse. Petals suborbicular, large, ca. 3 ×

2.7 cm, obtuse; lip spurred, 3-lobed; lateral lobes embracing column, subobovate, ca. 1.5 cm wide, rounded; mid-lobe spreading, obovate-triangular, ca. 2 cm, adaxially shortly hairy, deeply bilobed; spur conic, ca. 2 cm. Column ca. 5 mm, foot ca. 5 mm. Fl. May–Jun.  $2n = 38, 40$ .

Epiphytic on tree trunks in open forests or at forest margins; 500–900 m. S Yunnan [Bangladesh, Bhutan, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

**2. *Paphiophyte biswasiana*** (Ghose & Mukerjee) Garay, Bot. Mus. Leaflet 23: 371. 1974.

白花凤蝶兰 bai hua feng die lan

*Aerides biswasiana* Ghose & Mukerjee, Orchid Rev. 53: 124. 1945.

Stems erect or pendulous, terete, to 50 cm or longer, stout, 5–7 mm in diam., often unbranched, internodes 3–4 cm. Leaves

well spaced, terete, 13–16 cm × 3–4 mm, fleshy, abruptly contracted at apex and aristate. Inflorescence often slightly shorter than leaves, 1–3-flowered; peduncle with 2 or 3 short sheaths; floral bracts broadly ovate-triangular, 3–4 mm, slightly fleshy. Flowers opening widely, creamy white, sometimes tinged pale pink, large, thinly textured; pedicel and ovary ca. 3 cm. Sepals similar, obovate, ca. 2 × 1 cm, obtuse-rounded, lateral sepals adnate to column foot. Petals oblanceolate, ca. 1.8 × 1.5 cm, base contracted, margin ± erose, apex rounded; lip spurred, 3-lobed; lateral lobes erect, parallel to column, bilobed; proximal lobule linear, ca. 1.7 cm, attenuate toward apex; distal lobule ca. 2 mm, apex emarginate; mid-lobe spreading, subflabellate, ca. 1.4 cm, deeply bilobed, base with a claw ca. 5 mm, with 3 fleshy keels adaxially; spur cylindrical, ca. 2.5 cm × 3 mm, narrowed toward tip, slightly hooked. Column ca. 1 × 0.7 cm. Fl. Apr.

Epiphytic on tree trunks in forests; 1700–1900 m. S Yunnan [Myanmar, Thailand].

*Papilionanthe uniflora* (Lindley) Garay was reported to be found in SE Xizang (K. Y. Lang & Z. H. Tsi in C. Y. Wu, Fl. Xizang, 5: 778–780, fig. 421. 1987, as *Aerides uniflora* (Lindley) Summerhayes). The identification was based on a fruiting specimen that is very similar in habit to *P. biswasiana* rather than *P. uniflora*.

**3. *Papilionanthe taiwaniana*** (S. S. Ying) Ormerod, *Taiwania* 47: 242. 2002.

台湾凤蝶兰 tai wan feng die lan

*Vanda taiwaniana* S. S. Ying, Mem. Coll. Agric. Natl. Taiwan Univ. 29(2): 65. 1989; *Papilisia taiwaniana* (S. S. Ying) J. M. H. Shaw.

Stems pendulous, terete, 30–60 cm, 4–4.5 mm in diam., branched, enclosed in sheaths. Leaves laxly alternate, terete, 14–21 cm × 2–3.5 mm, base amplexicaul-sheathing, apex obtuse and apiculate; sheaths 3–3.5 cm, glabrous. Inflorescence 2–3 cm, usually 2-flowered; peduncle base with a terete bract 2–3 mm; floral bracts ovate-triangular, 1.5–2.5 mm. Flowers 4–5 cm in diam., dorsal sepal whitish, tinged yellowish, lateral se-

pals yellowish, petals white, lip yellowish, with many dark brown or brown-red longitudinal stripes, apex white, column white or yellowish; pedicel and ovary 2–3 cm. Dorsal sepal narrowly elliptic, 15–20 × 7–10 mm, obtuse; lateral sepals triangular-ovate, 14–20 × 10–12 mm. Petals obovate, 20–25 × 7–8 mm, base contracted; lip ovate-oblong in outline, 15–18 × 14–16 mm, 3-lobed; lateral lobes nearly erect, suborbicular to semiorbicular, 8–10 × 7–9 mm; mid-lobe subquadrate, 6–7 × 10–12 mm, apex emarginate. Column 5–6 mm. Fl. unknown.

• Epiphytic on trees in forests; 200–600 m. S Taiwan.

**4. *Papilionanthe vandarum*** (H. G. Reichenbach) Garay, Bot. Mus. Leaflet 23: 372. 1974.

万代凤蝶兰 wan dai feng die lan

*Aerides vandarum* H. G. Reichenbach, Gard. Chron. 1867: 997. 1867.

Stems pendulous, branched, terete, flexuous, covered by leaf sheaths, to 60 cm; sheaths ridged, overlapping, tubular, 1.5–2.3 cm. Leaves suberect, terete, grooved, acuminate, jointed, 9–25 × ca. 0.3 cm. Inflorescence leaf-opposed, 1–4-flowered; peduncle ca. 2.2 cm, sheathed; floral bracts triangular, 2–4 × 1.4–1.6 mm. Flowers 3.8–5 cm in diam., white with a purple-flushed base to lip and spur, pedicel pink; pedicel and ovary 1.5–3.3 cm. Dorsal sepal obovate-oblong, 2–3.6 × 0.8–1.5 cm, obtuse, margins undulate; lateral sepals similar, ca. 3 × 1 cm. Petals subrhombic, 2–2.5 × 1.1–1.9 cm, reticulately veined, base twisted, margins undulate, apex obtuse; lip 3-lobed, ca. 2.2 × 2.2 cm; lateral lobes erect, unequally bifid, flexuous, narrowly ovate, falcate, ca. 9 × 3 mm, dentate on apical margin; mid-lobe clawed, obovate, dilated and bilobulate at apex, ca. 9 × 9 mm across apex; lobules orbicular, ca. 5 × 4 mm, serrate-denticulate; spur cylindrical, base conic, straight, 1.8–2.5 cm. Column fleshy, ca. 6 mm; foot long. Fl. unknown.

Epiphyte. S China [Bhutan, NE India, Myanmar].

This species is included here on the basis of a record from S China (without precise locality) by Pearce and Cribb (*Orchids Bhutan*, 539. 2002).

## 176. PHALAENOPSIS Blume, Bijdr. 294. 1825.

蝴蝶兰属 hu die lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Kingidium* P. F. Hunt; *Kingiella* Rolfe; *Polychilos* Breda.

Herbs, terrestrial, lithophytic, and epiphytic, monopodial. Stems short, leafy, concealed by overlapping persistent leaf sheaths, rooting at base. Leaves persistent or sometimes deciduous, alternate, distichous, oblong to broadly elliptic, sometimes marbled or suffused with purple or silver, succulent. Inflorescences erect to laxly pendulous, axillary pedunculate racemes or panicles; peduncle terete; rachis terete or bilaterally compressed, rarely swollen relative to peduncle; floral bracts persistent, inconspicuous, succulent or papery. Flowers often fragrant, few to many, resupinate, produced simultaneously or in succession over time, often long-lasting, inconspicuous to showy, plain or variously spotted, marbled, or barred, membranous to thickly fleshy. Pedicel and ovary terete, slender, shallowly 6-sulcate. Sepals and petals free, spreading, subsimilar to dimorphic, lateral sepals usually oblique and larger than dorsal sepal. Lip 3-lobed, clawed, continuous with foot, sometimes saccate or subsaccate; lateral lobes erect and subparallel, often callose; mid-lobe oblong-elliptic to obtusulate, rarely transverse, apex sometimes with a pair of tendril-like appendages (cirri), sometimes pubescent to villous, callus uni-, bi-, or triseriate, longitudinal, rarely transverse; column stout, often subtended by a pair of fleshy kneelike protrusions, without wings, with a foot, usually dilated lateral to stigma. Pollinia 2 or 4, on a common spatulate stipe and viscidium. Capsule pedicellate.

Between 40 and 45 species: from India to S China, Thailand, Indochina, Malaysia, and Indonesia to the Philippines and New Guinea, the majority in Indonesia and the Philippines; 12 species (four endemic) in China.

The genus *Phalaenopsis* has been monographed by Christenson (*Phalaenopsis* Monogr. 2001).

*Phalaenopsis decumbens* (Griffith) Holttum (Bull. Gard. Singapore 11: 286. 1947; *Aerides decumbens* Griffith, Not. Pl. Asiat. 3: 365. 1851), described from Myanmar, has been noted from Hainan (Press et al., Annot. Checkl. Fl. Pl. Nepal, 223. 2000). However, the present authors found no relevant specimens and therefore could not substantiate the occurrence of this species in China.

- 1a. Roots strongly flattened; leaves deciduous; inflorescences few flowered; floral bracts small, scarious; lateral lobes of lip with flaplike flanges; callus biseriate; pollinia 4, on a spatulate stipe (*P.* subg. *Aphyllae* (H. R. Sweet) Christenson).
  - 2a. Spur prominent, a continuation of angle formed by junction of lip mid-lobe and lateral lobes.
    - 3a. Dorsal sepal 8–9 mm; flowers pink; column stout, broadly dilated at stigma; lip mid-lobe flat ..... 1. *P. taenialis*
    - 3b. Dorsal sepal 12–15 mm; flowers green or green suffused with bronze; column cylindric, not dilated at stigma; lip mid-lobe convex ..... 2. *P. braceana*
  - 2b. Spur not prominent, apparently absent or forming a small nipple-shaped structure beneath posterior callus.
    - 4a. Lip mid-lobe obcordate with a central apical fleshy knob ..... 3. *P. wilsonii*
    - 4b. Lip mid-lobe not obcordate, without a terminal notch.
      - 5a. Flowers deep green; lip mid-lobe oblanceolate, without any conspicuous constriction ..... 4. *P. stobartiana*
      - 5b. Flowers rose-pink; lip mid-lobe with a conspicuous constriction.
        - 6a. Lip mid-lobe flared below apex producing a 3-lobulate mid-lobe; flowers pink ..... 5. *P. hainanensis*
        - 6b. Lip mid-lobe widest below apex, apical margin reflexed along midvein, forming a subtubular apex that may appear emarginate in natural position; flowers pink or pale green ... 6. *P. honghenensis*
  - 1b. Not with above combination of characters.
    - 7a. Leaves deciduous or evergreen; pollinia 4; lip mid-lobe mobile; lip lateral lobes erect, subparallel, diverging in middle to form a U-shaped compound structure; column with prominent swellings at base (*P.* subg. *Parishianae* (H. R. Sweet) Christenson).
      - 8a. Lip mid-lobe white and orange or orange-yellow, broadly triangular, 4–5 mm, 3-lobulate; basal callus deeply forked, with a crested crescent-shaped appendage in middle, each arm of callus dividing into 2 filiform-linear antennae to 3 mm ..... 7. *P. malipoensis*
      - 8b. Lip mid-lobe white with 2 broad longitudinal chestnut-brown stripes, reniform or subtriangular, 9–11 mm, rounded-obtuse; basal callus of 4 filiform appendages superposed over a semicircular, ± reniform callus with minutely irregularly subdentate margins ..... 8. *P. lobbii*
    - 7b. Not with above combination of characters.
      - 9a. Lip mid-lobe anchor-shaped; lateral lobes of lip producing a raised tooth along leading edge; flowers produced simultaneously; petals conspicuously narrower than sepals; callus triseriate; sepals and petals pale yellow with dark brown spots and bars; lip slightly saccate at base created by folding (*P.* subg. *Polychilos* (Breda) Christenson) ..... 9. *P. mannii*
      - 9b. Lip mid-lobe not as above; lateral lobes of lip smooth, lacking a toothlike ridge; callus solitary; flowers essentially unmarked, white or pink (*P.* subg. *Phalaenopsis*).
        - 10a. Petals much broader than sepals; flowers white, callus variably marked with yellow and red; mid-lobe of lip subrhombic, with 2 long apical tails (cirri); callus solitary, erect, upper edge terminating in 2 pairs of subparallel teeth ..... 10. *P. aphrodite*
        - 10b. Petals and sepals subsimilar; other characters not as above combination.
          - 11a. Lateral lobes of lip with toothlike flaps, obliquely elliptic-obovate, spreading; callus uniseriate, longitudinal, bifid; flowers produced sequentially over long periods ..... 11. *P. deliciosa*
          - 11b. Lateral lobes of lip without toothlike flaps, oblong-oblanceolate, erect-incurved; callus uniseriate, peltate, quadrangular, apex truncate; flowers all opening simultaneously ..... 12. *P. equestris*

**1. *Phalaenopsis taenialis*** (Lindley) Christenson & Pradhan, Indian Orchid J. 1: 154. 1985.

小尖囊蝴蝶兰 xiao jian nang hu die lan

*Aerides taenialis* Lindley, Gen. Sp. Orchid. Pl. 239. 1833 ["*taeniale*"]; *Biermannia taenialis* (Lindley) Tang & F. T. Wang; *Doritis taenialis* (Lindley) J. D. Hooker; *Kingidium taeniale* (Lindley) P. F. Hunt; *Kingiella taenialis* (Lindley) Rolfe; *Polychilos taenialis* (Lindley) Shim.

Roots flattened, long, ± verrucose. Stems inconspicuous. Leaves basal, few, often deciduous at anthesis or during dry sea-

son, usually only 1 leaf persistent; leaf blade suboblong, 1–3.5 × 4–13 mm. Inflorescence borne from base of stem, 6.5–19 cm, unbranched, 1- or 2-flowered; rachis 5–10 mm; floral bracts ovate-triangular, ca. 3 mm, acute. Flowers opening widely, sepals and petals pale pink, lip and anther cap rose-purple; pedicel and ovary ca. 1.5 cm. Dorsal sepal oblong, 8–9 × ca. 4 mm, obtuse; lateral sepals subelliptic, ca. 9.5 × 4.5 mm, base adnate to column foot, apex obtuse. Petals obovate-spatulate, ca. 9 × 4 mm, rounded; lip 3-lobed; lateral lobes erect, subfusiform, ca. 5 × 1.5 mm, adaxially with a slightly thickened longitudinal ridge close to proximal margin, apex subtruncate; mid-lobe flat, spatulate, ca. 7 × 3 mm, base with a broad furcate-lobed appendage,

apex rounded; spur ca. 3 mm; callus biseriate, posterior callus fleshy, bidentate, on back wall of spur, anterior callus ligulate, deeply bifid, attached to front wall at base of mid-lobe. Column ca. 5 mm, stout, broadly dilated at stigma, foot ca. 3 mm; anther cap subglobose, apex slightly mucronulate. Fl. Jun.  $2n = 36, 38, 40, 57$ .

Epiphytic on tree trunks in forests; 1100–2200 m. S Xizang, NW to SE Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand].

**2. *Phalaenopsis braceana*** (J. D. Hooker) Christenson, Selbyana 9: 169. 1986.

尖囊蝴蝶兰 jian nang hu die lan

*Doritis braceana* J. D. Hooker, Fl. Brit. India 6: 196. 1890; *Biermannia navicularis* (Z. H. Tsi ex Hashimoto) Tang & F. T. Wang ex O. Gruss & Roellke; *Kingidium braceanum* (J. D. Hooker) Seidenfaden; *K. naviculare* Z. H. Tsi ex Hashimoto.

Roots flattened, long, densely verrucose. Stems inconspicuous. Leaves 1 or 2, deciduous, rarely present, oblong-elliptic, to  $2.4 \times 0.8$  cm, subacute. Inflorescences 1–3, from base of stem, pendulous or arching, 12–26 cm, unbranched, laxly many flowered; rachis dark green, 6–13 cm; floral bracts lanceolate, 3–5 mm, acuminate. Flowers opening widely, variable in color, sepals and petals yellow, green, or greenish bronze variously suffused pink, lip dark rose; pedicel and ovary yellowish green, 1.5–2.5 cm. Sepals obovate-oblong,  $10\text{--}15 \times 5\text{--}6$  mm, obtuse; lateral sepals base ca. 1/2 width adnate to column foot. Petals subspatulate,  $10\text{--}13 \times 3\text{--}4.5$  mm, base clawed, apex rounded; lip 3-lobed; lateral lobes erect, suboblong, ca.  $6 \times 3$  mm, adaxially with a high lamella close to proximal margin, apex rounded; mid-lobe erect, elliptic, convex,  $7\text{--}8 \times 3\text{--}4$  mm, slightly beaked, margin recurved, base with a flattened, furcate appendage; spur narrowly conic, ca. 3 mm; callus biseriate, basal callus fleshy, bifid with tips recurved and hornlike, on back wall of spur, apical callus slender, bifid, on front wall of spur becoming free at base of mid-lobe. Column cylindrical, ca. 5 mm, foot ca. 2 mm; anther cap white, subglobose; stipe spatulate, ca. 3.5 mm; viscidium elliptic. Fl. May.

On tree trunks in open forests; 1100–2000 m. S and SW Yunnan [Bhutan, N Vietnam].

**3. *Phalaenopsis wilsonii*** Rolfe, Bull. Misc. Inform. Kew 1909: 65. 1909.

华西蝴蝶兰 hua xi hu die lan

*Doritis wilsonii* (Rolfe) T. Yukawa & K. Kita; *Kingidium wilsonii* (Rolfe) O. Gruss & Roellke; *Phalaenopsis minor* F. Y. Liu; *Polychilos wilsonii* (Rolfe) Shim.

Roots well developed,  $\pm$  greenish, elongate, slightly flattened, densely verrucose. Stems ca. 1 cm, usually 4- or 5-leaved, leafless or with 1 or 2 small leaves at anthesis. Leaves often deciduous in dry season, sometimes purplish reddish abaxially when young, oblong or subelliptic,  $6.5\text{--}8 \times 2.6\text{--}3$  cm. Inflorescences often 1 or 2, suberect or arching, 4–8.5 cm, unbranched, laxly 10–15-flowered; floral bracts ovate-triangular, 4–5 mm, membranous. Flowers opening simultaneously, opening widely; sepals and petals pastel pink grading to medium rose at base, lip dark rose-purple, column white; pedicel and

ovary 3–3.8 cm. Sepals oblong-elliptic,  $15\text{--}20 \times 6\text{--}7$  mm, obtuse. Petals spatulate or elliptic-obovate,  $14\text{--}15 \times 6\text{--}10$  mm, rounded; lip base with a claw 2–3 mm, lip 3-lobed; lateral lobes erect, ca. 6 mm, adaxially with an incised-tipped keel; mid-lobe broadly obovate,  $8\text{--}13 \times 6\text{--}9$  mm, fleshy, notched at apex, convex, with a raised elliptic pad below apex, with a raised median keel at base; callus biseriate, subsimilar and subequal, sulcate, bilobed. Column ca. 6 mm, foot ca. 3 mm. Capsule cylindrical, to  $7 \text{ cm} \times \text{ca. } 6 \text{ mm}$ . Fl. Apr–Jul, fr. Aug–Sep.

Epiphytic on tree trunks or lithophytic on damp rocks in forests or along valleys; 800–2200 m. W Guangxi, SW Guizhou, SW Sichuan, SE Xizang, NW to SE Yunnan [N Vietnam].

**4. *Phalaenopsis stobartiana*** H. G. Reichenbach, Gard. Chron., n.s., 8: 392. 1877.

滇西蝴蝶兰 dian xi hu die lan

*Doritis stobartiana* (H. G. Reichenbach) T. Yukawa & K. Kita; *Kingidium stobartianum* (H. G. Reichenbach) Seidenfaden; *Phalaenopsis wightii* H. G. Reichenbach var. *stobartiana* (H. G. Reichenbach) Burbidge; *Polychilos stobartianus* (H. G. Reichenbach) Shim.

Stems very short, usually 3- or 4-leaved. Leaves often deciduous during dry season, but present at anthesis, ovate-lanceolate, oblong, or elliptic,  $7\text{--}11 \times 3\text{--}3.4$  cm. Inflorescences 1 or 2, often ascending, 7–37 cm, unbranched, laxly 2–4-flowered; floral bracts ovate-triangular, 4–5 mm. Flowers opening widely, sepals and petals apple-green to dark olive-green, lip and column brilliant rose; pedicel and ovary 4–4.3 cm. Dorsal sepal oblong-elliptic, ca.  $14 \times 6$  mm, base slightly contracted, apex obtuse; lateral sepals slightly oblique, ovate-elliptic, ca.  $14 \times 7$  mm, subacute. Petals elliptic-obovate, ca.  $14 \times 6$  mm, obtuse; lip base with a claw ca. 1 mm, lip 3-lobed; lateral lobes ca.  $7 \times 3.5$  mm, narrow; mid-lobe obovate-elliptic, ca.  $8 \times 5$  mm, narrowed toward base, apex mucronate, base with a deeply bilobed-tipped appendage, with a central longitudinal keel thickened toward base; callus concave adaxially and distinctly convex abaxially on disk. Column ca. 7 mm, base dilated, foot ca. 2 mm. Fl. May–Jun.

• Epiphytic on tree trunks in forests; 1300–1400 m. W Yunnan.

**5. *Phalaenopsis hainanensis*** Tang & F. T. Wang, Acta Phytotax. Sin. 12: 47. 1974.

海南蝴蝶兰 hai nan hu die lan

*Doritis hainanensis* (Tang & F. T. Wang) T. Yukawa & K. Kita; *Phalaenopsis chuxiongensis* F. Y. Liu.

Stems 1–1.5 cm, enclosed in leaf sheaths, 3- or 4-leaved. Leaves often deciduous at anthesis, or sometimes leaving a small leaf, obliquely oblong, ca.  $4 \times 1$  cm, retuse. Inflorescences usually 1 or 2, ascending, to 55 cm, sometimes branched, laxly 8–10-flowered; rachis 27–30 cm; floral bracts ovate, 3–4 mm. Flowers opening widely, pale pink, lip darker rose-pink; pedicel and ovary slender, 2–2.5 cm. Dorsal sepal oblong, ca.  $13 \times 3$  mm, obtuse; lateral sepals obliquely elliptic, ca.  $13 \times 5.5$  mm, acute. Petals spatulate, ca.  $12 \times 5\text{--}6$  mm, base contracted into a short claw, apex obtuse; lip base with a claw ca. 1 mm, lip 3-lobed; lateral lobes erect, falcate-oblong, ca.  $5 \times$

2.5 mm, obliquely truncate, adaxially with incised-tipped keels from middle to apex; mid-lobe obovate, ca.  $7 \times 5$  mm, dorsally keeled, 3-lobulate, obtuse-rounded, with a pair of small subapical reflexed flaps; callus biseriate, base of lip with a low bifid callus, base of mid-lobe with a larger, suberect pair of teeth. Column ca. 7 mm, foot short. Fl. Jul.

- Lithophytic on rocks in forests. C and S Hainan, Yunnan.

**6. *Phalaenopsis honghenensis*** F. Y. Liu, Acta Bot. Yunnan. 13: 373. 1991.

红河蝴蝶兰 hong he hu die lan

*Doritis honghenensis* (F. Y. Liu) T. Yukawa & K. Kita.

Roots minutely warty. Stems to 1 cm, 1- or 2-leaved. Leaves obliquely elliptic,  $5-7 \times 1.5-2.5$  cm, acute at apex, sheathing bases persistent, spotted purple-red. Inflorescences racemose, to 7.7 cm, 3-6-flowered; floral bracts ovate, to 6 mm. Flowers to 2.9 cm in diam., sepals and petals ranging from rose-pink to pale green, lip purple; pedicel and ovary 1.6-2.2 cm. Dorsal sepal oblong-elliptic, ca.  $1.3 \times 0.6$  cm, obtuse; lateral sepals obliquely elliptic-ovate, ca.  $1.3 \times 0.6$  cm, obtuse. Petals spatulate, ca.  $1.1 \times 0.6$  cm, obtuse; lip minutely spurred, 3-lobed; lateral lobes oblong, ca.  $7 \times 2$  mm, obliquely truncate; mid-lobe oblong, ca.  $8 \times 2$  mm, tapered at both ends, apex obtuse; spur nipplelike, to 1.5 mm; callus biseriate: posterior callus fleshy, bifid, terminating at base of mid-lobe; anterior callus platelike, bifid, extending beyond base of mid-lobe. Column to 9 mm, stout, conspicuously dilated to either side of stigma.

- About 2000 m. Yunnan.

One of us (Chen) would prefer to treat this taxon as a synonym of *Phalaenopsis braceana*.

**7. *Phalaenopsis malipoensis*** Z. J. Liu & S. C. Chen, Acta Bot. Yunnan. 27: 37. 2005.

麻栗坡蝴蝶兰 ma li po hu die lan

Roots flattened, to 50 cm. Stems short, enclosed in leaf sheaths. Leaves 3-5, subbasal, deciduous, or 1 or 2 persistent in winter, oblong to elliptic,  $4.5-7 \times 3-3.6$  cm, base broadly cuneate-rounded, apex obliquely obtuse to acute. Inflorescences 3 or 4, arising from base of stem, racemose, 8-15 cm, laxly 3- or 4-flowered; peduncle green, with 2-4 membranous sheaths; rachis straight; floral bracts yellow-green, triangular-lanceolate, 2-4 mm, acuminate. Flowers 1.2-1.6 cm in diam., sepals and petals white, sometimes tinged yellowish, lip white and orange or orange-yellow, tinged brownish on disk and central part of mid-lobe, column white with 1 or 2 crescent-shaped or semi-orbicular brown markings at base in front; pedicel and ovary white tinged pale green, 1-1.3 cm. Dorsal sepal oblong-elliptic,  $7-9 \times 3-4$  mm, obtuse; lateral sepals obliquely ovate-elliptic, 6-7 mm, 4-5 mm wide at base, base adnate to column foot, sometimes dorsally carinate. Petals spatulate or narrowly obovate,  $6-8 \times 2-3$  mm, rounded; lip 3-lobed; lateral lobes erect, subparallel, diverging in middle to form a U-shaped compound structure, sub lanceolate, 2-3 mm, with 2 orange and brownish tinged calli on disk in between; mid-lobe mobile, broadly triangular,  $4-5 \times 6-7$  mm, 3-lobulate; basal callus deeply forked, with a crested crescent-shaped appendage transversely lying

near middle, each arm of callus dividing into 2 filiform-linear antennae to 3 mm. Column 4-5 mm, foot 1-2 mm. Fl. Apr-May.

- Epiphytic on trees in sparse forests and on forest margins; 600-1300 m. S Yunnan (Lincang, Malipo).

**8. *Phalaenopsis lobbii*** (H. G. Reichenbach) H. R. Sweet, Gen. Phalaenopsis, 53. 1980.

罗氏蝴蝶兰 luo shi hu die lan

*Phalaenopsis parishii* H. G. Reichenbach var. *lobbii* H. G. Reichenbach, Refug. Bot. (Saunders) 2: ad t. 85. 1869; *Doritis lobbii* (H. G. Reichenbach) T. Yukawa & K. Kita; *Polychilos lobbii* (H. G. Reichenbach) Shim.

Roots copious, flattened. Stems clustered, abbreviated, branching basally. Leaves 2-4, subbasal, broadly elliptic,  $5-8 \times 3.5-4$  cm, obliquely bilobed. Inflorescences erect racemes, 5-10 cm, 2-4-flowered; floral bracts minute, elliptic, obtuse. Flowers white, swollen base of column with a few irregularly distributed brown spots, with a regular pair of darker brown spots below apices of swellings, leading edges of lateral lobes of lip brown spotted, mid-lobe white with 2 broad, longitudinal chestnut-brown stripes; pedicel and ovary to 1.5 cm. Dorsal sepal oblong-elliptic, concave, to  $10 \times 5$  mm, obtuse; lateral sepals somewhat reflexed, obliquely ovate to suborbicular, to  $8 \times 7$  mm, obtuse-rounded, adnate to column foot. Petals obovate-subspatulate, to  $8 \times 4$  mm, obtuse-rounded; lip 3-lobed; lateral lobes erect, falcate, parallel to middle and then diverging and forming a U-shaped structure, to  $3 \times 1$  mm, acute; mid-lobe reniform, to  $6 \times 10$  mm, concave with lateral margins shallowly incurved, rounded-obtuse; basal callus of 4 filiform appendages superposed over a semicircular,  $\pm$  reniform callus with minutely irregularly subdenticulate margins. Column to 5 mm, somewhat arcuate. Fl. Mar-May.

Epiphytic on tree trunks in open forests; below 600 m. SE Yunnan (Malipo) [Bhutan, India, Myanmar, Vietnam].

A recent record of *Phalaenopsis lobbii* from Lincang, Yunnan (Q. Liu et al., Acta Phytotax. Sin. 45: 855-856. 2007), refers in fact to *P. malipoensis*.

**9. *Phalaenopsis mannii*** H. G. Reichenbach, Gard. Chron. 1871: 902. 1871.

版纳蝴蝶兰 ban na hu die lan

*Polychilos mannii* (H. G. Reichenbach) Shim.

Stems stout, 1.5-7 cm, rooting from nodes, 4- or 5-leaved. Leaves oblong-ob lanceolate,  $20-23 \times 5-6$  cm, base cuneate, apex acute. Inflorescences 1 or 2, ascending or pendulous, 5.5-30 cm, unbranched or sometimes branched, sparsely few to many flowered; floral bracts lanceolate, 6-10 mm. Flowers opening widely, long-lasting, thickly textured, waxy, glossy, sepals and petals yellow with dark brown spots and bars, lip mid-lobe white, column yellow; pedicel and ovary 2-3 cm. Dorsal sepal obovate-lanceolate,  $15-18 \times 5-7$  mm, acute; lateral sepals obliquely ovate-elliptic,  $15-18 \times 7-9$  mm, acute. Petals suboblong,  $13-15 \times 4-5$  mm, acute; lip ca. 1 cm, base with a claw ca. 1 mm, 3-lobed; lateral lobes erect, appressed, oblong-subquadrate, ca.  $4 \times 2$  mm, obliquely truncate; mid-lobe

transverse, anchor-shaped, margin fimbriate-erose, apex a swollen knob with sparse trichomes; callus triseriate: posterior callus a small glandular patch, middle callus a bifid plate with long filiform divisions, anterior callus an erect, bilaterally compressed tooth. Column ca. 8 mm, with prominent basal knees, foot ca. 4 mm. Fl. Mar–Apr.  $2n = 38$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; 900–1400 m. S Yunnan [Bhutan, NE India, Myanmar, Nepal, Vietnam].

**10. *Phalaenopsis aphrodite*** H. G. Reichenbach, *Hamburger Garten-Blumenzeitung* 18: 35. 1862.

蝴蝶兰 hu die lan

Stems very short, stout. Leaves 3 or 4, green, often suffused red abaxially, elliptic, oblong, or falcate-oblong, 8–22 × 3–7 cm, base cuneate or sometimes oblique, apex acute or obtuse. Inflorescence to 50 cm, unbranched or sometimes branched, many flowered; rachis purplish green, ± flexuous; floral bracts ovate-triangular, 3–5 mm. Flowers mainly white, 5–6 cm in diam., lateral lobes of lip with red spots or lines, callus yellow, spotted green; pedicel and ovary green, slender, 2.5–4.5 cm. Dorsal sepal ovate-elliptic or subelliptic, 2.5–4 × 1.5–2.5 cm, base slightly contracted, apex obtuse; lateral sepals obliquely ovate, 2.5–3.5 × 1.4–2.2 cm, acute. Petals rhombic-obovate, 2.7–3.4 × 2.4–3.8 cm, base narrowed into a short claw, apex rounded; lip 3-lobed, base with a linear claw 7–9 mm; lateral lobes erect, falcate-obovate, ca. 2 cm, base contracted, apex rounded or acute; mid-lobe subrhombic, 2.8–3.5 × 1.4–1.7 cm, base cuneate, with 2 slender apical tails (cirri) 8–18 mm; disk with a forked callus between lateral lobes. Column ca. 1 cm, stout, foot broad; stipe ca. 4.5 mm. Fl. Apr–Jun.  $2n = 38$ .

Epiphytic on tree trunks in lowland forests or thickets. S Taiwan [Philippines].

- 1a. Leaves usually suffused red abaxially; inflorescences racemose or few-branched panicles; flowers large ..... 10a. subsp. *aphrodite*  
 1b. Leaves apple-green, without red suffusion abaxially; inflorescences much-branched panicles; flowers somewhat smaller ..... 10b. subsp. *formosana*

**10a. *Phalaenopsis aphrodite* subsp. *aphrodite***

蝴蝶兰(原亚种) hu die lan (yuan ya zhong)

*Phalaenopsis amabilis* Blume var. *aphrodite* (H. G. Reichenbach) Ames.

Leaves usually suffused red abaxially. Inflorescences racemose or few-branched panicles. Flowers large.

Epiphytic on tree trunks in lowland forests or thickets. S Taiwan [Philippines].

**10b. *Phalaenopsis aphrodite* subsp. *formosana*** Christenson, *Phalaenopsis Monogr.* 197. 2001.

台湾蝴蝶兰 tai wan hu die lan

Leaves apple-green, without any red pigmentation. Inflorescences paniculate, much-branched, producing side branches

even from most basal nodes. Flowers somewhat smaller than subsp. *aphrodite*.

• S Taiwan (?extinct) and outlying islands (Babuyan, Huoshao Dao, Lan Yu).

**11. *Phalaenopsis deliciosa*** H. G. Reichenbach, *Bonplandia* 2: 93. 1854.

大尖囊蝴蝶兰 da jian nang hu die lan

*Aerides latifolia* Thwaites; *Doritis deliciosa* (H. G. Reichenbach) T. Yukawa & K. Kita; *D. latifolia* (Thwaites) Bentham & J. D. Hooker; *D. wightii* (H. G. Reichenbach) Bentham & J. D. Hooker; *Kingidium deliciosum* (H. G. Reichenbach) Sweet; *K. wightii* (H. G. Reichenbach) O. Gruss & Roellke; *Phalaenopsis wightii* H. G. Reichenbach.

Stems 1–1.5 cm. Leaves 3 or 4, persistent at anthesis; leaf blade obovate-lanceolate or elliptic, 8–14.5 × 3–5.5 cm, papery, margin undulate, apex acute and slightly curved. Inflorescence often pendulous, 10–15 cm, upper part sometimes branched, densely several flowered; rachis dark green, 1.5–2.5 cm; floral bracts ovate-triangular, ca. 1 mm, acute. Flowers produced continuously and sequentially over long periods, whitish with pale purple stripes or markings; pedicel and ovary yellowish green, 0.4–0.5 cm. Dorsal sepal subelliptic, 6–7 × 3–3.5 mm, obtuse; lateral sepals obliquely ovate, 5.5–6 × 3.5–4 mm, base adnate to column foot, apex obtuse. Petals subobovate, 5–5.5 × 2.7–3 mm, obtuse; lip not clawed at base, 3-lobed; lateral lobes erect, obliquely elliptic-obovate, ca. 4 × 2.5 mm, rounded, with tooth-like flaps, base decurrent and forming a broadly conic spur with base of mid-lobe, adaxially with a high lamella; mid-lobe spreading horizontally, obovate-cuneate, ca. 6 × 5 mm, apex deeply emarginate, with a thickened central longitudinal ridge, base with a flattened appendage; appendage Y-shaped, apex deeply furcate-bilobed. Column ca. 3 mm, foot ca. 2 mm; anther cap nearly subglobose, apex subtruncate and emarginate; stipe spatulate, ca. 2 mm; viscidium subelliptic. Fl. Jul.  $2n = 38$ .

Epiphytic on tree trunks in forests, lithophytic on rocks along valleys; 300–1600 m. S and W Hainan, S and SE Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

*Phalaenopsis deliciosa* subsp. *hookeriana* (O. Gruss & Roellke) Christenson (*Phalaenopsis Monogr.* 223. 2001; *Kingidium hookerianum* O. Gruss & Roellke, *Die Orchidee* 46(1): 23. 1995) has somewhat larger, fuller, yellow flowers and appears to represent a well-defined subspecies, although the exact range is unknown (NE India, Myanmar, and probably China). The name *Doritis wightii*, based on a white-flowered plant from S India, has been consistently misapplied to these plants when exported.

**12. *Phalaenopsis equestris*** (Schauer) H. G. Reichenbach, *Linnaea* 22: 864. 1849.

小兰屿蝴蝶兰 xiao lan yu hu die lan

*Stauroglossis equestris* Schauer, *Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur.* 19(Suppl. 1): 432. 1843; *Phalaenopsis riteiwanensis* Masamune.

Stems very short, 3- or 4-leaved. Leaves linear-ligulate or narrowly oblong, 10–24 × 3–5 cm, base cuneate, apex obtuse or

unequally bilobed. Inflorescence to 30 cm, unbranched or sometimes branched, laxly many flowered; rachis dark purple, flexuous; floral bracts 2–4 mm. Flowers ca. 2 cm in diam., variable in color, typically sepals and petals white or pale pink with a central pink suffusion, lip rose or red, callus white or yellow, sometimes spotted rose or red, column rose, anther cap white; pedicel and ovary slender, 2–2.5 cm. Dorsal sepal oblong, 11–14 × 5–7 mm, acute; lateral sepals falcate-ovate, 10–14 × 6–7 mm. Petals oblong-obovate or rhombic, 10–12 × 4–7 mm, base

contracted and adnate to column foot, apex acute; lip base with a claw ca. 1.5 mm, lip 3-lobed; lateral lobes erect-incurved, oblong-ob lanceolate, 5–6.5 × 2–3 mm, rounded; mid-lobe spreading horizontally, ovate-elliptic, 9–11 × 7–8 mm, acute; callus solitary, peltate, quadrangular with a truncate apex. Column 6–9 mm, slender, foot ca. 3 mm; stipe ca. 3 mm; viscidium ovate-lanceolate, ca. 1 mm. Fl. Apr–May.  $2n = 38$ .

S Taiwan [Philippines].

### 177. CHAMAEANTHUS Schlechter ex J. J. Smith, Orch. Java, 552. 1905.

低药兰属 di yao lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems very short. Leaves few, to 7 × 1 cm, somewhat fleshy, jointed and sheathing at base. Inflorescences lateral, simple, to ca. 20-flowered; rachis usually clavate. Flowers ephemeral, only a few open at a time, greenish yellow, small, superficially resembling *Bulbophyllum*. Sepals and petals similar, often linear and acuminate, to 4–6 × 3 mm; lateral sepals adnate to column foot; lip movable, without a spur, sometimes saccate, 3-lobed; lateral lobes auriculate, margins somewhat fimbriate; mid-lobe conic, fleshy. Column short, stout, with a foot ca. 3 mm, rostellar projection elongate; stipe ligulate, ca. 2 × diam. of pollinia; viscidium obovate, small; pollinia 2, entire, although some specimens having a very tiny notch.

About three species: from S Thailand southeast to Java and New Guinea, northeast to Taiwan and the Philippines; one species in China.

#### 1. *Chamaeanthus wenzelii* Ames, Orchidaceae 5: 200. 1915.

低药兰 di yao lan

Stems 2–2.5 cm. Leaves 8–10, distichous; leaf blade linear, falcate, 2–10 × 0.3–0.5 cm, leathery, with an amplexicaul, sheathing base, apex acute and irregularly bilobed. Inflorescences axillary, 2–3 cm, many flowered; floral bracts linear-lanceolate, ca. 3 mm, acuminate. Flowers erect, yellow, small;

pedicel and ovary 2–2.5 mm. Sepals linear-lanceolate, 5–5.5 × ca. 1 mm, membranous, abaxially ± carinate, apex cuspidate; dorsal sepal concave. Petals lanceolate, 4–4.5 × ca. 1 mm, acuminate; lip immovable, 2–2.5 mm, 3-lobed; lateral lobes erect, nearly orbicular, membranous, margin ± serrate; mid-lobe triangular, 1–1.2 mm, subfleshy, acute. Fl. Feb.

Epiphytic on tree trunks in forests. S Taiwan [Philippines].

### 178. NEOFINETIA Hu, Rhodora 27: 107. 1925.

风兰属 feng lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Finetia* Schlechter, Beih. Bot. Centralbl. 36: 140. 1918, not Gagnepain (1917); *Nipponorchis* Masamune, nom. illeg. superfl.

Herbs, epiphytic, small, monopodial. Roots many, slightly flattened. Stems erect, enclosed in leaf sheaths, short, many leaved. Leaves distichous, narrow, ± conduplicate toward base, dorsally carinate, jointed and sheathing at base. Inflorescence axillary, racemose, laxly few flowered. Flowers opening widely, medium-sized. Sepals and petals free, similar; lip spurred at base, 3-lobed; lateral lobes erect; mid-lobe spreading, with appendages at base; spur slender, cylindrical, rather long, sometimes slightly curved. Column short, thick, winged, footless; rostellum furcate-bifid; anther cap narrowed at apex; pollinia 2, cleft, waxy, globose; stipe narrowly ovate-cuneate, geniculate-curved; viscidium broadly ovate, broader than stipe.

Three species: China, Japan, Korea; three species (two endemic) in China.

- 1a. Spur 3.5–5 cm ..... 1. *N. falcata*  
 1b. Spur 1–1.6 cm.  
     2a. Sepals and petals pinkish or becoming whitish; spur 1.5–1.6 cm, much longer than sepals, curved, spreading horizontally, lateral sepals mucronate at apex ..... 2. *N. xichangensis*  
     2b. Sepals and petals white; spur 1–1.1 cm, shorter than or ca. as long as sepals, straight, pendulous or nearly so, lateral sepals not mucronate at apex ..... 3. *N. richardsiana*

#### 1. *Neofinetia falcata* (Thunberg) Hu, Rhodora 27: 107. 1925.

风兰 feng lan

*Orchis falcata* Thunberg in Murray, Syst. Veg., ed. 14, 811. 1784; *Angorchis falcata* (Thunberg) Kuntze; *Angraecopsis falcata* (Thunberg) Schlechter; *Angraecum falcatum* (Thunberg) Lindley; *Finetia falcata* (Thunberg) Schlechter; *Holco-*

*glossum falcatum* (Thunberg) Garay & H. R. Sweet; *Limodorum falcatum* (Thunberg) Thunberg; *Nipponorchis falcata* (Thunberg) Masamune; *Oeceoclades falcata* (Thunberg) Lindley; *Vanda falcata* (Thunberg) Beer.

Plants usually 8–12 cm tall. Stems 1–6 cm, many leaved. Leaves narrowly oblong-falcate, 5–12 × 0.7–1 cm, thickly leathery, conduplicate and sheathing toward base, apex acute.

Inflorescence including flowers 5–8 cm, suberect, 2- or 3(–5)-flowered; peduncle 1–3 cm; floral bracts ovate-lanceolate, 7–9 mm, acuminate. Flowers fragrant, white, anther cap brown on both sides; pedicel and ovary 2.8–5 cm. Sepals subobovate, 8–10 × 2.5–4 mm, obtuse; lateral sepals falcate-curved, dorsally carinate apically, recurved. Petals oblanceolate or subspatulate, 8–10 × 2.2–3 mm, obtuse; lip fleshy, 3-lobed; lateral lobes oblong, 3.5–4 × 0.8–1 mm, obtuse; mid-lobe ligulate, 7–8 × 2–2.5 mm, retuse, with a triangular basal callus, adaxially with 3 slightly swollen ridges; spur arcuate, 3.5–5 cm × 1.5–2 mm, slender, obtuse. Column ca. 2 mm, with wings triangularly enlarged in upper part; anther cap apex narrowed and triangular. Fl. Apr.  $2n = 38$ .

Epiphytic on tree trunks in forests; 1500–1600 m. N Fujian, S Gansu, SW Hubei, W Jiangxi, Sichuan, Zhejiang [Japan, Korea].

**2. *Neofinetia xichangensis*** Z. J. Liu & S. C. Chen, Acta Bot. Yunnan. 26: 300. 2004.

西昌风兰 xi chang feng lan

Plants tufted. Stems ca. 2 cm. Leaves 6 or 7, linear, 4–6 × 0.5–0.6 cm, rigid, conduplicate and sheathing toward base, apex obliquely bilobed. Inflorescence including flowers 4–5 cm, (2 or)3- or 4-flowered; peduncle 3–5 mm; floral bracts subovate, 3–4 mm, scarious. Flowers unscented, sepals and petals pinkish, becoming whitish, lip white; pedicel and ovary green at base, whitish green toward top, 3.3–3.5 cm. Dorsal sepal sub-oblong, 6–7 × 2–3 mm, obtuse; lateral sepals obliquely oblong, 6–7 × 2–3 mm, mucronate. Petals suboblong, 5–6 × 1.5–2 mm,

obtuse; lip ovate-oblong in outline, 6–7 × 3–4 mm, 3-lobed; lateral lobes erect, obliquely oblanceolate; mid-lobe slightly recurved, ligulate, ca. 3 × 1.5 mm; disk with an indistinct transverse ridge between mid-lobe and disk; spur spreading horizontally and slightly upward, curved, cylindrical, 1.5–1.6 cm × 1–1.5 mm. Column ca. 2 mm. Fl. Apr–May.

• Epiphytic on tree trunks along valleys; 1400–1500 m. SW Sichuan (Xichang).

**3. *Neofinetia richardsiana*** Christenson, Lindleyana 11: 220. 1996.

短距风兰 duan ju feng lan

Plants tufted. Stems ca. 1.5 cm, many leaved. Leaves linear-oblong, ca. 6.5 × 0.6 cm, conduplicate and sheathing toward base, apex obliquely bilobed. Inflorescence including flowers 5–6 cm, densely few flowered; peduncle ca. 8 mm; floral bracts ovate, 3–4 mm, concave, scarious. Flowers white, tinged with pale pink at base of sepals and petals and tip of ovary; pedicel and ovary ca. 5 cm. Dorsal sepal oblong, ca. 6 × 2 mm, mucronate; lateral sepals obliquely oblong-oblanceolate, ca. 7 × 2 mm, dorsally carinate, shortly clawed at base. Petals obliquely oblong, ca. 6.5 × 1.5 mm, obtuse; lip 3-lobed; lateral lobes obliquely oblanceolate; mid-lobe slightly recurved, ligulate, ca. 6.5 × 3 mm, with a basal callus, apex obtuse; spur arcuate, ca. 1.1 cm × 1 mm. Column ca. 1.5 mm, thick. Capsule 6-ribbed. Fl. Apr–May.

• Epiphytic on tree trunks in forests; 1300–1400 m. Chongqing (Wanxian).

## 179. *SEDIREA* Garay & H. R. Sweet, Orchids S. Ryukyu Islands, 149. 1974.

萼脊兰属 e ji lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems short, with several leaves. Leaves nearly basal, distichous, flat, slightly fleshy or thickly leathery, jointed and shortly sheathing at base. Inflorescence racemose, axillary, laxly several flowered; floral bracts broadly ovate, shorter than pedicel and ovary. Flowers opening widely, medium-sized. Sepals and petals free, similar; lateral sepals adnate to column foot. Lip attached at base to column foot by a movable joint, spurred, 3-lobed; lateral lobes erect; mid-lobe recurved; spur long, parallel to mid-lobe, narrowed distally. Column rather long, base with a short foot, or footless; stigma large, deeply concave, near middle of column; rostellum large, bilobed; pollinia 2, waxy, subglobose, cleft, attached by a common linear stipe to a large viscidium.

Two species: China, Japan (Ryukyu Islands), Korea; two species (one endemic) in China.

The generic name is an anagram of *Aerides*.

- 1a. Sepals and petals yellowish green with pale brown spots adaxially; mid-lobe of lip narrowly oblong, entire ..... 1. *S. subparishii*  
1b. Sepals and petals whitish green; mid-lobe of lip spatulate, apical margin irregularly crenate ..... 2. *S. japonica*

**1. *Sedirea subparishii*** (Z. H. Tsi) Christenson, Taxon 34: 518. 1985.

短茎萼脊兰 duan jing e ji lan

*Hygrochilus subparishii* Z. H. Tsi, Acta Bot. Yunnan. 4: 267. 1982.

Stems 1–2 cm, with thick, slightly flattened, long roots. Leaves 3 or 4, nearly basal; leaf blade oblong or obovate-lanceolate, 5.5–19 × 1.5–3.4 cm, shallowly bilobed. Inflorescence

to 10 cm, laxly several flowered; floral bracts ovate, 6–9 mm. Flowers fragrant, slightly fleshy, yellowish green, spotted with pale brown adaxially, whitish abaxially; pedicel and ovary ca. 2.5 cm. Sepals suboblong, 16–20 × 7–9 mm, abaxially narrowly winged, apex acute; lateral sepals slightly narrower. Petals sub-elliptic, 15–18 × ca. 6 mm, acute; lip movable, 3-lobed; lateral lobes erect, suborbicular, margins slightly serrate; mid-lobe narrowly oblong, ca. 6 × 1.2 mm, fleshy, abaxially beaked near apex, adaxially with a laterally compressed conic callus at base and a high lamella extending from base to apex; spur spreading

forward, nearly parallel to mid-lobe, horn-shaped, ca. 1 cm, attenuate toward end. Column ca. 1 cm, base without a distinct foot, winged and with 2 apical teeth; rostellum elongate, lobules ca. 4 mm; stipe linear, often conduplicate, attenuate toward base; viscidium suborbicular. Fl. May.

• Epiphytic on tree trunks in forests; 300–1100 m. N Fujian, N Guangdong, NE Guizhou, SW Hubei, Hunan, NE Sichuan, Zhejiang.

**2. *Sedirea japonica*** (H. G. Reichenbach) Garay & H. R. Sweet, *Orchids S. Ryukyu Islands*, 149. 1974.

萼脊兰 e ji lan

*Aerides japonica* H. G. Reichenbach, *Hamburger Garten-Blumenzeitung* 19: 210. 1863.

Stems ca. 1 cm, with 4–6 nearly basal leaves. Leaves oblong or obovate-lanceolate, 6–13 × ca. 2.5 cm, slightly bilobed.

Inflorescence pendulous, ca. 18 cm, laxly ca. 6-flowered; floral bracts pale brown, broadly ovate, ca. 8 mm, concave. Flowers orange-scented, whitish green, with 1–3 transverse bands of dull brown spots adaxially on lateral sepals, lip mid-lobe spotted purple-red, margins of lateral lobes purple-red, claw with purplish red ridges adaxially; pedicel and ovary ca. 18 mm. Sepals oblong, ca. 17 × 7.5 mm, obtuse; lateral sepals slightly narrower than dorsal sepal. Petals oblong-ligulate, ca. 15 × 7 mm, obtuse; lip 3-lobed; lateral lobes subtriangular, very small; mid-lobe spatulate, large, ca. 1.5 cm, adaxially concave, clawed at base, margin irregularly crenate; spur spreading horizontally, nearly parallel to mid-lobe, ca. 1.3 cm, with a suberect fleshy appendage at entrance. Column ca. 1 cm, foot ca. 4 mm. Fl. Jun.

Epiphytic on tree trunks in open forests or on cliffs along valleys; 600–1400 m. W Yunnan, Zhejiang [Japan (Ryukyu Islands), Korea].

## 180. *AERIDES* Loureiro, *Fl. Cochinch. 2: 525. 1790.*

指甲兰属 zhi jia lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, medium-sized, coarse, monopodial, with many thick roots. Stems ascending, short to elongate, often stout, enclosed by leaf sheaths, with many nodes, leafy. Leaves distichous, linear-oblong to terete, leathery, slightly fleshy, base jointed and sheathing, apex bilobed. Inflorescence lateral, pendulous, variable, racemose or paniculate, usually densely many flowered. Flowers showy, medium-sized. Sepals and petals similar, broad, spreading; lateral sepals decurrent on column foot. Petals smaller than sepals; lip attached to end of column foot, usually immovable, spurred, 3-lobed; lateral lobes decurrent on column, erect; mid-lobe large or small, often erose; spur narrowly conic or horn-shaped, bent forward, usually with swellings or calli inside. Column elongate, often broadened at apex, with a short or long foot; rostellum short or long, bifid; anther 2-locular, ± beaked; pollinia waxy, 2, subglobose, grooved, attached by a long, slender stipe to a solitary, semicircular viscidium.

About 20 species: Sri Lanka, India, Nepal, Bhutan, Myanmar, China, Thailand, Indochina, and Malaysia to the Philippines and Indonesia; five species (one endemic) in China.

1a. Inflorescence laxly 3–8(–10)-flowered.

2a. Spur ca. 10 mm; mid-lobe of lip flabellate; column foot ca. 3 mm ..... 4. *A. flabellata*

2b. Spur 3–4 mm; mid-lobe of lip broadly ovate; column foot 10–12 mm ..... 5. *A. falcata*

1b. Inflorescence densely 15-flowered or more.

3a. Mid-lobe of lip 12–14 mm wide, subovate, much larger than lateral lobes; spur ca. 5 mm ..... 1. *A. rosea*

3b. Mid-lobe of lip 3–5 mm wide, much smaller than lateral lobes; spur ca. 3.5 mm or ca. 10 mm.

4a. Spur ca. 10 mm ..... 2. *A. odorata*

4b. Spur ca. 3.5 mm ..... 3. *A. orthocentra*

**1. *Aerides rosea*** Loddiges ex Lindley & Paxton, *Paxt. Fl. Gard.* 2: [109]. 1851 [*“roseum”*].

多花指甲兰 duo hua zhi jia lan

*Aerides affinis* Wallich ex Lindley var. *rosea* (Loddiges ex Lindley & Paxton) E. C. Parish; *A. fieldingii* B. S. Williams; *A. fieldingii* var. *williamsii* (Warner) Veitch; *A. williamsii* Warner.

Stems 5–20 cm, ca. 2.5 cm in diam., stout. Leaf blade narrowly oblong or lorate, 28–30 × 2–3.5 cm, fleshy, obtuse and unequally bilobed. Inflorescences often 1–3, arising from peduncle sheath, pendulous, racemose or paniculate, 15–35 cm, densely 20–40-flowered; floral bracts ovate-lanceolate, 5–7 mm. Flowers white, spotted or tinged with purplish red, particularly on lip, opening widely; pedicel and ovary 12–14 mm. Dorsal sepal subobovate, ca. 12 × 7 mm, base contracted, apex

obtuse; lateral sepals slightly oblique, ovate, ca. 8 × 7 mm, obtuse. Petals obovate, ca. 10 × 7 mm, obtuse; lip deltoid to truncate, slightly laterally compressed, 1.4–1.6 × 0.8–1.1 cm, immovable, 3-lobed, apex acute; lateral lobes small, incurved over mouth of spur; mid-lobe hastate, triangular-acute, margin slightly irregularly denticulate, base with a linear appendage running into spur; appendage hooked tipped, minutely papillate; spur spreading horizontally, parallel to mid-lobe, narrowly conic, ca. 5 mm. Column ca. 5 mm, foot ca. 1 mm. Capsule subovoid, ca. 2 × 1.2 cm. Fl. Jul, fr. Aug–Oct.  $2n = 38$ .

Epiphytic on tree trunks in open forests or at forest margins; 300–1600 m. S Guangxi, SW Guizhou, S and SE Yunnan [Bhutan, NE India, Laos, Myanmar, Thailand, Vietnam].

**2. *Aerides odorata*** Loureiro, *Fl. Cochinch. 2: 525. 1790.*

香花指甲兰 xiang hua zhi jia lan

*Epidendrum odoratum* (Loureiro) Poir.

Stems rather drooping, stout, branched. Leaf blade broadly lorate, 15–20 × 2.5–4.6 cm, thickly leathery, obtuse and unequally bilobed. Inflorescence numerous, nodding, racemose, 15–30 cm, densely 20–30-flowered; floral bracts broadly ovate, 5–9 mm, obtuse. Flowers fragrant, opening widely, 1.5–3 cm in diam., purple to almost white, often tipped and spotted purple, spur apex greenish yellow; pedicel and ovary 1–2.5 cm, slender. Dorsal sepal elliptic, ca. 10 × 8 mm, obtuse-rounded; lateral sepals broadly ovate, ca. 12 × 9 mm, adnate at base to column foot, apex obtuse. Petals subelliptic, 11–12 × 5–7 mm, base contracted, apex obtuse; lip immovable, spurred, 3-lobed, almost enclosing column; lateral lobes erect, obovate-cuneate, ca. 15 × 10 mm, distal margin irregularly toothed, apex obtuse-rounded; mid-lobe linear, ca. 12 × 3 mm, bilobed; spur bent forward, narrowly horn-shaped, ca. 1 cm. Column ca. 5 mm, thick, foot ca. 9 mm. Fl. May.  $2n = 36, 38, 40$ .

On tree trunks in forests; 200–1200 m. Guangdong, W Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

For a more extensive synonymy, see Seidenfaden (*Opera Bot.* 95: 242–243. 1988).

**3. *Aerides orthocentra*** Handel-Mazzetti, *Oesterr. Bot. Z.* 87: 132. 1938.

## 小蓝指甲兰 xiao lan zhi jia lan

Stems up to 6 cm, ca. 4 mm thick. Leaf blade linear, compressed, ca. 9 × 1.4 cm, fleshy, apex rounded, truncate, or emarginate. Inflorescence racemose; peduncle erect, 7–10 cm × ca. 2 mm; rachis ca. 7 cm, ca. 15-flowered; floral bracts broadly ovate, 1–3 mm wide, concave, spreading, somewhat scarios, rounded or acute. Flowers white, lip violet; pedicel and ovary slender, 2–2.5 cm. Sepals obovate, 9–10 × 6–7 mm, rounded. Petals similar to sepals, slightly narrower; lip hypochile rhombic, ca. 1/2 as long as epichile, cordate at base, sides connivent; epichile ca. 8 mm, ca. 4 mm wide at base, sinuate at center, apex broadly rounded, emarginate, ca. 5 mm wide, base with 2 gibbous calli and undulate crests; spur ca. 3.5 × 1 mm, spreading, obtuse. Column ca. 3 mm; anther cap apiculate. Fl. Apr.

• Epiphytic in forests; 1000–1500 m. Yunnan (“He-ho, Fufang, Chenpien”).

**4. *Aerides flabellata*** Rolfe ex Downie, *Bull. Misc. Inform. Kew* 1925: 387. 1925.

## 扇唇指甲兰 shan chun zhi jia lan

*Vanda flabellata* (Rolfe ex Downie) Christenson.

Stems 10–30 cm, stout. Leaf blade narrowly oblong or lorate, ca. 16 × 1.5–2 cm, thickly leathery, conduplicate toward base, apex unequally bilobed or ± praemorse. Inflorescences axillary, 1–2, racemose, 5–25 cm, sparsely few flowered; floral bracts broadly ovate, ca. 4 mm, obtuse. Flowers thickly textured, sepals and petals yellowish brown, spotted with reddish brown, lip white, spotted with pale purple, mid-lobe with a central purple stripe and yellow ridges, spur yellow with blackish tip, anther cap deep yellow and purplish spotted; pedicel and ovary ca. 2 cm. Dorsal sepal broadly ovate, ca. 10 × 8 mm, obtuse; lateral sepals oblique, broadly ovate, ca. 10 × 12 mm, base adnate to column foot, apex obtuse. Petals obliquely ovate, slightly smaller than dorsal sepal; lip movable, spurred, 3-lobed; lateral lobes erect, ovate-triangular, ca. 5 mm, adnate to apical part of column foot; mid-lobe flabellate, ca. 10 × 7 mm, channeled above, densely minutely papillate, and on both sides with 2 ridges; claw ca. 1.5 cm, margin erose; spur bent forward and pointing to mid-lobe, cylindrical, ca. 1 cm × 2–3 mm. Column ca. 3 mm, foot ca. 3 mm; anther cap truncate-rounded at apex. Fl. May.  $2n = 38$ .

Epiphytic on tree trunks in sparse evergreen broad-leaved forests or at forest margins; 600–1700 m. S and SE Yunnan [Laos, Myanmar, Thailand].

**5. *Aerides falcata*** Lindley & Paxton, *Paxt. Fl. Gard.* 2: 142. 1851 [*“falcatum”*].

## 指甲兰 zhi jia lan

*Aerides larpentae* H. G. Reichenbach; *A. siamensis* Klinge.

Stems ± elongate, stout, with several distichous leaves. Leaf blade lorate, 20–29 × 2.5–3.7 cm. Inflorescences racemose, sparsely several flowered. Flowers 2–2.5 cm in diam., whitish, tinged or spotted with purple or purplish red. Dorsal sepal broadly ovate or suborbicular, ca. 12 × 10 mm; lateral sepals broadly ovate, base completely adnate to column foot. Petals smaller than sepals; lip movable, spurred, 3-lobed; lateral lobes falcate-oblong; mid-lobe nearly broadly ovate, ca. 12 × 18 mm, margin erose-denticulate, apex emarginate, base with a suborbicular callus near spur entrance; spur ascending, nearly parallel to mid-lobe, 3–4 mm. Column 3–4 mm, foot ca. 1 cm or more; anther cap narrowed and beaked at apex. Fl. unknown.  $2n = 38$ .

Epiphytic on tree trunks in evergreen broad-leaved forests. SE Yunnan [Cambodia, NE India, Laos, Myanmar, Thailand, Vietnam].

**181. PTEROCERAS** Hasselt ex Hasskarl, *Flora* 25(2, Beibl.): 6. 1842.

## 长足兰属 chang zu lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems mostly short. Leaves few to ca. 10, ± distichous, flat, lorate, jointed and amplexicaul-sheathing at base, apex usually unequally bilobed. Inflorescences solitary to several, lateral or axillary, penetrating leaf sheaths, erect or pendulous, racemose, with a few to many spirally or distichously alternating flowers. Flowers usually resupinate, small. Sepals and petals free, spreading; lateral sepals often oblique and distinctly broader than petals, not adnate to column foot. Petals narrower than sepals; lip hinged to end of column foot by a movable joint, 3-lobed; lateral lobes erect, rather long; mid-lobe very short and small, fleshy, base spurred; spur or sac pointing forward in line with column foot, without interior ornaments, although front wall

sometimes quite fleshy. Column short and stout, with a long foot; rostellum small, 2-lobed; pollinia 2, waxy, subglobose, cleft, attached by a common suboblong stipe to a ± triangular viscidium.

About 20 species: from NE India to Indonesia (Maluku); two species (one endemic) in China.

The genus *Pteroceras* has been monographed by Pedersen (Opera Bot. 117: 1–64. 1993).

*Pteroceras simondianum* (Gagnepain) Averyanov (Bot. Zhurn. (Moscow & Leningrad) 73: 432. 1988; *Ornithochilus simondianus* Gagnepain, Bull. Mus. Natl. Hist. Nat., sér. 2, 22: 632. 1951) was erroneously recorded from Yunnan by Y. M. Shui and W. H. Chen (Seed Pl. Karst Region China 1: 250. 2006). The record was based on a misidentified specimen.

1a. Surface of peduncle glabrous and smooth; stems 2–14 cm; ovary strongly 3-keeled ..... 1. *P. leopardinum*  
1b. Surface of peduncle densely black hispid; stems 1.5–4.6 cm; ovary terete ..... 2. *P. asperatum*

**1. *Pteroceras leopardinum*** (E. C. Parish & H. G. Reichenbach) Seidenfaden & Smitinand, Orchids Thailand 4(1): 535. 1963.

长足兰 chang zu lan

*Thrixspermum leopardinum* E. C. Parish & H. G. Reichenbach, Trans. Linn. Soc. London 30: 145. 1874; *Sarcochilus leopardinus* (E. C. Parish & H. G. Reichenbach) J. D. Hooker.

Stems 2–10 cm, 4–5 mm in diam., rigid, 3–6-leaved. Leaf blade suboblong, 9.5–14 × 1.5–2 cm, thinly leathery, acute. Racemes 2–6, 1–2 cm, to 10-flowered; peduncle and rachis dilated distally, glabrous, longitudinally ribbed; floral bracts ovate-triangular, ca. 1 mm. Flowers slightly fleshy, yellow with purplish brown spots, lip white abaxially, spur white; pedicel and ovary 5–6 mm, ovary strongly 3-keeled. Dorsal sepal subovate-lanceolate, ca. 4 × 2 mm, obtuse; lateral sepals broadly ovate-triangular, ca. 4 × 4 mm, obtuse. Petals oblong, ca. 4 × 1.5 mm, obtuse; lip movable, 3-lobed; lateral lobes erect, oblong, ca. 3 × 1 mm, obtuse-rounded; mid-lobe ovate-triangular, ca. 1.5 × 1 mm, fleshy, base with 2 calli on either side, apex obtuse; spur conic-oblong, ca. 4 × 2 mm, inside densely hairy, apex obtuse. Column ca. 2 mm, thick, foot ca. 3 mm. Fl. May.

Epiphytic on tree trunks in open forests or at forest margins; 900–1300 m. S Yunnan [India, Malay Archipelago (Borneo), Myanmar, Philippines, Thailand, Vietnam].

**2. *Pteroceras asperatum*** (Schlechter) P. F. Hunt, Kew Bull. 24: 96. 1970.

毛葶长足兰 mao ting chang zu lan

*Sarcochilus asperatus* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 75. 1919.

Stems inconspicuous, usually 2- or 3-leaved. Leaf blade obliquely oblong or oblong-ligulate, 13–23 × 3–4.5 cm, obtuse and unequally bilobed. Inflorescence suberect, 5–14 cm, laxly few to many flowered; peduncle and rachis densely black hispidulous; floral bracts ovate-triangular, small, abaxially black hispidulous. Flowers white; pedicel and ovary ca. 8 mm, slender, black hispidulous. Sepals suboblong, ca. 6 × 4 mm, abaxially black hispidulous, apex obtuse; lateral sepals oblique, obtuse. Petals oblong, ca. 6 × 3 mm, obtuse; lip movable, 3-lobed; lateral lobes erect, oblong, ca. 3 mm, distal margin with a small tooth, apex obtuse; mid-lobe nearly reniform, ca. 1 × 2 mm, thickly fleshy, adaxially with a high lamella, apex obtuse; spur cylindrical, ca. 2 mm, obtuse. Column ca. 3 mm, foot ca. 3.5 mm; stipe loriate; viscidium subquadrate, apex with irregular teeth. Fl. unknown.

• Epiphytic on tree trunks in evergreen broad-leaved forests; ca. 1500 m. S Yunnan.

## 182. **BIERMANNIA** King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 591. 1897.

胼胝兰属 pian zhi lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems short, enclosed in leaf sheaths. Leaves several, linear, ± fleshy, jointed and sheathing at base, unequally bilobed, lobules acute. Inflorescence lateral, racemose, rather short, several flowered; floral bracts small. Flowers usually opening successively, short-lived, resupinate, small. Sepals and petals free, subequal; lateral sepals attached to column base, usually broader. Petals shorter than sepals; lip sessile, narrowly but firmly adnate to column foot at a right angle, sides enveloping or parallel with column, base with a small slitlike opening leading to a small hidden pouch, spur absent, 3-lobed; lateral lobes parallel to or ± embracing column; mid-lobe linear to narrowly ovate. Column short or rather long, usually stout, with a short foot; pollinia 2, waxy, subglobose, slightly grooved or with a small cavity, attached by a common broadly linear-oblong stipe to a solitary viscidium.

About nine species: China, India, Indonesia, Peninsular Malaysia, Thailand, Vietnam; one species in China.

**1. *Biermannia calcarata*** Averyanov, Bot. Zhurn. (Moscow & Leningrad) 73: 429. 1988.

胼胝兰 pian zhi lan

Stems ca. 5 mm, base with several fleshy roots. Leaves basal, 4 or 5, oblong-lanceolate, 3–5 × ca. 1 cm, unequally

bilobed. Inflorescence pendulous, 5–12 mm, 3–6-flowered; peduncle and rachis slightly flattened; floral bracts 1–3 mm. Flowers small, pale yellow, lip mid-lobe white; pedicel and ovary 3–5 mm. Sepals similar, elliptic-lanceolate, ca. 9 × 3 mm, dorsally carinate, cuspidate-acuminate. Petals similar to sepals, ca. 8 × 2.5 mm, acuminate; lip 3-lobed; lateral lobes erect,

ovate-triangular, ca. 1 × 0.5 mm; mid-lobe spreading horizontally, conic-cucullate, ± slipper-shaped, ca. 6 × 2 mm, fleshy, obtuse; pouch oblong-cylindric, ca. 2 × 1.5 mm, slightly

trifid-tipped. Column ca. 2 mm; stipe ca. 0.5 mm. Fl. Jul–Sep.

Epiphytic on trees in forests; ca. 800 m. SW Guangxi [Vietnam].

### 183. *LUISIA* Gaudichaud, Voy. Uranie, Bot. 426. 1829.

钗子股属 *chai zi gu shu*

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Mesoclastes* Lindley.

Herbs, epiphytic or lithophytic, monopodial. Stems erect or climbing, often branched at base and tufted, some with a single shoot, terete, slender, usually stiff, enclosed in leaf bases. Leaves many, well spaced, linear, terete, distichous, facing all directions or secund, fleshy, jointed and sheathing at base. Inflorescence axillary, racemose, dense, subsessile, fewer than 10-flowered; peduncle and rachis attenuate. Flowers usually small, fleshy. Sepals and petals free, similar or petals longer and narrower, spreading; lateral sepals often dorsally carinate or narrowly winged toward apex. Lip pendulous, fleshy, fixed immovably to base of column, often distinctly divided by a groove into basal hypochile and apical epichile; hypochile often concave, base sometimes with lateral lobes embracing column; epichile often extending forward, adaxially often longitudinally wrinkled or grooved. Column subcylindric, short, stout, foot absent; rostellum short, wide, apex subtruncate; pollinia 2, waxy, globose, porate, attached by a short and broad stipe to a solitary, short, broad viscidium.

About 40 species: Bhutan, China, India, Indochina, Indonesia, Japan, Malaysia, New Guinea, Pacific islands, Philippines, Sri Lanka, and Thailand; 11 species (five endemic) in China.

*Luisia macrotis* H. G. Reichenbach (Gard. Chron. 1869: 1110. 1869) was recently recorded from W Yunnan (Lushui: Gaoligong Shan, 2500 m) by X. H. Jin, H. Li, and D. Z. Li (Acta Phytotax. Sin. 45: 805. 2007). The species otherwise occurs in India (Assam), Laos, Thailand, and Vietnam.

Reviewer L. Averyanov notes that *Luisia appressifolia* Averyanov (Lindleyana 15(2): 79. 2000), described from N Vietnam, should also occur in S China. However, the present authors could not substantiate this assertion because they found no relevant specimens.

1a. Petals linear, 1.5–2 mm wide.

2a. Sepals and petals whitish; epichile of lip broadly ovate-triangular ..... 9. *L. filiformis*

2b. Sepals and petals green; epichile of lip cordate ..... 11. *L. cordata*

1b. Petals oblong or elliptic, 4–9 mm wide.

3a. Carinate midvein on abaxial surface of lateral sepals protruding from apex forming a tooth or a fine sharp point.

4a. Lip without a distinct boundary between epichile and hypochile ..... 1. *L. longispica*

4b. Lip with a distinct boundary between epichile and hypochile.

5a. Sepals and petals yellowish green; epichile of lip emarginate at apex, margin ± erose ..... 2. *L. morsei*

5b. Sepals and petals purple-red; epichile of lip obtuse at apex, margin entire ..... 10. *L. ramosii*

3b. Carinate midvein on abaxial surface of lateral sepals becoming winged at apex or sometimes protruding from apex forming a keeled or winged mucro.

6a. Lip with a distinct boundary between epichile and hypochile ..... 3. *L. magniflora*

6b. Lip without a distinct boundary between epichile and hypochile.

7a. Lip unlobed at apex.

8a. Petals yellowish green, narrowly oblong, 1.6–1.8 mm wide; hypochile narrower than epichile ..... 7. *L. brachystachys*

8b. Petals pink, obovate-elliptic, 3–3.2 mm wide; hypochile wider than epichile ..... 8. *L. zollingeri*

7b. Lip bilobed at apex.

9a. Dorsal sepal 13–17 mm; epichile of lip distinctly adaxially reticulate-sulcate ..... 6. *L. megasepala*

9b. Dorsal sepal 6–11 mm; epichile of lip not adaxially reticulate-sulcate.

10a. Petals ca. 6 mm; epichile of lip with 3 or 4 papillate longitudinal adaxial ridges ..... 4. *L. hancockii*

10b. Petals 7–13 mm; epichile of lip with a fleshy longitudinal adaxial ridge ..... 5. *L. teres*

**1. *Luisia longispica*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 32: 556. 1994.

长穗钗子股 *chang sui chai zi gu*

Stems to 20 cm, ca. 5 mm in diam., internodes ca. 2 cm. Leaves 9–11 cm × ca. 3 mm, obtuse. Inflorescences 1 or 2, ca. 2 cm, 4–8-flowered; floral bracts ovate-triangular, ca. 1 mm, fleshy. Flowers yellowish green, tinged with purplish red, lip purple-red; pedicel and ovary ca. 4 mm. Dorsal sepal ovate elliptic, ca. 3.2 × 2 mm, slightly concave, obtuse; lateral sepals

spreading, sublanceolate, ca. 4 × 1.8 mm, dorsally carinate, midvein protruding from apex forming a subulate point ca. 1.5 mm, apex obtuse. Petals subovate, ca. 3 × 2.8 mm, obtuse; lip subovate-triangular, ca. 4 mm, without distinct boundary between epichile and hypochile; hypochile ca. 4 mm wide, concave, base with a pair of longitudinal ridges running to base of column; epichile nearly suborbicular, ca. 1.2 × 2.8 mm. Column ca. 1.5 mm, apex with 2 short teeth on both front sides; anther cap subglobose; stipe subobovate, ca. 1.2 mm; viscidium elliptic, ca. 0.8 mm wide. Fl. May.

• Epiphytic on tree trunks in forests along valleys; ca. 800 m. S and SE Yunnan.

**2. *Luisia morsei*** Rolfe, J. Linn. Soc., Bot. 36: 33. 1903.

钗子股 *chai zi gu*

*Luisia tonkinensis* Schlechter.

Stems ascending, to 30 cm, 4–5 mm in diam., rigid, with many distichous leaves. Leaves 9–13 cm × ca. 3 mm, obtuse. Inflorescences 1–3, 5–10 mm, usually 4–6-flowered; floral bracts broadly ovate-triangular, ca. 4 mm, fleshy. Flowers small, opening widely, sepals and petals yellowish green, tinged with purplish brown abaxially and purplish or purplish brown on lip, column purple, anther cap yellow; pedicel and ovary ca. 1 cm, yellowish green. Dorsal sepal elliptic, ca. 5.5 × 3.5 mm, slightly concave, obtuse; lateral sepals obliquely ovate, ca. 7 × 3.5 mm, dorsally carinate-winged toward apex and then becoming a tooth protruding from apex, apex obtuse. Petals subovate, ca. 5 × 3 mm, obtuse; lip 8–9 mm, with a distinct boundary between epichile and hypochile; hypochile embracing column, broader than epichile, slightly concave; epichile nearly reniform-triangular, abaxially with a conic wart, margin ± erose, apex emarginate. Column ca. 3 mm. Fl. Apr–May.

Epiphytic on tree trunks in forests; 300–1200 m. SW Guangxi, SW Guizhou, Hainan, S Yunnan [Laos, Thailand, Vietnam].

**3. *Luisia magniflora*** Z. H. Tsi & S. C. Chen, Acta Phytotax. Sin. 32: 558. 1994.

大花钗子股 *da hua chai zi gu*

Stems ascending, to 30 cm, 5–8 mm in diam., rigid, internodes 2–2.5 cm. Leaves 9–18 cm × 2–3 mm, obtuse. Inflorescence ca. 1 cm, often 2- or 3-flowered; rachis stout; floral bracts broadly ovate, ca. 3 mm, fleshy, obtuse. Flowers fleshy, yellowish to yellowish green, tinged or spotted with purplish red or brownish abaxially on sepals and petals, lip epichile brown or dark purple, column yellowish green; pedicel and ovary ca. 9 mm. Dorsal sepal ovate-oblong, 9–12 × 5–6 mm, concave, obtuse; lateral sepals suboblong, 10–12 × 4–5 mm, margin incurved, ± embracing epichile, abaxially carinate-winged and becoming a long winged tail at apex. Petals subelliptic, 10–11 × 5–5.5 mm, obtuse; lip 1–1.3 cm, with a distinct boundary between epichile and hypochile; hypochile smaller than epichile, with lateral lobes on both sides embracing column; epichile cordate, ca. 1 cm wide, adaxially papillate, margin recurved, apex emarginate. Column ca. 5 mm, thick. Fl. Apr–Jul.

• Epiphytic on tree trunks in open forests; 600–1900 m. S Yunnan.

**4. *Luisia hancockii*** Rolfe, Bull. Misc. Inform. Kew 1896: 199. 1896.

纤叶钗子股 *xian ye chai zi gu*

Stems tufted, ascending, to 20 cm, 3–4 mm in diam., rigid, internodes 1.5–2 cm. Leaves facing all directions, 5–9 cm × 2–2.5 mm, obtuse. Inflorescence 1–1.5 cm, usually 2- or 3-flowered; floral bracts broadly ovate, 1.5–2 cm, fleshy, obtuse. Flowers fleshy, opening widely, yellowish green, lip hypochile purple-red; pedicel and ovary 1–1.2 cm. Dorsal sepal obovate-

oblong, ca. 6 × 3 mm, obtuse; lateral sepals oblong, concuplicate, ca. 7 × 3 mm, dorsally carinate and becoming winged at apex, margin incurved, apex obtuse. Petals slightly oblique, oblong, ca. 6 × 3 mm, obtuse; lip nearly ovate-oblong, ca. 7 mm, base ca. 4 mm wide, without a distinct boundary between epichile and hypochile; hypochile slightly concave, base with lateral lobes ca. 0.5 mm; epichile bilobed, emarginate at apex, margin crenate or undulate, adaxially with 3 or 4 papillate longitudinal ridges. Column ca. 2 mm; stipe obovate, ca. 1 mm; viscidium transversely oblong, ca. 1.6 mm, thick. Capsule ellipsoid-cylindric, 1.5–2 cm. Fl. May–Jul, fr. Aug.

• Lithophytic on cliffs along valleys, epiphytic on tree trunks in open forests; 200–300 m. Fujian, Hubei, Zhejiang.

**5. *Luisia teres*** (Thunberg) Blume, Rumphia 4: 50. 1849.

叉唇钗子股 *cha chun chai zi gu*

*Epidendrum teres* Thunberg in Murray, Syst. Veg., ed. 14, 818. 1784; *Luisia botanensis* Fukuyama; *L. teres* var. *botanensis* (Fukuyama) T. P. Lin.

Stems ascending or pendulous, to 55 cm, 3–5 mm in diam. usually unbranched, internodes 2.5–2.8 cm. Leaves facing all directions, 7–13(–20) cm × 2–2.5 mm, obtuse. Inflorescences borne from upper part of stem, ca. 1 cm, 1–7-flowered; floral bracts broadly ovate, ca. 2 mm. Flowers fleshy, greenish yellow or whitish, sometimes tinged with purple on abaxial surface and apex of sepals and petals, lip marked with purple or purplish brown, anther cap pale yellow; pedicel and ovary ca. 8 mm. Dorsal sepal ovate-oblong, 7.5–11 × 3–6 mm, obtuse; lateral sepals similar to but slightly longer than dorsal sepal, acute, dorsally carinate-winged and becoming winged at apex. Petals slightly falcate-elliptic, 7–13 × 2–4 mm, obtuse; lip 10–16 mm, thickly fleshy, without a distinct boundary between epichile and hypochile; hypochile slightly concave, base with subquadrate lateral lobes ca. 1 mm; epichile spreading, subovate, large, adaxially with a fleshy longitudinal ridge near apex, furcately bilobed; lobules subtriangular, entire, with finely papillate hairs. Column 3.5–4 mm; rostellum large, bilobed; stipe obovate, ca. 1.8 × 1.2 mm; viscidium transversely oblong, large, ca. 2.2 mm wide. Fl. Mar–May.  $2n = 38$ .

Epiphytic on tree trunks in forests; 1200–1600 m. W Guangxi, SW Guizhou, W Sichuan, Taiwan, SE Yunnan [Japan, Korea].

**6. *Luisia megasepala*** Hayata, Icon. Pl. Formosan. 4: 85. 1914.

台湾钗子股 *tai wan chai zi gu*

Stems often pendulous or arching, to 50 cm, ca. 5 mm in diam., laxly many leaved. Leaves 5–10 cm × 2.5–4 mm, rigid. Inflorescences short, 1–3-flowered; floral bracts ovate-triangular, ca. 3 mm. Flowers 2.5–3 cm in diam., sepals and petals yellowish green, spotted with purple, lip with green and purple-spotted lateral lobes and a dark purple epichile; pedicel and ovary spotted with purple, 12–18 mm. Sepals elliptic, 12.5–17 × 6–7 mm; lateral sepals dorsally carinate, keel becoming winged at apex. Petals obovate to spatulate, 17–20 × 7–9 mm; lip 13–18 mm; hypochile short, lateral lobes ovate-triangular, ca. 3 × 2 mm; epichile nearly broadly oblong, 11–15 × 7–9 mm, adaxially distinctly reticulate-sulcate, bilobed; apical lobules triangular, ca. 4 mm. Column 5–6 mm, stout. Fl. Mar–May.

• Epiphytic on tree trunks in open forests; 700–2000 m. C and S Taiwan.

**7. *Luisia brachystachys*** (Lindley) Blume, Rumphia 4: 50. 1849.

小花钗子股 xiao hua chai zi gu

*Mesoclastes brachystachys* Lindley, Gen. Sp. Orchid. Pl. 45. 1830; *Luisia siamensis* Rolfe ex Downie.

Stems suberect, to 18 cm, stout, ca. 7 mm in diam., internodes 1–1.5 cm. Leaves 9–11 cm × 3–4 mm, obtuse. Inflorescences 2 or 3, ca. 1 cm, 3–6-flowered; rachis 3–4 mm in diam.; floral bracts ovate-triangular, ca. 2 mm, fleshy. Flowers opening widely, sepals and petals yellowish green, abaxial midvein purplish brown, lip pale yellow, column green, purple margined, anther cap yellow spotted with purple; pedicel and ovary pale yellow, tinged with purplish brown, ca. 6 mm. Dorsal sepal ovate, ca. 4 × 2.3 mm, obtuse; lateral sepals ovate-oblong, 4–4.5 × ca. 2.5 mm, dorsally slightly carinate and keel becoming winged at apex, apex obtuse. Petals narrowly oblong, 5–6 × 1.6–1.8 mm, obtuse; lip ca. 5 mm, glabrous, without a distinct boundary between epichile and hypochile; hypochile concave, narrower than epichile, base without distinct lateral lobes; epichile nearly suborbicular or triangular-rhombic, ca. 3 × 4.5 mm, obtuse. Column ca. 2.5 mm, stout. Fl. Apr.  $2n = 40$ .

Epiphytic on tree trunks in forests along valleys; 600–1300 m. S Yunnan [Bhutan, India, Laos, Myanmar, Vietnam].

**8. *Luisia zollingeri*** H. G. Reichenbach, Ann. Bot. Syst. 6: 622. 1863.

长叶钗子股 chang ye chai zi gu

Stems erect or arching, to 30 cm, 5–7 mm in diam., sometimes branched, internodes 1.5–2 cm. Leaves usually borne from upper part of stem, 12–17 cm × 3–4 mm, obtuse. Inflorescences opposite to leaves, ca. 1 cm, 3–6-flowered; rachis ca. 7 mm, thick; floral bracts broadly ovate-triangular, ca. 2 mm, fleshy. Flowers opening widely, sepals and petals pale pink, abaxially lateral sepals yellowish green in basal half, lip purple-red, apical margin green, abaxially yellowish green, column purplish red, anther cap yellow; pedicel and ovary green, ca. 6 mm. Dorsal sepal ovate, ca. 4 × 3 mm, obtuse; lateral sepals subovate, ca. 6 × 2.8 mm, dorsally slightly carinate, but winged toward apex and forming a narrowly winged mucro protruding from apex. Petals obovate-elliptic, ca. 5 × 3.2 mm, obtuse; lip ca. 5 × 4.5 mm, without a distinct boundary between epichile and hypochile; hypochile broader than epichile, concave, with 2 small lateral lobes, and a pair of calli at base bordering base of column; epichile suborbicular, glabrous, entire. Column ca. 2.5 mm, thick. Fl. May.

Epiphytic on tree trunks in forests along valleys; 500–1000 m. S Yunnan [India (Andaman Islands), Indonesia, Malaysia, Thailand, Vietnam].

**9. *Luisia filiformis*** J. D. Hooker, Fl. Brit. India 6: 23. 1890.

长瓣钗子股 chang ban chai zi gu

Stems often pendulous, 34–90 cm, 4–5 mm in diam., internodes 3–4 cm. Leaves secund, 14–26 cm × ca. 3 mm. Inflorescences erect, arising from lower part or near base of stem, 1–2

cm, few flowered; floral bracts broadly ovate-triangular, ca. 2 mm, fleshy. Flowers slightly fleshy, whitish, lip dark purple; pedicel and ovary ca. 8 mm. Dorsal sepal ovate, ca. 7 × 3 mm, concave, obtuse; lateral sepals similar to dorsal sepal, ca. 8 × 3 mm, dorsally carinate and becoming winged at apex. Petals linear, 8–11 × 1.5–1.7 mm, obtuse; lip ca. 7 mm, with a distinct boundary between epichile and hypochile; hypochile lateral lobes ca. 4 × 4 mm; epichile broadly ovate-triangular, ca. 4 × 5 mm, adaxially with several papillate longitudinal ridges, apex obtuse. Column ca. 4 mm. Fl. Apr–Jun.

Epiphytic on tree trunks in dense forests; 300–1100 m. S and SE Yunnan [Bhutan, India (NE and Orissa), Laos, Thailand, Vietnam].

**10. *Luisia ramosii*** Ames, Philipp. J. Sci., C, 6: 55. 1911.

宽瓣钗子股 kuan ban chai zi gu

Stems often arching, ca. 28 cm, 4–5 mm in diam., internodes ca. 1.5 cm. Leaves mostly on upper part of stem, 8–11 cm × 3.5–4 mm, obtuse. Inflorescences opposite to leaves, ca. 1 cm, 3–6-flowered; floral bracts broadly ovate-triangular, ca. 2 mm, thickly leathery. Flowers opening widely, purplish red, thinly textured; pedicel and ovary ca. 8 mm. Dorsal sepal elliptic, ca. 5 × 3 mm, concave, obtuse; lateral sepals slightly oblique, oblong, ca. 6 × 3 mm, dorsally carinate and winged toward apex; wing abruptly contracted and protruding from apex forming an awn. Petals ovate, ca. 6.2 × 3.2 mm, obtuse; lip 6–6.5 mm, strongly contracted near middle, with a distinct boundary between epichile and hypochile; hypochile 5.5–7 mm wide, broader than epichile, concave; epichile somewhat reniform-triangular, 5–6.2 mm wide, entire, obtuse. Column ca. 3 mm; stipe ovate, ca. 0.8 mm; viscidium suborbicular, large, ca. 1.3 mm wide. Fl. May–Jun.  $2n = 38, 40$ .

Epiphytic on tree trunks in open forests along valleys; 100–500 m. Guangxi, Hainan [Philippines, Vietnam].

*Luisia trichorrhiza* (Hooker) Blume was reported from Hainan (Merrill & Metcalf, Lingnan Sci. J. 21: 12. 1945) and Xizang (K. Y. Lang in C. Y. Wu, Fl. Xizang, 5: 776. 1987). The specimens reported from Hainan were identified by us as *Luisia ramosii*, and those of Xizang (*Qinghai-Xiang Exp. Team 74-4223*) remain doubtful, as they only bear young fruit.

**11. *Luisia cordata*** Fukuyama, Bot. Mag. (Tokyo) 48: 306. 1934.

心唇钗子股 xin chun chai zi gu

Stems erect or pendulous, 30–60 mm, ca. 5 mm in diam., usually unbranched. Leaves ca. 20 cm × 3 mm, acute at apex. Inflorescences 2- or 3-flowered; floral bracts distichous, broadly ovate, ca. 3 mm, acute. Flowers often nodding, ca. 1 cm in diam., sepals and petals green, lip deep purple-red; pedicel and ovary green, ca. 1 cm. Dorsal sepal ligulate, ca. 5 × 3 mm, 5-veined, obtuse; lateral sepals ovate-lanceolate, cymbiform, ca. 6 × 4 mm, dorsally carinate, 7-veined, apex acute. Petals linear, ca. 7.5 × 2 mm, acute; lip ca. 7 mm, fleshy, glabrous, without a distinct boundary between hypochile and epichile; hypochile ca. 3 × 4.5 mm, concave, lateral lobes very short; epichile cordate, large, ca. 4 × 5 mm, with a swelling near apex. Column ca. 3.5 mm. Fl. Jan.

• Epiphytic on tree trunks in thickets along the seashore. S Taiwan.

**184. HARAELLA** Kudô, J. Soc. Trop. Agric. 2: 26. 1930.香兰属 *xiang lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems short, with several distichous leaves. Leaves nearly basal, flat, jointed and sheathing at base. Inflorescences often 2 or 3, axillary, pendulous, racemose, few flowered. Flowers medium-sized, opening successively. Sepals and petals free, similar, spreading; lip immovably attached to base of column, not spurred, larger than sepals and petals, contracted near middle forming hypochile and epichile; hypochile with a fleshy callus at base; epichile orbicular, adaxially hairy, margin fimbriate-ciliate. Column short, footless; rostellum 2-lobed; anther cap subterminal; pollinia 2, waxy, globose, porate, attached by a common linear stipe to a saddlelike viscidium.

• One species: China.

**1. *Haraella retrocalla*** (Hayata) Kudô, J. Soc. Trop. Agric. 2: 27. 1930.

香兰 *xiang lan*

*Saccolabium retrocallum* Hayata, Icon. Pl. Formosan. 4: 92. 1914; *Gastrochilus odoratus* (Kudô) J. J. Smith; *G. retrocallus* (Hayata) Hayata; *G. retrocallosus* Schlechter; *Haraella odorata* Kudô; *S. odoratum* (Kudô) Makino & Nemoto.

Stem 1.5–2 cm, densely rooting at base. Leaves usually 5 or 6; leaf blade falcate-oblongate or suboblong, 2.5–4 × 0.5–1 cm, leathery, obtuse or acute, usually bilobed. Inflorescences nearly as long as leaves, 1–4-flowered; floral bracts ovate,

small, ca. 2 mm. Flowers yellowish white, with dark red or blackish purple markings on lip, opening widely, thickly textured; pedicel and ovary ca. 1 cm, slender. Sepals similar, ± elliptic-obovate, 8–10 × 3–5 mm, acute. Petals oblique, elliptic-oblong, 8–10 × 2.5–3 mm, base contracted, apex obtuse; lip nearly pandurate, 12–14 × 8.5–10 mm, contracted near middle; hypochile nearly oblate, adaxially pubescent, base with retrorse callus, margin fimbriate-ciliate; epichile suborbicular, adaxially densely hairy at center, margin fimbriate-ciliate, apex rounded or retuse. Column ca. 2.5 mm; anther cap ovoid, apex truncate and irregularly dentate. Fl. Jul–Nov.

• Epiphytic on tree trunks in broad-leaved forests; 500–1500 m. Taiwan.

**185. GASTROCHILUS** D. Don, Prodr. Fl. Nepal. 32. 1825.盆距兰属 *pen ju lan shu*Chen Xinqi (陈心启 *Chen Sing-chi*), Ji Zhanhe (吉占和 *Tsi Zhan-huo*); Jeffrey J. Wood

Herbs, epiphytic, small to medium-sized, monopodial. Stems rather short or elongate, ascending or pendulous, enclosed in basal sheaths of leaves. Leaves many, usually distichous, narrowly elliptic or strap-shaped, slightly fleshy or leathery, flat, jointed and amplexicaul-sheathing at base, sometimes twisted at base and ± lying in one plane, apex unequally bilobed, acute or rarely with 3 setae. Inflorescence lateral, rather short, racemose or subumbellate, few to many flowered. Flowers small to medium-sized, ± fleshy. Sepals and petals free, similar, spreading. Lip firmly attached to base of column, with a subglobose-saccate or conic hypochile with lateral lobes reduced to often fleshy edges of sac; epichile fan-shaped, often broadly triangular, often hairy or papillose, margin entire to fimbriate. Column short and thick, footless; rostellum short, 2-lobed; anther subglobose, apex narrowed; pollinia waxy, 2, subglobose, porate or rarely cleft, attached by a common narrow stipe to a bilobed viscidium.

About 47 species: from India and Sri Lanka to E Asia and south to Indonesia; 29 species (17 endemic) in China.

The following three species were recently described or recorded from China:

*Gastrochilus affinis* (King & Pantling) Schlechter (Repert. Spec. Nov. Regni Veg. 12: 314. 1913; *Saccolabium affine* King & Pantling, Ann. Roy. Bot. Gard. Calcutta 8: 228. 1898), recorded from NW Yunnan (Fugong: Gaoligong Shan, 2500–2600 m) by X. H. Jin, H. Li, and D. Z. Li (Acta Phytotax. Sin. 45: 804. 2007).

*Gastrochilus alatus* X. H. Jin & S. C. Chen (Acta Phytotax. Sin. 45: 800. 2007), described from W Yunnan (Fugong, 2700–2800 m).

*Gastrochilus malipoensis* X. H. Jin & S. C. Chen (Acta Phytotax. Sin. 45: 801. 2007), described from SE Yunnan (Malipo, 1300–1400 m).

In addition, reviewer L. Averyanov notes that *Gastrochilus minutiflorus* Averyanov (Bot. Zhurn. (Moscow & Leningrad) 82(3): 143. 1997), described from N Vietnam, should also occur in S China. However, the present authors could not substantiate this assertion because they found no relevant specimens.

1a. Stem either very short with basal leaves or elongate and rather stout (4–7 mm in diam.) with large cauline leaves (4.5–)6–23 cm.

2a. Leaves 2–2.5 cm.

3a. Petals suborbicular, fimbriate at margin; lip epichile white hairy adaxially ..... 13. *G. rantabunensis*

3b. Petals oblong, entire at margin; lip epichile glabrous adaxially ..... 14. *G. xuanenensis*

2b. Leaves more than (3–)5 cm.

4a. Inflorescence racemose; leaves 3–5 cm ..... 1. *G. platycalcaratus*

- 4b. Inflorescence subumbellate; leaves (5–)6–23 cm.
- 5a. Central cushion on lip epichile with a groove or cavity at base.
- 6a. Flowers 2–3 cm in diam.; dorsal sepal 12–17 mm ..... 2. *G. bellinus*
- 6b. Flowers 1–1.8 cm in diam.; dorsal sepal 5–10 mm.
- 7a. Stem 1–2 cm; lip epichile glabrous adaxially ..... 3. *G. hainanensis*
- 7b. Stem 5–30 cm; lip epichile with dense papillate hairs adaxially ..... 4. *G. calceolaris*
- 5b. Central cushion on lip epichile without a groove or cavity at base.
- 8a. Epichile ± papillate-hairy adaxially.
- 9a. Leaves linear, 5–8 mm wide; margin of lip epichile irregularly fimbriate ..... 10. *G. linearifolius*
- 9b. Leaves ligulate or oblong, 1–2.5 cm wide; margin of lip epichile lacinate-erose.
- 10a. Epichile transversely oblong or oblate, margin irregularly denticulate ..... 12. *G. acinacifolius*
- 10b. Epichile broadly triangular, margin lacerate to erose.
- 11a. Stem 1–2 cm, with subbasal leaves; petals ± spatulate, yellow with purple spots ..... 6. *G. subpapillosus*
- 11b. Stem to 20 cm, with cauline leaves; petals ligulate-oblong, yellowish tinged with brownish at apex ..... 11. *G. yunnanensis*
- 8b. Epichile glabrous adaxially except for cushion.
- 12a. Stem 1–1.5 cm, with subbasal leaves 1.7–6 cm wide; sepals 6–12 × 3.5–6 mm ..... 9. *G. obliquus*
- 12b. Stem (2–)5–20 cm, with cauline leaves 0.5–1.2(–1.7) cm wide; sepals 5–6 × 2.2–3 mm.
- 13a. Epichile 5–8 mm wide, with a papillate cushion adaxially; stem terete ..... 8. *G. japonicus*
- 13b. Epichile 3–5 mm wide, with a glabrous cushion adaxially; stem slightly compressed terete.
- 14a. Lip hypochile narrower than epichile; cushion on epichile extending to subglobose hypochile ..... 5. *G. intermedius*
- 14b. Lip hypochile broader than epichile; cushion on epichile not extending to hypochile ..... 7. *G. guangtungensis*
- 1b. Stem elongate and slender (ca. 2 mm in diam.) with small cauline leaves 1–2.5(–4.5) cm.
- 15a. Epichile glabrous adaxially.
- 16a. Hypochile broader than epichile; leaves ± with purple-red spots.
- 17a. Inflorescence 5- or 6-flowered; leaves with 1–3 short awns at apex ..... 15. *G. pseudodistichus*
- 17b. Inflorescence 1- or 2-flowered; leaves without awns at apex ..... 16. *G. fuscopunctatus*
- 16b. Hypochile narrower than epichile; leaves without purple-red spots.
- 18a. Epichile suborbicular, with 2 conic calli at base ..... 17. *G. distichus*
- 18b. Epichile broadly triangular, without calli at base ..... 18. *G. fargesii*
- 15b. Epichile ± hairy adaxially.
- 19a. Dorsal sepal 2.2–3 mm.
- 20a. Hypochile cylindric, 2.8–3 mm tall; epichile reniform ..... 19. *G. nanus*
- 20b. Hypochile subglobose, ca. 2 mm tall; epichile triangular ..... 20. *G. ciliaris*
- 19b. Dorsal sepal 3.5–7 mm.
- 21a. Hypochile subcupular or subglobose.
- 22a. Epichile papillate-hairy only on central cushion, surroundings glabrous ..... 26. *G. formosanus*
- 22b. Epichile densely shortly hairy adaxially.
- 23a. Epichile not 2-lobed nor emarginate at apex ..... 27. *G. saccatus*
- 23b. Epichile 2-lobed or emarginate at apex.
- 24a. Epichile rounded and emarginate at apex ..... 28. *G. gongshanensis*
- 24b. Epichile subtruncate and deeply 2-lobed at apex ..... 29. *G. nanchuanensis*
- 21b. Hypochile conic.
- 25a. Saccate hypochile ca. 2 × as tall as wide ..... 23. *G. raraensis*
- 25b. Saccate hypochile ca. as tall as or slightly taller than wide.
- 26a. Saccate hypochile ca. 2 mm tall; epichile obtuse at apex ..... 21. *G. linii*
- 26b. Saccate hypochile 3–4.5 mm tall; epichile emarginate or retuse at apex.
- 27a. Saccate hypochile distinctly curved forward, parallel to epichile; leaves without colored spots ..... 24. *G. matsudae*
- 27b. Saccate hypochile not or only slightly curved forward, not parallel to epichile; leaves with purple-red or brownish purple spots.
- 28a. Epichile 4–5 mm wide; saccate hypochile slightly curved forward; flowers with purple-red spots ..... 22. *G. sinensis*
- 28b. Epichile ca. 8 mm wide; saccate hypochile straight; flowers with brown spots ..... 25. *G. hoi*

**1. *Gastrochilus platycalcaratus*** (Rolfe) Schlechter, *Orchideen*, 582. 1914.

滇南盆距兰 dian nan pen ju lan

*Saccolabium platycalcaratum* Rolfe, *Bull. Misc. Inform. Kew* 1909: 368. 1909; *Gastrochilus diannanensis* Z. H. Tsi & Y. Z. Ma.

Stems ca. 5 cm, ca. 4 mm in diam. Leaves 3–6, nearly basal; blade green, tinged with purplish red, oblong, 3–5 × 0.7–1.2 cm, obtuse and unequally bilobed. Inflorescence racemose, to 9-flowered; peduncle pale yellowish green, usually 1.5–2 cm, upper part enlarged; rachis ca. 5 mm; floral bracts ovate-triangular, obtuse; pedicel and ovary yellowish green with purple spots, ca. 8 mm. Flowers widely opening; sepals and petals yellowish green, sometimes with purplish red spots; lip whitish, ± with purple-blackish spots on hypochile and greenish cushion on epichile. Dorsal sepal oblong, concave, ca. 3 × 1.5 mm, apex obtuse; lateral sepals slightly oblique, oblong, ca. 3 × 1 mm, apex obtuse. Petals ovate-elliptic, ca. 3 × 2 mm, apex obtuse; lip with an epichile and a hypochile; epichile triangular-ovate, ca. 3 × 3 mm, adaxially densely hirsute and with a central cushion, slightly reflexed, rounded at apex; hypochile subconic, ca. 4 mm tall, ca. 1.8 mm in diam., slightly narrowed at middle, strongly dorsiventrally compressed from middle to tip, subtruncate and concave at tip. Column pale yellow, tinged with purplish blue, short; anther cap yellow. Fl. Mar.

On tree trunks in dense forests; 700–800 m. S Yunnan [Myanmar, Thailand].

**2. *Gastrochilus bellinus*** (H. G. Reichenbach) Kuntze, *Revis. Gen. Pl.* 2: 661. 1891.

大花盆距兰 da hua pen ju lan

*Saccolabium bellinum* H. G. Reichenbach, *Gard. Chron.*, n.s., 21: 174. 1884.

Stems 2–5 cm, stout, internodes ca. 1 cm. Leaf blade lorate or oblong, 11.5–23.5 × 1.5–2.3 cm, apex unequally 2-lobed. Inflorescences usually 2 or 3, subumbellate, 4–6-flowered; peduncle ca. 2 cm, stout, with 2 short cupular sheaths at base; pedicel and ovary pale yellow, tinged with purple. Flowers 2–3 cm in diam.; sepals and petals pale yellow with brownish purple markings; lip white, with few sparse purple markings. Sepals subsimilar, elliptic, 12–17 × 6–7 mm, apex obtuse-rounded. Petals slightly smaller than sepals; lip with an epichile and a saccate hypochile; epichile usually ± recurved, nearly reniform-triangular, 7–10 × 15–20 mm, adaxially with dense white papillate hairs except on central cushion, margin erose or fimbriate; cushion yellow, with a cavity at base; hypochile subconic or subglobose, ca. 9 mm tall, ca. 9 mm in diam., rounded-tipped. Fl. Apr.

On tree trunks in dense forests; 1600–1900 m. S Yunnan [Myanmar, Thailand, N Vietnam].

**3. *Gastrochilus hainanensis*** Z. H. Tsi, *Bull. Bot. Res.*, Harbin 9(2): 21. 1989.

海南盆距兰 hai nan pen ju lan

Stems 1–2 cm, ca. 5 mm in diam. Leaves 4 or 5, nearly

basal; blade oblong, 14–17 × 2–3 cm, fleshy, apex obtuse and unequally 2-lobed. Inflorescence subumbellate, short, several flowered; peduncle 2–3 cm, ca. 3 mm in diam.; floral bracts ovate-triangular, 3–4 mm. Flowers widely opening, thickly textured; sepals and petals yellow, with purplish red spots; lip white, with purple-red spots. Sepals subsimilar, obovate-elliptic, 7–10 × 3–4 mm, apex obtuse. Petals shorter and narrower than sepals; lip with an epichile and a saccate hypochile; epichile ovate-triangular, ca. 6 × 10 mm, thickly fleshy, glabrous, basal margin membranous and slightly toothed, with a large central cushion, and a reversely T-shaped groove at its base, apex rounded, recurved; hypochile conic, 7–8 mm tall, 5–5.5 mm in diam. Column purple, short, thick; rostellum pale yellow, 2-lobed; anther cap nearly subglobose, apex narrowed into a beak. Fl. Aug.

On tree trunks in forests. C Hainan [Thailand, Vietnam].

The record of *Saccolabium obliquum* in Fl. Hainan. (4: 257. 1977) was based on material of this species.

**4. *Gastrochilus calceolaris*** (Buchanan-Hamilton ex Smith) D. Don, *Prodr. Fl. Nepal.* 32. 1825.

盆距兰 pen ju lan

*Aerides calceolaris* Buchanan-Hamilton ex Smith in Rees, *Cycl.* 39: *Aerides* no. 11. 1818; *Saccolabium calceolare* (Buchanan-Hamilton ex Smith) Lindley.

Stems often arching, 5–30 cm, 5–8 mm in diam., with many leaves. Leaves distichous; blade often falcate, narrowly oblong, 20–23 × 1.5–2.5 cm, slightly fleshy, apex obtuse and unequally 2-lobed. Inflorescences several to many, from upper part of stem, opposite to leaves, subumbellate, 2–3 cm, several to many flowered; floral bracts small; pedicel and ovary slightly compressed, 1.3–2 cm. Flowers widely opening; sepals and petals yellow, with purplish brown markings; lip with white epichile and yellow hypochile, both with purple-red marks. Sepals similar, obovate-oblong, 7–8 × ca. 4 mm, base contracted, apex obtuse-rounded. Petals similar to sepals, slightly smaller, apex obtuse-rounded; lip with an epichile and a saccate hypochile; epichile spreading forward, suborbicular-triangular or lunate-triangular, 2–3 × 5–7 mm, adaxially with long white hairs except on yellow and purple-spotted central cushion and with a cavity at base of cushion, margin irregularly fimbriate or erose; hypochile yellowish green with purplish red margin, helmetlike, ca. 5 mm tall, ca. 5 mm in diam. Fl. Mar–Apr.  $2n = 38, 40, 76$ .

On tree trunks in forests; 1000–2700 m. Hainan, S Xizang, S and W Yunnan [Bhutan, NE India, Malaysia (Peninsular), Myanmar, Nepal, Thailand, Vietnam].

**5. *Gastrochilus intermedius*** (Griffith ex Lindley) Kuntze, *Revis. Gen. Pl.* 2: 661. 1891.

细茎盆距兰 xi jing pen ju lan

*Saccolabium intermedium* Griffith ex Lindley, *J. Proc. Linn. Soc., Bot.* 3: 33. 1858.

Stems slightly flattened, ca. 15 cm, 3–4 mm in diam., slender, branched, internodes 5–8 mm. Leaves distichous; blade narrowly lanceolate, 5–6 × 0.7–1 cm, apex acuminate and 2- or

3-lobed, lobes setiform. Inflorescence subumbellate, short, often 2- or 3-flowered; peduncle ca. 1 cm; floral bracts ovate, ca. 1.5 mm, apex acute; pedicel and ovary ca. 1 cm. Flowers pale yellow, small. Sepals similar, elliptic, ca.  $5.5 \times 2.5$  mm, 3-veined, apex obtuse. Petals oblanceolate, ca.  $5 \times 2$  mm, apex rounded; lip with an epichile and a saccate hypochile; epichile suborbicular-triangular, ca.  $2 \times 5$  mm, adaxially glabrous, with a central cushion extending to front wall of hypochile, margin erose or irregularly toothed, apex rounded; hypochile subglobose or helmetlike, ca. 4 mm tall, ca. 4 mm in diam., apex rounded and with 2 or 3 ridges on distal surface outside, with erect lateral margins. Anther cap slightly narrowed toward apex. Fl. Oct.

On tree trunks in forests; ca. 1500 m. SE Sichuan [NE India, Thailand, Vietnam].

**6. *Gastrochilus subpapillosus*** Z. H. Tsi, Guihaia 16: 142. 1996.

歪头盆距兰 wai tou pen ju lan

Stems ca. 2 cm, stout, with 5 or 6 leaves. Leaf blade spatulate or nearly oblong,  $13\text{--}18.5 \times$  ca. 2.1 cm, apex unequally 2-lobed. Inflorescence subumbellate, 3–3.5 cm, 5- or 6-flowered; peduncle ca. 3 cm, with 2 or 3 cupular sheaths; floral bracts broadly ovate, ca. 4 mm; pedicel and ovary ca. 1.4 cm. Sepals and petals yellow, with purple spots; lip white with yellow cushion on epichile. Sepals similar, oblong,  $6\text{--}7 \times$  ca. 3 mm, 3-veined, apex obtuse. Petals subspatulate, ca.  $6 \times 2.2$  mm, 3-veined, apex obtuse; lip with an epichile and a saccate hypochile; epichile broadly triangular, ca.  $2 \times 6$  mm, adaxially sparsely shortly papillate-hairy except on central cushion, margin erose; hypochile cucullate,  $\pm$  laterally compressed, ca. 4 mm tall, ca. 6 mm in diam. Column ca. 5 mm, stout; rostellum deeply 2-lobed; anther cap narrowed toward apex. Fl. Oct.

- On tree trunks in dense forests; 1100–1400 m. S Yunnan.

**7. *Gastrochilus guangtungensis*** Z. H. Tsi, Guihaia 16: 139. 1996.

广东盆距兰 guang dong pen ju lan

Stems  $\pm$  compressed terete, 6–17 cm, ca. 4 mm in diam., slender, internodes ca. 1 cm, sometimes branched. Leaves several, distichous; blade falcate-oblong or oblong,  $4.5\text{--}9.5 \times 0.6\text{--}1.1$  cm, apex acuminate and 2-aristate. Inflorescence subumbellate, 1–1.5 cm, usually 2- or 3-flowered; peduncle ca. 1 cm, base with 2 cupular sheaths; floral bracts broadly ovate, ca. 2 mm, membranous; pedicel and ovary ca. 8 mm. Flowers yellow. Sepals similar, obovate,  $5\text{--}6 \times 2.2\text{--}2.7$  mm, apex obtuse. Petals similar to sepals, slightly smaller; lip with an epichile and a saccate hypochile; epichile subovate-triangular, ca.  $2.5 \times 3$  mm, adaxially glabrous, with a large central cushion, margin slightly erose, apex acute; hypochile subglobose, ca. 3.5 mm tall, ca. 4.5 mm in diam. Fl. Oct.

- On tree trunks in forests; ca. 1500 m. N Guangdong, SW Yunnan.

**8. *Gastrochilus japonicus*** (Makino) Schlechter, Repert. Spec. Nov. Regni Veg. 12: 315. 1913.

黄松盆距兰 huang song pen ju lan

*Saccolabium japonicum* Makino, Ill. Fl. Japan 1(7): 3, t.

13. 1891; *Gastrochilus holttumianus* S. Y. Hu & Barretto; *G. somae* (Hayata) Hayata; *S. somae* Hayata; *S. taiwanianum* S. S. Ying (1977), not (Hayata) Tang & F. T. Wang (1951).

Stems ascending or pendulous, 2–10 cm, 3–5 mm in diam. Leaves distichous, closely spaced; blade  $\pm$  falcate, linear-oblong, or linear-lanceolate,  $5\text{--}14 \times 1\text{--}2.5$  cm, fleshy, apex subacute and slightly hooked. Inflorescence subumbellate, 4–7(–10)-flowered; peduncle 1.5–2 cm; floral bracts ovate-triangular, 2–3 mm, apex acute; pedicel and ovary 10–12 mm. Flowers widely opening; sepals and petals yellowish green, with purplish red spots; lip whitish, tinged with yellow at apex of epichile and with yellow and purple-spotted cushion. Sepals similar, obovate-elliptic or subelliptic,  $5\text{--}9 \times 3\text{--}5$  mm, apex obtuse. Petals similar to sepals, slightly narrower, apex obtuse; lip with an epichile and a saccate hypochile; epichile subtriangular,  $2\text{--}4 \times 5\text{--}8$  mm, adaxially glabrous except on finely papillate central cushion, margin erose or nearly entire; hypochile cupular, laterally compressed, 5–7 mm tall, 4–6 mm in diam. Column pale purple, short. Fl. Jun–Sep.  $2n = 30, 38, 40$ .

On tree trunks in forests; 200–1500 m. Hong Kong, Taiwan [Japan (Ryukyu Islands)].

**9. *Gastrochilus obliquus*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 661. 1891.

无茎盆距兰 wu jing pen ju lan

*Saccolabium obliquum* Lindley, Gen. Sp. Orchid. Pl. 223. 1833.

Stems 1–2 cm, stout, with 3–5 leaves. Leaves nearly basal, distichous; blade oblong to oblong-lanceolate,  $8\text{--}20 \times 1.7\text{--}6$  cm, slightly fleshy or leathery, apex obtuse and unequally 2-lobed. Inflorescences 1–4, from base of stem, subumbellate, often 5–8-flowered; peduncle straight, 1–2 cm, stout, with 2 cupular sheaths; floral bracts broadly ovate, ca. 3 mm; pedicel and ovary 1–1.5 cm. Flowers fragrant, with yellow sepals and petals and white lip, all with brownish purplish spots. Sepals similar, subelliptic,  $6\text{--}12 \times 3.5\text{--}6$  mm, base contracted, apex obtuse. Petals spatulate, smaller than sepals, apex obtuse; lip with an epichile and a saccate hypochile; epichile subtriangular, ca.  $5 \times 8\text{--}10$  mm, adaxially glabrous, with a central cushion, margin lacerate or erose, apex obtuse and with a small wart abaxially; hypochile with yellow tip, with purplish red spots, nearly subglobose-cucullate, laterally compressed, 5–6 mm tall, 6–7 mm in diam., outside with 3 ridges. Column short. Fl. Oct.

On tree trunks at forest margins; 500–1400 m. SW Sichuan, S Yunnan [Bhutan, India (Andaman Islands, Sikkim), Laos, Myanmar, Nepal, Thailand, Vietnam].

Chinese collections all belong to *Gastrochilus obliquus* var. *obliquus*; *G. obliquus* var. *suavis* (Seidenfaden) Z. H. Tsi, from NE India, differs from var. *obliquus* in having sepals and petals with dense bright red dots.

**10. *Gastrochilus linearifolius*** Z. H. Tsi & Garay, Guihaia 16: 138. 1996.

狭叶盆距兰 xia ye pen ju lan

Stems pendulous, 15–32 cm, ca. 5 mm in diam., slender,

usually branched, internodes 1.5–2 cm. Leaves distichous, well spaced; blade linear, falcate, 8–15 × 0.5–0.8 cm, apex long acuminate and with 2 or 3 awns. Inflorescence subumbellate, 3- or 4-flowered; peduncle 1–1.5 cm, slender; floral bracts ovate, ca. 2 mm, apex acute; pedicel and ovary ca. 5 mm. Flowers small, widely opening. Dorsal sepal subovate, ca. 5 × 2.5 mm, apex obtuse; lateral sepals similar to dorsal sepal, slightly narrower. Petals oblong, smaller than sepals, apex obtuse; lip with an epichile and a saccate hypochile; epichile suborbicular, ca. 2.2 × 4 mm, adaxially finely papillate on central cushion, margin irregularly fimbriate, inside villous at apex, apex rounded; hypochile subcupular, ca. 3.5 mm tall, ca. 2.5 mm in diam., with a ridge, rounded at apex. Fl. Sep.

On tree trunks in forests; ca. 1600 m. SE Xizang [India (Sikkim)].

The record of *Gastrochilus intermedius* in Fl. Xizang. (5: 783. 1987) was based on material of this species.

**11. *Gastrochilus yunnanensis*** Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 76. 1919 [*“yunnanense”*].

云南盆距兰 yun nan pen ju lan

*Gastrochilus monticola* (Rolfe ex Downie) Seidenfaden & Smitinand; *Saccolabium monticola* Rolfe ex Downie; *S. yunnanense* (Schlechter) S. Y. Hu.

Stems elongate, to 20 cm, 4–7 mm in diam., internodes 1.5–2 cm. Leaves distichous, well spaced; blade ligulate or oblong, 6–16.5 × 1.5–2.5 cm, apex long acuminate and with 2 or 3 awns. Inflorescence subumbellate, 4–15-flowered; peduncle 1.5–5.5 cm, rigid, base with 1 or 2 sheaths; floral bracts ovate-triangular, 1–2 mm; pedicel and ovary ca. 1 cm. Flowers small; sepals and petals pale yellow, tinged brownish at apex; lip white, with yellowish white and sparsely purple-red spotted cushion on epichile and purple-red spots near entrance of hypochile. Sepals similar, ligulate-oblong, 5–7 × 2.7–3.5 mm, apex obtuse. Petals similar to sepals, narrower; lip with an epichile and a saccate hypochile; epichile broadly triangular, ca. 2.5 × 5 mm, adaxially with papillate yellow and slightly purplish red spotted central cushion, margin lacerate-erose; hypochile nearly subglobose, ca. 5 mm tall, ca. 5 mm in diam. Column short. Fl. Oct.

On tree trunks in dense forests; ca. 1500 m. S Yunnan [Bangladesh, N Thailand, N Vietnam].

**12. *Gastrochilus acinacifolius*** Z. H. Tsi, Bull. Bot. Res., Harbin 9(2): 25. 1989.

镰叶盆距兰 lian ye pen ju lan

Stems ± compressed terete, usually 8–11 cm, 4–5 mm in diam., internodes ca. 1 cm. Leaves distichous; blade usually falcate-oblong, 7–14 × 1–2 cm, apex acute and with 2 short awns. Inflorescences 1 or 2, almost opposite to leaf, subumbellate, several flowered; peduncle 1–1.5 cm, upper part enlarged, with 2 or 3 cupular sheaths at base; floral bracts deltoid, 1–2 mm, subfleshy; pedicel and ovary ca. 1 cm. Flowers widely opening; sepals and petals pale yellow with purplish red spots; lip white, with yellow and purple-red spotted cushion on epichile. Sepals similar, obovate-spatulate, 6–7 × 3–4 mm, apex obtuse. Petals similar to sepals, smaller, apex obtuse; epichile

white, transversely oblong or oblate, adaxially sparsely papillate-hairy except on central cushion, margin irregularly denticulate; hypochile nearly subglobose, ca. 5 mm tall, ca. 5 mm in diam., outside with 3 ridges. Column ca. 3 mm; anther cap narrowed toward apex. Fl. Sep–Dec.

● On tree trunks in forests; ca. 1000 m. Hainan.

This species was treated as *Saccolabium intermedium* in Fl. Hainan. (4: 258. 1977).

**13. *Gastrochilus rantabunensis*** C. Chow ex T. P. Lin, Native Orchids Taiwan 3: 109. 1987.

合欢盆距兰 he huan pen ju lan

Stems erect, very short. Leaves nearly tufted, basal; blade obovate-oblong, 2–2.5 × 0.4–0.7 cm, apex acute and unequally 2-lobed. Inflorescence subumbellate, 3- or 4-flowered; peduncle ca. 2 cm, upper part enlarged, base with 1 or 2 sheaths; floral bracts ovate-triangular, 3–4 mm, apex acute; pedicel and ovary green with purplish red spots, ca. 9 mm. Sepals and petals green to yellowish with red spots; lip white with a green cushion on epichile. Dorsal sepal obovate, ca. 3.8 × 3 mm, apex rounded; lateral sepals obliquely ovate-triangular, 3–4 × ca. 2.5 mm, apex obtuse. Petals suborbicular, 3–3.5 × 2.5–3 mm, margin fimbriate, apex rounded; lip with an epichile and a saccate hypochile; epichile subreniform, 2–3 × 5–6.5 mm, adaxially densely white hairy except on central cushion, apex retuse; hypochile subconic, slightly laterally compressed, ca. 3.5 cm tall, ca. 4 mm in diam., apex rounded and slightly concave. Column short. Fl. Jan–Feb or Jul.

● On tree trunks in coniferous forests; ca. 2000 m. S Hunan, C Taiwan.

S. S. Ying (Quart. J. Chin. Forest. 21: 115. 1988) recorded material of this species from Taiwan as *Gastrochilus bellinus*.

**14. *Gastrochilus xuanenensis*** Z. H. Tsi, Acta Bot. Yunnan. 4: 269. 1982.

宣恩盆距兰 xuan en pen ju lan

Stems ca. 5 cm, ca. 2 mm in diam., with 4–6 leaves. Leaves basal, closely spaced, distichous; blade oblong or falcate-oblong, 2–2.5 × 0.5–0.8 cm, apex acute and with 2 or 3 awns. Inflorescence subumbellate, few flowered; peduncle 5–9 mm, base with 1 or 2 cupular sheaths; floral bracts ovate-triangular, 1–2 mm; pedicel and ovary ca. 6 mm. Flowers small, widely opening. Dorsal sepal oblanceolate-elliptic, ca. 4 × 1.5 mm, apex acute; lateral sepals oblong, ± oblique, ca. 3 × 1.5 mm, apex acute. Petals similar to lateral sepals, ca. 3 × 1.5 mm; lip with an epichile and a saccate hypochile; epichile reniform-triangular, ca. 2 × 3.5 mm, adaxially glabrous, with a central cushion extending to front wall of hypochile, entire; hypochile helmetlike, 2.5–3 mm tall, 2–2.5 mm in diam., outside with 3 ridges, apex rounded, ± auriculate on both sides of its entrance. Column short. Fl. May.

● On tree trunks at forest margins; 500–700 m. NE Guizhou, SW Hubei.

**15. *Gastrochilus pseudodistichus*** (King & Pantling) Schlechter, Repert. Spec. Nov. Regni Veg. 12: 315. 1913.

小唇盆距兰 xiao chun pen ju lan

*Saccolabium pseudodistichum* King & Pantling, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 64: 341. 1895; *Gastrochilus hoyopse* (Rolfe ex Downie) Seidenfaden & Smitinand; *S. hoyopse* Rolfe ex Downie.

Stems pendulous or creeping, to 28 cm, ca. 2 mm in diam., slender, sometimes branched, internodes 6–7 mm. Leaves distichous, green, with purplish red spots; blade ovate-lanceolate or oblong, 1.5–2.7 × 0.5–0.6 cm, apex acute and with 2 or 3 awns. Inflorescence subumbellate, 5- or 6-flowered; peduncle green, with purplish red spots, 1–2 cm, upper part enlarged, often with 2 sheaths at base; floral bracts ovate-lanceolate, 1–2 mm; pedicel and ovary ca. 1 cm. Flowers yellow, with purplish red marks or spots. Sepals similar, oblanceolate-oblong, ca. 3.5 × 1.8 mm, apex obtuse. Petals subobovate, slightly smaller than sepals, apex obtuse; lip with an epichile and a saccate hypochile; epichile nearly suborbicular, concave, narrower than hypochile, ca. 2 mm wide, thickly fleshy, adaxially glabrous, entire, obtuse at apex; hypochile cupular, ca. 3 mm tall, ca. 4 mm in diam. Column ca. 2 mm; anther cap narrowed, beaked at apex. Fl. Jun.  $2n = 38$ .

On tree trunks in forests, on branches in thickets; 1000–2500 m. SE to W Yunnan [Bhutan, NE India, N Thailand, N Vietnam].

**16. *Gastrochilus fuscopunctatus*** (Hayata) Hayata, Icon. Pl. Formosan. 6(Suppl.): 78. 1917.

红斑盆距兰 hong ban pen ju lan

*Saccolabium fuscopunctatum* Hayata, Icon. Pl. Formosan. 2: 143. 1912.

Stems often pendulous, 3–7 cm, ca. 2 mm in diam. Leaves distichous, green, with dense purplish red spots; blade oblong or falcate-oblong, 1.5–2.2 × 0.3–0.5 cm, apex acute and slightly 3-lobed. Inflorescence subumbellate, often 1- or 2-flowered; peduncle 8–20 mm, base with 1 or 2 sheaths; floral bracts ovate-triangular, 1–2 mm, apex acute; pedicel and ovary ca. 7 mm. Sepals and petals yellowish green with brown spots; lip whitish, with a yellow and brown-spotted cushion on epichile. Dorsal sepal elliptic, ca. 4 × 2.3 mm, apex obtuse; lateral sepals obliquely ovate-oblong, 3–4 × ca. 2 mm, apex subacute. Petals subelliptic, ca. 3.2 × 2.2 mm, apex rounded; lip with an epichile and a saccate hypochile; epichile elliptic-orbicular, concave, ca. 2.5 × 2 mm, thickly fleshy, abaxially carinate, adaxially glabrous, with a central cushion, entire, obtuse at apex; hypochile cupular, ± laterally compressed, ca. 5 mm tall, ca. 3.2 mm in diam. Column very short, both sides with purplish red spots; anther cap narrowed into a beak. Fl. Jan–Jul.

• On tree trunks in dense forests; 1000–2500 m. Taiwan.

**17. *Gastrochilus distichus*** (Lindley) Kuntze, Revis. Gen. Pl. 2: 661. 1891.

列叶盆距兰 lie ye pen ju lan

*Saccolabium distichum* Lindley, J. Proc. Linn. Soc., Bot. 3: 36. 1858.

Stems pendulous, usually 1.5–20 cm, ca. 2 mm in diam., slender, often branched. Leaves many, distichous; blade lanceolate or falcate-lanceolate, 1.5–3 × 0.4–0.6 cm, apex acute and

with 2 or 3 awns. Inflorescences several, opposite to leaves, subumbellate, 2–4-flowered; peduncle 1–3 cm, slender, upper part enlarged, lower part with 2 cupular sheaths; floral bracts ovate-lanceolate, 1–2 mm; pedicel and ovary ca. 8 mm. Flowers pale green, with reddish brown spots. Sepals similar, usually concave, oblong-elliptic, 4.5–5 × 2.5–3 mm, apex obtuse. Petals subobovate, slightly smaller than sepals, apex obtuse; lip with an epichile and a saccate hypochile; epichile nearly suborbicular, ca. 3 × 5 mm, adaxially glabrous, with a central cushion, near base with 2 conic calli, entire, obtuse at apex; hypochile subcupular, ca. 4 mm tall, 2–3 mm in diam., apex rounded. Column ca. 2.5 mm; anther cap narrowed into a beak toward apex. Fl. Jan–May.  $2n = 38$ .

On tree trunks in forests; 1100–2800 m. SE Xizang, W Yunnan [Bhutan, NE India, Nepal].

**18. *Gastrochilus fargesii*** (Kraenzlin) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 288. 1919.

城口盆距兰 cheng kou pen ju lan

*Saccolabium fargesii* Kraenzlin, J. Bot. (Morot) 17: 423. 1903 [“*fargesii*”].

Stems repent, 3–13 cm, ca. 2 mm in diam., slender, with many leaves. Leaves distichous; blade narrowly oblong or falcate-oblong, 2–4.5 × 0.4–0.6 cm, apex acute and with 2 or 3 short awns. Inflorescences several, subumbellate, 2- or 3-flowered; peduncle 5–10 mm, upper part enlarged, lower part with 2 sheaths; floral bracts ovate-lanceolate, 1–2 mm; pedicel and ovary ca. 2 mm. Flowers small, yellowish green, with purplish red spots. Sepals similar, oblong-elliptic, ca. 4 × 2 mm, apex obtuse. Petals narrowly oblong, ca. 3 × 1.5 mm, base contracted, apex obtuse-rounded; lip with an epichile and a saccate hypochile; epichile broadly triangular, 2–3 × 4–4.5 mm, adaxially glabrous, with a cushion extending to front wall of hypochile, margin ± erose, apex obtuse; hypochile subconic, ca. 2.2 mm tall, ca. 3 mm in diam., apex obtuse. Column ca. 1.5 mm; anther cap narrowed and beaked at apex. Fl. May–Jun.

• On tree trunks in forests; ca. 2300 m. N Chongqing, W Sichuan, SE Yunnan.

**19. *Gastrochilus nanus*** Z. H. Tsi, J. Arnold Arbor. 71: 121. 1990.

江口盆距兰 jiang kou pen ju lan

Stems creeping, 3–4 cm, ca. 2 mm in diam. Leaves many, closely spaced, distichous; blade deep green, with purplish red spots, elliptic-oblong, 8–10 × 5–6 mm, apex acute. Inflorescence from near apex of stem, subumbellate, 5- or 6-flowered; peduncle suberect, 6–11 mm, upper part enlarged, base with 1 or 2 tubular sheaths; floral bracts green, with purplish red spots, ovate-triangular, 1–1.3 mm; pedicel and ovary ca. 5 mm. Flowers yellowish green. Dorsal sepal elliptic, concave, ca. 2.2 × 1.2 mm, apex obtuse; lateral sepals ± oblique, oblong, ca. as large as dorsal sepal. Petals oblong, smaller than sepals; lip with an epichile and a saccate hypochile; epichile spreading, reniform, ca. 2 × 2.5 mm, margin and adaxial surface densely white hairy, with an olive central cushion, apex subtruncate and emarginate; hypochile straight, nearly parallel to ovary, subcylindric, 2.8–3

mm tall, ca. 1 mm in diam., slightly narrowed at middle, apex rounded. Column ca. 0.5 mm; anther cap narrowed into a beak at apex. Fl. Aug.

- On tree trunks at forest margins; ca. 1000 m. NE Guizhou.

**20. *Gastrochilus ciliaris*** F. Maekawa, J. Jap. Bot. 12: 92. 1936.

缘毛盆距兰 yuan mao pen ju lan

Stems creeping, to 10 cm, with many leaves. Leaf blade abaxially with brown spots, ovate-elliptic to oblanceolate, 0.8–2.5 × 0.4–0.5 cm, fleshy, leathery, apex acute or apiculate. Inflorescence subumbellate, ca. 1.2 cm, 3- or 4-flowered; floral bracts small, ca. 1 mm; pedicel and ovary 3–4 mm. Flowers yellowish green, with brown spots abaxially. Sepals similar, elliptic, 2.7–3 × 1–1.3 mm, concave, apex obtuse or acute. Petals rhombic-elliptic, 2.4–2.7 × ca. 1.3 mm; lip with an epichile and a saccate hypochile; epichile triangular, ca. 3 mm wide, ciliate, adaxially very sparsely pubescent; hypochile nearly subglobose, ca. 2 mm tall. Column ca. 1 mm, stout. Fl. unknown.

- On trees in forests; ca. 1800 m. C Taiwan [Japan].

**21. *Gastrochilus linii*** Ormerod, Taiwania 47: 242. 2002.

金松盆距兰 jin song pen ju lan

*Gastrochilus flavus* T. P. Lin, Native Orchids Taiwan 3: 95. 1987, not (J. D. Hooker) Kuntze (1891); *G. raraensis* Fukuyama var. *flavus* S. S. Ying.

Stems often less than 8 cm. Leaves distichous, closely spaced; blade grayish green abaxially, green adaxially, elliptic or oblong, ca. 3 × 0.8 cm, apex acute. Inflorescence subumbellate, 3–7-flowered; peduncle ca. 1 cm; pedicel and ovary ca. 1.2 cm. Flowers yellow, with brown spots. Sepals and petals similar, elliptic or narrowly elliptic, 5–5.5 × 2.5–3 mm, apex rounded; lip with an epichile and a saccate hypochile; epichile reflexed, white, deltoid, ca. 4 × 5.5 mm, margin and adaxial surface with white hairs, with a yellow central cushion, apex obtuse; hypochile conic, slightly laterally compressed, ca. 2 mm tall, laterally shallowly grooved, slightly attenuate and obtuse at tip, ± curved. Column short. Fl. May.

- On trunks of *Pinus* trees; ca. 2000 m. C Taiwan.

**22. *Gastrochilus sinensis*** Z. H. Tsi, Bull. Bot. Res., Harbin 9(2): 23. 1989.

中华盆距兰 zhong hua pen ju lan

Stems repent, 10–20 cm or more, ca. 2 mm in diam., slender. Leaves distichous, well spaced, very shortly petiolate; blade green, with purple-red spots, elliptic or oblong, 1–2 × 0.5–0.7 cm, apex acute and with 3 short awns. Inflorescences 2 or 3, subumbellate, 2- or 3-flowered; peduncle ca. 1 cm, slender, upper part enlarged; floral bracts ovate-triangular, ca. 1 mm; pedicel and ovary yellowish green, with purplish red spots, ca. 7 mm. Flowers small, widely opening, yellowish green, with purplish red spots. Dorsal sepal subelliptic, concave, 4–5 × ca. 2.5 mm, apex obtuse; lateral sepals slightly oblique, oblong, ca. as large as dorsal sepal, abaxially ± carinate. Petals subobovate,

slightly smaller than sepals, apex rounded; lip with an epichile and a saccate hypochile; epichile reniform, ca. 2.5 × 4–5 mm, margin and adaxial surface densely shortly hairy, with a central cushion, apex broadly emarginate; hypochile subconic, ± laterally compressed, 3.5–4 mm tall, ca. 3 mm in diam., apex obtuse-rounded and slightly bent forward, densely hairy near entrance. Column ca. 2 mm; anther cap narrowed toward apex. Fl. Oct.

- On tree trunks in forests, on rocks along valleys; 800–3200 m. N Fujian, NE Guizhou, NW Yunnan, NW Zhejiang.

**23. *Gastrochilus raraensis*** Fukuyama, Bot. Mag. (Tokyo) 48: 441. 1934.

红松盆距兰 hong song pen ju lan

*Saccolabium raraense* (Fukuyama) S. Y. Hu.

Stems creeping, usually 2–15 cm, slender. Leaves many, distichous; blade yellowish green, often with red speckles on both surfaces, oblong to lanceolate, 1.5–2.6 × 0.4–0.7 cm, apex acute and often with 3 short awns. Inflorescence subumbellate, 3–7-flowered; peduncle short, 8–10 mm; floral bracts ca. 1 mm; pedicel and ovary 5–6 mm. Flowers small, not widely opening, yellowish to yellowish green, with purplish blue spots near base of sepals and petals. Sepals similar, subelliptic, 3.5–4.5 × 1.7–2.5 mm, apex obtuse. Petals subobovate, shorter than sepals, apex rounded; lip with an epichile and a saccate hypochile; epichile nearly suborbicular or reniform, 2–3 × 3–4 mm, adaxially densely white barbate, with a yellow glabrous central cushion, apex rounded or slightly emarginate; hypochile subconic, ± laterally compressed, 3.5–4.5 mm tall, ca. 2 mm in diam., with narrowed tip and bent forward. Column very short; anther cap narrowed at apex. Fl. Jan–Feb.

- On tree trunks in coniferous forests; 1500–2200 m. Taiwan.

The record of the Japanese species *Gastrochilus toramanus* (Makino) Schlechter in the first edition of Fl. Taiwan (5: 1001. 1978) was based on the synonymization of *G. raraensis* within that species.

**24. *Gastrochilus matsudae*** Hayata, Icon. Pl. Formosan. 9: 116. 1920 [*“matsudai”*].

宽唇盆距兰 kuan chun pen ju lan

*Saccolabium matsudae* (Hayata) Makino & Nemoto.

Stems creeping, elongate, slender. Leaves distichous; blade narrowly lanceolate or linear-lanceolate, ca. 3 × 0.4–0.6 cm, fleshy, base cuneate, apex acute. Inflorescence subumbellate, 3- or 4-flowered; peduncle ca. 2 cm; pedicel and ovary 4–5 mm. Flowers yellowish green, with a few brown spots. Sepals similar, obovate-oblong or subelliptic, concave, 4.5–6 × 3–3.7 mm, base contracted, apex obtuse. Petals similar to sepals, slightly smaller; lip with an epichile and a saccate hypochile; epichile reflexed, suborbicular or flabellate, ca. 5 × 6–7 mm, adaxially densely white pubescent, with a yellow central cushion, apex rounded and retuse; hypochile parallel to epichile, distinctly bent forward, subconic, ± laterally compressed, 3–4.8 mm tall, 2–3.8 mm in diam. Column ca. 1 mm. Fl. Jan–Feb.

- On tree trunks in forests; ca. 1000 m. S Taiwan.

**25. *Gastrochilus hoi*** T. P. Lin, Native Orchids Taiwan 3: 103. 1987 [*"hoii"*].

何氏盆距兰 he shi pen ju lan

Stems prostrate, 4–10 cm, slender. Leaves distichous; blade oblong to lanceolate, 2–2.1 × 0.7–0.9 cm, base narrowed, apex acute. Inflorescence subumbellate, 2–4-flowered; peduncle short; floral bracts ovate, ca. 2 mm; pedicel and ovary ca. 1 cm. Flowers yellowish green, sometimes with brown spots. Dorsal sepal elliptic, 4–5 × ca. 3 mm, apex obtuse; lateral sepals obliquely ovate, 4–5 × 2.5–3 mm, apex acute. Petals elliptic, ca. 4 × 3 mm; lip with an epichile and a saccate hypochile; epichile recurved, reniform, 3–5 × 6–8 mm, adaxially with dense white hairs, with a green central cushion, apex emarginate; hypochile straight, conic, slightly flattened, ca. 4.5 mm tall, ca. 4 mm in diam., obtuse at tip. Column very short. Fl. Jan–Feb.

- On tree trunks in coniferous forests; 2000–2500 m. Taiwan.

**26. *Gastrochilus formosanus*** (Hayata) Hayata, Icon. Pl. Formosan. 6(Suppl.): 78. 1917.

台湾盆距兰 tai wan pen ju lan

*Saccolabium formosanum* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 336. 1911; *Gastrochilus formosanus* var. *shaoyaoi* (S. S. Ying) S. S. Ying; *G. nebulosus* Fukuyama; *G. quercetorum* Fukuyama; *G. rupestris* Fukuyama; *S. nebulosum* (Fukuyama) S. Y. Hu; *S. quercetorum* (Fukuyama) S. Y. Hu; *S. rupestre* (Fukuyama) S. Y. Hu; *S. shaoyaoi* S. S. Ying.

Stems often prostrate, to 37 cm, ca. 2 mm in diam., slender, often branched, internodes ca. 5 mm. Leaves many, distichous; blade green, sometimes with purple-red spots on both surfaces, oblong or elliptic, 1.5–3 × 0.4–0.8 cm, slightly fleshy, apex acute or bifid, with an abaxial awn. Inflorescence subumbellate, 2- or 3-flowered; peduncle often 1–1.5 cm; floral bracts triangular, 1–2 mm, membranous; pedicel and ovary pale yellow, with purplish red spots, 1–1.5 mm. Flowers yellowish, with purplish speckles or irregular blotches. Dorsal sepal concave, elliptic-oblong, 4.8–7 × 2.5–4 mm, apex obtuse; lateral sepals obliquely oblong, similar in size to dorsal sepal, apex obtuse. Petals oblanceolate, 4–5 × 2.8–3 mm, apex rounded; lip with an epichile and a saccate hypochile; epichile white, broadly triangular or nearly suborbicular, 2.2–3.2 × 7–9 mm, adaxially with a yellow densely papillate-hairy cushion, margin entire or slightly dentate-undulate, apex subtruncate or rounded; hypochile subcupular, ca. 5 mm tall, ca. 4 mm in diam. Column ca. 1.5 mm; anther cap narrowed toward apex. Fl. throughout year.

- On tree trunks in forests; 500–2500 m. N Fujian, W Hubei, S Shaanxi, Taiwan.

Material of this species was treated by T. S. Liu and H. J. Su (Fl. Taiwan 5: 1001. 1978) as *Gastrochilus matsuran* (Makino) Schlechter, a species restricted to Japan and Korea.

**27. *Gastrochilus saccatus*** Z. H. Tsi, Guihaia 16: 149. 1996.

四肋盆距兰 si lei pen ju lan

Stems creeping, 3–9 cm, ca. 2 mm in diam., sometimes

branched, internodes 4–5 mm. Leaves many, distichous; blade elliptic, 1–1.8 × 0.4–0.7 cm, apex acute and slightly 3-lobed. Inflorescence subumbellate, 2- or 3-flowered; peduncle ca. 7 mm, slender, upper part slightly enlarged, with 2 sheaths at base; floral bracts ovate-triangular, small, ca. 1 mm; pedicel and ovary ca. 6 mm. Dorsal sepal elliptic, ca. 4.8 × 2.8 mm, apex obtuse; lateral sepals slightly oblique, oblong, ca. 5 × 2.6 mm, apex obtuse. Petals oblanceolate, ca. 4 × 2.6 mm, apex rounded; lip with an epichile and a saccate hypochile; epichile recurved, reniform or reniform-triangular, ca. 2.7 × 9 mm, margin and adaxial surface densely shortly hairy, with a central cushion extending to hypochile, apex obtuse; hypochile straight, subglobose or cupular, ca. 4 mm tall, ca. 3 mm in diam., outside 4-ridged, apex rounded. Column short; anther cap ca. 2 mm, narrowed toward apex. Fl. unknown.

- Yunnan.

**28. *Gastrochilus gongshanensis*** Z. H. Tsi, Guihaia 16: 149. 1996.

贡山盆距兰 gong shan pen ju lan

Stems creeping, ca. 14 cm, ca. 2 mm in diam., internodes 4–5 mm. Leaves many, distichous; blade oblong, 1.5–1.6 × ca. 0.6 cm, apex acute and slightly 3-lobed. Inflorescence subumbellate, often 2-flowered; peduncle ca. 1 cm, upper part enlarged, lower part with 2 cupular sheaths; floral bracts ovate-triangular, ca. 1.5 mm. Dorsal sepal subelliptic, concave, ca. 5 × 3 mm, 1-veined, apex obtuse; lateral sepals oblong, ca. 5 × 2.3 mm, 1-veined, apex obtuse. Petals subobovate, ca. 4.5 × 2.5 mm, 1-veined, apex rounded; lip with an epichile and a saccate hypochile; epichile reniform, ca. 2.5 × 4 mm, margin and adaxial surface densely shortly barbate, with a central cushion, apex rounded and broadly emarginate; hypochile nearly subglobose, ca. 3 mm tall, ca. 2.5 mm in diam. Column ca. 1 mm; anther cap narrowed and beaked at apex. Fl. unknown.

- On rocks in forests; ca. 3200 m. NW Yunnan.

**29. *Gastrochilus nanchuanensis*** Z. H. Tsi, Guihaia 16: 149. 1996.

南川盆距兰 nan chuan pen ju lan

Stems creeping, 4–7 cm, ca. 2 mm in diam., internodes 4–5 mm. Leaves many, distichous; blade green, with purple-red spots, ovate or elliptic, 1.3–1.6 × 0.6–0.9 cm, apex acute and 3-lobed. Inflorescence subumbellate, 2- or 3-flowered; peduncle 5–7 mm, lower part with 2 cupular sheaths; floral bracts ovate, ca. 1 mm, apex acute; pedicel and ovary ca. 9 mm. Flowers yellow, with purplish red spots, not widely opening. Sepals similar, elliptic, concave, ca. 4.2 × 3.5 mm, apex obtuse. Petals similar to sepals, ca. 4.1 × 2.9 mm, apex obtuse; lip with an epichile and a saccate hypochile; epichile nearly suborbicular or reniform, ca. 3 × 6 mm, adaxially densely shortly hairy, with a central cushion extending to hypochile, apex subtruncate and deeply 2-lobed; hypochile subconic, dorsiventrally compressed, ca. 3.3 mm tall, ca. 4.2 mm in diam., apex rounded. Column very short; anther cap narrowed and beaked at apex. Fl. Dec.

- On tree trunks in dense forests; ca. 1200 m. Chongqing (Nanchuan).

**186. HOLCOGLOSSUM** Schlechter, *Repert. Spec. Nov. Regni Veg. Beih.* 4: 285. 1919.槽舌兰属 *cao she lan shu*

Jin Xiaohua (金效华); Jeffrey J. Wood

Herbs, epiphytic, monopodial, small to moderate-sized. Stems enclosed by persistent leaf sheaths, rooting mostly from base or lower part. Leaves many, distichous, terete, subterete, or broadly subterete, fleshy, adaxially channeled, jointed and dilated into sheathing base. Inflorescences axillary, racemose, few to many flowered; rachis usually purple; floral bracts much shorter than pedicel and ovary. Flowers usually opening widely. Sepals subsimilar, dorsally usually  $\pm$  carinate; lateral sepals often slightly larger, oblique. Petals similar to dorsal sepal; lip saccate or spurred, 3-lobed; lateral lobes erect beside entrance of spur, spotted; mid-lobe rather larger, often narrowed and with appendages at base; spur often cylindric and curved, attenuate toward tip, interior usually hispid papillose. Column short, thick, winged, with a very short but distinct foot; rostellum distinct, sometimes reduced, bilobed; pollinia 2, waxy, globose, porate, attached by a common, short, linear stipe to a broad viscidium.

Twelve species: mainly in China, extending to Vietnam, Laos, Thailand, Myanmar, and NE India; 12 species (seven endemic) in China.

- 1a. Leaves broadly subterete, 5–10 mm wide ..... 1. *H. amesianum*  
 1b. Leaves terete or subterete, 2–3(–4) mm wide.  
 2a. Spur broadly saccate; mid-lobe of lip with an incurved margin, concave or shallowly cucullate at base ..... 2. *H. subulifolium*  
 2b. Spur cylindrical to hornlike; mid-lobe of lip flat, not concave nor cucullate at base.  
 3a. Mid-lobe of lip entire or nearly entire, with fleshy and thickened callus at base; spur 7–8(–12) mm.  
 4a. Plants erect; inflorescence 6–10-flowered ..... 9. *H. rupestre*  
 4b. Plants pendulous or slanting; inflorescence 1–3-flowered.  
 5a. Flowers very small (sepals 9–10  $\times$  4–5 mm, petals ca. 8  $\times$  4 mm), spur unornamented inside ..... 11. *H. sinicum*  
 5b. Flowers medium to large, spur hispid papillate inside.  
 6a. Leaves 4–8.5 cm  $\times$  3–4 mm; floral bracts 5–8 mm ..... 8. *H. flavescens*  
 6b. Leaves 20–30 cm  $\times$  ca. 2 mm; floral bracts ca. 2 mm.  
 7a. Mid-lobe of lip semicircular ..... 10. *H. weixiense*  
 7b. Mid-lobe of lip rhombic ..... 12. *H. mujiangense*  
 3b. Mid-lobe of lip with a denticulate or undulate margin, with crested lamellae at base; spur (8–)12–20 mm.  
 8a. Spur cylindrical, not narrowed toward end; mid-lobe of lip ca. 2  $\times$  as long as spur ..... 7. *H. wangii*  
 8b. Spur narrowed toward end; mid-lobe of lip nearly as long as spur.  
 9a. Mid-lobe of lip suborbicular, purple ..... 3. *H. kimballianum*  
 9b. Mid-lobe of lip ligulate to obovate-rhombic, white.  
 10a. Lateral lobes of lip entire; mid-lobe obovate-rhombic; column foot indistinct ..... 4. *H. quasipinifolium*  
 10b. Lateral lobes of lip bilobed, with 2 lobules; mid-lobe ligulate; column foot distinct, 1.5–2 mm.  
 11a. Mid-lobe of lip ca. 2  $\times$  as long as wide, lower lobule of lateral lobe triangular ..... 5. *H. omeiense*  
 11b. Mid-lobe of lip ca. 3  $\times$  as long as wide, lower lobule of lateral lobe ovate ..... 6. *H. lingulatum*

**1. *Holcoglossum amesianum*** (H. G. Reichenbach) Christenson, *Notes Roy. Bot. Gard. Edinburgh* 44: 255. 1987.

大根槽舌兰 *da gen cao she lan*

*Vanda amesiana* H. G. Reichenbach, *Gard. Chron.*, ser. 3, 1: 764. 1887.

Plants ascending. Stems 2–5 cm, rooting at base. Leaves 4–7, nearly basal; blade broadly subterete, 9–30 cm  $\times$  5–10 mm, fleshy, adaxially channeled or  $\pm$  conduplicate, acute. Inflorescence ascending, 23–25 cm, several flowered; peduncle to 15 cm, 4–5 mm in diam., with 2–4 short sheaths; floral bracts ovate, 3–4 mm, obtuse. Flowers thinly textured, sepals and petals white with pinkish midvein, lip with 3 deep purple-red ridges above, anther cap white; pedicel and ovary whitish, 3–5 cm. Dorsal sepal elliptic, ca. 15  $\times$  10 mm, base contracted, apex obtuse; lateral sepals obliquely ovate-elliptic, ca. 15  $\times$  11 mm, obtuse. Petals oblanceolate, ca. 14  $\times$  9 mm, base contracted, apex obtuse; lip spurred, 3-lobed; lateral lobes ascending, ovate-triangular, ca. 4  $\times$  5 mm,  $\pm$  adnate to base of column,

obtuse; mid-lobe reniform-orbicular, ca. 10  $\times$  14 mm, base with an erect square appendage at spur entrance, margin denticulate, apex retuse; spur narrowly conic, ca. 6  $\times$  3–4 mm, obtuse and slightly curved backward at tip. Column ca. 6 mm, thick; anther cap narrowed and truncate at apex. Fl. Dec–Mar.  $2n = 38$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; 1200–2000 m. S and W Yunnan [India, Laos, Myanmar, Thailand, Vietnam].

**2. *Holcoglossum subulifolium*** (H. G. Reichenbach) Christenson, *Notes Roy. Bot. Gard. Edinburgh* 44: 255. 1987.

凹唇槽舌兰 *ao chun cao she lan*

*Vanda subulifolia* H. G. Reichenbach, *Flora* 69: 552. 1886;  
*Holcoglossum auriculatum* Z. J. Liu, S. C. Chen & X. H. Jin; *V. watsonii* Rolfe.

Plants ascending. Stems 2–20 cm. Leaves often 3–5; blade nearly subterete, 5–14 cm  $\times$  ca. 3 mm, fleshy, adaxially channeled, apex acute. Inflorescence ascending, arching, ca. 14 cm, several flowered; floral bracts ovate, ca. 5 mm. Flowers

opening widely, white, thinly textured, lateral lobes of lip brownish yellow, tinged with pale purple, mid-lobe with yellowish brown ridges, anther cap pale yellow; pedicel and ovary white, tinged with purple, 2–3 cm. Dorsal sepal suboblong, ca.  $17 \times 6$  mm, base contracted, apex acute; lateral sepals falcate-oblong, ca.  $19 \times 7$  mm. Petals oblong-lanceolate, slightly smaller than dorsal sepal; lip spurred, 3-lobed; lateral lobes erect, triangular, acute; mid-lobe broadly triangular, ca.  $12 \times 10$  mm, concave or shallowly cucullate, base with 3 ridges, margin incurved, undulate and irregularly denticulate; spur conic, 2–3 mm, obtuse. Column 4–5 mm, foot very short; anther cap slightly narrowed toward apex. Fl. Mar–May.

Epiphytic on tree trunks in broad-leaved evergreen forests; 1300–2200 m. SW Hainan, SE Yunnan (Malipo) [Myanmar, Thailand, Vietnam].

**3. *Holcoglossum kimballianum*** (H. G. Reichenbach) Garay, Bot. Mus. Leaflet 23: 182. 1972.

管叶槽舌兰 *guan ye cao she lan*

*Vanda kimballiana* H. G. Reichenbach, Gard. Chron., ser. 3, 5: 232. 1889; *Holcoglossum saprophyticum* (Gagnepain) Christenson; *V. saprophytica* Gagnepain.

Plants ascending. Stems short to slightly elongate. Leaves often 4 or 5; blade terete, 30–60 cm  $\times$  3–4 mm, fleshy, adaxially channeled, apex acuminate. Inflorescence nodding, 10–28 cm, laxly many flowered; floral bracts broadly ovate, ca. 5 mm, obtuse. Flowers large, opening widely, thinly textured, sepals and petals white, sometimes tinged with pale purple, lip purple or white heavily striped with purple, lateral lobes brownish, spur and column white; pedicel and ovary 3–3.5 cm. Dorsal sepal elliptic, ca.  $23 \times 8$  mm, base contracted into a short claw, apex obtuse; lateral sepals obliquely ovate-falcate, ca.  $27 \times 10$  mm, obtuse. Petals similar to dorsal sepal; lip spurred, 3-lobed; lateral lobes erect, somewhat ovate-lanceolate, oblique, abruptly contracted near middle, apical half linear-lanceolate and curved; mid-lobe suborbicular, ca. 1.6 cm, adaxially with 2 or 3 basal lamellae, margin  $\pm$  erose, apex retuse; spur  $\pm$  arcuate, cylindrical, ca. 1.5 cm, attenuate toward tip. Column ca. 7 mm; anther cap narrowed at apex. Fl. Oct–Nov.  $2n = 38$ .

Epiphytic on tree trunks or rocks in forests; 1000–1700 m. S Yunnan [Laos, Myanmar, Thailand, NW Vietnam].

**4. *Holcoglossum quasipinifolium*** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 285. 1919.

槽舌兰 *cao she lan*

*Saccolabium quasipinifolium* Hayata, Icon. Pl. Formosan. 2: 144. 1912.

Plants ascending. Stems ca. 5 cm. Leaves 6–10; blade subterete, 7–10 cm  $\times$  ca. 3 mm, adaxially channeled; basal sheaths equitant. Inflorescence axillary, 6–10 cm, usually 1–5 flowered; peduncle 4–6 cm, with 2 or 3 tubular sheaths; floral bracts ovate, usually 6–7 mm. Flowers opening widely, white, tinged with pink and slightly spotted with brownish red on midvein of sepals and petals, tinged yellowish brown on lateral lobes of lip; pedicel and ovary ca. 2.5 cm. Dorsal sepal obovate-oblong,  $10\text{--}16 \times 4\text{--}6$  mm, dorsally carinate, base contracted,

apex obtuse; lateral sepals obliquely oblong or falcate-oblong,  $12\text{--}17 \times 6\text{--}8$  mm, dorsally carinate, base contracted, apex acute. Petals slightly oblique, oblong-elliptic,  $10\text{--}16 \times 6\text{--}8$  mm, dorsally slightly carinate, base contracted, apex obtuse; lip spurred, 3-lobed; lateral lobes erect, 5–6 mm; mid-lobe obovate-cuneate,  $13\text{--}16 \times 7\text{--}8$  mm, with 5–7 crested lamellae near base, apical margin  $\pm$  denticulate, apex truncate and retuse; spur cylindrical,  $1.2\text{--}1.8$  cm  $\times$  ca. 2 mm, narrowed toward tip, sometimes bent forward. Column ca. 6 mm. Fl. Feb–Apr.

• Epiphytic on tree trunks in mixed or coniferous forests; 1800–2800 m. Taiwan.

**5. *Holcoglossum omeiense*** X. H. Jin & S. C. Chen, Kew Bull. 59: 633. 2005.

峨眉槽舌兰 *e mei cao she lan*

Plants ascending or arching. Stems 2–30 cm. Leaves many; blade terete, 6–20 cm  $\times$  ca. 2 mm, slender, fleshy, adaxially channeled, apex acute. Inflorescences 1–10-flowered; rachis flexuous; floral bracts ovate, ca. 4 mm. Flowers white, veins usually reddish or pinkish, fully opening; pedicel and ovary ca. 2 cm. Sepals and petals slightly twisted; dorsal sepal obovate-oblong, ca.  $12 \times 5$  mm, apex obtuse; lateral sepals falcate-oblong obtuse, ca.  $15 \times 6$  mm, oblique at base. Petals oblong, ca.  $12 \times 4$  mm, base contracted, apex obtuse; lip spurred, 3-lobed; lateral lobes ca. 5 mm, erect, bilobulate, lower lobule triangular; mid-lobe oblong-ligulate,  $13\text{--}20 \times 7\text{--}9$  mm, spreading, with 3–7 crested basal lamellae, apical margins undulate or crenulate; spur conic-cylindrical, 16–20 mm, usually rigid, narrowed toward tip,  $\pm$  bent forward. Column 5–6 mm, foot ca. 2 mm. Fl. Sep–Oct.

• Epiphytic on tree trunks in open forests; 700–1000 m. SC Sichuan (Emei Shan).

**6. *Holcoglossum lingulatum*** (Averyanov) Averyanov, Konsp. Sosud. Rast. Fl. Vietnam 1: 110. 1990.

舌唇槽舌兰 *she chun cao she lan*

*Holcoglossum kimballianum* (H. G. Reichenbach) Garay var. *lingulatum* Averyanov, Bot. Zhurn. (Moscow & Leningrad) 73: 426. 1988; *H. tangii* Christenson.

Plants ascending or arching. Stems 2–20 cm, ca. 7 mm in diam. Leaves many, often twisted at base and  $\pm$  secund; blade terete, 10–19 cm  $\times$  2–3 mm, slender, fleshy, adaxially channeled, apex acute. Inflorescence shorter or nearly as long as leaves, 1–6-flowered; peduncle and rachis slender; rachis flexuous; floral bracts deflexed, ovate, ca. 3 mm. Flowers white, often slightly spotted with reddish brown, opening widely; pedicel and ovary 2–2.5 cm, ovary 5- or 6-ribbed. Sepals and petals slightly twisted; dorsal sepal obovate-oblong, ca.  $13 \times 5$  mm, base contracted, apex obtuse; lateral lobes falcate-oblong or obliquely ovate-oblong, ca.  $13 \times 6$  mm, obtuse. Petals oblong, ca.  $12 \times 4.5$  mm, base contracted, apex obtuse; lip spurred, 3-lobed; lateral lobes erect, ca. 5 mm, unequally bilobulate, lower lobule ovate; mid-lobe from deep gap of front wall of spur, spreading, ligulate,  $12\text{--}15 \times 3\text{--}5$  mm, with 2 or 3 crested basal lamellae, apical margin undulate or crenulate, apex obtuse and retuse or shallowly bilobed; spur funnel-shaped, ca. 2 cm,

usually rigid, narrowed toward tip, sometimes  $\pm$  bent forward. Column ca. 6 mm, foot ca. 1.5 mm. Fl. Oct–Jan.  $2n = 38$ .

Epiphytic on tree trunks in open forests; 1000–1300 m. NW Guangxi, SE Yunnan [NW Vietnam].

**7. *Holcoglossum wangii*** Christenson, Lindleyana 13: 123. 1998.

筒距槽舌兰 tong ju cao she lan

Stems ca. 2 cm. Leaves several, nearly basal; blade subterete, 30–58 cm  $\times$  ca. 4 mm, fleshy. Inflorescence ca. 5 cm, 3–5-flowered; rachis purple; floral bracts ovate, ca. 2 mm. Flowers white, lateral lobes of lip yellow, spotted with purple; pedicel and ovary ca. 3.3 cm. Dorsal sepal oblong, ca. 20  $\times$  7 mm, obtuse; lateral sepals oblique, elliptic, ca. 23  $\times$  10 mm, base clawed and  $\pm$  twisted, apex obtuse. Petals elliptic-oblong, ca. 28  $\times$  10 mm, base twisted and clawed, apex obtuse; lip spurred, 3-lobed; lateral lobes erect, unequally bilobulate; mid-lobe oblong-elliptic, ca. 18  $\times$  15 mm, with 3–5 basal lamellae; spur cylindrical, 8–10 mm. Column ca. 6 mm. Fl. Oct–Dec.  $2n = 38^*$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; 800–1200 m. SW Guangxi, SE Yunnan [N Vietnam].

**8. *Holcoglossum flavescens*** (Schlechter) Z. H. Tsi, Acta Phytotax. Sin. 20: 441. 1982.

短距槽舌兰 duan ju cao she lan

*Aerides flavescens* Schlechter, Repert. Spec. Nov. Regni Veg. 19: 382. 1924; *Papilionanthe flavescens* (Schlechter) Garay; *Saccolabium yunpeense* Tang & F. T. Wang.

Stems 1–2 cm, with several leaves. Leaves nearly basal, distichous; blade subterete, 4–8.5 cm  $\times$  3–4 mm, fleshy or thickly leathery, adaxially broadly channeled or  $\pm$  conduplicate, apex acute. Inflorescence suberect or arching, 3–5 cm, 1–3-flowered; floral bracts slightly reflexed, broadly ovate, 5–8 mm. Flowers opening widely, white, tinged with yellow, lateral lobes of lip with brownish purple stripes, callus yellow, column striped purplish red on either side, anther cap white; pedicel and ovary ca. 1.7 cm. Dorsal sepal elliptic, 9–12  $\times$  4.5–6 mm, base slightly contracted, apex obtuse; lateral sepals obliquely oblong, 13–14  $\times$  5–6 mm, dorsally  $\pm$  carinate, apex obtuse. Petals elliptic, 9–12  $\times$  4.2–5.5 mm, obtuse; lip spurred, 3-lobed; lateral lobes erect, subovate or ovate-triangular, obtuse; mid-lobe broadly ovate-rhombic, 6–8  $\times$  ca. 7 mm, margin slightly undulate, apex obtuse-rounded or sometimes emarginate, with a broadly ovate-triangular basal callus; callus strongly thickened, centrally channeled; spur bent forward, horn-shaped, ca. 7 mm, narrowed toward tip. Column ca. 5 mm, winged, foot ca. 2 mm; rostellum large. Capsule ellipsoid, 2–3 cm  $\times$  6–7 mm. Fl. Mar–May, fr. Aug–Sep.  $2n = 38^*$ .

• Epiphytic on tree trunks in broad-leaved evergreen forests; 1200–2700 m. N Fujian, SW Hubei, SW Sichuan, N Yunnan.

**9. *Holcoglossum rupestre*** (Handel-Mazzetti) Garay, Bot. Mus. Leaf. 23: 182. 1972.

滇西槽舌兰 dian xi cao she lan

*Vanda rupestris* Handel-Mazzetti, Anz. Akad. Wiss. Wien,

Math.-Naturwiss. Kl. 62: 241. 1925; ?*Holcoglossum tsii* T. Yukawa.

Plants erect. Stems ca. 2 cm, base with many roots to 50 cm. Leaves many; blade terete, 12–28 cm  $\times$  2–2.5 mm, fleshy, acuminate. Inflorescence ascending, 5–10 cm, 2–10-flowered; peduncle with several ovate sheaths; rachis soft, slender; floral bracts persistent, ovate, ca. 1 cm. Flowers opening widely, ca. 3 cm in diam., sepals and petals white, lip with yellowish callus at base; pedicel and ovary 2.5–3.5 mm. Dorsal sepal subelliptic, ca. 12  $\times$  7 mm, obtuse; lateral lobes slightly oblique, oblong, ca. 12  $\times$  7 mm, dorsally carinate, apex obtuse. Petals subovate-elliptic, ca. 10  $\times$  5.5 mm, obtuse-rounded; lip spurred, 3-lobed; lateral lobes erect, subobovate, slightly unequally bilobulate; mid-lobe ovate, 11–12  $\times$  ca. 7 mm, with 2 or 3 small crested basal appendages, margin  $\pm$  undulate, apex rounded; spur bent forward, nearly cylindrical, ca. 8  $\times$  2 mm, narrowed toward tip, acute. Column ca. 5 mm, slightly enlarged toward apex. Fl. Jun.  $2n = 38^*$ .

• Epiphytic on *Quercus* in mixed forests; 2000–2400 m. NW Yunnan.

**10. *Holcoglossum weixiense*** X. H. Jin & S. C. Chen, Syst. Gen. Holcoglossum, 94. 2003.

维西槽舌兰 wei xi cao she lan

Plants pendulous. Stems 1–2 cm, rooting at base. Leaves many, nearly basal; leaf blade subterete, 10–30 cm  $\times$  1.5–2 mm, fleshy, acuminate. Inflorescence short, 1–5-flowered; floral bracts ovate, ca. 2 mm. Flowers white, slightly tinged with pink, lip lateral lobes with purple stripes adaxially; pedicel and ovary ca. 2 cm. Dorsal sepal elliptic, ca. 10  $\times$  7 mm, subobtuse; lateral sepals oblique, similar to dorsal sepal, ca. 15  $\times$  9 mm. Petals spatulate, ca. 11  $\times$  6 mm, obtuse; lip attached to end of column foot, immovable, spurred, 3-lobed; lateral lobes erect, triangular, base extending to column foot; mid-lobe semicircular, ca. 10  $\times$  12 mm, entire, with a strongly thickened basal callus, its sides swollen and forming 2 ridges; spur ca. 7 mm, narrowed toward end, inside papillate. Column ca. 4 mm, foot ca. 1 mm. Fl. May–Jun.  $2n = 38^*$ .

• Epiphytic on tree trunks in broad-leaved forests along valleys; 2500–3000 m. NW Yunnan.

**11. *Holcoglossum sinicum*** Christenson, Notes Roy. Bot. Gard. Edinburgh 44: 255. 1987.

中华槽舌兰 zhong hua cao she lan

Plants pendulous. Stems very short. Leaves many, nearly basal; blade subterete, 10–20 cm  $\times$  ca. 2 mm, fleshy, acute. Inflorescence very short, 1–3-flowered; floral bracts ovate, ca. 2 mm. Flowers opening widely, white, lip callus yellow. Dorsal sepal elliptic, ca. 9  $\times$  4 mm, obtuse; lateral sepals slightly oblique, subelliptic, ca. 10  $\times$  5 mm, obtuse. Petals similar to dorsal sepal, ca. 8  $\times$  4 mm, obtuse; lip spurred, 3-lobed; lateral lobes erect, ovate-triangular, ca. 2 mm wide, base decurrent and adnate to column foot, apex obtuse; mid-lobe subrhombic, ca. 7 mm wide, with a basal callus, margin entire, apex rounded; spur narrowly conic, ca. 8 mm. Column erect, ca. 3 mm, foot ca. 2 mm; stipe linear, tapering; viscidium

irregularly square, wider than stipe. Capsule cylindrical, ca. 1.3 cm × 3 mm, 6-ribbed. Fl. May, fr. Jun–Aug.  $2n = 38^*$ .

• Epiphytic on tree trunks in *Alnus* or *Quercus* forests; 2600–3200 m. N Yunnan.

**12. *Holcoglossum nujiangense*** X. H. Jin & H. Li, *Nordic J. Bot.* 25: 127. 2008.

怒江槽舌兰 nu jiang cao she lan

Plants pendulous. Roots white, terete, ca. 2 mm in diam. Stems 1–2 cm. Leaves subterete, 20–30 cm × ca. 1.5 mm, apex acuminate. Inflorescence lateral, 1–5-flowered; peduncle ca. 1

cm; floral bracts ovate, ca. 7 mm. Flowers fully opening, white; pedicel and ovary ca. 2 cm. Dorsal sepal erect, elliptic, ca. 1.4 × 6 mm, apex obtuse; lateral sepals oblique, narrowly elliptic, ca. 1.3 × 5 mm. Petals narrowly ovate, ca. 1.2 × 6 mm; lip 3-lobed; lateral lobes erect, triangular, adaxially with red stripes; mid-lobe broadly rhombic, ca. 6 × 8 mm, entire, obtuse, with a yellow fleshy callus at its base; spur funnel-shaped, curved forward, 6–10 mm. Column white, ca. 3 mm, foot ca. 1 mm; viscidium narrowly suborbicular. Fl. Apr–May.  $2n = 38^*$ .

• Epiphytic on tree trunks in evergreen broad-leaved forests; 2500–3000 m. W Yunnan.

**187. *ASCOCENTRUM*** Schlechter ex J. J. Smith, *Bull. Jard. Bot. Buitenzorg, sér. 2*, 14: 49. 1914.

鸟舌兰属 niao she lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

*Ascolabium* S. S. Ying.

Herbs, epiphytic, small, monopodial. Stems short or sometimes ± elongate, enclosed in leaf sheaths, rooting at nodes near base. Leaves several to many, usually distichous, either nearly lorate with conduplicate basal half and praemorse apex, or subterete and deeply channeled above, jointed and sheathing at base. Inflorescences axillary, racemose, erect or spreading, usually many flowered. Flowers small, opening widely. Sepals and petals similar; lip firmly adnate to base of column, immovable, 3-lobed, spurred; lateral lobes suberect, small, usually adnate to column; mid-lobe larger, oblong, porrect or decurved, base often with thickenings at spur entrance; spur slender, usually rather long, unornamented inside. Column short, footless; rostellum short, 2-lobed; pollinia 2, waxy, globose, cleft, attached by a common, short, linear stipe to a broad viscidium.

About five species: from the Himalayas to Indonesia and the Philippines; three species (one endemic) in China.

- 1a. Leaves flat, 10–15 mm in diam. .... 1. *A. ampullaceum*  
 1b. Leaves terete, 1.5–5 mm in diam.  
     2a. Stems 9–20 cm; leaves usually 30–50 cm; lip white ..... 2. *A. himalaicum*  
     2b. Stems 1.5–2 cm; leaves 3–8 cm; lip pink ..... 3. *A. pumilum*

**1. *Ascocentrum ampullaceum*** (Roxburgh) Schlechter, *Repert. Spec. Nov. Regni Veg. Beih.* 1: 975. 1913.

鸟舌兰 niao she lan

*Aerides ampullacea* Roxburgh, *Fl. Ind.*, ed. 1832, 3: 476. 1832; *Gastrochilus ampullaceus* (Roxburgh) Kuntze; *Oeceoclades ampullacea* (Roxburgh) Lindley ex Voigt; *Saccolabium ampullaceum* (Roxburgh) Lindley.

Stems erect, 1–4 cm, stout. Leaves usually 3 or 4, nearly basal; leaf blade abaxially ± tinged reddish, adaxially yellowish green with purplish red spots, narrowly oblong, 5–20 × 1–1.5 cm, flat, conduplicate in basal half, thickly leathery, apex praemorse. Inflorescences often 2–4, erect, 5–7 cm, shorter than leaves, many flowered; peduncle and rachis pale vermilion; floral bracts ovate-triangular, ca. 1 mm, acute. Flowers uniformly deep pinkish red, opening widely, 1.5–1.8 cm in diam., anther cap and pollinia purplish; pedicel and ovary pale vermilion, 13–15 mm. Sepals and petals broadly ovate, 7–9 × 4–6 mm, obtuse; lip 3-lobed; lateral lobes erect, subtriangular, very small, obtuse; mid-lobe narrowly oblong, or ligulate, 6–7 × 1–2 mm, apex obtuse to acute, base with 2 calli at spur entrance; spur pale, cylindrical, 8–9 × ca. 2.5 mm, apical half ± curved and slightly dilated. Column ca. 2 mm, thick. Fl. Apr–May.  $2n = 38$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; 1100–1500 m. S and SE Yunnan [Bhutan, India (including Andaman Islands), Laos, Myanmar, Nepal, Thailand].

**2. *Ascocentrum himalaicum*** (Deb, Sengupta & Malick) Christenson, *Notes Roy. Bot. Gard. Edinburgh* 44: 256. 1987.

圆柱叶鸟舌兰 yuan zhu ye niao she lan

*Saccolabium himalaicum* Deb, Sengupta & Malick, *Bull. Bot. Soc. Bengal* 22(2): 213. 1968; *Holcoglossum himalaicum* (Deb, Sengupta & Malick) Averyanov; *H. junceum* Z. H. Tsi.

Plants pendulous. Stems 9–24 cm, 5–8 mm in diam., upper part with 3–5 leaves. Leaf blade terete, 35–50 × 0.1–0.2 cm, fleshy, channeled adaxially, apex acute. Inflorescences often 1 or 2, supra-axillary, racemose, 4–9 cm, several to 11-flowered; rachis ca. 3 cm; floral bracts reflexed, ovate, ca. 4 mm, membranous. Flowers ca. 1 cm, not opening widely, sepals and petals reddish, lip white; pedicel and ovary ca. 1.3 mm. Sepals and petals elliptic, 4–5 × 2–2.3 mm, dorsally carinate, apex obtuse; lateral sepals slightly broader; lip spurred, 3-lobed, ecallose; lateral lobes erect, ca. 2 × 1.5 mm, rounded; mid-lobe spreading, subobovate-cuneate, 3–4 × 2–2.3 mm, adaxially with 3 longitudinal central veins, apex subtruncate; spur upcurved and falcate, cylindrical, 1.3–1.5 cm × ca. 1 mm, obtuse. Column ca. 1 mm, thick. Capsule fusiform, 3–4 cm × 5–7 mm. Fl. Nov, fr. Dec–Jan.  $2n = 38, 57$ .

Epiphytic on tree trunks in broad-leaved evergreen forests; below 1900 m. SW and W Yunnan [Bhutan, NE India, Myanmar].

**3. *Ascocentrum pumilum*** (Hayata) Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 4: 285. 1919.

尖叶鸟舌兰 *jian ye niao she lan*

*Saccolabium pumilum* Hayata, Bot. Mag. (Tokyo) 20: 77. 1906; *Ascolabium pumilum* (Hayata) S. S. Ying.

Stems erect, 1.5–2 cm, 2–3 mm in diam., usually with 5–7 leaves. Leaves distichous; leaf blade green or sometimes brownish green, terete, 3–8 cm × 1.5–3 mm, fleshy, channeled above. Inflorescence axillary, erect, to 4 cm, 3–10-flowered; peduncle and rachis slender; floral bracts lanceolate or ovate-

lanceolate, 3.5–5 mm, membranous. Flowers small, not opening widely, pink, lip lateral lobes yellowish, spur greenish, tinged with purple, column red; pedicel and ovary 6–10 mm. Sepals and petals similar, oblong-lanceolate, 4–7 × 2–3 mm, obtuse; lip spurred, 3-lobed; lateral lobes erect, yellowish, suborbicular, ca. 1 mm; mid-lobe ovate, 4–5 × 3–4 mm, acute or apiculate; spur nearly parallel to ovary, straight, cylindrical, 5–6 × ca. 0.5 mm. Column ca. 2 mm. Fl. Dec–Feb.  $2n = 38^*$ .

• Epiphytic on tree trunks in broad-leaved evergreen forests; 1000–2000 m. Taiwan.

## 188. *PENKIMIA* Phukan & Odyuo, Orchid Rev. 114: 330. 2006.

心启兰属 *xin qi lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

*Chenorthis* Z. J. Liu, K. W. Liu & L. J. Chen.

Herbs, epiphytic, monopodial, small. Stems rather short, enclosed in leaf sheaths, rooting near base. Leaves many, distichous, subterete and channeled above, jointed and sheathing at base. Inflorescence from basal portion of stem, racemose, many flowered. Flowers small. Sepals and petals somewhat similar; lip adnate to base of column, immobile, 3-lobed, spurred; lateral lobes from both lower sides of mid-lobe; spur cylindrical, unornamented inside. Column short, footless; rostellum large, subsquare, conspicuously broader than column; pollinia 2, waxy, each with a distinct caudicle attached to subterminal portion of a common linear stipe; viscidium subelliptic, slightly broader than stipe.

One species: China, NE India.

*Penkimia* may be related to *Ascocentrum* and *Holcoglossum*. *Chenorthis singchii* was described as a new genus and species by Liu et al. (Acta Ecol. Sin. 28: 2433–2444. Jun 2008). Its holotype (Yunnan: Tengchong, Wuhe, 1650 m, 16 Feb 2008, Z. J. Liu 3862, NOCC) is from the same area as the first Chinese gathering of *P. nagalandensis* (Yunnan: Tengchong, Wuhe, 2000 m, 15 Mar 2007, X. H. Jin 8923, PE) reported five months after the publication of *Chenorthis* by Jin and Fan (Acta Bot. Yunnan. 30: 531–532. Oct 2008). *Penkimia* was described as a new genus in 2006 and therefore has priority.

**1. *Penkimia nagalandensis*** Phukan & Odyuo, Orchid Rev. 114: 331. 2006.

心启兰 *xin qi lan*

*Chenorthis singchii* Z. J. Liu, K. W. Liu & L. J. Chen.

Stems erect or ascending, 2–2.5 cm × 3–4 mm, with 2–6 leaves. Leaves fleshy; blade 2–18 cm × 2.5–3.5 mm. Inflorescences 1 or 2, arching or pendulous, 3–4.5 cm, with 2–10 flowers; rachis clavate, 2–3 mm thick; floral bracts ovate, 2.5–3 mm, membranous. Flowers purple-red, tinged with yellowish or

pale yellow, not fully opening; pedicel and ovary 6–8 mm. Sepals and petals suboblong to ovate-elliptic, 2.5–3.5 × 1.2–1.7 mm, petals slightly smaller than sepals; lip 3-lobed; lateral lobes ovate-elliptic, 1.7–2 × 0.9–1.1 mm; mid-lobe orbicular, concave, 2–2.5 mm, emarginate at apex; spur cylindrical, 2–2.3 mm, parallel to ovary, slightly curved toward end. Column ca. 1 mm; rostellum ca. 1.4 mm wide; pollinia subglobose; caudicles very short; stipe ca. 1.3 mm. Fl. Feb–Mar.

Epiphytic on tree trunks or branches in broad-leaved forests; 1600–2000 m. W Yunnan (Tengchong: Gaoligong Shan) [NE India (Assam)].

## 189. *MICROTATORCHIS* Schlechter in K. Schumann & Lauterbach, Nachtr. Fl. Schutzgeb. Südsee, 224. 1905.

拟蜘蛛兰属 *ni zhi zhu lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Herbs, small, monopodial, epiphytic herbs similar in habit to *Taeniophyllum*. Roots photosynthetic, usually well developed, radiately spreading, stout. Stems very short. Leaves distichous, small, few, basal, articulate to sheath, sometimes absent or only present in growing season. Inflorescences lateral, racemose, gradually elongating; peduncle and rachis narrowly winged; peduncle with many foliaceous persistent sterile bracts; rachis angled, several flowered; floral bracts persistent, alternate, distichous; sterile and floral bracts usually with stipulelike appendages on both sides decurrent to form wings on peduncle and rachis. Flowers very small, not opening widely. Sepals and petals similar, fused at base forming a short tube; lip entire or 3-lobed, with a subapical introrse bristlelike appendage, base with a short, saccate spur. Column short, footless; pollinia 2, waxy, globose, entire, attached by a common stipe to a large viscidium.

About 47 species: Java, Borneo, Sulawesi and the Philippines, eastward through New Guinea to the Solomon Islands, Vanuatu, New Caledonia, Fiji, and other Pacific islands, with the center of distribution in New Guinea; one species in China.

**1. *Microtatorchis compacta*** (Ames) Schlechter, Repert. Spec. Nov. Regni Veg. 10: 209. 1911.

拟蜘蛛兰 ni zhi zhu lan

*Taeniophyllum compactum* Ames, Orchidaceae 2: 247. 1908; *Microtatorchis taiwaniana* S. S. Ying.

Roots 1–3 cm, 0.5–1 mm in diam., radiately appressed to surface of branches. Stem abbreviated, with 2–4 small leaves. Leaf blade narrowly oblong, oblanceolate, or linear, 5–15 × 1–3 mm, subleathery, acute to acuminate. Inflorescences often 2 or 3, erect or ascending, few flowered; peduncle 1.5–2.5 cm,

winged, with many sterile bracts; sterile and floral bracts ovate, slightly conduplicate, 2–3 mm. Flowers green; pedicel and ovary yellowish green, 1–1.8 mm. Sepals and petals 1.4–2 mm, connate at base forming a tube, free apical lobes 1–1.5 mm, triangular-lanceolate, those derived from sepals dorsally carinate and from petals clawed at base; lip including basal spur to 3 mm, broadly ovate, obscurely 3-lobed, basal margin incurved, apex with a reversely hooked linear appendage; spur saccate-globose, ca. 1 mm in diam. Fl. Jan–Feb.

Epiphytic on trees in coniferous or broad-leaved forests; 1000–1600 m. C Taiwan [Philippines].

## 190. GROSOURDYA H. G. Reichenbach, Bot. Zeitung (Berlin) 22: 297. 1864.

火炬兰属 huojulan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems very short, enclosed in basal leaf sheaths. Leaves few to several, basal, distichous, flat, narrowly oblong to lanceolate, jointed and shortly sheathing at base, apex often unequally bilobed. Inflorescences lateral, usually shorter than leaves, often many borne simultaneously on a plant; peduncle longer than rachis, slender, both usually prickly-hairy, with 1 or 2 flowers open at a time; rachis usually thickened, rather short; floral bracts persistent. Flowers ephemeral, opening widely, to 1.5 cm in diam. Sepals and petals free, similar, spreading. Petals narrower than sepals; lip movably attached to end of column foot, spurred, ± 3-lobed; lateral lobes erect, narrow; mid-lobe often replicate on spur, sometimes with 2 basal lobules on both sides, with a small median tooth, giving a “4-lobed” appearance; spur broad, usually spreading forward, rarely pendulous. Column elongate, slender, bent forward at an obtuse angle at stigma base, with a rather long foot; rostellum elongate; pollinia 2, waxy, subglobose, entire, each with a caudicle attached by a common cuneate or triangular-cuneate stipe to a small triangular viscidium.

About ten species: India (Andaman Islands), Myanmar, Thailand, and Indochina to Malaysia, Indonesia, and the Philippines; one species in China.

**1. *Grosourdya appendiculata*** (Blume) H. G. Reichenbach, Xenia Orchid. 2: 123. 1868.

火炬兰 huojulan

*Dendrocolla appendiculata* Blume, Bijdr. 289. 1825; *Sarcocochilus hirulus* J. D. Hooker.

Stem inconspicuous. Leaves usually 3–6, basal; leaf blade falcate-oblong, 7–10 × 1.4–1.9 cm, somewhat fleshy, base attenuate, apex acute and unequally bilobed. Peduncle and rachis densely minutely black hispid; peduncles 2–5, 3–4 cm; rachis laxly 2- or 3-flowered; floral bracts ovate-triangular, very small, fleshy, abaxially hairy. Flowers small, yellow with brown

spots; pedicel and ovary ca. 4 mm. Sepals ovate-oblong, ca. 3 × 2 mm, acute; lateral sepals: basal 2/3 of width adnate to column foot. Petals oblong, ca. 3 × 1 mm, obtuse; lip spurred, 3-lobed; lateral lobes erect, narrowly oblong, ca. 3 mm, rounded and curved backward; mid-lobe with a very small apical lobule and 2 erect basal lobules; basal lobules parallel to lateral lobes, but shorter and broader; spur ca. 3 mm, almost continuing line of column foot. Column ca. 2 mm, winged, foot ca. 0.5 mm. Fl. Aug.

Epiphytic on tree trunks in evergreen broad-leaved forests. C and W Hainan [India (Andaman Islands), Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

## 191. TUBEROLABIUM Yamamoto, Bot. Mag. (Tokyo) 38: 209. 1924.

管唇兰属 guan chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems short, enclosed in leaf sheaths. Leaves few, linear-falcate or strap-shaped, flat, jointed and sheathing at base. Inflorescence lateral, often pendulous, racemose, rather long, few to many flowered, a few flowers open at once or all open together; peduncle short; rachis terete, sometimes clavate, fleshy, sulcate; floral bracts small. Flowers rather short-lived or lasting for ca. 1 week, to 9 mm in diam., white, yellowish, or greenish with various purple, brownish purple, or red markings, slightly fleshy. Sepals and petals free, spreading; lateral sepals usually larger than dorsal sepal, base adnate to back wall of spur. Petals smaller than sepals; lip base firmly connate to base of column, immovable, very fleshy, spurred, 3-lobed; lateral lobes on either side of spur entrance, very small, toothlike; mid-lobe laterally compressed, very fleshy, with incurved margin; spur often ± laterally compressed, broadly conic, thickly walled, unornamented inside, sometimes with protuberances at its entrance. Column short,

stout, footless; rostellum short; pollinia 2, waxy, subglobose to ovoid, entire, attached by a common linear stipe to a solitary ovate viscidium.

Eleven species: India, Thailand, and Peninsular Malaysia, north to Taiwan and the Philippines, south to Indonesia, east to New Guinea, Australia, and the Pacific islands; one species (endemic) in China.

The genus *Tuberolabium* has been monographed by J. J. Wood (Nordic J. Bot. 10: 481–486. 1990).

**1. *Tuberolabium kotoense*** Yamamoto, Bot. Mag. (Tokyo) 38: 209. 1924.

管唇兰 guan chun lan

*Saccolabium kotoense* (Yamamoto) Yamamoto.

Stems short, indistinct. Leaves 2–7, ± basal; blade oblong or oblong-elliptic, 6.5–16 × 2–4 cm, rather fleshy or thickly leathery, apex obtuse and slightly bilobed. Inflorescence pendulous, 10–15 cm, densely many small flowered; peduncle and rachis 4–5 mm in diam.; floral bracts broadly ovate-triangular, 2–3 mm, sometimes denticulate toward apex. Flowers white, often tinged with yellow, lip lateral lobes purplish, mid-lobe

white with a central purplish patch and 2 purple basal swellings, spur white or pale green, sometimes with purplish stripes or spots, column purplish, rostellum white; pedicel and ovary 5–8 mm. Dorsal sepal obovate-elliptic, 4.5–5.5 × 2.2–3 mm, concave, obtuse; lateral sepals obliquely obovate, 5–6 × 2.5–4 mm, obtuse. Petals oblong-spatulate, ca. 5 × 1.8 mm, obtuse; lip spurred, ca. 3 mm, 3-lobed; lateral lobes erect, subquadrate, 1–1.5 cm, obtuse to rounded; mid-lobe thickly fleshy, adaxially slightly depressed at base and with 2 swellings partly covering spur entrance; spur conic, laterally compressed, ca. 2 mm. Column 1–1.5 mm; rostellum ca. 0.3 mm. Fl. Dec–Feb.  $2n = 30^*$ .

• Epiphytic on tree trunks in thickets. S Taiwan.

## 192. PARAPTEROCERAS Averyanov, Bot. Zhurn. (Moscow & Leningrad) 75: 723. 1990.

虾尾兰属 xia wei lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, monopodial. Stems ascending or sometimes pendulous, short or elongate, enclosed in leaf sheaths. Leaves several to many, distichous, flat, jointed and sheathing at base, apex unequally bilobed. Inflorescences lateral, arching to pendulous, racemose, several to many flowered; peduncle and rachis ± fleshy. Flowers small. Sepals free; lateral sepals usually larger, base adnate to column foot. Petals often smaller than sepals; lip immovably attached to end of column foot, spurred, 3-lobed; lateral lobes on both sides of spur entrance, ascending, rather large; mid-lobe ± spreading forward, very small; spur often spreading horizontally, almost continuing line of column foot, ± laterally compressed, narrowed toward tip, thickly walled especially near base of mid-lobe, without appendages inside. Column short, thick, with a distinct foot; rostellum short, 2-lobed; pollinia 2, waxy, subglobose, entire, attached by a common broad and flat stipe to a solitary viscidium.

About five species: mainly in SE Asia; one species in China.

**1. *Parapteroceras elobe*** (Seidenfaden) Averyanov, Bot. Zhurn. (Moscow & Leningrad) 75: 723. 1990.

虾尾兰 xia wei lan

*Pteroceras elobe* Seidenfaden, Bot. Tidsskr. 65: 149. 1969;  
*Tuberolabium elobe* (Seidenfaden) Seidenfaden.

Stems 2–12 cm, 4–5 mm in diam., internodes 5–8 mm. Leaves many; leaf blade oblong or falcate-oblong, 6–17 × 1.5–2.5 cm, acute. Inflorescences 2–8, borne opposite leaves, 8–23 cm, laxly many flowered; peduncle and rachis yellowish green, ca. 2 mm in diam., longitudinally ribbed; rachis 4–11 cm; floral

bracts broadly ovate, ca. 1 mm. Flowers white, tinged with purplish on lip, spur white with purplish red tip; pedicel and ovary 8–10 mm. Sepals and petals thinly textured; dorsal sepal ovate-elliptic, ca. 4.5 × 2.7 mm, obtuse; lateral sepals obovate, rather large, ca. 5 × 3 mm, rounded. Petals obovate-elliptic, ca. 4 × 2.5 mm, obtuse; lip spurred, 3-lobed; lateral lobes ascending, sub-oblong, ca. 2 × 1 mm, obtuse; mid-lobe very small, ca. 0.4 mm, slightly fleshy, base with 2 calli on both sides; spur conic, ca. 2.5 mm, obtuse. Column ca. 1 mm, foot ca. 2.5 mm. Fl. Jul.

Epiphytic on tree trunks at forest margins; 1000–1500 m. Hainan, S Yunnan [Thailand, Vietnam].

## 193. PENNILABIUM J. J. Smith, Bull. Jard. Bot. Buitenzorg, sér. 2, 13: 47. 1914.

巾唇兰属 jin chun lan shu

Chen Xinqi (陈心启 Chen Sing-chi); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems short, with a few close leaves. Leaves clustered, flat, elliptic to oblong, ± fleshy, base often ± twisted, jointed and sheathing, apex unequally laterally bilobed. Inflorescence lateral, racemose, usually rather short, unbranched, with 1 or 2 flowers open at a time, placed in 2 rows; rachis somewhat thickened and complanate; floral bracts distichous. Flowers opening successively, lasting 1 or 2 days, white, cream-colored, yellow, or orange, medium-sized. Sepals and petals free, similar. Petals slightly smaller, margin often dentate; lip adnate to column base, immovable, spurred, 3-lobed, internal callosities absent; lateral lobes either rather large, well developed, and truncate or reduced to small earlike lobes, when present often

fimbriate or toothed; mid-lobe large, fleshy and solid or reduced to a small fleshy lobe. Column short, slightly dorsiventrally compressed, footless; stigma very large; rostellum long, narrow, 2-lobed; pollinia waxy, 2, subglobose, entire, attached by a common long subcuneate or spatulate stipe to a very small viscidium.

About ten to 12 species: from India (Assam) through Thailand and Malaysia to Indonesia and the Philippines; one species in China.

**1. *Pennilabium yunnanense*** S. C. Chen & Y. B. Luo, *Acta Phytotax. Sin.* 42: 457. 2004.

巾唇兰 *jin chun lan*

Stems erect, ca. 1 cm, with 3 or 4 leaves. Leaf blade oblong, 4–6 × 1.3–1.5 cm, base slightly twisted, apex acute and unequally bilobed. Inflorescence from base of stem, ± pendulous, ca. 4 cm, 2- or 3-flowered; rachis flattened, ca. 5 mm; floral bracts distichous, ovate-triangular, ca. 1 mm. Flowers white, petals with dark purplish red spots inside, especially in basal half, thinly textured; pedicel and ovary ca. 11 mm. Dorsal sepal oblong-lanceolate, ca. 17 × 4 mm, acuminate; lateral sepals falcately oblong-lanceolate, ca. as large as dorsal sepal,

acuminate. Petals oblong-lanceolate, ca. 16 × 3 mm, entire, acuminate; lip spurred, 3-lobed; lateral lobes subspatulate-flabellate, ca. 7 × 4 mm, apical margin shortly fimbriate; mid-lobe subligulate, ca. 4 × 2 mm, entire, acute; spur cylindrical, ca. 6 × 1.5 mm, rounded-tipped. Column ca. 2 mm; stigma large, nearly covering whole front surface of column; anther cap slightly narrowed into a triangular apex; stipe ca. 0.8 mm, widened at top; viscidium elliptic, ca. 0.4 mm, thick. Fl. Sep.

Epiphytic on tea trees; ca. 1300 m. S Yunnan [NE India, Thailand].

Chinese records of *Pennilabium proboscideum* A. S. Rao & J. Joseph (e.g., in *FRPS* 19: 435. 1999) are referable to *P. yunnanense*.

## 194. *MALLEOLA* J. J. Smith & Schlechter, *Repert. Spec. Nov. Regni Veg. Beih.* 1: 979. 1913.

槌柱兰属 *chui zhu lan shu*

Chen Xinqi (陈心启 *Chen Sing-chi*); Jeffrey J. Wood

Herbs, epiphytic, small, monopodial. Stems enclosed in basal leaf sheaths, pendulous, elongate or rarely short, sometimes slightly compressed. Leaves scattered along stem, several to many, distichous, often flushed with purple-red, oblique, usually narrowly elliptic to oblong, jointed and sheathing at base, apex unequally bilobed. Inflorescences 1–3, lateral, ascending or pendulous, mostly shorter than leaves, many flowered. Flowers facing in all directions, small, thinly textured. Sepals and petals free, spreading; dorsal sepal often cymbiform; lateral sepals and petals flatter. Lip firmly attached to column, immovable, with a variably shaped cylindrical spur usually with interior ornaments; lateral lobes erect, broadly triangular, short; mid-lobe upcurved or downcurved, usually linear-lanceolate, sometimes conic, very small, usually with a ridge or thickening at base. Column hammer-shaped, short, stout, foot absent, often bent backward at apex; anther cap ± dorsal, large, apex narrowed and beaked; pollinia waxy, 2, globose, entire or rarely porate, attached by a common long spatulate stipe that is very broad below pollinia; viscidium very small.

About 30 species: from Thailand and Vietnam to Malaysia and Indonesia, to the Philippines, New Guinea, and the Pacific islands, with the center of distribution in the Malay Archipelago; one species in China.

*Malleola insectifera* (J. J. Smith) J. J. Smith & Schlechter (*Repert. Spec. Nov. Regni Veg. Beih.* 1: 981. 1913; *Saccolabium insectiferum* J. J. Smith, *Orch. Java*, 641. 1905) was recorded from Hainan (Jianfeng Ling, 500–600 m) by X. Q. Song, Q. W. Meng and Y. B. Luo (*Acta Bot. Yunnan.* 31: 32. 2009). The present authors could not confirm this because they have not seen the specimen (*X. Q. Song 061219*, PE).

**1. *Malleola dentifera*** J. J. Smith, *Bull. Jard. Bot. Buitenzorg*, sér. 3, 9: 191. 1927.

槌柱兰 *chui zhu lan*

Stems pendulous, slightly flattened terete, 3–10 cm, 3–4 mm in diam., unbranched, internodes 5–10 mm. Leaves many; leaf blade narrowly oblong, 4–7.5 × 0.5–1 cm, leathery, unequally bilobed or somewhat praemorse. Inflorescences borne opposite leaves, shorter than leaves, many flowered; floral bracts narrowly lanceolate, 1–2 mm. Flowers ca. 8 mm in diam., sepals and petals pale brownish yellow with 2 crimson stripes, lip purple and white, anther cap purple; pedicel and ovary ca. 8

mm. Dorsal sepal cymbiform, ovate, ca. 3 × 2 mm, acute; lateral sepals obliquely ovate, ca. 3 × 2 mm, ± concave. Petals oblong, ca. 3 × 1.5 mm, acute; lip spurred, 3-lobed; lateral lobes erect, broadly ovate-triangular, ca. 1 × 1 mm, with 3 triangular lobules at apex; distal lobule smaller, with thickened and incurved apical margin; mid-lobe recurved, narrowly lanceolate, fleshy thickened in basal half, narrowed toward apex, with a longitudinal groove from base to middle; spur subconic-oblong, ca. 5 × 2–3 mm, narrowed near tip. Capsule narrowly ovoid, 1–1.5 cm × 4–5 mm. Fl. Jul, fr. Aug–Sep.

Epiphytic on tree trunks in forests; 600–700 m. S Hainan, S Yunnan [Indonesia, Malaysia, Thailand, Vietnam].