

## 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. Hengduan 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 streamsides; 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 truncate, 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 lorate, 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 tridentulate 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,  $3-4 \times 3-4.2$  cm, abaxially puberulent, minutely ciliate, acuminate at apex; synsepal ovate to ovate-lanceolate,  $2-3.5 \times 0.9-1.6$  cm, abaxially puberulent, minutely ciliate, acuminate at apex. Petals suboblong,  $3.5-5 \times 1-1.4$  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  $2-3 \times 2.2-2.8$  cm, outside minutely warty. Staminode lunate,  $7-8 \times 10-11$  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,  $8-23 \times 2.5-4.1$  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,  $3-4.5 \times 2-3.5$  cm, both surfaces puberulent particularly on veins, ciliate, acuminate at apex; synsepal ovate-lanceolate or lanceolate,  $3.5-4.5 \times 1.4-2.5$  cm, both surfaces puberulent, ciliate, acute or acuminate at apex. Petals usually spreading horizontally, suboblong or oblong-lanceolate,  $4.5-6 \times 1.5-2$  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  $2.2-2.5 \times 2-2.4$  cm, outside slightly puberulent. Staminode obcordate-lunate,  $9-10 \times 13-15$  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,  $10-21.5 \times 2.5-5.7$  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,  $2.7-3 \times 2.1-2.3$  cm, abaxially pubescent particularly on midvein, ciliate, acuminate at apex; synsepal ovate,  $2.3-3.6 \times 1.4-1.6$  cm, abaxially pubescent, ciliate, acute at apex. Petals suboblong-oblong-lanceolate,  $3.5-4 \times 1.2-1.4$  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  $2.2-2.4 \times 2-2.8$  cm, outside usually minutely papillate-puberulent. Staminode reniform-obcordate,  $6-7 \times 9-13$  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].