

POACEAE (GRAMINEAE)

禾本科 he ben ke

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Annual or perennial herbs, or tall woody bamboos. Flowering stems (culms) jointed, internodes hollow or solid; branches arising singly from nodes and subtended by a leaf sheath and 2-keeled prophyll, often fascicled in bamboos. Leaves arranged alternately in 2 ranks, differentiated into sheath, blade, and an adaxial erect appendage at sheath/blade junction (ligule); leaf sheath surrounding and supporting culm-internode, split to base or infrequently tubular with partially or completely fused margins, modified with reduced blade in bamboos (culm sheaths); leaf blades divergent, usually long, narrow and flat, but varying from inrolled and filiform to ovate, veins parallel, sometimes with cross-connecting veinlets (especially in bamboos); ligule membranous or a line of hairs. Inflorescence terminal or axillary, an open, contracted, or spikelike panicle, or composed of lax to spikelike racemes arranged along an elongate central axis, or digitate, paired, or occasionally solitary; axillary inflorescences often many, subtended by spatheoles (specialized bladeless leaf sheaths) and gathered into a leafy compound panicle; spikelets often aggregated into complex clusters in bamboos. Spikelets composed of distichous bracts arranged along a slender axis (rachilla); typically 2 lowest bracts (glumes) empty, subtending 1 to many florets; glumes often poorly differentiated from accompanying bracts in bamboos. Florets composed of 2 opposing bracts enclosing a single small flower, outer bract (lemma) clasping the more delicate, usually 2-keeled inner bract (palea); base of floret often with thickened prolongation articulated with rachilla (callus); lemma often with apical or dorsal bristle (awn), glumes also sometimes awned. Flowers bisexual or unisexual; lodicules (small scales representing perianth) 2, rarely 3 or absent, 3 to many in bamboos, hyaline or fleshy; stamens 3 rarely 1, 2, 6, or more in some bamboos, hypogynous, filaments capillary, anthers versatile; ovary 1-celled, styles (1 or)2(rarely 3), free or united at base, topped by feathery stigmas, exerted from sides or apex of floret. Fruit normally a dry indehiscent caryopsis with thin pericarp firmly adherent to seed, pericarp rarely free, fleshy in some bamboos; embryo small or large; hilum punctate to linear.

About 700 genera and 11,000 species: widely distributed in all regions of the world; 28 tribes, 226 genera (seven endemic), and 1795 species (809 endemic) in China.

Grasses are present throughout China, but the largest area of natural grassland lies in the northern part of the country, forming part of the temperate Eurasian steppe. Much of this area has now been converted from rangeland into farmland with wheat (*Triticum*) as the major food crop. The moister grasslands of northeast China support forest steppe, the dominant natural grasses being *Leymus chinensis* and *Stipa grandis*. The climate becomes progressively drier eastward, supporting steppe and semidesert steppe. Species of *Stipa* are dominant, with *Agropyron*, *Cleistogenes*, *Koeleria*, and *Leymus*. Common grasses of the dry alpine steppe of the high Xizang-Qinghai Plateau include species of *Elymus*, *Festuca*, *Leymus*, *Poa*, *Puccinellia*, and *Stipa*. Desert grasses of northwest China include sand-binding species of *Aeluropus*, *Cleistogenes*, and *Orinus*.

In warm, subtropical areas of southern China widespread tropical genera are well represented, including *Cymbopogon*, *Digitaria*, *Eulalia*, *Paspalum*, *Pennisetum*, and *Setaria*. The major food crop here is rice (*Oryza*). Other tropical genera with their center of distribution in southeast Asia extend into China, including *Arundinella*, *Isachne*, and *Microstegium*. Extensive pure stands of *Phacelurus latifolius* are found in coastal salt marshes, as are introduced species of *Spartina*. *Phragmites* species form large colonies in the shallow margins of inland lakes and rivers.

The subfamilies of Poaceae are not included here, as they are largely based on non-morphological characters that are not readily available for identification purposes. However, the traditional grass tribes, as broadly accepted over the last two decades, do mainly have a morphological expression, backed up by characteristics of anatomy, embryology, and other cryptic characters. With practice and increasing familiarity with the family, it is usually possible to assign an unknown grass to a tribe without undue difficulty. The tribe is therefore taken as the primary division here.

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Modern molecular systematic studies are providing new insights into grass relationships. This new information has been incorporated where it has proved possible to link it to morphology, mainly by the separation of *Danthonieae* from *Arundineae* and the repositioning of a few individual genera. However, where the new information leads to the redefinition of tribes, or the genera within them, on grounds not easily expressed morphologically, the traditional treatment has been retained. *Aveneae* are upheld as distinct from *Poeae*, and *Eragrostideae* as distinct from *Cynodonteae*, because they are usually easily recognizable and hence useful for identification. Grass taxonomy is at present undergoing a period of rapid modification. The incorporation of molecular data into the classification scheme is incomplete, alterations are ongoing, and a new system with overall acceptance has not yet emerged. The primary purpose of a Flora is to provide an identification guide, usually for the non-specialist, and it must therefore be based mainly on morphology. Those interested in the latest research and new ideas on grass relationships can find more detailed information in the taxonomic literature. The following is recommended: Columbus, J. T. et al., eds. 2006. *Monocots: comparative biology and evolution*. [Aliso, 2 volumes]. Rancho Santa Ana Botanic Garden, Claremont.

Extensive use has been made of *Genera Graminum* by Clayton and Renvoize (1986) during the preparation of this volume. In particular, Chen Shouliang and Sylvia Phillips have used the key to tribes and the tribal descriptions there as the basis for those in this volume.

The names of the Chinese agrostologists Sun Bixing and Liu Liang are abbreviated as “B. S. Sun” and “L. Liu” in this volume, but the alternative abbreviations “B. X. Sun” and “L. Liou” occur sometimes in other literature. The bamboo specialist Xue Jiru (Hsueh Chi-ju) is abbreviated as “Hsueh” in this volume because he always gave his name as “Hsueh” as the author of plant names, regardless of any different spelling used for him as the author of the works in which the names were published.

Wang Zhengping, Ye Guanghan, Yang Yaling, Yu Zehua, Hu Chenhua, Geng Bojie, Feng Xuelin, Jia Liangzhi, Xia Nianhe, Li Dezhu, Zhang Weiping, Xue Jiru, Zhu Zhengde, Zhao Qiseng, Chen Shouliang, Sheng Guoying, Chen Shaoyun, Yao Changyu, Lu Jionglin, Sun Jiliang, Lin Wantao, Yi Tongpei, Zhao Huiru, Wen Taihui & Dai Qihui. 1996. *Gramineae (Poaceae) (1)*. *In*: Geng Bojie & Wang Zhengping, eds., *Fl. Reipubl. Popularis Sin.* 9(1): 1–704; Liu Liang, Zhu Taiping, Chen Wenli, Wu Zhenlan & Lu Shenglian. *Gramineae (Poaceae) (2)*. *In*: Liu Liang, ed., *Fl. Reipubl. Popularis Sin.* 9(2): 1–405; Lu Sheng-lian, Sun Yong-hua, Liu Shang-wu, Yang Yong-chang, Wu Zhen-lan, Kuo Pen-chao, Yang Hsi-ling, Wang Chaopin & Tsui Nai-ran. 1987. *Gramineae (3)*. *In*: Kuo Pen-chao, ed., *Fl. Reipubl. Popularis Sin.* 9(3): 1–329; Chen Shouliang, Jin Yuexing, Zhuang Tide, Fang Wenzhe, Sheng Guoying, Liu Liang, Wu Zhenlan, Lu Shenglian, Sun Bisin, Hu Zhihao, Wang Song, Sun Xiangzhong, Wang Huiqin, Yang Xilin, Wang Chaopin, Li Binggui & Wen Shaobin. 1990. *Gramineae (Poaceae) (4)*. *In*: Chen Shouliang, ed., *Fl. Reipubl. Popularis Sin.* 10(1): 1–401; Chen Shouliang, Zhuang Tide, Fang Wenzhe, Sheng Guoying, Jin Yuexing, Liu Liang, Sun Bisin, Hu Zhihao & Wang Song. 1997. *Gramineae (Poaceae) (5)*. *In*: Chen Shouliang, ed., *Fl. Reipubl. Popularis Sin.* 10(2): 1–301.

Glossary of botanical terms used in the Poaceae

Adapted from the glossary in *Flora of Ethiopia and Eritrea*, vol. 7 (1995).

aristate – with an awn

aristulate – diminutive of aristate

auricle – an earlike lobe or appendage at the junction of leaf sheath and blade

auriculate – with an auricle

awn – a bristle arising from a spikelet part

callus – a hard projection at the base of a floret, spikelet, or inflorescence segment, indicating a disarticulation point

caryopsis – a specialized dry fruit characteristic of grasses, in which the seed and ovary wall have become united

collar – pale or purplish zone at the junction of leaf sheath and blade

column – the lower twisted portion of a geniculate awn, or the part below the awn branching-point in *Aristideae*

compound – referring to inflorescences made up of a number of small constituent inflorescences (as in some *Andropogoneae*), or a raceme with some secondary branching

culm – the flowering stem of a grass plant

culm sheath (bamboos) – modified, often non-photosynthetic, culm leaf with an expanded sheath and much reduced blade, usually deciduous as the culm matures

diffuse (bamboos) – culms arising singly from long slender rhizomes.

extravaginal – branching in which the young shoot breaks through the base of the leaf sheath

floret – the individual unit of a spikelet, comprising a lemma and palea with enclosed reproductive organs

glume – one of a pair of empty scales at the base of a grass spikelet

heterogamous spikelets – the paired spikelets found in most *Andropogoneae*, where one spikelet of the pair is sessile and produces a caryopsis, and the other spikelet is pedicelled, of different form, and staminate or sterile

hilum – the scar on the caryopsis marking the site of the attachment of the pericarp and testa, found on the opposite side from the embryo

homogamous spikelets – in *Andropogoneae* the paired spikelets sometimes present at the base of the raceme, of similar appearance and not producing any caryopses, often resembling the pedicelled spikelets or assuming a protective involucre function

intravaginal – branching in which the young shoot grows up inside the leaf sheath, emerging at the sheath mouth

iterauctant (bamboos) – inflorescence with pseudospikelets with glumes subtending axillary buds capable of partial or extensive spikelet ramification

leaf blade – the distal expanded part of a grass leaf

leaf sheath – the basal part of the grass leaf which normally encloses a culm internode

lemma – the lower of the two bracts enclosing the grass flower and together with the palea comprising a floret

leptomorph (bamboos) – rhizome monopodial, elongated, more slender than culms

ligule – a membrane or line of hairs on the inner (adaxial) side of the junction of the leaf sheath and leaf blade; bamboos sometimes have an external ligule on the abaxial side of the junction

lodicule – a small scale-like or fleshy structure at the base of the stamens in a grass floret, usually 2 in each floret (often 3 or more in bamboos); they swell at anthesis, causing the floret to gape open

oral setae – marginal setae inserted at junction of leaf sheath and blade, on the auricles when these are present

pachymorph (bamboos) – rhizome sympodial, thicker than culms

palea – the upper and inner scale of the grass floret which encloses the grass flower, usually 2-keeled

panicle – in grasses, an inflorescence in which the primary axis bears branched secondary axes with pedicellate spikelets

pedicel – in grasses, the stalk of a single spikelet within an inflorescence

peduncle – the stalk of a raceme or cluster of spikelets

pluricaespitose (bamboos) – culms arising in a series of clusters along a long slender rhizome

prophyll – in grasses, a 2-keeled, hyaline, modified leaf, placed within a leaf sheath on the adaxial side of a branch

pseudopetiole – the narrow basal portion of some leaf blades, resembling a petiole

pseudospikelet (bamboos) – spikelet in which the outer glumes or bracts subtend axillary buds which can develop to form lateral spikelets or branches

raceme – in grasses, an unbranched axis bearing spikelets; racemes may be solitary, digitate, or scattered

raceme base – short stalk beneath the individual racemes of a pair in some *Andropogoneae*

raceme pair – pairs of racemes supported by spatheoles in the compound panicles of some *Andropogoneae*

rachilla – the central axis of the spikelet which bears the florets

rachilla extension – a prolongation of the rachilla beyond the uppermost (or single) floret

rachis – the axis of a raceme

secondary spathe – spathe supporting a second tier of branching within the compound panicle of some *Andropogoneae*

semelauctant (bamboos) – inflorescence with glumes not subtending viable buds or branches

sinus – the space between two projecting lobes or teeth

spathe – with spathes

spathe – a bract or modified bladeless leaf subtending the inflorescence or part of it

spatheole – the uppermost spathe supporting the racemes within the compound inflorescence of some *Andropogoneae*

spikelet – the basic unit of a grass inflorescence; usually composed of two glumes and one or more florets on a rachilla

spikelet pair – the arrangement of one sessile and one pedicelled spikelet arising from the same node characteristic of the *Andropogoneae*

tiller – a leafy non-flowering shoot

triad – a group of three spikelets borne together

unicaspirose (bamboos) – culms all arising in a single clump from pachymorph rhizomes

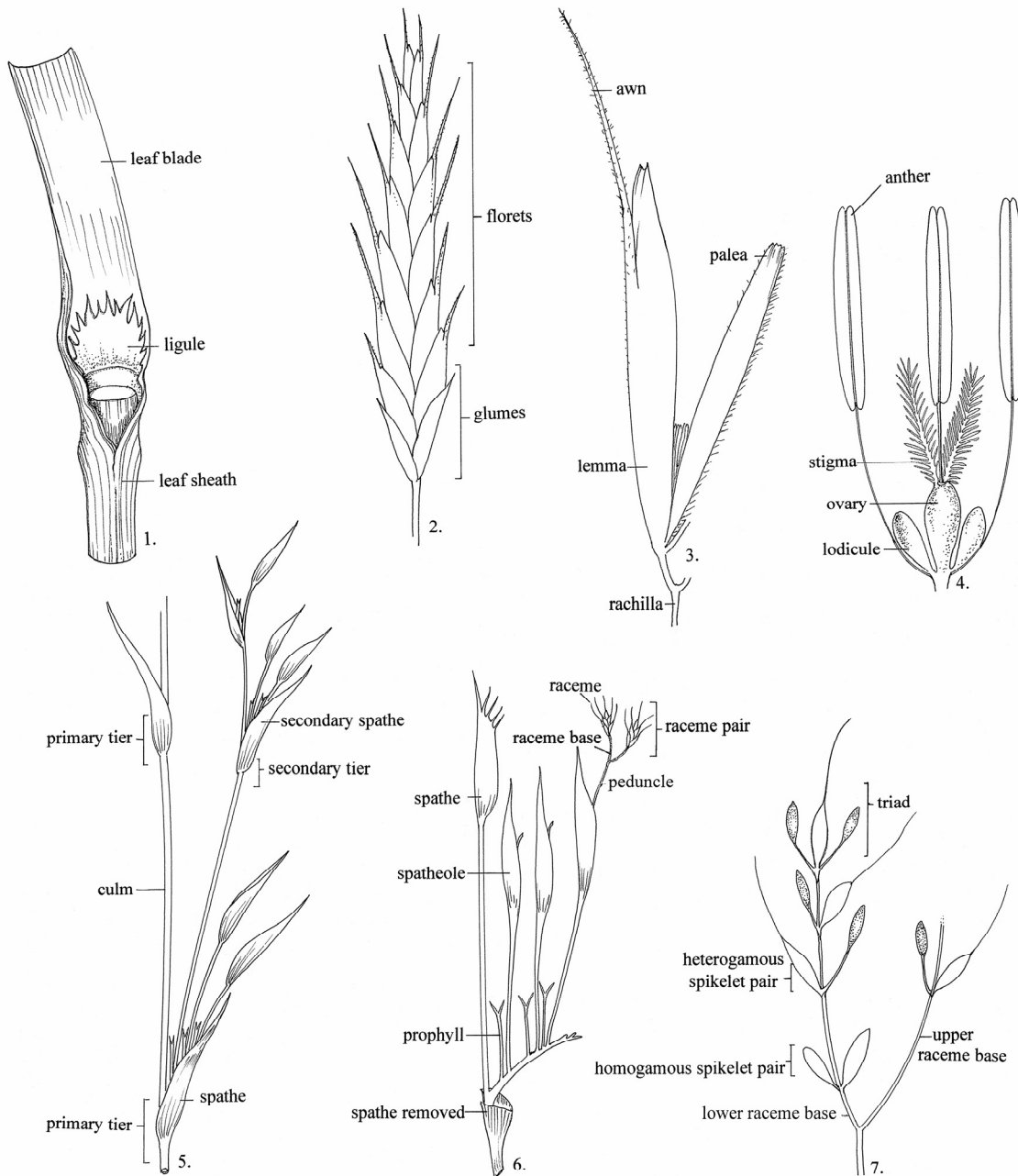


Figure 1. 1–4. Parts of a typical grass (based on *Bromus*). —1. Portion of leaf. —2. Spikelet. —3. Floret. —4. Flower. 5–7. Compound panicle and raceme pair structure in *Andropogoneae* (based on *Hyparrhenia*). —5. Compound panicle with primary and secondary tiers. —6. Compound panicle with primary tier showing raceme pair. —7. Diagram of raceme pair structure. Drawn by Yevonn Wilson-Ramsey.

Systematic list of tribes and genera

● indicates endemic genera

- 1. Bambuseae (p. 7)**
 1. *Bambusa*
 2. *Thyrsostachys*
 3. *Dendrocalamus*
 4. *Gigantochloa*
 5. *Melocalamus*
 6. *Bonia*
 7. *Schizostachyum*
 8. *Cephalostachyum*
 9. *Pseudostachyum*
 10. *Melocanna*
 11. *Neomicrocalamus*
 12. *Yushania*
 13. *Thamnocalamus*
 14. *Fargesia*
 15. *Drepanostachyum*
 16. *Himalayacalamus*
 17. *Ampelocalamus*
 18. *Chimonocalamus*
 19. ● *Gaoligongshania*
 20. *Acidosasa*
 21. *Sasa*
 22. *Arundinaria*
 23. *Pseudosasa*
 24. *Pleioblastus*
 25. ● *Oligostachyum*
 26. ● *Gelidocalamus*
 27. ● *Ferocalamus*
 28. *Indocalamus*
 29. *Indosasa*
 30. *Sinobambusa*
 31. *Semiarundinaria*
 32. *Chimonobambusa*
 33. ● *Shibataea*
 34. *Phyllostachys*
- 2. Phareae (p. 180)**
 35. *Leptaspis*
- 3. Ehrharteae (p. 181)**
 36. *Ehrharta*
- 4. Oryzeae (p. 181)**
 37. *Oryza*
 38. *Leersia*
 39. *Chikusichloa*
 40. *Hygroryza*
 41. *Zizania*
- 5. Brachyelytreae (p. 187)**
 42. *Brachyelytrum*
- 6. Phaenospermateae (p. 187)**
 43. *Phaenosperma*
- 7. Stipeae (p. 188)**
 44. *Stephanachne*
 45. *Trikeraita*
 46. ● *Sinochasea*
 47. *Duthiea*
 48. *Psammochloa*
 49. *Piptatherum*
 50. *Stipa*
 51. *Ptilagrostis*
 52. *Achnatherum*
 53. *Orthoraphium*
- 8. Brylkinieae (p. 212)**
 54. *Brylkinia*
- 9. Meliceae (p. 212)**
 55. *Glyceria*
56. *Melica*
 57. *Schizachne*
- 10. Diarrheneae (p. 223)**
 58. *Diarrhena*
- 11. Poae (p. 224)**
 59. *Festuca*
 60. *Vulpia*
 61. *Lolium*
 62. *Scolochloa*
 63. *Cynosurus*
 64. *Puccinellia*
 65. *Briza*
 66. *Poa*
 67. *Dactylis*
 68. *Aniselytron*
 69. *Milium*
 70. *Colpodium*
 71. *Catabrosa*
 72. *Sclerochloa*
 73. *Pseudosclerochloa*
 74. *Parapholis*
- 12. Aveneae (p. 316)**
 75. *Helictotrichon*
 76. *Arrhenatherum*
 77. *Avena*
 78. *Trisetum*
 79. *Koeleria*
 80. *Deschampsia*
 81. *Holcus*
 82. *Aira*
 83. *Phalaris*
 84. *Anthoxanthum*
 85. *Coleanthus*
 86. *Agrostis*
 86a. × *Agropogon*
 87. *Deyeuxia*
 88. *Calamagrostis*
 89. *Polypogon*
 90. *Cinna*
 91. *Cyathopus*
 92. *Beckmannia*
 93. *Alopecurus*
 94. *Phleum*
- 13. Brachypodieae (p. 368)**
 95. *Brachypodium*
- 14. Bromeae (p. 370)**
 96. *Littledalea*
 97. *Bromus*
- 15. Triticeae (p. 386)**
 98. *Leymus*
 99. *Psathyrostachys*
 100. *Hordeum*
 101. *Hystrix*
 102. *Elymus*
 103. *Pseudoroegneria*
 104. *Elytrigia*
 105. *Kengyilia*
 106. *Agropyron*
 107. *Eremopyrum*
 108. *Secale*
 109. *Triticum*
 110. *Aegilops*
- 16. Centotheceae (p. 444)**
 111. *Centotheca*
112. *Lophatherum*
- 17. Thysanolaeneae (p. 446)**
 113. *Thysanolaena*
- 18. Arundineae (p. 447)**
 114. *Molinia*
 115. *Arundo*
 116. *Phragmites*
- 19. Danthoneae (p. 449)**
 117. *Cortaderia*
 118. *Elytrophorus*
 119. *Danthonia*
 120. *Schismus*
- 20. Aristideae (p. 452)**
 121. *Aristida*
 122. *Stipagrostis*
- 21. Pappophoreae (p. 456)**
 123. *Erneapogon*
- 22. Eragrostideae (p. 457)**
 124. *Aeluropus*
 125. *Neyraudia*
 126. *Cleistogenes*
 127. *Orinus*
 128. *Tripogon*
 129. *Leptochloa*
 130. *Dinebra*
 131. *Eragrostis*
 132. *Eragrostiella*
 133. *Harpachne*
 134. *Desmostachya*
 135. *Dactyloctenium*
 136. *Acrachne*
 137. *Eleusine*
 138. *Sporobolus*
 139. *Crypsis*
 140. *Muhlenbergia*
- 23. Cynodonteae (p. 487)**
 141. *Lepturus*
 142. *Chloris*
 143. *Enteropogon*
 144. *Eustachys*
 145. *Microchloa*
 146. *Cynodon*
 147. *Spartina*
 148. *Bouteloua*
 149. *Buchloe*
 150. *Tragus*
 151. *Zoysia*
 152. *Perotis*
- 24. Paniceae (p. 499)**
 153. *Pseudechinolaena*
 154. *Oplismenus*
 155. *Ichmanthus*
 156. *Panicum*
 157. *Hymenachne*
 158. *Sacciolepis*
 159. *Ottochloa*
 160. *Cyrtococcum*
 161. ● *Setiacis*
 162. *Acroceras*
 163. *Echinochloa*
 164. *Alloteropsis*
 165. *Brachiaria*
 166. *Urochloa*
167. *Eriochloa*
 168. *Thuarea*
 169. *Paspalum*
 170. *Axonopus*
 171. *Setaria*
 172. *Paspalidium*
 173. *Stenotaphrum*
 174. *Melinis*
 175. *Digitaria*
 176. *Pseudoraphis*
 177. *Pennisetum*
 178. *Cenchrus*
 179. *Spinifex*
- 25. Isachneae (p. 554)**
 180. *Isachne*
 181. *Coelachne*
 182. *Sphaerocaryum*
- 26. Eriachneae (p. 561)**
 183. *Eriachne*
- 27. Arundinelleae (p. 561)**
 184. *Garnotia*
 185. *Arundinella*
- 28. Andropogoneae (p. 570)**
 186. *Spodiopogon*
 187. *Saccharum*
 188. *Miscanthus*
 189. *Imperata*
 190. *Eulalia*
 191. *Pseudopogonatherum*
 192. *Pogonatherum*
 193. *Eulaliopsis*
 194. *Polytrias*
 195. *Microstegium*
 196. *Apocopis*
 197. *Germania*
 198. *Sorghum*
 199. *Pseudosorghum*
 200. *Chrysopogon*
 201. *Dichanthium*
 202. *Capillipedium*
 203. *Bothriochloa*
 204. *Sehima*
 205. *Ischaemum*
 206. *Apluda*
 207. *Dimeria*
 208. *Arthraxon*
 209. *Schizachyrium*
 210. *Andropogon*
 211. *Cymbopogon*
 212. *Hyparrhenia*
 213. *Themeda*
 214. *Heteropogon*
 215. *Pseudanthistiria*
 216. *Phacelurus*
 217. *Hemarthria*
 218. *Mnesithea*
 219. *Rottboellia*
 220. *Eremochloa*
 221. *Hackelochloa*
 222. *Ophiuros*
 223. *Coix*
 224. *Chionachne*
 225. *Polytoca*
 226. *Zea*

Keys to tribes**Key 1**

- 1a. Bamboos, culms woody; lower culm sheaths broad with rudimentary blades 1. *Bambuseae* (p. 7)
- 1b. Herbs, occasionally reeds or culms canelike; lower culm sheaths with normal blades.
- 2a. Spikelets arranged in pairs (rarely triads) on fragile racemes; raceme rachis breaking up into segments bearing a sessile and pedicelled spikelet *Key 2*
- 2b. Spikelets arranged singly in panicles or racemes (occasionally raceme fragile but spikelets single; or spikelets paired but raceme tough).
- 3a. Spikelets with strictly 2 florets and no rachilla extension; lower floret staminate or barren, sometimes reduced to an empty lemma, upper floret fertile *Key 2*
- 3b. Spikelets with 1 to many florets (if 2 florets, then both fertile, or the lower fertile, or rachilla extension present).
- 4a. Spikelets with 2 or more fertile florets *Key 3*
- 4b. Spikelets with 1 fertile floret, sometimes with additional staminate or barren florets *Key 4*

Key 2

- 1a. Spikelets disarticulating at maturity above glumes.
- 2a. Spikelets disarticulating above glumes; lemmas both orbicular to broadly elliptic, awnless; leaf blades lanceolate to ovate 25. *Isachneae* (p. 554)
- 2b. Spikelets disarticulating below fertile (upper) floret; lower lemma resembling upper glume, persistent, upper lemma terete, often awned; leaf blades linear 27. *Arundinelleae* (p. 561)
- 1b. Spikelets falling entire at maturity, either singly or with other spikelets and inflorescence parts attached.
- 3a. Spikelets single, or if paired both spikelets alike; glumes thinner than fertile floret, lower glume short or even suppressed; fertile floret papery to crustaceous or leathery, awnless 24. *Panicaceae* (p. 499)
- 3b. Spikelets paired, usually one sessile and the other pedicelled, often dissimilar and arranged in fragile racemes; glumes as long as spikelet, tougher than and enclosing hyaline florets; fertile floret often with geniculate awn (spikelets rarely single or both pedicelled, but then either in fragile racemes or geniculate awned) 28. *Andropogoneae* (p. 570)

Key 3

- 1a. Inflorescence of one or more racemes.
- 2a. Ligule a line of hairs; lemmas 1–3-veined 22. *Eragrostideae* (p. 457)
- 2b. Ligule membranous; lemmas 5 or more veined.
- 3a. Leaf sheaths tubular, margins joined for most or all of length 9. *Meliceae* (p. 212)
- 3b. Leaf sheaths not tubular, margins free.
- 4a. Spikelets placed broadside to rachis; both glumes present; ovary with hairy apical appendage.
- 5a. Spikelets shortly pedicellate, usually terete or almost so; lemmas 7–9-veined 13. *Brachypodieae* (p. 368)
- 5b. Spikelets sessile, laterally compressed (if rarely pedicellate, lemmas 5-veined) 15. *Triticeae* (p. 386)
- 4b. Spikelets placed edgewise to rachis; lower glume absent (except terminal spikelet); ovary glabrous 11. *Poeae* (61. *Lolium*: p. 243)
- 1b. Inflorescence a panicle, open, contracted, or dense and spike-like.
- 6a. Spikelets with 2 florets, rachilla extension absent; one or both florets usually indurated.
- 7a. Lemmas entire, awnless, glabrous or puberulous 25. *Isachneae* (p. 554)
- 7b. Lemmas 2-toothed, awned from sinus, densely hispid 26. *Eriachneae* (p. 561)
- 6b. Spikelets with several florets, or if 2 then rachilla extension present.
- 8a. Lemmas deeply cleft into 7–9 awns 21. *Pappophoreae* (p. 456)
- 8b. Lemmas awnless or 1-awned.
- 9a. Leaf sheaths tubular, the margins joined for most or all of length 9. *Meliceae* (p. 212)
- 9b. Leaf sheaths not tubular, margins free.
- 10a. Culms reedlike, usually tall; panicle large, plumose 18. *Arundineae* (p. 447)
- 10b. Culms mostly slender, if tall then not reedlike; panicle not large and plumose (if plant a large tussock with serrate leaf blades and plumose panicle, see 113. *Cortaderia*).
- 11a. Ligule a line of hairs.
- 12a. Basal internodes swollen; leaf blades articulated with sheath 18. *Arundineae* (114. *Molinia*: p. 447)
- 12b. Basal internodes not swollen; leaf blades persistent 22. *Eragrostideae* (p. 457)
- 11b. Ligule membranous.
- 13a. Pericarp thickened into a pale beak or knob at grain apex 10. *Diarrheneae* (p. 223)
- 13b. Pericarp not thickened.
- 14a. Leaf blades with obvious cross veins, broad 16. *Centothecaeae* (p. 444)

- 14b. Leaf blades without cross veins.
 - 15a. Lemmas 3-veined; spikelets in dense globular clusters on an elongate axis 18. *Arundineae* (118. *Elytrophorus*: p. 450)
 - 15b. Lemmas 5 or more veined; spikelets not in globular clusters.
 - 16a. Glumes usually as long as spikelet, always longer than lowest lemma.
 - 17a. Ligule a line of hairs; awn, when present, arising from sinus of 2-lobed apex 19. *Danthonieae* (p. 449)
 - 17b. Ligule membranous; awn, when present, arising from lemma back 12. *Aveneae* (p. 316)
 - 16b. Glumes shorter than spikelet, usually shorter than lowest lemma; lemmas awnless or a straight awn arising at or near apex.
 - 18a. Ovary glabrous or hairy, styles arising from its apex; lemmas awnless or awned from apex (awn rarely subapical, but then leaf sheaths glabrous and palea keels scabrid) 11. *Poeae* (p. 224)
 - 18b. Ovary with a hairy apical appendage, styles arising beneath it; lemmas awned from just below apex; leaf sheaths hairy; palea keels ciliate 14. *Bromeae* (p. 370)

Key 4

- 1a. Glumes absent or both very short.
 - 2a. Spikelets in umbellate clusters; dwarf ephemeral 12. *Aveneae* (85. *Coleanthus*: p. 340)
 - 2b. Spikelets in a panicle; annual or perennial.
 - 3a. Palea 3–7-veined, 1-keeled; anthers often 6; caryopsis not beaked 4. *Oryzeae* (p. 181)
 - 3b. Palea 2-veined, convolute; anthers 2; caryopsis beaked 5. *Brachyelytreae* (p. 187)
- 1b. Glumes well developed, at least the upper.
 - 4a. Spikelets unisexual; female spikelet inflated, shell- or urn-shaped 2. *Phareae* (p. 180)
 - 4b. Spikelets bisexual, not shell- or urn-shaped.
 - 5a. Leaf blades with cross veins, broadly linear to ovate.
 - 6a. Pedicel falling with spikelet; spikelets very small, numerous in a large panicle; florets 2; lower floret sterile, upper floret fertile, its lemma with ciliate margins 17. *Thysanolaeneae* (p. 446)
 - 6b. Pedicel persistent; florets 1 or more; lowest floret fertile when more than 1.
 - 7a. Leaf blades broadly linear with twisted pseudopetiole; grain globose with thick loose pericarp 6. *Phaenospemateae* (p. 187)
 - 7b. Leaf blades lanceolate to ovate, not pseudopetiolate or twisted; grain an ovoid to trigonous caryopsis.
 - 8a. Glumes persistent; lemma 3–9-veined 16. *Centothecaeae* (p. 444)
 - 8b. Glumes deciduous; lemma 1-veined; low trailing annual 25. *Isachneae* (182. *Sphaerocaryum*: p. 560)
 - 5b. Leaf blades without cross veins, usually narrow.
 - 9a. Inflorescence composed of one or more racemes.
 - 10a. Spikelets in triads 15. *Triticeae* (100. *Hordeum*: p. 395)
 - 10b. Spikelets single.
 - 11a. Rachis fragile; glumes placed side by side 11. *Poeae* (74. *Parapholis*: p. 315)
 - 11b. Rachis tough; glumes opposite.
 - 12a. Lemma 5-veined; spikelets orbicular with gibbously inflated glumes enclosing floret 12. *Aveneae* (92. *Beckmannia*: p. 364)
 - 12b. Lemma 1–3-veined; spikelets not as above 23. *Cynodonteae* (p. 487)
 - 9b. Inflorescence an open, contracted or spikelike panicle.
 - 13a. Spikelets with 2 florets, lower floret staminate or barren, awned from low on back, upper floret fertile 12. *Aveneae* (76. *Arrhenatherum*: p. 322)
 - 13b. Spikelets with 1 to several florets (if 2 florets, lower floret fertile).
 - 14a. Ligule a line of hairs.
 - 15a. Lemma cleft into 7–9 awns 21. *Pappophoreae* (p. 456)
 - 15b. Lemma with 1 or 3 awns, or awnless.
 - 16a. Awns 3, or combined into a single 3-branched awn 20. *Aristideae* (p. 452)
 - 16b. Lemma awnless 22. *Eragrostideae* (p. 457)
 - 14b. Ligule membranous (sometimes with shortly ciliate margin).
 - 17a. Lemma indurated at maturity, terete, often enclosing palea; spikelets strictly 1-flowered without rachilla extension; awned from apex 7. *Stipeae* (p. 188)

- 17b. Lemma not indurated, palea exposed.
- 18a. Spikelets with 3 florets, 2 sterile lemmas below fertile floret.
- 19a. Spikelets falling entire together with pedicel; caryopsis with apical caplike appendage 8. *Brylkinieae* (p. 212)
- 19b. Spikelets disarticulating above glumes; caryopsis without apical cap.
- 20a. Lower lemmas enclosing fertile floret, epaleate, often transversely wrinkled, upper hooked at base 3. *Ehrharteae* (p. 181)
- 20b. Lower lemmas short and subulate, or longer and sometimes staminate, often pubescent, not wrinkled or hooked 12. *Aveneae* (p. 316)
- 18b. Spikelets with 1 floret.
- 21a. Spikelets falling entire.
- 22a. Spikelets dorsally compressed; base of spikelet often shortly bearded; lemma 1–3-veined 27. *Arundinelleae* (184. *Garnotia*: p. 562)
- 22b. Spikelets laterally compressed; base of spikelet glabrous; lemma (3–)5-veined 12. *Aveneae* (p. 316)
- 21b. Spikelets disarticulating above glumes.
- 23a. Glumes (1–)3–9-veined; lemma deeply 2-lobed, awned from sinus 7. *Stipeae* (p. 188)
- 23b. Glumes 0–3-veined; lemma entire or shortly 2-toothed, awnless or awned from apex or back.
- 24a. Lemma 3-veined.
- 25a. Lemma awned 22. *Eragrostideae* (140. *Muhlenbergia*: p. 486)
- 25b. Lemma awnless 11. *Poeae* (70. *Colpodium*: p. 311)
- 24b. Lemma 5-veined.
- 26a. Glumes shorter than floret; lemma awnless or with terminal straight awn 11. *Poeae* (68. *Aniselytron*, 70. *Colpodium*: pp. 310, 311)
- 26b. Glumes longer than floret, or lemma with dorsal or geniculate awn 12. *Aveneae* (p. 316)

1. Tribe BAMBUSEAE

籐竹族 le zhu zu

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Rhizomes pachymorph (branching sympodial) or leptomorph (branching monopodial). Culms perennial, woody, diffuse (culms solitary), pluricaespitose (culms in a series of clumps connected by rhizomes) or unicaespitose (culms in a single dense clump), self-supporting, scrambling, or rarely climbing; internodes usually hollow, terete, or quadrangular, sometimes flattened or grooved above branch clusters; nodes level or raised at supra-nodal ridge or sheath base, basal nodes often with ring of aerial roots or rarely with hardened root thorns. Culm branches solitary to very many densely fasciculate at nodes, basal branch sheathing often reduced, bud scales variously derived, reduced, or absent. Leaves on most of culm except apex usually deciduous, modified into culm sheaths with a supportive and protective role: sheath thickened, blade much reduced, thickened, generally not photosynthetic; oral setae often well developed, on auricle margins when auricles present. Foliage leaf sheath with interior ligule and a less distinct external ligule, often with well-developed auricles and/or oral setae; blade deflexed, broad, roughly linear-lanceolate, base narrowed into pseudopetiole, articulating and eventually separating from persistent sheath, transverse veinlets often forming distinctly tessellate venation. Inflorescences (more correctly synflorescences) aggregations of sessile florets in spikelets or pseudospikelets, branching absent to compound, bracteate or ebracteate; spikelets prophyllate or not, glumes often poorly distinguished from basal bracts and lemmas, not subtending viable buds or branches (semelautant), or in pseudospikelets subtending axillary buds capable of partial or extensive spikelet ramification (iterauctant); lodicules absent to very many, usually 3, usually ciliate, veined, posterior lodicule usually narrower than anterior pair. Stamens usually (2 or)3(or 4) or (5 or)6(or 7), rarely very many. Style short or long; stigmas 1–3. Fruit usually a dry caryopsis, sometimes succulent with a thickened, fleshy pericarp. Several South American genera are morphologically rather more diverse.

About 88 genera and ca. 1400 species: Asia, South America, Pacific Islands, N Australia, Africa, especially Madagascar, Central and North America; 34 genera (five endemic, one introduced) and 534 species (469 endemic, three introduced) in China.

Woody bamboos are found extensively in most of southern, central, and southwestern China and are also found in northern China as far north as Beijing. They have been a significant natural resource throughout China's history, providing food and raw materials for construction and manu-