

## CYPERACEAE

莎草科 suo cao ke

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Herbs, annual or perennial, rhizomatous to stoloniferous. Culms (stems) simple, often 3-sided. Leaves basal and/or cauline, often 3-ranked, comprising a blade and sheath but sometimes only sheath present; sheath open or closed; ligule often present, sometimes on opposite side to leaf blade; leaf blade usually linear, grasslike, sometimes basally broader and constricted into a pseudopetiole. Involucral bracts 1 to several, leaflike or glumelike. Inflorescences unbranched and spicate or capitate, to branched and anthelate (umbel-like) or paniculate, comprising 1 to many ultimate inflorescence units, these either indeterminate and called spikelets or in a few genera determinate and called pseudospikelets (see explanation below). Spikelets with 1 to many glumes, sometimes reduced to a single flower and aggregated into unisexual spikes; glumes membranous to leathery, spirally arranged or 2-ranked, each subtending a single flower. Pseudospikelets comprising 2–12 membranous scalelike floral bracts on a much reduced axis; lowest 2 bracts opposite, keeled, pseudospikelet subtended and usually hidden by a glumelike bract; bracts spirally arranged and aggregated into spikeletlike spikes. Flowers bisexual or unisexual with plants monoecious or rarely dioecious. Perianth absent or reduced to bristles or scales. Stamens 1–3; anthers basifixed. Ovary 2- or 3-carpellate, unilocular, with a single ovule; style divided or rarely undivided, base sometimes persistent and variously shaped in fruit; stigmas 2 or 3. Fruit usually a hard 2- or 3-sided nutlet, rarely with a succulent or corky exocarp, surface smooth or variously minutely patterned, sometimes partially or completely enclosed by an enlarged basal prophyll (utricle).

One hundred and six genera and ca. 5,400 species: worldwide except Antarctica; 33 genera and 865 species (326 endemic, five introduced) in China.

Recent phylogenetic studies (e.g., D. A. Simpson et al., *Aliso* 23: 72–83. 2007; A. M. Muasya et al., *Bot. Rev. (Lancaster)* 75: 52–66. 2009) suggest that tribal and generic delimitation in Cyperaceae is likely to be modified in the future.

The closest relatives to Cyperaceae are Juncaceae and Thurniaceae (D. A. Simpson in P. Rudall, P. J. Cribb, D. F. Cutler & C. J. Humphries, eds., *Monocot. Syst. Evol.* 2: 497–509. 1995) in the order Poales. Poaceae, which shares some characteristics of Cyperaceae, such as wind pollination and reduced floral structure, has often been placed near to Cyperaceae but is now shown to be more distantly related (H. P. Linder & E. A. Kellogg in P. Rudall et al., loc. cit.: 473–496; D. A. Simpson in P. Rudall et al., loc. cit.: 497–509).

Inflorescence structure in Cyperaceae is notoriously difficult to interpret due to its highly reduced nature. Consequently, the terminology used in describing parts of the inflorescence can be confusing with several terms often being applied to the same structure. In addition, several terms are also used in the Poaceae, but they do not always relate to the same structure in both families. A laudable attempt to standardize terminology in Cyperaceae was made by I. Kukkonen (*Ann. Bot. Fenn.* 31: 37–43. 1994). In our treatment we have attempted to keep terminology as simple as possible.

Inflorescences are generally either unbranched or very shortly branched and spicate or capitate in appearance to prominently branched and paniculate or anthelate (umbel-like), with variations around these. The basic unit of the inflorescence in most Cyperaceae is the spikelet. This comprises a very short to elongated axis, which subtends one to many scalelike bracts, referred to here as glumes. Each glume subtends and partially hides a single very small, bisexual or unisexual flower, which may or may not have a perianth. The perianth, when present, is reduced to bristles or scales. There may be 1–3 stamens and a pistil comprising an ovary, style, and 2 or 3 stigmas. The ovary gives rise to a hard, 1-seeded nutlet (sometimes referred to as an achene). Spikelets tend to be aggregated into larger structures known as spikes. In the tribe Cariceae this basic structure is modified such that the spikelet is reduced to a single flower that is enclosed by a saclike structure known as a utricle, the latter being a modified prophyll at the base of the spikelet. The utricle is subtended by a glumelike bract, and the whole structure is again aggregated with others into spikes. Some confusion arises with caricoid spikes especially as the spikelets comprise only one flower and are subtended by a glumelike bract. This has meant that spikes are sometimes referred to as spikelets and the glumelike bracts as true glumes.

The spikelet is indeterminate, i.e., having no terminal flower. However, in *Hypolytrum*, *Lepironia*, and *Mapania*, the basic inflorescence unit has an apparently terminal female flower. To distinguish this type of unit, the term pseudospikelet is used here; some authors refer to it as a spicoid. Its structure is rather different to that of the spikelet, comprising 2–12 scalelike floral bracts on a very much reduced axis. The two lowest bracts are opposite, keeled, and often enclose the upper bracts (when the latter are present). The lower bracts subtend a male flower comprising a single stamen, the upper bracts usually being empty. The terminal flower, which is not subtended by a floral bract, is female. There are no perianth bristles or scales, and the whole structure is subtended and partially to fully hidden by a glumelike bract. These are again aggregated into spikes, but there is further

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confusion in terminology with the spikes sometimes being referred to as spikelets. The above interpretation of the pseudospikelet is widely accepted, although some workers have interpreted it as a single flower.

One of us (Dai) believes that if *Kyllinga* and *Pycurus* are treated as separate genera from *Cyperus*, as they are in this treatment, then *Juncellus* and *Mariscus* should also be separated from *Cyperus* on account of their distinct morphological characters.

Tang Tsin & Wang Fa-Tsuan. 1961. Cyperaceae (1). In: Tang Tsin & Wang Fa-Tsuan, eds., Fl. Reipubl. Popularis Sin. 11: i–xv, 1–261; Liang Song-yun, Dai Lun-kai, Tang Yan-cheng & Li Pei-chun. 2000. Cyperaceae (2). In: Dai Lun-kai & Liang Song-yun, eds., Fl. Reipubl. Popularis Sin. 12: i–xxii, 1–582.

### Glossary

Within the definitions, *italics* indicate terms that are defined in this glossary.

- Amphicarpous** – applied to a small secondary inflorescence occurring at the base of the *culm* in certain genera, particularly *Schoenoplectus*.
- Androgynous** – having male and female flowers in the same structure such as a *spike* in *Carex*.
- Anthela** (plural *anthelae*, adjective *anthelate*) – an umbel-like inflorescence in which the primary branches  $\pm$  arise from the same point, the inflorescence being subtended by 1 to several *involucral bracts*.
- Beak** – short extension at the apex of a *utricle* or *nutlet*.
- Biconvex** – 2-sided, the sides convex.
- Cancellate** – having the appearance of a lattice.
- Capitate** – headlike inflorescence, without any apparent branching.
- Cladoprophyll** – a sterile *utricle* found at the base of a *Carex spike*.
- Compound** – applied to an inflorescence or partial inflorescence where there are 2 orders of branching, i.e., primary and secondary.
- Compressed trigonous** – 3-sided, but distinctly flattened and thus appearing to be 2-sided.
- Conic** – cone-shaped, being wider at the base than the apex; here it is used as the 3-dimensional equivalent of lanceolate.
- Contraligule** – membranous, ligulelike structure at the apex of the leaf sheath on the side of the *culm* facing away from the leaf blade.
- Culm** – stem supporting the inflorescence.
- Decomound** – applied to an inflorescence or partial inflorescence where there are 3 or more orders of branching, i.e., primary, secondary, and tertiary.
- Determinate** – applied to an inflorescence with terminal flowers and therefore not capable of indefinite growth.
- Disk** – 3-lobed structure occurring at the base of the *nutlet* in *Scleria* and *Diplacrum*. In some species it may be indistinct, whereas in *Scleria sumatrensis* it is developed into a cuplike structure  $\pm$  covering the *nutlet*.
- Distichous** (of *glumes* and *spikelets*) – arranged in 2 opposite rows down the *rachilla* or *rachis*.
- Glume** – membranous to leathery scalelike structure subtending individual flowers.
- Gynophore** – short stalk at the base of a *nutlet*.
- Indeterminate** – inflorescence which, in theory, is capable of indefinite growth.
- Involucral bract** – bract or bracts occurring at the point where the inflorescence arises from the *culm*. Vary from being leaflike to glumelike or *setaceous*.
- Isodiametric** – of equal size both horizontally and vertically.
- Keel** – used here for the midrib of a *glume* or scalelike bract.
- Lageniform** – urn-shaped with a constriction in the middle.
- Ligule** – membranous tissue or fringe of hairs occurring at the apex of the leaf sheath on the inner side at the point where it joins the leaf blade.
- Nutlet** – hardened, usually minute, 1-seeded fruit, the surface of which may be smooth to variously patterned and a diagnostic character for many species. Often called an achene in literature on Cyperaceae.
- Paniculate** – inflorescence comprising partial inflorescences arising at intervals along the main inflorescence axis.
- Partial inflorescence** – primary branches of an inflorescence.
- Perianth bristles** – small bristlelike or scalelike structures at the base of the *nutlet*. Presumed to be the remnants of a fully developed perianth.
- Prophyll** – 2-keeled structure at the base of a branch within an inflorescence. It may be glumelike or tubular or, in *Kobresia* and *Carex*, developed into a *utricle*.
- Pseudospikelet** – the ultimate inflorescence unit in *Hypolytrum*, *Lepironia*, and *Mapania*. Has a much reduced axis and appears flowerlike. Comprises 2–12 scalelike bracts each subtending a male flower. The whole structure is terminated by a female flower, thus making it determinate.
- Rachis** – the axis of a *spike*.
- Rachilla** – the axis of a *spikelet*.
- Ray** – branches of an *anthela*.
- Rhizome** – underground stem, which may be short, often giving the plant a tufted habit, or long creeping.
- Scalelike bract** – membranous scalelike structure in a *pseudospikelet* each of which subtends a male flower comprising a single stamen only. The lowest 2 floral bracts usually have a keel and are opposite.
- Scrobiculate** – having numerous minute pits or depressions.
- Septate** – partitioned. In some species, particularly in *Eleocharis*, the *culm* has a series of horizontal septa, which are best seen in dried material.
- Simple** – applied to an inflorescence or partial inflorescence where there is only one order of branching, i.e., primary branching.
- Spike** – an aggregation of *spikelets* or *pseudospikelets*; sometimes the whole structure is similar in appearance to a spikelet (in *Ascolepis* Nees ex Steudel, *Carex*, *Hypolytrum*, *Kobresia*, *Lepironia*, *Lipocarpa*, and *Mapania*).
- Spikelet** – the ultimate inflorescence unit in most genera of Cyperaceae. Has an elongated or reduced axis with 1 to many *glumes*, each *glume* subtending a bisexual or unisexual flower.
- Squarrose** – with tips spreading outward. In Cyperaceae usually applied to the apex of the *glumes*.
- Stipe** – short, narrowed extension to the base of the *nutlet*.
- Stolon** – in Cyperaceae this term is applied to a thin underground branch arising from the *rhizome* or base of the *culm*. Each stolon terminates in an aerial shoot.
- Style base** – a variously shaped portion at the base of the style which is persistent on the mature *nutlet* in some genera.
- Trabeculate** – having the appearance of minute girders.
- Trigonous** – 3-sided, with the margins blunt and rounded. Applied here to the *culm* and *nutlet*.
- Triquetrous** – 3-sided with the margins acute. Applied here to the *culm* and *nutlet*.
- Utricle** – a prophyll which has developed into a characteristic bottlelike structure and partially to completely surrounds the *nutlet* in *Kobresia* and *Carex*.

### Systematic list of subfamilies, tribes, and genera

Cyperaceae is the third largest family in the Monocotyledons (after Orchidaceae and Poaceae). The largest genera in China are *Carex* (527 spp.), *Cyperus* (62 spp.), *Fimbristylis* (53 spp.), *Eleocharis* (35 spp.), and *Scleria* (24 spp.). In the present treatment we follow D. A. Simpson (Amer. J. Bot. 90: 1071–1087. 2003) for subfamily delimitation and Goetghebeur (in K. Kubitzki, Fam. Gen. Vasc. Pl. 4: 141–190. 1998) for tribal and generic delimitation and sequence. Two subfamilies and eight tribes of Cyperaceae occur in China with generic allocation as follows:

#### 1. MAPANIOIDEAE

##### 1. Hypolytreae

1. *Hypolytrum* (p. 168)
2. *Mapania* (p. 169)
3. *Lepironia* (p. 170)

#### 2. CYPEROIDEAE

##### 2. Scirpeae

4. *Scirpus* (p. 171)
5. *Eriophorum* (p. 174)
6. *Trichophorum* (p. 176)
7. *Fuirena* (p. 178)
8. *Bolboschoenus* (p. 179)
9. *Actinoscirpus* (p. 181)
10. *Schoenoplectus* (p. 181)

11. *Eleocharis* (p. 188)

##### 3. Abildgaardieae

12. *Fimbristylis* (p. 200)
13. *Bulbostylis* (p. 218)

##### 4. Cypereae

14. *Isolepis* (p. 219)
15. *Cyperus* (p. 219)
16. *Courtoisina* (p. 241)
17. *Remirea* (p. 241)
18. *Pycreus* (p. 242)
19. *Kyllinga* (p. 246)
20. *Lipocarpa* (p. 249)

##### 5. Dulichieae

21. *Blysmus* (p. 251)

##### 6. Schoeneae

22. *Actinoschoenus* (p. 252)
23. *Rhynchospora* (p. 253)
24. *Schoenus* (p. 256)
25. *Gahnia* (p. 257)
26. *Cladium* (p. 258)
27. *Machaerina* (p. 259)
28. *Lepidosperma* (p. 260)
29. *Tricostularia* (p. 260)

##### 7. Sclerieae

30. *Scleria* (p. 260)
31. *Diplacrum* (p. 268)

##### 8. Cariceae

32. *Kobresia* (p. 269)
33. *Carex* (p. 285)

### Key to genera

For accurate identification of Cyperaceae good fruiting material should be used wherever possible. Indeed this is essential in certain genera, such as *Fimbristylis* and *Scleria*. It is also important to have underground parts as these may be diagnostic for some species. Care is needed when counting the number of stigmas as these are easily broken off. Several should be observed from the same specimen. Care is also needed when counting the stamens. Anthers break off easily leaving the filaments partially hidden within the glumes. Always check that filaments are present. Also, care should be taken to distinguish perianth bristles from filaments as the number of perianth bristles may be useful in separating taxa. The bristles will usually have antrorse or retrorse hairs on them.

- 1a. Inflorescence comprising small units (pseudospikelets) with 2 opposite, keeled, scalelike bracts at base often enclosing a further 2–10 scalelike bracts, each unit subtended and usually hidden by a glumelike bract.
  - 2a. Leaves without blades; culms with transverse septa ..... 3. *Lepironia*
  - 2b. Leaves with blades fully developed; culms without septa.
    - 3a. Pseudospikelets with 5 or 6 scalelike bracts; stamens 3 per pseudospikelet ..... 2. *Mapania*
    - 3b. Pseudospikelets with 2 scalelike bracts; stamens 2 per pseudospikelet ..... 1. *Hypolytrum*
- 1b. Inflorescence not as above.
  - 4a. All flowers unisexual.
    - 5a. Female flowers and nutlets not hidden by a utricle.
      - 6a. Inflorescence made up of capitate clusters of spikelets arising along whole length of culm; nutlets tightly enclosed by 2 subtending glumes and shed with them ..... 31. *Diplacrum*
      - 6b. Inflorescence paniculate or ± capitate, arising on upper part of culm; nutlets not tightly enclosed by 2 glumes ..... 30. *Scleria*
    - 5b. Female flowers and nutlets hidden by a utricle.
      - 7a. Utricle ± open on one side; at least some spikelets bisexual with male flowers above female flower ..... 32. *Kobresia*
      - 7b. Utricle completely closed except at apex; spikelets all unisexual with either 1 male or 1 female flower ..... 33. *Carex*
  - 4b. At least some flowers bisexual.
    - 8a. Spikelets much reduced, with 0–2 glumes subtended by a glumelike spikelet bract, spikelets densely clustered into spikes or in a capitate inflorescence.
      - 9a. Perennial with long-creeping rhizome; sandy beaches near sea only ..... 17. *Remirea*
      - 9b. Annual or perennial, without long-creeping rhizome; inland ..... 20. *Lipocarpa*
    - 8b. Spikelets not as above, elongated, with spirally or distichously arranged glumes.
      - 10a. Spikelets usually with bisexual and male flowers.
        - 11a. Nutlets biconvex, with persistent style base; stigmas 2 or style undivided ..... 23. *Rhynchospora*
        - 11b. Nutlets trigonous or obtuse trigonous-cylindric, without persistent style base; stigmas 3.
          - 12a. Glumes distichous, middle glumes with flowers, lowest empty ..... 24. *Schoenus*
          - 12b. Glumes spirally arranged, rarely distichous, usually apex or near apex with flowers.
            - 13a. Leaves flat, midrib conspicuous or inconspicuous; inflorescence paniculate spreading and loose or small capitate; perianth bristles present or absent; nutlets beaked.

- 14a. Glumes spirally arranged; leaves dorsiventral ..... 26. *Cladium*  
 14b. Glumes  $\pm$  distichous; leaves unifacial ..... 27. *Machaerina*
- 13b. Leaf midrib inconspicuous or terete; inflorescence densely narrowly paniculate,  
 long and large and spreading, loose; perianth bristles present or absent; nutlets  
 beakless.  
 15a. Leaves linear or terete, involute on margins; perianth bristles absent ..... 25. *Gahnia*  
 15b. Leaves terete or flat; perianth bristles present.  
 16a. Leaves terete; perianth connate at base, glabrous; nutlets smooth .... 28. *Lepidosperma*  
 16b. Leaves flat; perianth separate, pubescent; nutlets with reticulate  
 wrinkles ..... 29. *Tricostularia*
- 10b. Spikelets usually with bisexual flowers only.  
 17a. Glumes increasing in length toward apex of spikelet ..... 22. *Actinoschoenus*  
 17b. Glumes  $\pm$  equal in length (with 1–3 smaller glumes often at base of spikelet).  
 18a. Style jointed with ovary and clearly demarcated from it.  
 19a. Leaf blades absent; perianth bristles present ..... 11. *Eleocharis*  
 19b. Leaf blades usually present, if absent then style base not persistent on nutlet;  
 perianth bristles absent.  
 20a. Leaf sheath without long silky hairs at apex; nutlets without persistent  
 style base ..... 12. *Fimbristylis*  
 20b. Leaf sheath with long silky hairs at apex; nutlets with persistent  
 style base ..... 13. *Bulbostylis*
- 18b. Style continuous with ovary and not demarcated from it.  
 21a. Inflorescence spicate with few to many apparently distichous spikelets ..... 21. *Blysmus*  
 21b. Inflorescence not as above.  
 22a. Glumes distichous.  
 23a. Stigmas 3, rarely 2; nutlets trigonous, rarely biconvex with 1 side  
 facing spikelet axis.  
 24a. Annual or perennial; glumes not winged ..... 15. *Cyperus*  
 24b. Annual; glumes prominently winged ..... 16. *Courtoisina*  
 23b. Stigmas 2; nutlets 2-sided with 1 margin facing spikelet axis.  
 25a. Spikelets with more than 2 glumes; spikelet axis and glumes  
 persistent ..... 18. *Pycreus*  
 25b. Spikelets with 1 or 2 glumes; spikelet axis deciduous, spikelets  
 falling whole ..... 19. *Kyllinga*
- 22b. Glumes spirally arranged.  
 26a. Perianth bristles present, 3 inner ones squamellate ..... 7. *Fuirena*  
 26b. Perianth bristles present but not as above, or absent.  
 27a. Perianth bristles 10–30, elongating extremely after anthesis,  
 smooth, silky ..... 5. *Eriophorum*  
 27b. Perianth bristles up to 6, elongating or not after anthesis, or  
 absent.  
 28a. Inflorescence paniculate.  
 29a. Culms not nodose; leaves basal only ..... 9. *Actinoscirpus*  
 29b. Culms nodose; leaves basal and up to 8 cauline ..... 4. *Scirpus*  
 28b. Inflorescence a single spikelet, up to 3 spikelets, or capitate,  
 if paniculate then longest inflorescence bract culmlike and  
 apparently continuous with culm, inflorescence appearing  
 to be lateral.  
 30a. Inflorescence bract glumelike, shorter than  
 inflorescence ..... 6. *Trichophorum*  
 30b. Inflorescence bracts leaflike or culmlike, longest  
 exceeding inflorescence.  
 31a. Spikelets up to 4 mm; perianth bristles absent;  
 nutlet up to 0.9 mm (mostly ca. 0.5 mm) ..... 14. *Isolepis*  
 31b. Spikelets 4 mm or more; perianth bristles  
 usually present; nutlet 1 mm or more.  
 32a. At least 2 involucre bracts over 1.5 cm,  
 longest involucre bract leaflike, erect  
 to spreading ..... 8. *Bolboschoenus*

- 32b. One involucre bract over 1.5 cm, longest involucre bract erect, culmlike and apparently continuous with culm, inflorescence appearing to be lateral ..... 10. *Schoenoplectus*

## 1. *HYPOLYTRUM* Persoon, Syn. Pl. 1: 70. 1805.

割鸡芒属 ge ji mang shu

Dai Lunkai (戴伦凯); David A. Simpson, Gordon C. Tucker

Herbs, perennial, moderately robust to robust, rhizomatous [or stoloniferous]. Roots coarse. Culms central or lateral, if lateral then with cataphylls at base. Leaves 3-ranked, basal or cauline, ligulate; basal leaf sheath folded, adaxially open, cauline leaf sheath tubular; leaf blade leathery, glabrous. Involucral bracts leaflike or glumelike, basal bract usually longest. Inflorescence usually an open compound panicle or capitate, with 1 to many spikes. Spikes comprising many spirally imbricate glumelike bracts each subtending a bisexual spikeletlike unit with a much reduced axis (pseudospikelet). Pseudospikelets comprising a naked apparently terminal female flower and 2(or 3) glumes all subtending a male flower comprising 1 stamen; basal 2 glumes opposite, keeled. Perianth bristles absent. Stigmas 2 or 3. Nutlet with a sculptured hard outer surface, apex often conically rostrate or sometimes mucronate.

About 60 species: tropical and subtropical regions; four species (two endemic) in China.

- 1a. Culms central; inflorescences paniculate with many spikes; basalmost involucre bract 15–30 × 0.7–1.7 cm, much longer than inflorescence ..... 1. *H. nemorum*  
 1b. Culms lateral; inflorescences capitate, with 1 to many spikes; basalmost involucre bract 1.5–5 × ca. 5 cm, shorter to slightly longer than inflorescence.  
 2a. Culms 30–45 cm; leaf blade 2–6 mm wide; spike 1(or 2) ..... 4. *H. shurenii*  
 2b. Culms 5–40 cm; leaf blade 1–2 cm wide; spikes few to many.  
 3a. Culms 5–10 cm tall; spikes few; nutlet olivaceous, subglobose, ca. 2 mm, apex mucronate ..... 2. *H. paucistrobiliferum*  
 3b. Culms 30–40 cm tall; spikes many; nutlet brown, obovoid to ovoid, ca. 3 mm, apex conically rostrate ..... 3. *H. hainanense*

**1. *Hypolytrum nemorum*** (Vahl) Sprengel, Syst. Veg. 1: 233. 1824.

割鸡芒 ge ji mang

*Schoenus nemorum* Vahl, Symb. Bot. 3: 8. 1794; *Hypolytrum formosanum* Ohwi; *H. latifolium* Persoon.

Roots few, hard, fibrous. Rhizomes short, slightly thick, woody, with dense reddish scales. Culms central, 30–90 cm tall, 3–4 mm thick, 3-angled, stiff. Leaves basal and 1 or 2 cauline, longer than culm; basal leaf sheath brownish, 5–15 cm, margin thickly membranous, basal few bladeless; leaf blade 35–120 × 0.8–2.6 cm or longer, flat, stiff, subleathery, base folded, margin scabrous near apex. Involucral bracts 3–5, leaflike, at base of inflorescence and branches, basalmost much longer than inflorescence, not sheathing. Inflorescences paniculate, ovoid-globose to subglobose, 3–7 × 4.5–6 cm, with many spikes; rachis and rachilla angles scabrous. Spikes obovoid, becoming globose when mature, 3–7 × 3–6 mm, with many glumelike bracts. Glumelike bracts brown, spirally and imbricately arranged, obovate, ca. 2 mm, mid-veined, each subtending a pseudospikelet, apex rounded and mucronate. Pseudospikelets ca. 1.5 mm, with 2 glumes, 2 male flowers, and 1 female flower; glumes brown, lateral and opposite, cymbiform, ca. 1.2 mm, membranous, keeled, connate on adaxial side, spinulose on keel, each with a male flower. Filaments slender; anthers narrowly oblong. Stigmas 2. Nutlet dark grayish brown, subglobose, 2–2.5 mm (including rostrum), compressed, longitudinally rugose, apex conically rostrate. Fl. and fr. Apr–Aug.

Wet places in forests or scrub, valleys; 100–1200 m. Fujian,

Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and America, NE Australia, Indian Ocean islands, Pacific islands].

**2. *Hypolytrum paucistrobiliferum*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 234. 1961.

少穗割鸡芒 shao sui ge ji mang

Roots few, thick, hard, fibrous. Rhizomes ± thick, woody. Culms purple, lateral, 5–10 cm tall, with several cataphylls toward base. Leaves basal, distichous; leaf sheath 1–1.8 cm, smooth, not closed, margin narrowly thickly membranous; leaf blade 55–105 × 1.5–2 cm, apically gradually narrowed, flat, papery, smooth, margin and abaxial midvein apically serrulate and scabrous. Involucral bracts 3–5, leaflike, 2–5 cm, basalmost bract equaling inflorescence, basally closed into sheath. Inflorescence a corymbose panicle congested into a head, with few spikes. Spikes with many glumelike bracts, each subtending a pseudospikelet. Pseudospikelets ca. 2 mm, with 2 glumes, 2 male flowers, and 1 female flower; glumes lateral and opposite, cymbiform, membranous, keeled, connate on adaxial side, hispidulous on keel, each with a male flower, margin hyaline. Anther linear; connective apex slightly prominent beyond anther. Stigmas 2, longer than style. Nutlet olivaceous, shortly stipitate, subglobose, ca. 2 mm, both lateral sides angular, abaxial and adaxial surfaces irregularly longitudinally rugose, apex mucronate. Fl. and fr. Aug–Sep.

• Dry places on hills; ca. 100 m. Hainan (Lingshui).

**3. *Hypolytrum hainanense*** (Merrill) Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 201. 1961.

海南割鸡芒 hai nan ge ji mang

*Mapania hainanensis* Merrill, Lingnan Sci. J. 9: 35. 1930.

Roots fibrous. Rhizomes stout, woody. Culms lateral, 30–40 cm tall, 3-angled, basally with several scales and bladeless sheaths. Basal scales broadly ovate. Bladeless sheaths dark grayish brown, densely spirally arranged. Leaves basal, tufted; leaf sheath reddish, to 14 cm, not closed, slightly folded, smooth, margin thickly membranous; leaf blade flat, ca. 1 m × 1–1.8 cm, apically gradually narrowed, papery, glabrous, margin and abaxial midvein serrulate. Involucral bracts 2 or 3, leaf-like, 1.5–5 cm, slightly longer than inflorescence; basalmost bract sheathing. Inflorescence a corymbose panicle congested into a head, 1.3–2 × 1.5–2.5 cm, with many spikes. Spikes narrowly ellipsoid, becoming globose in fruit, 5–6 mm in diam., with many glumelike bracts and pseudospikelets. Glumelike bracts yellowish brown, spirally and imbricately arranged, oblong-obovate, 2.5–3 mm, leathery, punctate, keeled, each subtending a pseudospikelet. Pseudospikelets ca. 2 mm, with 2 glumes, 2 male flowers, and 1 female flower; glumes dark grayish brown, lateral and opposite, narrowly elliptic and cymbiform, ca. 2.5 mm, keeled, membranous, connate on adaxial side, spinulose on keel, each with a male flower. Anther narrowly oblong; connective apex not prominent beyond anther. Stigmas 2. Nutlet dark grayish brown, broadly obovoid to ovoid, ca. 3 mm, biconvex, irregularly longitudinally rugose, apex with a conic beak. Fl. and fr. May–Aug.

Forests, dry places on mountain slopes; 100–300 m. Hainan, Hong Kong [Vietnam].

**4. *Hypolytrum shurenii*** D. A. Simpson & G. C. Tucker, sp. nov.

树仁割鸡芒 shu ren ge ji mang

Type: China. Hainan: Changjiang, 10 Dec 1933, *Liang Xiangri* 66046 (holotype, MO!).

*Haec species Hypolytro humili Boeckeler affinis, sed ab eo culmis capillaribus, foliis 2–6 mm latis ad apicem caudatis, spicis 1 vel 2 atque nucula ellipsoideo-ovoidea differt.*

Paratypes: Hainan: Ledong Li Autonomous County, 3 Jul 1936, *Liu Xinqi* 27397 (MO); Dongfang City, 10 Dec 1955, *Hainan Station* 237 (MO); Qiongzhou County, 11 Dec 1956, *Anonymous* 3677 (MO); Baisha County, 24 Feb 1936, *Liu Xinqi* 25437 (MO); Ya County (now Sanya), 28 Jul 1933, *Huang Zhi* 33414 (MO).

Perennials, 30–45 cm tall. Roots fibrous. Rhizomes to 1 cm thick, hardened, oblique to horizontal, covered with tough fibrous remnants of leaf sheaths. Culms lateral/axillary, (5–)10–20 cm tall, delicate, flexuose, smooth or scabridulous but scabrous on winged angles, basally flattened, apically becoming roundly 3-angled. Leaves basal, tufted; leaf sheath reddish, to 14 cm, not closed, slightly folded, smooth, margin thickly membranous; leaf blade linear, 15–30 cm × 2–6 mm, flat or slightly plicate, leathery, glabrous, margin and abaxial midvein serrulate, apex with a slender 3–6 cm cauda. Involucral bracts 2 (or 3), deltate, 2–3 mm, shorter than spike; basalmost bract with tubular or amplexicaul sheath to 1 mm. Inflorescences of 1 or 2 spikes (if 2 then proximal one stalked, subtended by a bladeless sheath up to 6 mm). Spikes ovoid, 4–5 mm, with 10–20 glumelike bracts and pseudospikelets. Glumelike bracts yellowish brown, spirally arranged and imbricate, ovate-deltate, 2.5–3 mm, leathery, ca. 7-veined, keeled, margin white membranous, apex rounded; basal 3 bracts sterile, apical ones each with a pseudospikelet. Pseudospikelets with 2 glumes, 3 male flowers, and 1 female flower, ca. 2 × 1 mm; glumes light brown, lateral and opposite, connate on adaxial (and ?abaxial) side, narrowly elliptic, cymbiform, ca. 2.5 mm, membranous, keeled, spinulose on keel especially distally, each with a male flower. Anther linear, ca. 0.7 mm; connective apex slightly prolonged beyond anther. Style ca. 0.5 mm; stigmas 2. Nutlet light brown, stipitate, ellipsoid-ovoid (widest at mid-length), ca. 2.3 × 1.1 mm, roundly 3-sided, irregularly rugose, apex apiculate. Fl. and fr. Dec–Jul.

• Open woods, clearings; 900–1400 m. Hainan.

## 2. MAPANIA Aublet, Hist. Pl. Guiane 1: 47. 1775.

播鼓蒨属 lei gu li shu

Dai Lunkai (戴伦凯); David A. Simpson, Gordon C. Tucker

Herbs, perennial, robust. Roots coarse. Rhizomes woody. Culms central or lateral (arising from basal leaf axils or below leaves), if lateral then with cataphylls at base. Leaves 3-ranked, basal or rarely cauline; basal leaf sheath folded, open adaxially; cauline leaf sheath tubular; ligule absent; leaf blade linear to oblong, leathery or subleathery. Involucral bracts leaflike or glumelike, basal bract longest. Inflorescences corymbose paniculate or capitate, with 1, few, or many spikes. Spikes comprising few to many spirally imbricate glumelike bracts, each subtending a bisexual spikeletlike unit with a much reduced axis (pseudospikelet). Pseudospikelets comprising an apparently terminal female flower and 5 or 6 scalelike glumes; basal 2 pseudospikelet glumes opposite and keeled; basal 3 pseudospikelet glumes subtending a male flower comprising 1 stamen, remaining glumes empty. Perianth bristles absent. Styles slender; stigmas [2 or]3. Nutlet with a hard or succulent outer surface, smooth or sculptured, lateral costae or furrows 0 or 2–4.

About 85 species: pantropical and extending into warm temperate regions; three species in China.

- 1a. Inflorescences corymbose paniculate; nutlet with 2–4 longitudinal furrows ..... 1. *M. sumatrana*  
 1b. Inflorescences capitate or with only a single spikelet; nutlet without longitudinal furrows.  
 2a. Inflorescences capitate with up to 4 spikes, broadly ovoid, 1.8–2.5 × 1.5–1.8 cm ..... 2. *M. silhetensis*  
 2b. Inflorescence a single spike, ellipsoid to subobovoid, ca. 3 × 1.6–2 cm ..... 3. *M. wallichii*

**1. *Mapania sumatrana*** (Miquel) Bentham subsp. ***pandanophylla*** (F. Mueller) D. A. Simpson, Revis. Gen. *Mapania*, 53. 1992.

露兜树叶野长蒲 lu dou shu ye ye chang pu

*Hypolytrum pandanophyllum* F. Mueller, Fragm. 9: 16. 1875; *Thoracostachyum pandanophyllum* (F. Mueller) Domin.

Rhizomes short or stolonlike. Culms central, ca. 1 m tall, 2–10 mm thick, straight, 3-angled, glabrous. Leaves basal and cauline, glabrous, basal leaves stipitate, cauline leaves sheathing; leaf sheath greenish to reddish brown, 7–24 cm; leaf blade to 2 m × 2.5–3 cm or longer, 3-angled, inverse W-shaped in cross section, 3-veined, margins scabrous or serrulate, apex flagelliform-acuminate. Involucral bracts 4 or 5, leaflike; basalmost bract to 70 × 1–2 cm or longer, much longer than inflorescence, not sheathing. Inflorescences corymbose paniculate, ca. 5 × 8 cm or longer; racemes several at apex of branches, with many spikes. Spikes 1 or 3–5 fascicled, ellipsoid, 5–6 mm, sessile, with many glumelike bracts subtending pseudospikelets. Glumelike bracts densely spirally and imbricately arranged, elliptic to broadly elliptic, ca. 2.5 mm, slightly shiny, glabrous, veins obsolete, apex rounded; basal 2 bracts empty, remainder each with a pseudospikelet. Pseudospikelets with 6 glumes, 3 male flowers, and 1 female flower; basal 2 glumes opposite, cymbiform, membranous to hyaline, keeled, ciliate on keel, each subtending 1 male flower; remaining 4 glumes linear-oblong, hyaline, outermost one subtending a male flower. Filaments to 3.7 mm; anthers linear to linear-oblong. Style ca. 1 mm; stigmas 3. Nutlet mid- to dark grayish brown, ovoid, 3–4 × 2.1–2.2 mm, outer surface hard, shiny, and with 2–4 longitudinal furrows. Fl. Mar–Apr.

Wet places in sparse forests or scrub; ca. 1100 m. Hunan, S Yunnan [Indonesia, Malaysia, Papua New Guinea; NE Australia, Pacific islands].

**2. *Mapania silhetensis*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 681. 1894.

华播鼓蒴 hua lei gu li

*Mapania sinensis* Uittien.

Rhizomes thick, woody. Culms lateral, 25–54 cm tall, ca. 3 mm thick, with several cataphylls toward base. Leaves basal, distichous; leaf sheath brownish, ca. 12 cm, margin thickly membranous; leaf blade ca. 1.3 m × 2.5–3.5 cm or longer, subleathery, smooth, 3-veined, apical margin and abaxial midvein serrulate, apex caudate-acuminate. Involucral bracts brown,

glumelike, ovate to ovate-deltate, 1.5–2.5 cm, shorter than inflorescence, leathery, apex acute. Inflorescences capitate, broadly ovoid, 1.8–2.5(–5) × 1.5–1.8 cm, with 4 spikes fascicled at apex of culm, with many glumelike bracts and pseudospikelets. Glumelike bracts straw-colored, spirally and imbricately arranged, narrowly oblong, ca. 1 cm, papery, apex obtuse. Pseudospikelets with 6 glumes, 3 male flowers, and 1 female flower; basal 2 glumes opposite, cymbiform, membranous, keeled, spinulose on apical part of keel, each subtending 1 male flower; remaining 4 bracts narrowly oblong, outermost one subtending a male flower. Filaments to 1.6 cm; anthers linear, 7–8 mm. Style ca. 6.5 mm; stigmas 3. Nutlet dark brown, obovoid, 4–4.5 mm, obtusely 3-sided, outer surface succulent, apex conically rostrate. Fl. and fr. Oct.

Forests; 600–700 m. Guangdong, Guangxi [Bangladesh, India, Vietnam].

**3. *Mapania wallichii*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 682. 1894.

单穗播鼓蒴 dan sui lei gu li

*Mapania dolichopoda* Tang & F. T. Wang.

Rhizomes thick, woody. Culms lateral, 20–70 cm tall, 2–4 mm thick, with several cataphylls toward base. Leaves basal, ± distichous; leaf sheath dark green, open, folded, overlapping each other, 7–12 cm, leathery; leaf blade ca. 1.2 m × 2–3.5 cm or longer, subleathery, margin and abaxial midvein serrulate, apically gradually narrowed into an acutely triquetrous and flagelliform apex. Involucral bracts yellowish green, glumelike, ovate-lanceolate, 1.5–2.5 cm, slightly shorter to nearly as long as inflorescence, leathery, midvein abaxially elevated, margin brown and thickly membranous. Inflorescence a single terminal spike, ellipsoid to subobovoid, 3–3.5 × 1.5–2 cm, with many glumelike bracts and pseudospikelets. Glumelike bracts yellowish, spirally and imbricately arranged, ovate-oblong, 1.2–1.5 cm, papery. Pseudospikelets with 6 glumes, 3 male flowers, and 1 female flower; basal 2 glumes opposite, cymbiform, membranous, keeled, spinulose on apical part of keel, each subtending 1 male flower; remaining 4 bracts narrowly oblong, outermost one subtending a male flower. Filaments to 1.5 cm; anthers linear, ca. 8 mm. Style ca. 9 mm; stigmas 3. Nutlet brown, shortly stipitate, subobovoid to ellipsoid, ca. 7.5 mm, obtusely 3-sided, outer surface succulent, apex conically rostrate. Fl. and fr. Oct–Nov.

River margins, dense forests, ditch margins in valleys; ca. 500 m. Fujian, Guangdong, Guangxi, Hainan [Indonesia, Malaysia].

### 3. **LEPIRONIA** Persoon, Syn. Pl. 1: 70. 1805.

石龙台属 shi long chu shu

Dai Lunkai (戴伦凯); Jeremy J. Bruhl, David A. Simpson

Perennials. Rhizomes woody. Culms erect, terete, with transverse septa. Leaves basal, without a leaf blade. Primary involucral bracts subulate, cylindrical, erect. Inflorescence a single spike, pseudolateral, with many spirally arranged imbricate glumelike bracts. Basal glumelike bracts empty, most subtending pseudospikelets. Pseudospikelets with 2 outer strongly keeled glumes and many non-keeled glumes, most subtending 1 stamen and a solitary apparently terminal female flower. Perianth bristles absent. Stigma 2, long, slender. Nutlet plano-convex, apex not beaked.

One species: tropical Asia, Australia, Madagascar, Pacific islands.

**1. *Lepironia articulata*** (Retzius) Domin, *Biblioth. Bot.* 85: 486. 1915.

石龙刍 shi long chu

*Restio articulatus* Retzius, *Observ. Bot.* 4: 14. 1786; *Lepironia compressa* Boeckeler; *L. mucronata* Persoon; *L. mucronata* var. *compressa* (Boeckeler) E. G. Camus.

Rhizomes creeping, covered by brown ovate scales. Culms 0.7–1.5(–2) m tall, 5–8 mm thick when dried, terete, with 3 or 4 leaf sheaths at base; sheaths open, brown to reddish, 10–30 cm, papery, margin thickly membranous. Involucral bract 3–7 cm. Spike brown to blackish, pseudolateral, ellipsoid to ovoid-ellipsoid, 1–2 × 0.6–1 cm, with many glumelike bracts. Glume-like bracts orange, dark brown, or black, ovate, broadly ovate, or obovate-oblong, 4–5 × 4.5–5 mm, concave, striate, apex rounded. Pseudospikelets with many brown glumes; basal 2

glumes lateral, narrowly spatulate and cymbiform, ca. 5 mm, membranous, keeled, with stout prickly hairs on keel, apex acute; middle glumes linear-lanceolate and cymbiform, slightly shorter, membranous, each with or without a single stamen, apex acuminate; central gynoeceum surrounded by empty glumes. Anther linear-oblong; connective apex ca. 0.5 mm, prominent beyond anther. Style white at anthesis, shorter than stigmas. Nutlet yellowish, maturing to dark gray brown, obovoid, ca. 4 × 3 mm, compressed, with 7–9 dark brown longitudinal striae on both sides, margins distally scaberulose. Fl. and fr. Feb–Jun.

Usually in coastal ponds, marshes, and streams; 100–200 m. Guangdong, Hainan, Taiwan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Australia, Madagascar, Pacific islands].

*Lepironia articulata* is used for making mats and baskets.

#### 4. **SCIRPUS** Linnaeus, *Sp. Pl.* 1: 47. 1753, nom. cons.

蘆草属 biao cao shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker

Herbs, perennials. Culms tufted, 3-angled to obtusely 3-angled, rarely terete, few to many nodose. Leaves basal and cauline; leaf blade linear, grasslike, ligulate, base sheathing. Involucral bracts leaflike, spreading. Inflorescence a terminal corymbiform anthela, with many spikelets. Spikelets ovoid to ellipsoid, generally rather small. Glumes spirally arranged, deciduous, each subtending a flower. Flowers bisexual. Perianth bristles 3–6, as long as to much longer than nutlet, deciduous with nutlet. Stamens 1–3. Style base not thickened, persistent; stigmas 2 or 3. Nutlet obovoid to ellipsoid, compressed 3-sided to biconvex, smooth, apex beaked.

About 35 species: mostly in temperate regions of N Hemisphere, greatest diversity in North America; 12 species (four endemic) in China.

- 1a. Involucral bracts spathe-like ..... 11. *S. maximowiczii*  
 1b. Involucral bracts leaflike.  
 2a. Prophyll subtending a bisexual flower ..... 12. *S. paniculato-corymbosus*  
 2b. Prophyll absent.  
 3a. Spikelets dark green (to grayish).  
 4a. Perianth bristles erect, retrorsely scabrous, nearly as long as nutlet ..... 1. *S. orientalis*  
 4b. Perianth bristles prominently flexuose to contorted, retrorsely scabrous only near apex,  
 2–4 × as long as nutlet ..... 2. *S. radicans*  
 3b. Spikelets ± reddish brown.  
 5a. Spikelets narrowly ovoid; basal several glumes empty ..... 9. *S. filipes*  
 5b. Spikelets globose, ovoid, oblong, or ellipsoid; all glumes with a flower.  
 6a. Perianth bristles basally glabrous and apically densely pubescent with long yellowish brown  
 hairs ..... 10. *S. hainanensis*  
 6b. Perianth bristles antrorsely scabrous but not pubescent.  
 7a. Glumes 1-veined, apex acuminate; perianth bristles flexuose, 1.5–4 × as long as nutlet;  
 nutlet compressed 3-sided; stigmas 3.  
 8a. Glumes lanceolate to ovate-lanceolate, 2.5–3 mm ..... 3. *S. karuisawensis*  
 8b. Glumes deltoid-ovate to oblong-ovate, 1.3–2 mm.  
 9a. Spikelets globose-ellipsoid; glumes 1.3–1.5 mm, apex obtuse ..... 4. *S. lushanensis*  
 9b. Spikelets globose; glumes 1.8–2 mm, apex acute ..... 5. *S. wichurae*  
 7b. Glumes 1-, 3-, or 5-veined, apex obtuse; perianth bristles slightly flexuose, less than 1.5 ×  
 as long as nutlet; nutlet biconvex; stigmas 2.  
 10a. Spikelets 2–3 mm; glumes broadly ovate, ca. 1 mm, 3-veined ..... 8. *S. rosthornii*  
 10b. Spikelets 3–6 mm; glumes ± broadly ovate-orbicular, 1.2–1.5 mm, 1- or 5-veined.  
 11a. Glumes ca. 1.2 mm, without brown short lines, 1-veined; nutlet 0.7–1 mm ..... 6. *S. ternatanus*  
 11b. Glumes ca. 1.5 mm, with brown short lines, 5-veined; nutlet ca. 1.5 mm ..... 7. *S. chunianus*

**1. *Scirpus orientalis*** Ohwi, *Acta Phytotax. Geobot.* 1: 76. 1932.

东方蘆草 dong fang biao cao

*Scirpus sylvaticus* Linnaeus var. *maximowiczii* Regel; *S. sylvaticus* var. *subradicans* Kükenthal ex Tang.

Rhizomes short, stoloniferous. Culms 0.6–1.8 m tall, 7–12

mm thick, obtusely 3-angled, 5–7-nodose. Leaves cauline, as long as or shorter than inflorescence; leaf blade 4–15 mm wide, flat, abaxial midvein and margin usually scabrous. Involucral bracts 2–4, leaflike, much longer than inflorescence. Inflorescence a terminal large compound anthela; rays many, to 10 cm, apically scabrous. Spikelets usually solitary or in clusters of 2 or 3, dark gray, ovoid to narrowly ovoid to rarely ovoid, 4–6 × ca. 2 mm, many flowered. Glumes dark green, broadly ovate, ca. 1.5 mm, with 3 yellowish green veins, apex acute to subrounded. Perianth bristles 5 or 6, as long as or slightly longer than nutlet, erect, retrorsely scabrous. Stamens 3; anthers linear-oblong, ca. 1 mm; connective apex very short. Style slightly longer than nutlet; stigmas 3. Nutlet pale yellow, obovoid to ellipsoid, compressed 3-sided. Fl. Jun–Jul, fr. Aug.  $2n = 60$ .

Swampy places in woods, wet places; 400–2700 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Xinjiang [Japan, Korea, Mongolia, Russia (Far East, Siberia)].

**2. *Scirpus radicans*** Schkuhr, Ann. Bot. (Usteri) 4: 48. 1793.

单穗蔗草 dan sui biao cao

*Nemocharis radicans* (Schkuhr) Beurling; *Scirpus sylvaticus* Linnaeus var. *radicans* (Schkuhr) Willdenow; *Seidlia radicans* (Schkuhr) Opiz.

Rhizomes short. Culms slightly tufted, 0.7–1.5 m tall, obtusely 3-angled, 7- or 8-nodose, smooth but slightly scabrous near inflorescence. Leaves cauline, shorter than inflorescence; sheath ± long; leaf blade 7–10 mm wide, abaxial midvein and margin slightly scabrous. Involucral bracts 2 or 3, leaflike, overtopping inflorescence. Inflorescence a terminal large compound anthela, with many rays; first rays to 9 cm, glabrous. Spikelets solitary, oblong-ovoid to narrowly ovoid, 5–8 × ca. 2 mm, many flowered, apex acuminate. Glumes densely arranged, oblong, ca. 2 mm, membranous, both surfaces dark grayish black, midvein pale yellow, base sometimes straw-colored, margin apically ciliate, apex rounded. Perianth bristles 6, usually 2–4 × as long as nutlet, prominently flexuose, retrorsely scabrous only near apex. Anthers ca. 1 mm, linear-oblong. Style slightly short; stigmas 3. Nutlet pale yellow, obovoid, ca. 1 mm, compressed 3-sided. Fl. and fr. Jun–Sep.  $2n = 56$ .

In water, swampy places; 400–900 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Kazakhstan, Korea, Mongolia, Russia; Europe].

**3. *Scirpus karuisawensis*** Makino, Bot. Mag. (Tokyo) 18: 119. 1904.

华东蔗草 hua dong biao cao

*Scirpus fuirenooides* Maximowicz var. *jaluanus* Komarov; *S. jaluanus* (Komarov) Nakai ex Mori.

Rhizomes short. Culms 0.8–1.5 m tall, stout, rigid, obtusely 3-angled, 5–7-nodose, clothed at base with a few bladeless leaf sheaths. Leaves shorter than culm; sheath reddish brown; leaf blade linear, 4–10 mm wide, stiff. Involucral bracts 1–4, leaflike, overtopping inflorescence. Inflorescences consisting of a terminal and 2–4 lateral lax anthelae; lateral anthelae simple, with 5 or fewer ca. 7 cm rays; terminal decompound anthela with many rays. Spikelets in spherical clusters of 5–10,

oblong to ovoid, 5–9 × 3–4 mm, densely many flowered, apex obtuse. Glumes reddish brown, lanceolate to oblong-ovate, 2.5–3 mm, membranous, 1-veined, apex acute. Perianth bristles 6, white, 3–4 × as long as nutlet, basally flexuose, apically sparsely antrorsely scabrous. Anthers linear. Style of medium length; stigmas 3. Nutlet yellowish, oblong to obovoid, ca. 1 mm, compressed 3-sided, shiny, apex shortly beaked. Fl. and fr. Aug–Sep.

Wet places, swamps; 600–1200 m. Anhui, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, Yunnan, Zhejiang [Japan, Korea].

**4. *Scirpus lushanensis*** Ohwi, Acta Phytotax. Geobot. 7: 134. 1938.

庐山蔗草 lu shan biao cao

*Scirpus lineatus* Michaux var. *lushanensis* (Ohwi) T. Koyama; *S. rongchenensis* F. Z. Li; *S. wichurae* Boeckeler var. *lushanensis* (Ohwi) T. Koyama.

Rhizomes short, stout. Culms 1–1.5 m tall, stout, erect, rigid, obtusely 3-angled, 5–8-nodose. Leaves shorter than culm; sheath usually reddish brown, 3–10 cm; leaf blade 0.5–1.5 cm wide, ± stiff. Involucral bracts 2–4, leaflike, usually shorter to rarely longer than inflorescence. Inflorescences terminal and lateral, a large compound or decompound anthela, with many rays; first ray to 20 cm, slender; rays and peduncles scabrous. Spikelets mostly solitary, sometimes in clusters of 2–8, globose-ellipsoid, 2.5–3.5 mm, densely many flowered, apex rounded. Glumes rust-colored (concolorous), deltoid-ovate to broadly ovate, 1.3–1.5 × 0.7–0.8 mm, membranous, with 1(–3) brown veins, apex acute. Perianth bristles 6, ca. 1.5 × as long as nutlet, basally flexuose, distally straight, apically antrorsely scabrous. Anthers linear-oblong. Style of medium length; stigmas 3. Nutlet pale yellow, ellipsoid, ca. 1.5 × 0.5 mm, compressed 3-sided, slightly exceeding subtending glume when mature. Fl. Jun–Jul, fr. Aug–Sep.

Moist grasslands, swamps, trail margins on slopes, stream margins; 300–2800 m. Anhui, S Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, SE Sichuan, SE Xizang, Yunnan, Zhejiang [NE India, Indonesia (Sumatra), Japan, Korea, Russia (Far East), Thailand, Vietnam].

**5. *Scirpus wichurae*** Boeckeler, Linnaea 36: 729. 1870 [“*wichurai*”].

球穗蔗草 qiu sui biao cao

*Scirpus asiaticus* Beetle; *S. lineatus* Michaux subsp. *wichurae* (Boeckeler) T. Koyama; *S. wichurae* var. *asiaticus* (Beetle) T. Koyama ex W. T. Lee.

Culms 60–100 cm tall, stout, 3-angled, several nodose. Leaves shorter than culm; basal sheaths blackish purple, shiny, apex with a distinct tongue; leaf blade usually shorter than culm, 0.5–1.5 m × 1–1.5 cm, flat, stiff, leathery, margin slightly scabrous. Involucral bracts 5 or 6, leaflike, basal 3 or 4 overtopping inflorescence. Inflorescence a large compound or decompound anthela, turbinate with concave center, 7–10 × 8–15 cm; rays 5 or more, to 9 cm, slender, spreading (often in same direc-

tion), pubescent. Spikelets sessile, in glomerules of 3–7, globose, 3–8 × 2.5–3.5 mm, many flowered, apex obtuse. Glumes rusty brown (concolorous), densely arranged, ovate to ovate-deltate, 1.8–2 × ca. 0.8 mm, membranous, with 1 pale brown vein, apex attenuate to mucronate and woolly at maturity from exerted bristle tips. Perianth bristles 6, 1.5–2 × as long as nutlet, erect, basally connate, apical half sparsely antrorsely scabrous. Style filiform, 1.2–1.5 mm. Nutlet pale yellowish brown, ellipsoid to obovoid, ca. 1.3 mm, 3-sided, apex subulate beaked. Fl. and fr. probably Jul–Oct.

Wet places, hillsides, valleys; 1800–2500 m. Guizhou, Liaoning, Qinghai, Shandong, Yunnan [Bangladesh, Bhutan, N India, Indonesia (Sumatra), Japan, Korea, N Thailand].

*Scirpus wichurae* and *S. lushanensis* were treated together as *S. asiaticus* by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 12. 1961), but we consider them to be quite distinct as can be seen from the key differences. If varieties are recognized for *S. wichurae*, plants from Japan are the typical variety, and plants from China and elsewhere in the range are *S. wichurae* var. *asiaticus*.

**6. *Scirpus ternatanus*** Reinwardt ex Miquel, Fl. Ned. Ind. 3: 307. 1856.

百穗蘆草 bai sui biao cao

Culms 60–100 cm tall, stout, 3-angled, several nodose. Leaves longer than culm; basal sheaths blackish purple, shiny; leaf blade 1–1.5 cm wide, flat, stiff, leathery, margin slightly scabrous. Involucral bracts 5 or 6, leaflike, basal 3 or 4 overtopping inflorescence. Inflorescence a large compound or decomposed anthela, 7–10 × 8–15 cm; rays 5 or more, to 9 cm, stout, spreading, smooth. Spikelets sessile, in headlike clusters of 4–10, ovoid, ellipsoid, or oblong, 3–8 × 2.5–3.5 mm, many flowered, apex obtuse. Glumes brown, densely arranged, broadly ovate to ovate-orbicular, ca. 1.2 mm, membranous, with 1 pale brown vein, apex obtuse to rounded. Perianth bristles 2 or 3, longer than nutlet, erect, apical half sparsely antrorsely scabrous. Style filiform, 1.2–1.5 mm; stigmas ??. Nutlet pale yellow, ellipsoid, obovoid, or subspherical, 0.7–1 mm, biconvex. Fl. and fr. (May–)Jun–Aug.

Wet places, hillsides, valleys; 300–1400(–1800) m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hubei, Hunan, Jiangxi, Shandong, Sichuan, Taiwan, SE Xizang, Yunnan [Bhutan, India, Indonesia, Japan, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; Pacific islands].

**7. *Scirpus chunianus*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 221. 1961.

陈氏蘆草 chen shi biao cao

Culms 0.9–1.5 m tall, stout, obtusely 3-angled, acutely 3-angled just basal to inflorescence. Leaves longer than culm; sheath 5–7.5 cm; leaf blade 0.8–1.4 cm wide, flat, stiff, abaxial midvein and margin scabrous. Involucral bracts 7, leaflike, overtopping inflorescence, abaxial midvein and margin scabrous. Inflorescence a large terminal decomposed anthela; rays many, scabrous; first rays to 9 cm, stout, 3-angled. Spikelets sessile, in headlike clusters of 3–7, ellipsoid to oblong, 4–6 × 2–3 mm, many flowered, apex obtuse to rounded. Glumes brown with dark brown short lines, deltoid-ovate, ca. 1.5 mm, membranous,

5-veined, apex rounded. Perianth bristles 2 or 3, white, slightly longer than nutlet, erect, apically sparsely antrorsely scabrous. Stamens 2. Stigmas ??. Nutlet yellow, broadly ellipsoid to subspherical, ca. 1.5 mm, biconvex, densely minutely verruculose. Fl. and fr. Mar–Apr.

• Forests along valleys; 300–600 m. Guangdong, Guangxi, Hainan (Baoting), Hunan.

**8. *Scirpus rosthornii*** Diels, Bot. Jahrb. Syst. 29: 228. 1900.

百球蘆草 bai qiu biao cao

Rhizomes short. Culms 70–100 cm tall, stout, 3-angled, stiff, nodose. Leaves overtopping inflorescence; sheath 3–12 cm, with transverse veins; leaf blade 0.6–1.5 cm wide, ± stiff, abaxial midvein and margin scabrous. Involucral bracts 3–5, leaflike, usually overtopping inflorescence. Inflorescence a large terminal decomposed anthela; rays 6 or 7, to 12 cm, stout, scabrous. Spikelets sessile, in headlike clusters of 4–15, ovoid to ellipsoid, 2–3 × ca. 1.5 mm, many flowered, apex subrounded. Glumes straw-colored to brown but later becoming blackish brown, broadly ovate, ca. 1 mm, with 3 green veins, apex obtuse. Perianth bristles 2 or 3, longer than nutlet, erect, apical half antrorsely scabrous. Stigmas 2. Nutlet yellow, ellipsoid to subspherical, 0.6–0.7 mm, biconvex. Fl. and fr. May–Sep.

Forests, forest margins, slopes, trail margins, wet places, swamps; 300–2600 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Shandong, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Nepal].

**9. *Scirpus filipes*** C. B. Clarke, J. Linn. Soc., Bot. 36: 249. 1903.

细枝蘆草 xi zhi biao cao

Rhizomes short, woody. Culms 25–100 cm tall, 3-angled, stiff, scabrous, obscurely nodose, clothed at base with several pale brown leaf sheaths. Leaves shorter than culm; sheath very long; leaf blade 5–6 mm wide, stiff, veins and margin scabrous. Involucral bracts 1 or 2, leaflike, overtopping inflorescence, both surfaces and margin scabrous. Inflorescence a terminal simple anthela or pseudolateral head; rays 7–12, to 6 cm, ± slender. Spikelets solitary or in clusters of 2–6, brown, narrowly ovoid, 7–9 × 1.5–2 mm, ca. 10-flowered, basally several glumes empty. Glumes reddish brown, lanceolate-oblong to oblong-ovate, ca. 4 mm, with 1–3 dark yellow veins, apex acute to obtuse. Perianth bristles 6, longer than nutlet, antrorsely scabrous. Stamens 3; anthers linear, ca. 2.5 mm. Stigmas 3. Nutlet yellow, obovoid, less than 1/2 as long as subtending glume, compressed 3-sided. Fl. and fr. May–Jun.

• Forests, forest margins, slopes, trail margins, grassy slopes, wet places, stream margins, swamps, on rocks; 300–2400 m. Fujian, Guangdong, Guangxi.

- 1a. Culms 70–100 cm tall; inflorescence a terminal simple anthela; spikelets in clusters of 2–6 ..... 9a. var. *filipes*
- 1b. Culms ca. 25 cm tall; inflorescence a pseudolateral head; spikelets 1 or 2 ..... 9b. var. *paucispiculatus*

**9a. *Scirpus filipes* var. *filipes***

细枝蕹草(原变种) xi zhi biao cao (yuan bian zhong)

Culms 70–100 cm tall. Inflorescence a terminal simple anthela. Spikelets in clusters of 2–6.

• Forests, forest margins, slopes, trail margins, grassy slopes, wet places, stream margins, swamps; 300–2400 m. Fujian, Guangdong, Guangxi.

**9b. *Scirpus filipes* var. *paucispiculatus* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 221. 1961.**

少花细枝蕹草 shao hua xi zhi biao cao

Culms ca. 25 cm tall. Inflorescence a pseudolateral head. Spikelets 1 or 2.

• On rocks. Fujian (Nanping).

**10. *Scirpus hainanensis* S. M. Huang, Fl. Hainan. 4: 538. 1977.**

海南蕹草 hai nan biao cao

Rhizomes short or not. Culms tufted, 60–90 cm tall, slender, erect, terete, nodose, glabrous. Leaves basal or 3–5 on culm, shorter than culm; sheath brown, 1.5–3 cm, mouth obliquely truncate; leaf blade linear, 3–5 mm wide, flat, abaxial midvein and margin scabrous, apex acuminate. Involucral bracts leaf-like, usually shorter than inflorescence, sheathing. Inflorescences consisting of a terminal and 3–5 lateral anthelae; rays long, each with 3–12 spikelets. Spikelets solitary, sessile or pedunculate, oblong to ovoid-oblong, 5–7 × 2–3 mm, 10–15-flowered, sometimes spikelets bearing small plants. Glumes yellowish brown to pale yellow, ovate to oblong-ovate, 2–2.5 mm, membranous, both surfaces with dark brown short lines, with 1 yellowish green vein, apex acute to very shortly mucronate. Perianth bristles 6, ca. 1 mm, basally glabrous, apically densely yellowish brown long pubescent. Stamen 1; anther oblong, ca. 1 mm; connective apex short. Style ca. 1.5 mm, base slightly thickened; stigmas 3. Nutlet yellowish brown, obovoid to broadly obovoid, ca. 1.5 mm, 3-sided, shiny. Fl. and fr. Aug–Dec.

• Moist places, forests along valleys. Fujian, Hainan, Hong Kong, Jiangsu.

**11. *Scirpus maximowiczii* C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 30. 1908.**

佛焰苞蕹草 fo yan bao biao cao

*Eriophorum japonicum* Maximowicz; *E. maximowiczii* (C. B. Clarke) Beetle; *Scirpus japonicus* (Maximowicz) Fernald (1905), not (Miquel) Franchet & Savatier (1877).

Rhizomes oblique, stoloniferous. Culms solitary, 15–30 cm tall, 3-angled, nodose, basally clothed with leaf sheaths eventually disintegrating into fibers, apically slightly scabrous. Basal leaves shorter than culm; leaf blade broadly linear, 3–6 mm wide, flat, apically abruptly narrowed to 3-angled, abaxial midvein and margin slightly scabrous, apex obtuse. Cauline leaves 2 or 3; sheath green, nearly black at apex; leaf blade linear-lanceolate, 3–6 cm × 4–6 mm, flat or slightly plicate. Involucral bracts 1–3, spathe-like, suberect, base blackish brown. Inflorescence a terminal anthela; rays unequal in length, to 3 cm, each terminated by (1 or)2 or 3(or 4) spikelets, nodding on side, scabrous. Spikelets grayish brown, ellipsoid to ovoid, 5–7 mm, many flowered. Glumes elliptic to oblong, 3–4 × 1.2–1.5 mm, membranous, 1-veined, apex obtuse. Perianth bristles 6, 4–6 mm, flexuose, antrorsely scabrous at apex. Stamens 3; anthers 2–2.5 mm. Style slender; stigmas 3. Nutlet narrowly obovoid, 1.8–2 × ca. 1 mm, 3-sided. Fl. and fr. Jul–Sep.  $2n = 64$ .

Wet places, slopes, alpine frozen soil; 1800–2400 m. S Jilin (Changbai Shan) [Japan, Korea, Russia (Far East, E Siberia)].

**12. *Scirpus paniculato-corymbosus* Kükenthal, Acta Horti Gothob. 5: 35. 1930.**

高山蕹草 gao shan biao cao

Rhizomes 3–5 cm, slender, creeping. Culms 18–30 cm tall, slender, scattered, glabrous. Leaves shorter than culm; sheath reddish purple; leaf blade 4–5 mm wide, flat, abaxial midvein and margin scabrous. Inflorescence a large panicle, consisting of a terminal and 2 or 3 lateral anthelae; rays 3 or 4, 1.5–4 cm; prophyll subtending a bisexual flower at base, on opposite side of bractlet. Spikelets solitary at ends of rays or raylets (secondary rays), narrowly ovoid, 7–10 × 1.5–2.5 mm, 6–8-flowered. Glumes reddish purple, lanceolate, 5–7 mm (including awn), papery, with 3 green costae excurrent into a scabrous awn. Perianth bristles 6, very short, glabrous. Stamens 3; anthers linear. Style slender; stigmas 3, nearly as long as style. Nutlet narrowly obovoid, ca. 1.5 mm, 3-sided; persistent style base blackish purple. Fl. May, fr. Jun–Jul.

• Stream margins in grasslands; 2000–2800 m. W Sichuan.

**5. ERIOPHORUM Linnaeus, Sp. Pl. 1: 52. 1753.**

羊胡子草属 yang hu zi cao shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker, David A. Simpson

*Erioscirpus* Palla.

Herbs, perennial. Rhizomes creeping. Culms tufted or nearly scattered, obtusely 3-angled, clothed at base with bladeless leaf sheaths. Leaves basal and cauline; leaf blade of basal leaves slender, elongate, flat or 3-angled; cauline leaves usually reduced to a sheath. Involucral bracts spathe-like or glumelike, rarely leaflike. Inflorescence a terminal simple or compound anthela or reduced to a single spikelet. Spikelets with few to many spirally arranged deciduous glumes. Glumes each subtending a bisexual flower. Perianth bristles 10–30, white or brownish red, elongating extremely after anthesis, smooth, silky. Stamens 3. Style base not distinct, not or slightly thickened; stigmas 3. Nutlet obovoid to oblong, 3-sided, smooth, apex beaked.

About 25 species: mostly in cool temperate, alpine, and arctic regions of N Hemisphere; seven species (one endemic) in China.

*Eriophorum japonicum*, recognized by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 36. 1961), is a synonym of *Scirpus maximowiczii* in this treatment (see p. 174).

- 1a. Spikelets solitary, terminal; involucre bracts glumelike.  
 2a. Perianth bristles pale reddish brown to reddish; nutlet spinulate on apical margin ..... 6. *E. russeolum*  
 2b. Perianth bristles white or pure white; nutlet smooth.  
 3a. Culms tufted; perianth bristles white; nutlet obovoid; anthers ca. 2 mm ..... 5. *E. vaginatum*  
 3b. Culms scattered; perianth bristles pure white; nutlet oblong; anthers ca. 1 mm ..... 7. *E. scheuchzeri*  
 1b. Spikelets many, arranged in a compound or single anthela; involucre bracts leaflike or spathe-like.  
 4a. Spikelets arranged in a compound anthela; involucre bracts leaflike.  
 5a. Spikelets many, densely congested capitate; glumes reddish brown with red lines, oblong ..... 1. *E. transiens*  
 5b. Spikelets solitary or a cluster of 2 or 3; glumes brown, ovate-lanceolate ..... 2. *E. comosum*  
 4b. Spikelets arranged in a simple anthela; involucre bracts spathe-like.  
 6a. Glumes usually 1-veined; culms ± stout; leaf blade 3–5(–7) mm wide, flat but apex 3-angled ..... 3. *E. angustifolium*  
 6b. Glumes many veined; culms ± slender; leaf blade ca. 1 mm wide, compressed 3-angled ..... 4. *E. gracile*

**1. *Eriophorum transiens*** Raymond, Naturaliste Canad. 86: 240. 1959.

中间羊胡子草 zhong jian yang hu zi cao

Culms tufted, 20–25 cm tall, ca. 1.6 mm thick, rigid, striate, clothed at base with dark reddish brown scabrous leaf sheaths. Basal leaves reddish brown-gray; leaf blade ca. 75 cm × 3–4 mm, leathery, margin scabrous, apex acuminate. Involucral bracts 5 or 6, leaflike, ± ascending, ca. 30 cm, overtopping inflorescence, base cymbiform; bractlets cymbiform, broad, dark reddish brown hyaline with fine red lines, apex acuminate and scabrous. Inflorescence a compound anthela, 3–4 cm; rays unequal, ± rigid; second anthela 6–8 mm, sessile or pedunculate. Spikelets 6–20, densely congested into capitate spherical clusters, 1–1.2 × 1.2–1.5 cm, many flowered. Glumes reddish brown with fine red lines, oblong, 3–3.5 mm, 1-veined costa excurrent into an erect short mucro. Perianth bristles many, white, flat, surpassing glume, often connate at base. Stamen 1; connective apex conic, long. Style long; stigmas 3, reddish brown. Nutlet immature, ca. 1.5 mm, oblong 3-sided, apex acuminate. Fl. and (immature) fr. May.

• Guizhou.

This species is known only from the type gathering.

**2. *Eriophorum comosum*** (Wallich) Nees in Wight, Contr. Bot. India, 110. 1834.

从毛羊胡子草 cong mao yang hu zi cao

*Scirpus comosus* Wallich in Roxburgh, Fl. Ind. 1: 234. 1820; *Erioscirpus comosus* (Wallich) Palla.

Rhizomes short, stout. Culms densely tufted, obtusely 3-angled or rarely cylindrical, 14–78 cm tall, 1–2 mm thick, smooth, clothed at base with black to brown leaf sheaths. Leaves many, overtopping inflorescence; leaf blade linear, 0.5–1 mm wide, margin involute and scabrous, gradually tapering and setaceous toward apex. Involucral bracts leaflike, overtopping inflorescence; bractlets lanceolate, margin scabrous, apically setaceous. Inflorescence a large compound or decomposed anthela, 6–22 cm. Spikelets many, solitary or a cluster of 2 or 3, oblong but ellipsoid at anthesis, 6–12 mm. Glumes

brown, ovate-lanceolate, 2.3–3 mm, membranous, keel green, excurrent into a mucro at acute to obtuse apex; basal 4 glumes empty. Perianth bristles many, surpassing glume at maturity, ca. 7 mm, smooth. Stamens 2; anthers purplish black, narrowly ovoid, apex mucronate. Style shorter than nutlet; stigmas 3. Nutlet narrowly oblong, ca. 2.5 × 0.5 mm (including beak), compressed 3-sided. Fl. and fr. May–Nov.  $2n = 52$ .

Crevice on rock or cliffs, grassland slopes; 500–2800 m. Chongqing, S Gansu, Guangxi, Guizhou, Hubei, NW Hunan, Sichuan, SE Xizang, Yunnan [Afghanistan, Bangladesh, Bhutan, N India, Indonesia (Java), Kashmir, N Myanmar, Nepal, Pakistan, Vietnam; SW Asia].

**3. *Eriophorum angustifolium*** Honckey, Verz. Gew. Teutschl. 153. 1782.

东方羊胡子草 dong fang yang hu zi cao

Rhizomes short; stolons slender, creeping. Culms scattered, 35–114 cm tall, subterete but apically 3-angled, smooth. Basal leaves shorter than culm; leaf blade 2–9 mm wide, flat, leathery, margin scabrous, apex long acuminate and 3-angled. Cauline leaves 1–3; sheath blackish purple, long, slightly inflated; leaf blade 3–5(–7) mm wide, plicate or flat, apex 3-angled. Involucral bracts 2 or 3, dark brown, spathe-like, erect, with leaflike blade to 12 cm, apex 3-angled and green. Inflorescence a simple anthela, with (1 or) 2–10 spikelets. Spikelets ovoid to ellipsoid, 10–15 × 5–7 mm; peduncles unequal, flattened, smooth or scabrous, often dropping. Glumes pale brownish gray, ovate to lanceolate, 5–5.5 × 1.8–2 mm, membranous, 1-veined but sometimes obscurely 3-veined at base, apex obtuse. Perianth bristles 10 or more, white, 3–4 mm, soft, unbranched at ends, apex acute. Stamens 3; anthers linear, (2–) 3–4(–5) mm. Style slender; stigmas 3. Nutlet black, narrowly obovoid, 2–3 × ca. 1 mm, compressed 3-sided, apex beaked. Fl. and fr. Jun–Aug.  $2n = 58$ .

Marshes, wet places; (100–) 400–800 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, N Sichuan [Japan, Kazakhstan, Korea, Mongolia, Russia; Europe, North America].

In FRPS (11: 37, t. XV. 1961), the name *Eriophorum latifolium* Hoppe was misapplied to this species, following the usage in Fl. URSS (3: 29. 1935). The name *E. polystachion* Linnaeus, nom. utique rej., has often been applied to both species.

**4. *Eriophorum gracile*** W. D. J. Koch ex Roth, Catal. Bot. 2: 259. 1800.

细秆羊胡子草 xi gan yang hu zi cao

*Eriophorum asiaticum* V. N. Vassiljev; *E. coreanum* Palla; *Scirpus ardea* T. Koyama; *S. ardea* var. *coreanus* (Palla) T. Koyama.

Rhizomes long creeping, slender. Culms scattered, 25–50 cm tall, slender, ± 3-angled, smooth or sometimes scabrous below inflorescence. Basal leaves narrowly linear, ca. 1 mm wide, compressed 3-angled, channeled only in basal part. Cauline leaves ± short (apicalmost with blade shorter than sheath), 1.5–2.5 cm. Involucral bracts 1 or 2, dark green, sheathlike, ca. 1.5 cm, erect or oblique. Inflorescence a simple anthela with 2–4 spikelets. Spikelets obovoid, 6–10 mm in flower; peduncles unequal, ca. 2 cm, flattened, scabrous, yellow tomentose, partly dropping. Glumes dark black to gray, broadly ovate, 4.5–5 mm, many veined, keeled, margin hyaline, apex obtuse. Perianth bristles 10 or more, whitish, 1–1.5 cm. Stamens 3; anthers 2–3 mm. Style slender; stigmas 3. Nutlet yellowish brown, oblong, ca. 3 mm, compressed 3-sided. Fl. and fr. Jun–Jul.  $2n = 60$ .

Marshes, meadows; (below 100–)700–2200 m. Heilongjiang, Jilin, N Liaoning, NE Nei Mongol, N Sichuan, N Xinjiang, Yunnan (Tengchong) [Japan, Kazakhstan, Korea, Russia; Europe, North America].

**5. *Eriophorum vaginatum*** Linnaeus, Sp. Pl. 1: 52. 1753.

白毛羊胡子草 bai mao yang hu zi cao

*Eriophorum fauriei* E. G. Camus; *E. scabridum* Ohwi; *E. spissum* Fernald; *Scirpus fauriei* (E. G. Camus) T. Koyama.

Rhizomes short. Culms densely tufted, 15–80 cm tall, obtusely 3-angled, smooth but sometimes scabrous below inflorescence, clothed at base with brown leaf sheaths disintegrating into fibers. Basal leaves linear, shorter than culm; leaf blade ca. 1 mm wide, 3-angled, scabrous, apically narrowly tapering, apex obtuse to acute. Cauline leaves 1 or 2, often black, reduced to a bladeless sheath, 3–6 cm with apical one inflated, membranous, with finely transverse veins. Involucral bracts grayish black, glumelike, ovate-lanceolate, membranous, apex acuminate. Inflorescences terminal with only 1 spikelet, 1–3 cm, many flowered, with ca. 10 sterile basal glumes. Spikelet erect, grayish brown, obovoid-globose and ca. 1.5 cm in flower, subglobose and 2.5–3.5 × 2.5–3.5 cm in fruit. Glumes ovate-lanceolate to deltoid-lanceolate, thinly membranous, 1-veined, margin gray to dark gray with pale hyaline edge, apex acuminate. Perianth bristles 10 or more, white, 1.5–2.5 cm. Stamens 3; anthers linear, 2–2.5 mm. Stigmas 3. Nutlet brown, obovoid, 2–2.2[–3] × ca. 1 mm, compressed 3-sided, minutely apiculate, smooth. Fl. and fr. Jun–Sep.  $2n = 26, 58, 60, 61, 83$ .

Swamps, moist places; 1700–1800 m. Heilongjiang, Jilin, N Liaoning, NE Nei Mongol [Japan, Kazakhstan, Korea, Mongolia, Russia; SW Asia, Europe, North America].

**6. *Eriophorum russeolum*** Fries in Hartman, Handb. Skand. Fl., ed. 3, 13. 1838.

红毛羊胡子草 hong mao yang hu zi cao

*Eriophorum mandshuricum* Meinshausen; *E. russeolum* var. *majus* Sommier; *Scirpus russeolus* (Fries) T. Koyama var. *major* (Sommier) T. Koyama.

Rhizomes creeping. Culms erect, 30–60 cm tall, slender, terete. Basal leaves linear, ca. 1 mm wide, subterete, apex obtuse. Cauline leaves 1 or 2, reduced to bladeless leaf sheaths. Leaf sheaths grayish black with reddish fine transverse veins, cylindric, 6.5–7.5 cm, apically slightly inflated, apex obtuse. Involucral bracts grayish black, glumelike, ovate-lanceolate, 3–9-veined, apex acuminate. Inflorescences terminal with only 1 spikelet. Spikelet oblong-cylindric and 1.5–2.5 cm in flower, obovoid, fairly lax, and 2.5–4 cm in fruit. Glumes brownish gray, ovate-lanceolate, ca. 7 mm, thinly membranous, 1-veined, margin broadly whitish hyaline, apex obtuse. Perianth bristles 10 or more, usually pale reddish brown to reddish, ca. 3 mm. Stamens 3; anthers linear, 2–3 mm. Stigmas 3. Nutlet oblong-obovoid to obovoid, ca. 2.5 mm, compressed 3-sided, margin spinulate, apex beaked. Fl. and fr. Jun–Jul.  $2n = 58, 60, 62$ .

Marshes, moist places; below 100 m. Heilongjiang, Jilin, NE Nei Mongol [Japan, Korea, Mongolia, Russia; N Europe, North America].

**7. *Eriophorum scheuchzeri*** Hoppe, Bot. Taschenb. Anfänger Wiss. Apothekerkunst 11: 104. 1800.

羊胡子草 yang hu zi cao

Rhizomes long, slender. Culms solitary, scattered, erect, 8–30[–70] cm tall, ± stout, terete. Basal leaves with leaf blade narrowly linear, channeled at base. Apicalmost cauline leaf with a narrow sheath, slightly inflated in apical part and with a very short blade. Involucral bract glumelike, broadly ovate, larger than glumes, apex subobtuse to shortly acuminate. Inflorescences reduced to a single terminal erect spikelet. Spikelet broadly obovoid to subglobose and 0.8–1.2 cm in flower, compressed globose, very dense, and 2–2.5 cm in fruit. Glumes dark gray to blackish, narrowly lanceolate, margin usually whitish and narrow, apex long acuminate. Perianth bristles 10 or more, pure white, ca. 2 cm. Stamens 3; anthers 0.5–1.5 mm. Style slender; stigmas 3. Nutlet oblong, ca. 2 × 0.5 mm, apex with a subulate beak. Fl. and fr. Jun–Jul.  $2n = 58$ .

Swampy meadows; 2200–3000 m. Xinjiang [Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia; Europe, North America].

No specimen from China has been seen by the present authors.

**6. TRICHOPHORUM** Persoon, Syn. Pl. 1: 69. 1805, nom. cons.

针蔺属 zhen lin shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker

Herbs, perennial. Culms tufted, naked but clothed at base with a few bladeless ligulate leaf sheaths. Leaf blade much reduced. Involucral bract 1, glumelike, suberect, apex mucronate or awned. Inflorescences reduced to a single terminal spikelet, rarely an anthela or capitate with a few spikelets. Spikelets ellipsoid. Glumes pale brown, spirally arranged, membranous, deciduous, all

bearing a bisexual flower in axil. Flower bisexual or unisexual. Perianth bristles 6, filiform, silky, usually much elongated after anthesis and overtopping subtending glume. Stamens 2 or 3 or 6. Style base not distinct, slightly thickened,  $\pm$  persistent. Nutlet obovoid, 3-sided or dorsiventrally compressed, smooth, apex slightly beaked.

About ten species: arctic and subarctic regions, alpine areas in temperate and tropical regions; six species (one endemic) in China.

- 1a. Perianth bristles absent; nutlet broadly obovoid or narrowly obovoid, ca. 0.9 mm wide; involucre bracts not awned.
- 2a. Flower bisexual; nutlet oblong-obovoid, ca. 1.5 mm, 3-sided; stigmas 3 ..... 5. *T. pumilum*
- 2b. Flower unisexual; nutlet broadly obovoid, ca. 2 mm, plano-convex; stigmas 2 ..... 6. *T. distigmaticum*
- 1b. Perianth bristles 6–9; nutlet ovoid or oblong, 0.6–0.7 mm wide; involucre bracts awned.
- 3a. Inflorescences consisting of 2–4 spikelet clusters (sometimes reduced to a single terminal spikelet in *T. mattfeldianum*); stolons absent.
- 4a. Culms 3-angled; stamens 6 ..... 1. *T. mattfeldianum*
- 4b. Culms terete; stamens 3 ..... 2. *T. subcapitatum*
- 3b. Inflorescences reduced to a single terminal spikelet; stolons present.
- 5a. Glumes 0.9–3.5 mm, apex obtuse and not awned; perianth bristles 4–6, less than  $1.5 \times$  as long as nutlet, erect ..... 3. *T. alpinum*
- 5b. Glumes 4–4.5 mm, apex with a scabrous awn; perianth bristles 7–9, ca.  $3 \times$  as long as nutlet, curved .... 4. *T. schansiense*

**1. *Trichophorum mattfeldianum*** (Kükenthal) S. Yun Liang, Higher Pl. China 12: 270. 2009.

三棱针蔺 san leng zhen lin

*Scirpus mattfeldianus* Kükenthal, Repert. Spec. Nov. Regni Veg. 27: 108. 1929.

Roots slender, fibrous. Rhizomes short, woody. Culms densely tufted, 20–100 cm tall, 3-angled, rigid, smooth, clothed at base with 4–6 pale brown leaf sheaths. Apical leaves with mouth obliquely truncate; leaf blade pale green, setaceous or reduced to a mucro, 3–12 mm but apical one to 20 cm, margin scabrous. Involucre bracts lanceolate to oblong-ovate, glume-like, apex mucronate. Inflorescences consisting of 2–4 cincinni or reduced to a single terminal spikelet. Spikelets ellipsoid to oblong,  $6\text{--}7 \times 2\text{--}3$  mm, several flowered. Glumes reddish brown to brown, laxly arranged, oblong-ovate, 3–4 mm, membranous, apex acute with a costa excurrent into a short mucro. Perianth bristles 6, longer than nutlet, apically sparsely antrorsely scabrous. Stamens 6; anthers linear, ca. 2 mm. Style slender; stigmas 3. Nutlet brown, oblong to oblong-obovoid, ca. 1.8 mm, 3-sided. Fl. and fr. Apr–May.

Wet places at forest margins; ca. 900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Shanxi, Zhejiang [Vietnam].

**2. *Trichophorum subcapitatum*** (Thwaites & Hooker) D. A. Simpson, Kew Bull. 53: 227. 1998.

玉山针蔺 yu shan zhen lin

*Scirpus subcapitatus* Thwaites & Hooker, Enum. Pl. Zeyl. 351. 1864; *Baeothryon subcapitatum* (Thwaites & Hooker) Á. Löve & D. Löve; *S. morrisonensis* Hayata; *S. subcapitatus* var. *morrisonensis* (Hayata) Ohwi.

Rhizomes short. Culms densely tufted, 20–90 cm tall, 0.7–1 mm thick, subterete, smooth except below inflorescences becoming 3-angled and scabrous on angles, clothed at base with 5 or 6 bladeless leaf sheaths. Leaf sheath brown to cinnamon, 5–18 cm, tightly surrounding base of culm, membranous, mouth obliquely truncate and with a hyaline margin; leaf blade of apical sheaths pale green, setaceous, 0.5–1.5 cm, margin scab-

rous. Involucre bracts glume-like, ovate to oblong, 3–7 mm, apex obtuse and with a  $\pm$  long scabrous mucro. Inflorescence a terminal, umbelliform corymb, bearing 2–4(–6) spikelets. Spikelets ovoid to narrowly ovoid-oblong,  $5\text{--}10 \times$  ca. 2 mm, 5–10-flowered; lateral spikelets with a short peduncle; terminal spikelet sessile. Glumes straw-colored to brown, laxly arranged, oblong to lanceolate-oblong, 3.5–4.5 mm, membranous, margin hyaline, apex acute to obtuse and with a costa sometimes excurrent into a mucro. Perianth bristles 6, as long as nutlet, apically antrorsely scabrous. Stamens 3; filaments long; anthers linear, ca. 2 mm. Style ca. 3 mm; stigmas 3, filiform. Nutlet yellowish brown, oblong to ellipsoid, 2–3 mm, 3-sided, apex apiculate. Fl. and fr. Mar–Jun.

Wet places, thickets, damp ledges in mountain woods; 600–2300 m. Anhui, Chongqing (Nanchuan), Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Taiwan, Zhejiang [India, Indonesia, Japan, Malaysia, Papua New Guinea, Philippines, Sri Lanka, N Thailand, Vietnam].

**3. *Trichophorum alpinum*** (Linnaeus) Persoon, Syn. Pl. 1: 70. 1805.

鳞苞针蔺 lin bao zhen lin

*Eriophorum alpinum* Linnaeus, Sp. Pl. 1: 53. 1753; *E. hudsonianum* Michaux; *Scirpus hudsonianus* (Michaux) Fernald; *Trichophorum alpinum* var. *hudsonianum* (Michaux) Persoon.

Rhizomes creeping, branched. Culms densely tufted, 20–30 cm tall, 3-angled, slightly scabrous, clothed at base with bladeless leaf sheaths. Leaf blade of apical leaf ca. 1 cm  $\times$  0.3 mm. Involucre bracts glume-like, basalmost awned. Inflorescences reduced to a single terminal spikelet, oblong,  $4.5\text{--}5 \times$  ca. 3 mm, few flowered. Glumes yellowish brown, oblong to narrowly ovate, ca.  $3.5 \times 0.9$  mm, 1-veined, apex obtuse. Perianth bristles 4–6, white, to 2 cm in fruit, flattened, smooth, silky, eventually  $\pm$  crinkled. Stigmas 3. Nutlet dark brown, oblong-obovoid, 1–1.5 mm, apex shortly pointed. Fl. and fr. Jun–Aug.

Alpine tundra. Jilin [Japan, Korea, Russia; Europe, North America].

**4. *Trichophorum schansiense*** Handel-Mazzetti, Oesterr. Bot. Z. 85: 224. 1936.

太行山针蔺 tai hang shan zhen lin

*Scirpus heleocharidioides* F. T. Wang & Tang; *S. schansiensis* (Handel-Mazzetti) Tang & F. T. Wang.

Rhizomes creeping. Culms tufted, 5–40 cm tall, slender, nearly 4-angled, smooth, clothed at base with 2 or 3 leaf sheaths. Leaf sheaths to 2 cm, with a setaceous blade at apex. Involucral bract glumelike, as long as or shorter than spikelet, apex with a short scabrous awn. Inflorescences reduced to a single terminal spikelet, obovoid to oblong, 4–5 × ca. 2 mm, 5- or 6-flowered. Glumes straw-colored to reddish brown, laxly arranged, oblong, ovate, or oblong-ovate, 4–4.5 mm, apex with 3 costae excurrent into a short scabrous awn. Perianth bristles 7–9, white, ca. 3 × as long as nutlet, curved, smooth, apically antrorsely scabrous. Stamens 2 or 3; anthers linear; connective apex evident beyond anthers. Style slender; stigmas 3, filiform. Nutlet yellowish green, obovoid, ca. 1 mm, 3-sided, shiny. Fl. and fr. May.

• Rock crevices in valleys; below 700 m. Beijing (Fangshan), Shanxi (Yangcheng).

**5. *Trichophorum pumilum*** (Vahl) Schinz & Thellung, Vierteljahrsschr. Naturf. Ges. Zürich 6: 265. 1921.

矮针蔺 ai zhen lin

*Scirpus pumilus* Vahl, Enum. Pl. 2: 243. 1805; *Baeothryon pumilum* (Vahl) Á. Löve & D. Löve; *Isolepis pumila* (Vahl) Roemer & Schultes.

Rhizomes creeping, long, slender. Culms rather densely caespitose, 5–15 cm tall, slender, terete, grooved when dry. Leaves basal, semiterete, only apicalmost bearing a blade; leaf blade 0.7–1.6 cm, shorter than culm, very slender. Involucral bract glumelike, shorter than spikelet, apex mucronate. Inflores-

cences reduced to a single terminal spikelet, obovoid to ellipsoid, ca. 4.5 × 2.5 mm, few flowered. Glumes ovate to elliptic, ca. 2.5 mm, membranous, both surfaces yellowish brown, with 1 green vein, margin pale hyaline, apex obtuse; basal 2 glumes empty. Perianth bristles absent. Stamens 3; anthers linear-oblong; connective apex slightly evident beyond anthers. Style of medium length; stigmas 3. Nutlet blackish brown, obovoid, ca. 1.5 mm, 3-sided. Fl. and fr. May–Sep.

Stream margins in grasslands, moist places along valleys; 500–4700 m. Gansu, Hebei, Nei Mongol, Ningxia, NW Sichuan, Xinjiang, Xizang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, North America].

**6. *Trichophorum distigmaticum*** (Kükenthal) T. V. Egorova in Grubov, Rast. Tsentral. Azii 3: 14. 1967.

双柱头针蔺 shuang zhu tou zhen lin

*Scirpus pumilus* Vahl subsp. *distigmaticum* Kükenthal, Acta Horti Gothob. 5: 34. 1930; *Baeothryon distigmaticum* (Kükenthal) Y. C. Yang & M. Zhan; *S. distigmaticum* (Kükenthal) Tang & F. T. Wang.

Plants dioecious. Rhizomes creeping, long, slender. Culms 10–25 cm tall, slender, subterete, smooth. Leaf sheath brown, to 2.5 cm, longer than blade; leaf blade setaceous, to 1.8 cm but basal 2 or 3 bladeless. Inflorescences reduced to a single terminal spikelet, ovoid, ca. 5 × 2.5–3 mm, few flowered. Glumes straw-colored, ovate, ca. 3.5 mm, thinly membranous, shiny, margin sometimes basally white but apically brown, apex obtuse. Perianth bristles absent. Stamens 3, sterile on female flowers. Style long; stigmas 2. Nutlet black at maturity, broadly obovoid, ca. 2 mm, plano-convex. Fl. and fr. Jul–Sep.

Alpine grasslands, river margins; 2000–4600 m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan, NE Xizang, Yunnan [Africa, Australia, Europe].

## 7. **FUIRENA** Rottbøll, Descr. Icon. Rar. Pl. 70. 1773.

芙兰草属 fu lan cao shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker, Jeremy J. Bruhl

Herbs, perennial or annual, sometimes with a creeping rhizome. Culms tufted or solitary, usually pubescent, nodose. Leaves mostly cauline, pubescent or glabrous; sheath usually completely surrounding culm; ligule tubular, hyaline; leaf blade usually elongate, linear to lanceolate. Involucral bracts leaflike, sheathing at base. Inflorescences paniculiform, with few to many glomerulate clusters or sessile spikelets at few to several nodes. Spikelets ovoid to ellipsoid, terete, many flowered, usually pubescent. Glumes spirally imbricately arranged, obovate, broadly elliptic, or oblong, each subtending a bisexual flower but basal 1 or 2 empty, apex obtuse and awned. Perianth bristles 3 or 6, 3 outer ones needlelike (sometimes reduced or absent), 3 inner ones squamellate and alternate with outer whorl. Stamens 3. Style not or hardly dilated at base, continuous with ovary, glabrous; stigmas 3. Nutlet ± stipitate, obovoid to ovoid, 3-sided, ± smooth or tuberculate.

About 30 species: warm regions of the world, most species in tropical Africa and tropical America; three species (one endemic) in China.

- 1a. Perianth bristles 3, all alike, obovate, subsessile, gradually narrowed at base; culms 60–120 cm tall; anthers 0.5–0.7 mm ..... 1. *F. umbellata*
- 1b. Perianth bristles 6, of two types, outer ones needlelike and scaberulose or smooth, inner ones with a subquadrate or spatulate blade abruptly narrowed at base to a distinct ca. 0.3 mm stalk; culms 7–68 cm tall; anthers 0.2–0.3 mm.
- 2a. Annuals; inflorescences glomerulate clusters each with 3–15 spikelets; spikelets 2.5–3 mm wide; inner whorl of perianth bristles with subquadrate blades ..... 2. *F. ciliaris*

2b. Perennials and rhizomatous; inflorescences glomerulate clusters each with 3–5 spikelets; spikelets

3.5–5 mm wide; inner whorl of perianth bristles with spatulate blades ..... 3. *F. rhizomatifera*

**1. *Fuirena umbellata*** Rottbøll, Descr. Icon. Rar. Pl. 70. 1773.

芙兰草 fu lan cao

Perennials. Rhizomes horizontally creeping. Culms solitary, erect, 60–120 cm tall, acutely 5-angular, glabrous except below inflorescence, basalmost node bulbously thickened. Cauline leaves with sheath 1.2–6.5 cm, tightly surrounding culm; ligule rust-colored, hyaline, truncate; leaf blade pale green, lanceolate to linear-lanceolate, 10–20 × 0.9–1.9 cm, flat, ± rigid, usually glabrous but sometimes basally pubescent, 5-veined, apex acuminate. Involucral bracts leaflike; bractlets setaceous, sheathless. Inflorescences paniculiform, with 4–20 glomerulate clusters of spikelets; glomerules single or binate, 1.5–2.5 cm wide, bearing 6–15 spikelets; peduncles single or binate, occasionally branched, white villous. Spikelets brownish green to dark brownish green at maturity, ovoid to ovoid-ellipsoid, 7–12 × ca. 3 mm, many flowered, wholly covered with woolly hairs. Glumes brown, broadly elliptic to oblong, ca. 2 mm, membranous, apical ones abaxially sparsely pilose, apex emarginate and with a 3-veined costa ending in a short recurved puberulent 0.5–0.7 mm awn. Perianth bristles brown; outer bristles absent; 3 inner bristles obovate, subsessile, gradually narrowed to base, margin ciliate, apex emarginate and with 3 prominent veins, with 1 costa usually excurrent into a short curved awn. Stamens 3; anthers oblong, 0.5–0.7 mm. Stigmas 3, as long as style. Nutlet brown at maturity, shortly stipitate, obovoid, ca. 1 mm (including stipitate base), 3-sided, base cuneate. Fl. and fr. Jun–Dec.  $2n = 48, 52$ .

Wet grasslands, river margins, paddy fields; near sea level to 1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, S Yunnan [Bangladesh, Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, America, and Australia, Pacific islands, South America].

**2. *Fuirena ciliaris*** (Linnaeus) Roxburgh, Fl. Ind. 1: 184. 1820.

毛芙兰草 mao fu lan cao

*Scirpus ciliaris* Linnaeus, Mant. Pl. Alt. 182. 1771; *Fuirena glomerata* Lamarck; *F. rotboellii* Nees.

Annuals. Rhizomes short. Culms tufted, 7–40 cm tall, 3-angled, striate-sulcate, pubescent, clothed at base with 1 or 2 bladeless pubescent leaf sheaths. Cauline leaves with sheath 1–3.5 cm; ligule rust-colored to reddish, 1–2 mm, membranous, mouth truncate; leaf blade linear, 5–15 × 3–7 mm, flat, soft, 3-costate, surfaces and margin ± pubescent, apex acuminate. Involucral bracts leaflike, surpassing inflorescence; bractlets set-

aceous, sheathless. Inflorescences with 1–3 clusters of spikelets, interrupted, glomerulate, 1–3 cm wide, bearing 3–15 spikelets; peduncles single, mostly enclosed in bractlet sheaths. Spikelets ovoid to oblong, 5–8 × 2.5–3 mm, many flowered, covered with woolly hairs. Glumes basally yellowish brown, apically grayish black, obovate, 1.2–2 mm, thinly membranous, abaxially pilose, apex obtuse, emarginate, and with a 3-veined costa excurrent into a recurved 1–1.5 mm awn. Perianth bristles 6; 3 outer bristles needlelike, occasionally much reduced, retrorsely scabrous; 3 inner bristles brownish, with subquadrate blades abruptly narrowed at base to a distinct ca. 0.3 mm stalk, apex mucronulate. Stamens 3; anthers oblong, 0.2–0.3 mm. Ovary white, oblong, 3-sided; style brownish, 3–4 × as long as ovary; stigmas 3, 1/3–1/2 as long as style. Nutlet brownish, shortly stipitate, obovoid, ca. 1 mm, 3-sided. Fl. and fr. Jul–Dec.  $2n = 38$ .

Wet places, often in paddy fields, river margins; near sea level to 200 m. Fujian, Guangdong, S Guangxi, Hainan, Hebei, Jiangsu, Shandong, Taiwan, S Yunnan [Bangladesh, Cambodia, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia].

**3. *Fuirena rhizomatifera*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 225. 1961 [*“rhizomatifer”*].

黔芙兰草 qian fu lan cao

*Fuirena umbellata* Rottbøll var. *angustifolia* Kükenthal.

Perennials. Rhizomes oblique; scales purplish brown, broadly ovate, apex acute. Culms laxly tufted, 35–68 cm tall, slender, subangular, striate-sulcate, clothed at base with 2 leaf sheaths. Cauline leaves with sheath 1–3 cm, glabrous; ligule reddish brown, 1–2 mm, membranous, mouth truncate; leaf blade 3–5 mm wide, flat, margin scabrous, apex acuminate. Involucral bracts leaflike, margin and sheath pubescent. Inflorescences with 3 glomerulate clusters of spikelets, each cluster bearing 3–5 spikelets; peduncles compressed, pubescent. Spikelets ovoid to spherical, 5.5–8 × 3.5–5 mm. Glumes brownish green to grayish black, broadly obovate, ca. 3 mm, pubescent, margin ciliate, apex rounded, emarginate, and with a 3-veined costa excurrent into a scabrous ca. 1 mm awn. Perianth bristles 6; 3 outer bristles brownish, needlelike, 1/2–2/3 as long as inner ones, squamellate, pubescent; 3 inner bristles with blades abruptly narrowed at base, distinctly stalked, margin ciliate, apex obtuse. Stamens 3; anthers oblong, 0.2–0.3 mm, apex obtuse. Stigmas 3, as long as style. Nutlet obovoid, ca. 1 mm, 3-sided. Fl. and fr. Jul–Nov.

• Swamps; ca. 800 m. SW Guangxi, Guizhou.

**8. BOLBOSCHOENUS** (Ascherson) Palla in Hallier & Brand, Syn. Deut. Schweiz. Fl., ed. 3, 3: 2531. 1905.

三棱草属 san leng cao shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker, David A. Simpson

*Scirpus* [unranked] *Bolboschoenus* Ascherson, Fl. Brandenburg 1: 753. 1864.

Herbs, perennial. Rhizomes often forming hard ovoid tubers. Culms many nodose, base bulbously thickened. Leaves basal and

cauline; sheath tubular; ligule absent; leaf blades linear, flat. Involucral bracts leaflike, surpassing inflorescence, spreading. Inflorescence a terminal anthela or capitate with 1 to many spikelets. Spikelets with many spirally arranged deciduous glumes, each subtending a bisexual flower. Perianth bristles 3–6, shorter to longer than nutlet, deciduous with nutlet. Stamens 3. Style base not distinct, slightly thickened or not, persistent. Nutlet biconvex to 3-sided, smooth, apex beaked.

About eight species: mainly in North America and E Asia; four species in China.

A hybrid, *Scirpus ×mariqueter* Tang & F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 223. 1961), was originally described from Beijing. It was believed to be a hybrid of *Bolboschoenus planiculmis* and *Schoenoplectus triquetus*. Specimens have since been collected from Shanxi. Under current generic concepts, it is considered an intergeneric hybrid, *×Bolboschoenoplectus mariqueter* (Tang & F. T. Wang) Tatanov (Novosti Sist. Vyssh. Rast. 39: 154. 2007).

- 1a. Nutlet 3-sided; stigmas 3; perianth bristles almost as long as nutlet; inflorescence a simple anthela ..... 1. *B. yagara*  
 1b. Nutlet biconvex; stigmas 2; perianth bristles ca. 1/2 as long as nutlet; inflorescences capitate and rarely with short rays or reduced to a single spikelet.  
 2a. Glumes pale yellow; anthers ca. 1 mm; nutlet 2–2.5 mm ..... 3. *B. affinis*  
 2b. Glumes bright orangish brown, brown, or dark brown; anthers 2–4 mm; nutlet 2.5–3.5 mm.  
 3a. Glumes brown to dark brown; nutlet 3–3.5 mm ..... 2. *B. planiculmis*  
 3b. Glumes bright orangish brown; nutlet ca. 2.5 mm ..... 4. *B. maritimus*

**1. *Bolboschoenus yagara*** (Ohwi) Y. C. Yang & M. Zhan, Acta Biol. Plateau Sin. 7: 14. 1988.

荆三棱 jing san leng

*Scirpus yagara* Ohwi, Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B, Biol. 18: 110. 1943; *S. fluviatilis* (Torrey) A. Gray var. *yagara* (Ohwi) T. Koyama.

Rhizomes long creeping, blackish brown, 3–6 mm thick, terminated by a tuber; tuber globose to depressed obovoid, 2–3 × 3–4 cm, woody, covered with blackish to purplish brown membranous broad scales. Culms solitary from a tuber, 0.6–1.5 m tall, sharply 3-angled, smooth. Leaves as long as or overtopping culm; sheath 5–20 cm, front with veins nearly to summit (i.e., lacking veinless area); blade broadly linear, 5–10 mm wide, ± stiff, margin scabrous. Involucral bracts 3 or 4, leaflike, usually longer than inflorescence. Inflorescence a simple anthela; rays 3–8, unequal, to 7 mm, smooth, each terminated by a single spikelet or a cluster of 2 or 3 (or 4) spikelets. Spikelets rust-colored brown, ovoid to oblong, 1–2 × 0.5–0.8(–1) cm, many flowered. Glumes rust-colored brown, densely imbricate, oblong, ca. 7 mm, membranous, abaxially minutely pubescent, 1-veined costa projected beyond apex forming a recurved 2–3 mm scabrous awn, apex 2-cleft and lacerate. Perianth bristles 6, almost as long as nutlet, retrorsely scabrous. Stamens 3; anthers linear, ca. 4 mm. Style slender; stigmas 3. Nutlet grayish brown, obovoid, 3-sided, base cuneate-attenuate, apex contracted to a conic short beak. Fl. and fr. May–Jul.

Lake margins, shallow water, marshes, wet places; near sea level to 200 m. Anhui, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, NE Nei Mongol, Shandong, Xinjiang, Yunnan, Zhejiang [India, Japan, Kazakhstan, Korea, Russia, Vietnam; Europe].

**2. *Bolboschoenus planiculmis*** (F. Schmidt) T. V. Egorova in Grubov, Rast. Tsentral. Azii 3: 20. 1967.

扁秆荆三棱 bian gan jing san leng

*Scirpus planiculmis* F. Schmidt, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 12(2) [Reis. Amur-Land., Bot.]: 190. 1868.

Rhizomes creeping, terminated in a globose tuber. Culms

solitary from a tuber, 60–100 cm tall, usually ± slender, 3-angled, smooth. Leaves basal, shorter to slightly overtopping inflorescence; sheath brownish, 5–16 cm; leaf blade linear, 2–5 mm wide, flat, apex acuminate. Involucral bracts 1–3, leaflike, often surpassing inflorescence, margin scabrous. Inflorescences of 1–6 spikelets, capitate or simple paniculate; rays 1 to few, short, each terminated by 1 to few spikelets. Spikelets rust-colored brown, ovoid to oblong-ovoid, 10–16 × 4–8 mm, many flowered. Glumes brown to dark brown, oblong to elliptic, 6–8 mm, membranous, abaxially sparsely pubescent, 1-veined costa projected beyond apex forming an awn, apex lacerate. Perianth bristles 4–6, 1/2–2/3 as long as nutlet, retrorsely scabrous. Stamens 3; anthers linear, 3–4 mm; connective apex ca. 0.5 mm. Style slender; stigmas 2. Nutlet broadly obovoid to obovoid, 3–3.5 mm. Fl. May–Jan, fr. Jul–Sep.  $2n = 50, 52, 56, 108$ .

Wet places by lakes and riverbanks, swampy areas; near sea level to 2900 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Taiwan, Xinjiang, Yunnan, Zhejiang [India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Papua New Guinea, Philippines, Russia, Tajikistan; SW Asia, Europe].

**3. *Bolboschoenus affinis*** (Roth) Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 16: 139. 1916.

球穗三棱草 qiu sui san leng cao

*Scirpus affinis* Roth in Roemer & Schultes, Syst. Veg. 2: 140. 1817; *Bolboschoenus popovii* T. V. Egorova; *B. strobilinus* (Roxburgh) V. I. Kreczetowicz; *S. maritimus* Linnaeus subsp. *affinis* (Roth) T. Koyama; *S. maritimus* var. *affinis* (Roth) C. B. Clarke; *S. strobilinus* Roxburgh.

Rhizomes creeping, terminated by a small ovoid tuber. Culms 10–50 cm tall, 3-angled, smooth. Leaf blade linear, 1–4 mm wide, flat, ± stiff, apical ones longer than or as long as culm. Involucral bracts 2 or 3, leaflike, overtopping inflorescence. Inflorescences of 1–10 spikelets, capitate, rarely with short rays. Spikelets ovoid, 10–16 × 3.5–7 mm, many flowered. Glumes pale yellow, oblong-ovate, 5–6 mm, membranous, abaxially ± pubescent, 1-veined costa excurrent into an awn, apex lacerate. Perianth bristles 6, ca. 1/2 as long as nutlet, retrorsely scabrous. Stamens 3; anthers linear-oblong, ca. 1 mm;

connective apex conic, ca. 0.5 mm. Style slender; stigmas 2. Nutlet yellowish white but becoming dark brown at maturity, broadly obovoid, ca. 2.5 mm, biconvex, shiny. Fl. and fr. Jun–Sep.

Lake margins, swampy places (often alkaline), wood margins; 1000–2900 m. Gansu, W Nei Mongol, Ningxia, Qinghai, Xinjiang [Afghanistan, Cambodia, India, Japan, Kazakhstan, Laos, Mongolia, Pakistan, Russia, Thailand, Turkmenistan, Uzbekistan, Vietnam; SW Asia, Europe].

This taxon is part of an inadequately studied worldwide complex centered around *Bolboschoenus maritimus*.

**4. *Bolboschoenus maritimus*** (Linnaeus) Palla in Hallier & Brand, Syn. Deut. Schweiz. Fl., ed. 3, 3: 2531. 1905.

海滨三棱草 hai bin san leng cao

*Scirpus maritimus* Linnaeus, Sp. Pl. 1: 51. 1753;  
*Schoenoplectus maritimus* (Linnaeus) Lye.

Rhizomes creeping, terminated by a small ovoid tuber. Culms 25–50[–150] cm tall, 3-angled, smooth. Leaf sheath fronts with veinless triangular to rhombic area at summit; leaf

blade linear, 2–6[–12] mm wide, flat, ± stiff, apical ones longer than or as long as culm. Involucral bracts 2 or 3, leaflike, overtopping inflorescence. Inflorescences of 1–10 spikelets, capitate [rarely with short rays]. Spikelets ovoid to narrowly ovoid, 10–16 × 3.5–7 mm, many flowered. Glumes bright orangish brown to stramineous, oblong-ovate, 5–8 mm, membranous, abaxially ± pubescent, 1-veined costa excurrent into a 1–3 mm awn, apex 2-cleft. Perianth bristles 6, ca. 1/2 as long as nutlet, retrorsely scabrous, usually not persistent on nutlet. Stamens 3; anthers linear-oblong, 2–4 mm; connective apex conic, ca. 0.5 mm. Style slender; stigmas 2, ± as long as style. Nutlet dark brown, broadly obovoid, ca. 2.5 mm, biconvex [compressed 3-sided], shiny, apex rounded to truncate. Fl. and fr. Jun–Sep.  $2n = 64$ , 104, 112.

Coastal marshes; near sea level. Taiwan, Xinjiang [Afghanistan, India, Japan, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; Africa, SW Asia, Atlantic Ocean islands, Europe, North and South America, Pacific islands].

This species is known in Taiwan from a single collection: Taiwan: "Takow," *A. Henry 1818* (MO).

## 9. ACTINOSCIRPUS (Ohwi) R. W. Haines & Lye, Bot. Not. 124: 481. 1971.

大蘆草属 da biao cao shu

Liang Songyun (梁松筠 Liang Song-jun); David A. Simpson, Gordon C. Tucker

*Scirpus* sect. *Actinoscirpus* Ohwi, Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B, Biol. 18: 98. 1943.

Herbs, perennial, robust. Rhizomes long creeping, slender, apex with a small tuber. Culms ± tall, inconspicuously septate. Leaves ligulate; leaf blade linear. Involucral bracts leaflike, exceeding inflorescence. Inflorescence a large terminal anthela, with many spikelets. Spikelets small. Glumes spirally imbricate, each subtending a bisexual flower, deciduous. Perianth bristles 5 or 6, mostly longer than nutlet, retrorsely scabrous, deciduous with nutlet. Stamens 3. Style base not distinct, not thickened, persistent; stigmas 3. Nutlet obovoid to subellipsoid, compressed 3-sided, smooth, apex beaked.

One species: E and S Asia, NE Australia, Pacific islands.

**1. *Actinoscirpus grossus*** (Linnaeus f.) Goetghebeur & D. A. Simpson, Kew Bull. 46: 171. 1991.

大蘆草 da biao cao

*Scirpus grossus* Linnaeus f., Suppl. Pl. 104. 1782;  
*Schoenoplectus grossus* (Linnaeus f.) Palla.

Plants stoloniferous. Culms scattered, 1–2 m tall, 1–1.2 cm thick, acutely 3-angled, smooth, clothed at base with 1 or 2 spongy leaf sheaths which disintegrate into reticulate fibers. Leaves basal only (not cauline), shorter than culm; sheaths spongy; leaf blade 7–12 mm wide, margin scabrous. Involucral bracts 3 or 4, leaflike, basal 1–3 longer than inflorescence, margin apically scabrous. Inflorescence a terminal compound anthela, with over 10 rays and many spikelets; rays to 5 cm, scab-

rous. Spikelets solitary, rust-colored to dark brown, sessile or pedunculate, ovoid to ellipsoid, 4–5 × 2.5–3 mm, densely many flowered. Glumes elliptic to broadly ovate, ca. 2.5 mm, membranous, margin apically ciliolate, apex obtuse with a green costa excurrent into a mucro. Perianth bristles 6, longer than nutlet, retrorsely scabrous. Stamens 3; anthers linear; connective apex black, deltoid, very short. Style ± long; stigmas 3. Nutlet pale brownish yellow, obovoid to subellipsoid, ca. 1.5 mm, compressed 3-sided, apex beaked. Fl. and fr. Jul–Oct.  $2n =$  ca. 88.

Moist places, shallow pools, swamps, paddy fields; below 100–900 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands].

## 10. SCHOENOPLECTUS (Reichenbach) Palla, Verh. K. K. Zool.-Bot. Ges. Wien 38 (Sitzungsber.): 49. 1888, nom. cons.

水葱属 shui cong shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker, Tetsuo Koyama

*Scirpus* subg. *Schoenoplectus* Reichenbach, Icon. Fl. Germ. Helv. 8: 40. 1846; *Schoenoplectiella* Lye.

Herbs, annual or perennial, sometimes with creeping rhizomes. Culms tufted, not nodose above base. Leaves usually reduced to

a sheath or more rarely developing a ligulate blade. Involucral bracts culmlike, erect. Inflorescence a pseudolateral anthela or more frequently capitate with (1 or) few to many spikelets. Spikelets ovoid to ellipsoid. Glumes many, spiral (rarely pseudodistichous), deciduous or rarely persistent, often each subtending a bisexual flower. Perianth bristles 0–6, needlelike, shorter to longer than nutlet, smooth, scabrous, or plumose, deciduous with nutlet. Stamens 1–3. Style base not distinct, not thickened, persistent. Nutlet obovoid, ± 3-sided or biconvex, smooth to rugose, apex beaked or not.

About 77 species: worldwide; 22 species (five endemic) in China.

- 1a. Perianth bristles plumosely fringed.
- 2a. Culms terete; perianth bristles longer than nutlet; stigmas 2 ..... 1. *S. subulatus*
- 2b. Culms 3-angled to obtusely 3-angled just below inflorescence; perianth bristles ± as long as nutlet; stigmas 3 ..... 2. *S. litoralis*
- 1b. Perianth bristles retrorsely scabrous.
- 3a. Glumes apex emarginate and with a 1-veined costa excurrent into an awn; nutlet smooth; culms scattered; leaves developed.
- 4a. Involucral bracts much overtopping inflorescence, 1.5–2.5 cm; creeping rhizomes not red ..... 3. *S. ehrenbergii*
- 4b. Involucral bracts usually shorter than inflorescence, 1.5–5.5 cm; creeping rhizomes red.
- 5a. Culms sharply 3-angled but sometimes basally terete and only 3-angled apically; creeping rhizomes slender ..... 4. *S. triqueter*
- 5b. Culms terete; creeping rhizomes stout.
- 6a. Spikelets 4–7(–10) mm; glumes abaxially with reddish resinous spots; stigmas 2; nutlet plano-convex ..... 5. *S. tabernaemontani*
- 6b. Spikelets 6–15 mm; glumes abaxially smooth; stigmas usually 3; nutlet compressed 3-sided ..... 6. *S. lacustris*
- 3b. Glumes apex acute to obtuse and without an awn; nutlet mostly rugose; culms tufted (except *S. lineolatus*); leaves absent.
- 7a. Culms 3-angled (3–5-angled in *S. trapezoideus* and *S. monocephalus*), sometimes winged.
- 8a. Perianth bristles longer than nutlet, retrorsely scabrous; nutlet compressed 3-sided ..... 7. *S. mucronatus*
- 8b. Perianth bristles shorter than nutlet, retrorsely scabrous or not; nutlet 3-sided or biconvex.
- 9a. Nutlet 3-sided; perianth bristles glabrous ..... 8. *S. chuanus*
- 9b. Nutlet biconvex; perianth bristles retrorsely scabrous ..... 9. *S. trapezoideus*
- 7b. Culms terete.
- 10a. Plants with a creeping rhizome; culms scattered.
- 11a. Glumes oblong to elliptic, margin not ciliate; perianth bristles as long to 2 × as long as nutlet ..... 10. *S. lineolatus*
- 11b. Glumes broadly ovate, margin ciliate; perianth bristles absent or 1–3 and very short ..... 11. *S. monocephalus*
- 10b. Plants without a creeping rhizome; culms densely tufted.
- 12a. Culms 56–120 cm tall.
- 13a. Involucral bracts often deflexed; culms without transverse septa; stigmas 2 ..... 12. *S. clemensii*
- 13b. Involucral bracts erect; culms with many transverse septa; stigmas 3 ..... 13. *S. articulatus*
- 12b. Culms 15–30(–?40) cm tall.
- 14a. Nutlet 3-sided, distinctly rugulose; stigmas 3.
- 15a. Perianth bristles very well developed, slightly longer than nutlet, retrorsely scabrous ..... 20. *S. chen-moui*
- 15b. Perianth bristles very short and glabrous or absent.
- 16a. Culms 2.5–3.5 mm thick; involucral bract 10–30 cm; perianth bristles very short, glabrous ..... 21. *S. schoofii*
- 16b. Culms ca. 1 mm thick; involucral bract 1.5–12 cm; perianth bristles absent .... 22. *S. supinus*
- 14b. Nutlet biconvex, obscurely rugulose or smooth; stigmas 2.
- 17a. Glumes oblong, 2–3 mm; nutlet 1–1.5 mm.
- 18a. Spikelets yellow, 7–20 mm; glume margin apically ciliate; nutlet obscurely rugulose ..... 18. *S. jingmenensis*
- 18b. Spikelets brownish green, 4–7 mm; glume margin entire; nutlet subsmooth ..... 19. *S. komarovii*
- 17b. Glumes broadly ovate, oblong-ovate, or elliptic, 3.5–5.5 mm; nutlet 1.6–2.5 mm.
- 19a. Glumes pale green to brownish green, oblong-ovate, 4–5.5 mm, apex acuminate; nutlet broadly ellipsoid, ca. 2.5 mm; stigmas 2; perianth bristles 4, longer than nutlet ..... 17. *S. wallichii*

- 19b. Glumes brown to dark brown, broadly ovate to ovate, 3.5–4 mm, apex acute; nutlet broadly obovoid to obovoid, 2–2.5 mm; stigmas 3; perianth bristles 5 or 6, shorter than or as long as nutlet.
- 20a. Culms spaced in row along rhizome; involucre bracts horizontal; glumes 3–3.2 mm ..... 16. *S. fuscrobens*
- 20b. Culms tufted; involucre bracts ± erect; glumes to 4.5 mm.
- 21a. Culms 0.7–1 mm thick, rigid, shiny; spikelets ovoid, 4–6 mm wide; nutlets trigonous; stigmas 3 ..... 15. *S. hotarui*
- 21b. Culms 1.5–7 mm thick, subrigid, opaque; spikelets elliptic to subcylindric, 3.5–5 mm wide; nutlets plano-convex; stigmas 2 ..... 14. *S. juncooides*

**1. *Schoenoplectus subulatus*** (Vahl) Lye, Bot. Not. 124: 290. 1971.

钻苞水葱 zuan bao shui cong

*Scirpus subulatus* Vahl, Enum. Pl. 2: 268. 1805; *Schoenoplectus litoralis* (Schrader) Palla subsp. *subulatus* (Vahl) Soják; *S. litoralis* var. *subulatus* (Vahl) Chiovenda.

Rhizomes short. Culms 50–120 cm tall, 3–8 mm thick, terete, clothed at base with several bladeless leaf sheaths. Leaf sheaths to 20 cm, subpapery, membranous at mouth, disintegrating into fibers. Involucre bract 1, culmlike, longer to shorter than inflorescence, nearly subulate, stiff, hyaline margins basally ca. 1 mm wide. Inflorescence a pseudolateral simple or decompound anthela; rays 5–8, to 5 mm, compressed 3-angled, scabrous. Spikelets solitary or binate, ovoid to oblong-ovoid, 6–20 mm, many flowered. Glumes pale brown to yellowish brown, ovate-elliptic, 3–4 mm, membranous, 1-veined, margin white hyaline, apex obtuse to emarginate. Perianth bristles 4 or 5, longer than nutlet, plumosely fringed. Stamens 2; anthers linear; connective apex with a fimbriate appendage. Stigmas 2. Nutlet brown at maturity, broadly obovoid, ca. 2 mm, compressed biconvex. Fl. and fr. Jul–Oct.

Moist places. Hainan (Qiongsan) [India, Indonesia, Japan, Malaysia, Sri Lanka, Thailand; Pacific islands].

Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 17. 1961) give a much wider distribution in China than indicated here, but the specimens outside of Hainan in China should be referred to *Schoenoplectus litoralis*.

**2. *Schoenoplectus litoralis*** (Schrader) Palla, Bot. Jahrb. Syst. 10: 299. 1888.

羽状刚毛水葱 yu zhuang gang mao shui cong

*Scirpus litoralis* Schrader, Fl. Germ. 1: 142. 1806.

Rhizomes short; stolons long creeping, slender. Culms erect, 50–120 cm tall, 3–10 mm thick, 3-angled to obtusely 3-angled just below inflorescence, glaucous. Leaves reduced to a bladeless or a shortly laminate sheath. Involucre bract 1, simulating a continuation of culm, 2–5(–10) cm, erect, rigid. Inflorescence a pseudolateral simple or compound anthela, 4–6 cm, with few to many spikelets; rays slender, smooth. Spikelets solitary, reddish brown, ovoid to oblong-ovoid, 6–12 × 1.5–3 mm, terete, densely many flowered, apex ± acute. Glumes broadly elliptic, 3.5–4 × ca. 2 mm, membranous, margin broadly white hyaline and apically minutely ciliate, apex obtuse to ± notched and with a prominent green vein excurrent into a short mucro.

Perianth bristles (3 or)4(or 5), rust-colored, ligulate-spatulate, ± as long as nutlet, antrorsely scabrous, apically plumosely fringed. Stamens (2 or)3; anthers 1.5–2 mm; connective apex with a fimbriate appendage. Stigmas 3. Nutlet dark reddish brown to blackish, broadly obovoid, ca. 2 × 1.3 mm, biconvex, smooth. Fl. and fr. Jul–Sep.  $2n = 42, 78, 80, 84$ .

Water margins, swampy places; ca. 600 m. Gansu, Ningxia, W Qinghai, Shanxi, Sichuan, Xinjiang [Afghanistan, India, Indonesia, Kazakhstan, Kyrgyzstan, W Mongolia, Pakistan, Papua New Guinea, Philippines, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Europe, Indian Ocean islands, Madagascar, Pacific Ocean islands].

**3. *Schoenoplectus ehrenbergii*** (Boeckeler) Soják, Čas. Nár. Mus., Odd. Přír. 140: 127. 1972.

剑苞水葱 jian bao shui cong

*Scirpus ehrenbergii* Boeckeler, Linnaea 36: 712. 1870.

Plants stoloniferous. Culms 1–1.5 m tall, ca. 1 cm thick, sharply 3-angled, angles slightly winged, base clothed with long leaf sheaths. Leaf blade 40–60 × ca. 0.8 cm, abaxially ribbed, basally folded. Involucre bract 1, culmlike, to 25 cm, erect, greatly overtopping inflorescence, obtusely 3-angled. Inflorescence a pseudolateral head, ± dense, with 3–5 spikelets. Spikelets oblong to oblong-ovoid, 8–10 × 2–3 mm, 10-flowered. Glumes brown, broadly ovate to elliptic, ca. 5 mm, membranous, margin white hyaline, apex emarginate with a 1-veined costa excurrent into a short awn. Perianth bristles 6, longer than nutlet, retrorsely scabrous. Stamens 3; anthers linear, ca. 2 mm. Style slender; stigmas 3, shorter than style. Nutlet broadly ovoid, ca. 2 mm, plano-convex. Fl. and fr. Aug–Oct.

Near water margins. Gansu, Hebei, Ningxia, Shandong, Xinjiang [Kazakhstan, Russia; E Europe].

**4. *Schoenoplectus triqueter*** (Linnaeus) Palla, Verh. K. K. Zool.-Bot. Ges. Wien 38: 49. 1888.

三棱水葱 san leng shui cong

*Scirpus triqueter* Linnaeus, Syst. Nat., ed. 12, 2: 83; Mant. Pl. 29. 1767; *Schoenoplectus trisetosus* (Tang & F. T. Wang) S. Yun Liang; *Scirpus trisetosus* Tang & F. T. Wang.

Rhizomes long creeping, reddish brown, slender. Culms solitary, erect, 20–100 cm tall, 2–8 mm thick, 3-angled, subrigid, clothed at base with 2 or 3 leaf sheaths. Leaf sheath pale green, 5–15 cm, membranous, distinctly transversely septate, mouth obliquely truncate; leaf blade flat, 1.3–5.5(–8) cm × 1.5–2 mm. Involucre bract 1, culmlike, 1.5–7 cm, 3-angled, usually

shorter than inflorescence, apex subacute. Inflorescence a pseudolateral anthela, 3–6 cm, laxly bearing 3–20 spikelets or sometimes congested in a headlike cluster; rays to 5 cm, ± stout, scabrous. Spikelets oblong to ovoid-oblong, 6–12 × 3–7 mm, densely many flowered, apex obtuse. Glumes yellowish brown, elliptic, oblong, or broadly ovate, 3–4 mm, membranous, margin sparsely ciliate, apex emarginate to rounded with a green costa excurrent into a mucro. Perianth bristles 3–5, almost as long as nutlet, retrorsely scabrous. Stamens 3; anthers linear; connective apex dark brown, evident beyond anthers. Style short; stigmas 2. Nutlet brownish at maturity, obovoid, 2–3 mm, plano-convex, shiny. Fl. and fr. Jun–Oct.  $2n = 40$ , 42.

Wet places at river margins, ditches, pond margins, swamps; 100–2300 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, N Guangxi, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, S Xizang, Yunnan, Zhejiang [Afghanistan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Pakistan, Russia, Tajikistan, Uzbekistan; N Africa, SW Asia, Atlantic Ocean islands, Europe].

**5. *Schoenoplectus tabernaemontani*** (C. C. Gmelin) Palla, Verh. K. K. Zool.-Bot. Ges. Wien 38: 49. 1888.

水葱 shui cong

*Scirpus tabernaemontani* C. C. Gmelin, Fl. Bad. 1: 101. 1805; *Schoenoplectus validus* (Vahl) Á. Löve & D. Löve; *Scirpus lacustris* Linnaeus subsp. *validus* (Vahl) T. Koyama; *S. lacustris* var. *validus* (Vahl) Kükenthal; *S. validus* Vahl; *S. validus* var. *laevigulumis* Tang & F. T. Wang.

Rhizomes brown, horizontally creeping. Culms 1–2[–3] m tall, terete, smooth, clothed at base with 3 or 4 leaf sheaths. Leaf sheaths to 38 cm, membranous, apicalmost sheath with a blade; leaf blade linear, 1.5–11 cm. Involucral bract 1, culmlike, subulate, usually shorter to rarely slightly longer than inflorescence, erect. Inflorescence a pseudolateral simple or decomposed anthela; rays 4–13 or more, unequal in length, to 5 cm, concave to convex, scabrous. Spikelets solitary or in clusters of 2 or 3, ovoid to oblong, 4–10 × 2–3.5 mm, densely many flowered, apex acute to obtuse. Glumes brown to purplish brown, elliptic to broadly ovate, 2.5–3 mm, membranous, abaxially with reddish resinous spots on apical median part, margin broadly white hyaline and ciliate toward apex, apex obtuse to emarginate with a green costa excurrent into a mucro. Perianth bristles (2–)6, reddish brown, shorter than to equaling nutlet, retrorsely scabrous except at base. Stamens 3; anthers linear; connective apex evident beyond anthers. Style ca. 2 mm; stigmas 2(or 3, and 3rd when present shorter than other 2). Nutlet grayish, broadly obovoid to ellipsoid, 2–2.5 mm, subplano-convex, apically contracted into a 0.2–0.4 mm beak. Fl. and fr. Jun–Sep.  $2n = 42$ .

Lake margins, shallow water; (near sea level to) 300–3200 m. Gansu, Guangdong, Guizhou, Hebei, Heilongjiang, Hubei, Hunan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, India, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia, Tajikistan, Turkmenistan, Uzbekistan, Vietnam; N Africa, SW Asia, Australia, Central, North, and South America, Europe, Pacific islands].

**6. *Schoenoplectus lacustris*** (Linnaeus) Palla, Verh. K. K. Zool.-Bot. Ges. Wien 38: 49. 1888.

沼生水葱 zhao sheng shui cong

*Scirpus lacustris* Linnaeus, Sp. Pl. 1: 48. 1753.

Rhizomes stout, horizontally creeping. Culms erect, green, 1–2.5 m tall, ca. 2(–3) cm thick, terete, smooth. Leaves mostly reduced to a sheath, glabrous; basal sheath brownish; apical 2 sheaths with leaf blades; leaf blade subulate to linear, 1–10 cm. Involucral bract 1, culmlike, subulate, as long as to slightly overtopping inflorescence. Inflorescence a pseudolateral simple or decomposed anthela; rays 2–8, unequal in length, 5–8 cm. Spikelets reddish brown, oblong to ovoid, 0.6–1.5 cm, apex acute. Glumes ovate, abaxially glabrous, margin ciliate, apex emarginate with a 1-veined costa excurrent into a short awn. Perianth bristles 5 or 6, slightly longer than nutlet, retrorsely scabrous. Stamens 3; anthers linear, 1.5–2 mm; connective apex with a pyramidal-ovoid bearded appendage. Stigmas 3. Nutlet grayish, obovoid, ca. 3 mm, compressed 3-sided (ridge evident on abaxial surface when immature). Fl. and fr. Jun–Aug.  $2n = 38$ , 42, 80.

Swamps, shallow water; ca. 1000 m. Xinjiang (Shawan) [Afghanistan, N India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N and S Africa, SW Asia, Europe].

**7. *Schoenoplectus mucronatus*** (Linnaeus) Palla subsp. **robustus** (Miquel) T. Koyama, Fl. Taiwan 5: 214. 1978.

水毛花 shui mao hua

*Scirpus mucronatus* Linnaeus var. *robustus* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 143. 1865; *Schoenoplectus mucronatus* var. *robustus* (Miquel) T. Koyama; *S. triangulatus* (Roxburgh) Soják; *Scirpus acutus* J. Presl & C. Presl (1828), not Muhlenberg ex Bigelow (1814); *S. mucronatus* subsp. *robustus* (Miquel) T. Koyama; *S. mucronatus* var. *subleiocarpus* Franchet & Savatier; *S. preslii* A. Dietrich; *S. triangulatus* Roxburgh; *S. triangulatus* var. *sanguineus* Tang & F. T. Wang; *S. triangulatus* var. *trialatus* Tang & F. T. Wang; *S. triangulatus* var. *tripteris* Tang & F. T. Wang.

Rhizomes short. Culms deep green, slightly densely tufted, 45–130 cm tall, 5–11 mm thick, sharply 3-angled with shallowly concave sides, clothed at base with 2–4 leaf sheaths. Leaf sheaths brown, 7–25 cm, membranous to herbaceous, obliquely truncate at mouth. Involucral bract 1, culmlike, upright or obliquely bent, 2–10 cm. Inflorescence a pseudolateral hemispheric head, with (3–)5–20 spikelets. Spikelets brownish greenish, ovoid, oblong-ovoid, or narrowly ovoid, 10–20 × 4–6 mm, terete, densely many flowered, apex subacute. Glumes pale green and brownish tinged usually with reddish brown, broadly obovate, ovate, or broadly ovate, 3.8–5 × 2.5–3 mm, very concave, papery, margin apically minutely ciliate, apex with a green 1–3-veined costa excurrent into a mucro. Perianth bristles 6, 1.5–2 × as long as nutlet, retrorsely scabrous. Stamens 3; anthers linear, ca. 2.5 mm; connective apex slightly prominent beyond anthers. Style ca. 4 mm; stigmas 3. Nutlet blackish brown at maturity, obovoid to broadly obovoid, 2–2.5 × 1.5–2 mm,

compressed 3-sided, conspicuously or inconspicuously transversely wrinkled,  $\pm$  shiny, base contracted to cuneate, apex rounded to mucronate. Fl. and fr. May–Nov.  $2n = 44$ .

Pond and lake margins, swamps, grasslands in streambanks, paddy fields; 100–2700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Malaysia, Sri Lanka; Africa, S Europe, Madagascar].

Only specimens of *Schoenoplectus mucronatus* subsp. *robustus*, as interpreted here, have been seen from China by the present authors. If recognized at specific rank, this taxon would be correctly named *S. triangularis*. *Schoenoplectus mucronatus* subsp. *mucronatus* occurs in Europe and is naturalized in North America.

**8. *Schoenoplectus chuanus*** (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, *Novon* 20: 170. 2010.

曲氏水葱 qu shi shui cong

*Scirpus chuanus* Tang & F. T. Wang, *Fl. Reipubl. Popularis Sin.* 11: 222. 1961.

Rhizomes short, creeping. Culms laxly tufted, 66–76 cm tall,  $\pm$  stout, 3-angled, distinctly channeled, smooth, clothed at base with 2 or 3 leaf sheaths. Leaf sheaths to 25 cm; basal sheaths dark brown, with prominent transverse veins; apical sheaths green to greenish brown, mouth obliquely truncate with hyaline margin. Involucral bract 1, erect to obliquely spreading, culmlike, 5–9 cm, 3-angled, smooth. Inflorescence a pseudolateral head, with ca. 10 spikelets. Spikelets oblong to ellipsoid, 5–10  $\times$  3–5 mm, densely many flowered. Glumes brown with dark brown short lines, broadly ovate, 2.5–3 mm, concave, papery, many veined, margin hyaline, apex rounded with a yellowish green costa excurrent into a mucro. Perianth bristles 6, 1/4–1/3 as long as nutlet, glabrous. Stamens 3; anthers narrowly deltoid, apex obtuse; connective apex slightly dilated. Style short; stigmas 3, slender. Nutlet black at maturity, obovoid, 1.5–2 mm, 3-sided, shiny. Fl. and fr. Jul–Aug.

- Shallow water. Jiangsu (Nanjing).

**9. *Schoenoplectus trapezoides*** (Koidzumi) Hayasaka & H. Ohashi, *J. Jap. Bot.* 75: 224. 2000.

五棱水葱 wu leng shui cong

*Scirpus trapezoides* Koidzumi, *Bot. Mag. (Tokyo)* 39: 26. 1925; *S. erectus* Poir. var. *triangularis* Honda; *S. juncooides* Roxburgh var. *triangularis* (Honda) Ohwi.

Rhizomes short. Culms tufted, erect, 40–70 cm tall,  $\pm$  slender, 3–5-angled, clothed at base with bladeless leaf sheaths. Leaf sheaths pale brown at base, to 12 cm, oblique at mouth. Involucral bract 1, erect, culmlike, 5–15 cm. Inflorescence a pseudolateral head, with 2–9 spikelets. Spikelets sessile, pale rust-colored brown, oblong-ovoid to ovoid, 8–14  $\times$  4–6 mm. Glumes pale rust-colored brown, broadly elliptic, 3–4 mm, thinly leathery, with a green costa excurrent into a mucro, apex acute. Perianth bristles 6, ca. 2/3 as long as nutlet, retrorsely scabrous. Stamens 3; anthers 1.2–1.5 mm. Style ca. 3 mm; stigmas (2 or)3. Nutlet blackish brown, broadly obovoid to sub-

spherical, ca. 2 mm, biconvex or unequally biconvex, obscurely wrinkled. Fl. and fr. Aug–Oct.

Wet places, swamps by streams; 200–1000 m. Fujian, Guangxi, Hebei, Jilin, Shandong [Japan].

**10. *Schoenoplectus lineolatus*** (Franchet & Savatier) T. Koyama, *Fl. Taiwan* 5: 215. 1978.

细匍匐茎水葱 xi pu fu jing shui cong

*Scirpus lineolatus* Franchet & Savatier, *Enum. Pl. Jap.* 2: 545. 1878.

Rhizomes creeping, long, slender. Culms solitary at nodes of rhizome, distantly arranged in a row, dark green, 7–35 cm tall, 0.8–1.2 mm thick, terete, clothed at base with 1 or 2 bladeless short leaf sheaths. Leaf sheaths pale brown, 1–5 cm, hyaline, mouth obliquely truncate. Involucral bract 1, erect, culmlike, apex subulate. Inflorescence generally a single pseudolateral spikelet. Spikelet sessile, greenish straw-colored, oblong to broadly narrowly ovoid, 4–6  $\times$  2–3 mm, densely many flowered. Glumes pale yellow with some brown lines, oblong to elliptic, 4–4.5  $\times$  1.8–2 mm, membranous, keel green, margin white hyaline, apex acute to obtuse. Perianth bristles 4 or 5, as long to 2  $\times$  as long as nutlet. Stamens 2 or 3; anthers linear, ca. 2.5 mm. Style 4–5 mm; stigmas 2. Nutlet black, obovoid to ellipsoid, 1.7–2.2  $\times$  1.2–1.8 mm, plano-convex, shiny. Fl. and fr. Jul–Oct.  $2n = ca. 60$ .

Marshy places; near sea level. Guangdong, Taiwan, Zhejiang [Japan, Russia (Far East)].

**11. *Schoenoplectus monocephalus*** (J. Q. He) S. Yun Liang & S. R. Zhang, *Novon* 20: 170. 2010.

单穗水葱 dan sui shui cong

*Scirpus monocephalus* J. Q. He, *Acta Phytotax. Sin.* 37: 291. 1999.

Rhizomes creeping, with several fusiform bulblets. Culms scattered, 10–20 cm tall, 0.5–1.5 mm thick, terete, channeled, smooth, clothed at base with 1 or 2 dark brown bladeless leaf sheaths. Leaf sheaths 1–3 cm, hyaline, mouth obliquely truncate. Involucral bract 1, erect, culmlike, 1–2.5 cm, apex subacute. Inflorescence generally a single pseudolateral spikelet. Spikelet sessile, oblong to ovoid, 4–10  $\times$  2–4 mm, densely 6–10-flowered. Glumes pale brown with minute brown spots, broadly ovate to ovate-oblong, 1–3.5 mm, veinless or 1-veined, apex obtuse. Perianth bristles absent or 1–3 unequal short bristles, when present 1/6–4/5 as long as nutlet, glabrous. Stamens 3; anthers linear, 1–1.5 mm. Style slender, ca. 3 mm; stigmas 2, ca. 1 mm. Nutlet brown, broadly ovoid, 1.5–2.5 mm, plano-convex, shiny, glabrous. Fl. and fr. Jun–Sep.

- Trail margins, wet places. Anhui (Fuyang).

**12. *Schoenoplectus clemensii*** (Kükenthal) G. C. Tucker, **comb. nov.**

佛海水葱 fo hai shui cong

Basionym: *Scirpus mucronatus* Linnaeus subsp. *clemensii* Kükenthal, *Bot. Jahrb. Syst.* 69: 259. 1938; *Schoenoplectus*

*fohaiensis* (Tang & F. T. Wang) Hayasaka; *S. mucronatus* (Linnaeus) Pallas subsp. *clemensii* (Kükenthal) Soják; *Scirpus clemensii* (Kükenthal) Ohwi; *S. fohaiensis* Tang & F. T. Wang.

Rhizomes short, without creeping stolons. Culms 60–120 cm tall, 5–8 mm thick, terete, smooth, clothed at base with 3 or 4 leaf sheaths. Leaf sheaths brown to greenish, mouth obliquely truncate and bladeless or sometimes setaceous. Involucral bract 1, culmlike, 2.5–5 mm, often deflexed, terete, apex acuminate. Inflorescence a pseudolateral head with many spikelets. Spikelets sessile, dark brown, ovoid to oblong, 4–5 × ca. 3 mm, many flowered. Glumes pale brown with dark brown lines, obovate to elliptic, 2–2.5 mm, membranous, margin ciliate, apex acute to obtuse with a costa excurrent into a mucro. Perianth bristles 5 or 6, as long as to slightly longer than nutlet, retrorsely scabrous. Stamens 3; anthers linear; connective apex evident beyond anthers. Style long; stigmas 2. Nutlet black at maturity, broadly obovoid to obovoid, ca. 1.2 mm, plano-convex, shiny. Fl. and fr. Mar–Jun.

Ponds; ca. 1600 m. Yunnan (Fuhai) [Papua New Guinea, Vietnam].

**13. *Schoenoplectus articulatus*** (Linnaeus) Palla, Bot. Jahrb. Syst. 10: 299. 1888.

节苞水葱 jie bao shui cong

*Scirpus articulatus* Linnaeus, Sp. Pl. 1: 47. 1753; *Schoenoplectiella articulata* (Linnaeus) Lye; *Schoenoplectus pseudoarticulatus* (L. K. Dai & S. M. Huang) S. Yun Liang & S. R. Zhang; *Scirpus pseudoarticulatus* L. K. Dai & S. M. Huang.

Plants 30–85 cm tall (including involucral bract). Rhizomes shortly creeping. Culms densely tufted, 12–30 cm tall, 5–7 mm thick, terete, transversely septate, clothed at base with 1 or 2 bladeless leaf sheaths. Leaf sheaths 10–25 cm, terete, obliquely truncate at mucronate mouth. Involucral bract 1, erect, culmlike, usually longer than culm, with many transverse septate nodes. Inflorescence a pseudolateral head with many spikelets. Spikelets sessile, ovoid, 7–9 × 4–4.5 mm, many flowered. Glumes brownish yellow with dark brown lines, deltoid-ovate, 5–5.5 mm, concave, thinly membranous, veins many and ± conspicuous, apex with a costa excurrent into a mucro. Perianth bristles absent. Stamens 3; stigmas 3. Nutlet yellowish gray at maturity, obovoid, 2–2.2 mm, 3-sided, smooth. Fl. and fr. May–Jul.

Moist places, pond margins; low elevations. S Hainan (Sanya) [India, Indonesia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Indian Ocean islands, Madagascar].

This species is widely distributed and very variable in the size of its vegetative parts. The Hainan plants were separated (as *Scirpus pseudoarticulatus*) mainly by their taller culms and relatively more pointed spikelets, but such features certainly fall within the variation range of *Schoenoplectus articulatus*.

**14. *Schoenoplectus juncooides*** (Roxburgh) Palla, Bot. Jahrb. Syst. 10: 299. 1888.

萤蔺 ying lin

*Scirpus juncooides* Roxburgh, Fl. Ind. 1: 216. 1820; *Schoenoplectiella juncooides* (Roxburgh) Lye; *Scirpus juncooides*

var. *ohwianus* (T. Koyama) T. Koyama; *S. ohwianus* T. Koyama.

Roots many, fibrous. Rhizomes short. Culms tufted, 18–70 cm tall, 1.5–7 mm thick, slightly stiff, opaque, obtusely to faintly several angled, smooth, clothed at base with 2 or 3 bladeless leaf sheaths. Leaf sheaths pale green, 5–15 cm, obliquely truncate at mucronate mouth. Involucral bract 1, erect, pale green, culmlike, 3–15 cm. Inflorescence a pseudolateral head with (2 or)3–5(–9) spikelets. Spikelets brown to pale brown, oblong-ovoid, 8–17 × 3.5–5 mm, many flowered. Glumes brown or brown with brown lines, broadly ovate to ovate, 3–4 × 1.8–2 mm, membranous, apex with a 3-veined green costa excurrent into a mucro. Perianth bristles 5 or 6, equaling or shorter than nutlet, retrorsely scabrous except at base. Stamens 3; anthers oblong; connective apex evident beyond anthers. Style 2–2.2 mm; stigmas 2. Nutlet dark brown at maturity, broadly obovoid to obovoid, ca. 2 mm, plano-convex, obscurely transversely wrinkled, shiny. Fl. and fr. Aug–Nov.

Wetlands, paddy field margins; 800–2000 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, S Xinjiang, SE Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Kashmir, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Tajikistan, Thailand, Uzbekistan; SW Asia, Australia, Indian Ocean islands, Madagascar, Pacific islands].

A putative hybrid between *Schoenoplectus juncooides* and *S. schoofii*, described from NE Yunnan (Dongchuan), was named *Scirpus ×intermedius* Tang & F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 224. 1961), but that name is illegitimate because it is a later homonym of *S. intermedius* Thuillier (Fl. Env. Paris, ed. 2, 21. 1799).

**15. *Schoenoplectus hotarui*** (Ohwi) T. Koyama, Makinoa, n.s., 7: 58. 2008.

细秆萤蔺 xi gan ying lin

*Scirpus hotarui* Ohwi, Repert. Spec. Nov. Regni Veg. 36: 44. 1934; *Schoenoplectus juncooides* (Roxburgh) Palla subsp. *hotarui* (Ohwi) Soják; *Scirpus juncooides* Roxburgh var. *hotarui* (Ohwi) Ohwi.

Plants annual. Roots fibrous. Culms tufted, 13–40 cm tall, 0.7–1 mm thick, terete, slender, rigid, shiny, clothed at base with ca. 3 bladeless sheaths. Involucral bracts erect. Inflorescence a pseudolateral head with 1–3(or 4) spikelets. Spikelets ovoid, 6–14 × 4–6 mm, apex acute. Glumes ovate-orbicular, 3–4.5 mm, brownish tinged on both sides of green costa, apex rounded. Perianth bristles 6, ca. 1.5 × as long as nutlet. Stamens 3. Nutlets blackish at maturity, broadly ovate-orbicular, 2–2.5 mm, trigonous, transversely wrinkled.

Wet places; ca. 1200 m. Jilin, S Liaoning [Japan, Korea, N Myanmar, Russia (Far East)].

This species can be easily discerned by the slender, rigid, and spiny culms with only 1–3 spikelets in contrast to the thicker, subrigid, and opaque culms bearing 4–9 spikelets of *Schoenoplectus juncooides*. *Schoenoplectus hotarui*, unlike *S. juncooides*, is found growing more frequently in natural habitats rather than as a rice field weed and has a more northerly distribution.

**16. *Schoenoplectus fuscrobens*** (T. Koyama) T. Koyama in H. Hara, Stearn & L. H. J. Williams, Enum. Fl. Pl. Nepal 1: 118. 1978.

褐红鳞水葱 he hong lin shui cong

*Scirpus fuscrobens* T. Koyama, Willdenowia 5: 491. 1969.

Roots many, fibrous. Rhizomes elongated, bearing culms in a well-spaced row forming a single rank. Culms not tufted, 15–70 cm tall, 1–4 mm thick, slightly stiff, terete or obtusely several angled, smooth, clothed at base with 2 or 3 bladeless leaf sheaths. Leaf sheaths pale green, 5–15 cm, obliquely truncate at mucronate mouth. Involucral bract 1, pale green, looking like a continuation of culm, 3–15 cm, perpendicular to it. Inflorescence a pseudolateral head with 2–4 spikelets. Spikelets brown to pale brown, ovoid to oblong-ovoid, 3–6 × ca. 3 mm, several flowered. Glumes brown or brown with brown lines, broadly ovate to ovate, 3–3.2 × 1.8–2 mm, membranous, marked with dark purplish brown on margins (and sometimes on sides as well), apex mucronate. Perianth bristles 5 or 6, equaling or shorter than nutlet, retrorsely scabrous except at base. Stamens 3; anthers oblong; connective apex evident beyond anthers. Style 2–2.2 mm; stigmas 2 or 3. Nutlet dark brown at maturity, broadly obovoid to obovoid, ca. 2 mm, plano-convex or 3-sided, obscurely transversely wrinkled, shiny. Fl. and fr. Aug–Nov.

Damp meadows on mountains; 2000–2700 m. Guizhou, Xizang [Bhutan, Nepal].

**17. *Schoenoplectus wallichii*** (Nees) T. Koyama, Fl. Taiwan 5: 210. 1978.

猪毛草 zhu mao cao

*Scirpus wallichii* Nees in Wight, Contr. Bot. India, 112. 1834; *Schoenoplectiella wallichii* (Nees) Lye; *Scirpus erectus* Poiret var. *wallichii* (Nees) Beetle; *S. sasakii* Hayata.

Plants without a distinct rhizome. Culms tufted, 10–40 cm tall, smooth, clothed at base with 2–4 leaf sheaths. Leaf sheaths 2–10 cm, with basal ones straw-colored and apical ones pale green, mouth obliquely truncate and with a subulate ca. 0.8 mm appendage. Involucral bract 1, erect, culmlike, 4.5–16 cm, base dilated, apex acute. Inflorescence a pseudolateral head, with 1–3 spikelets. Spikelets pale green to pale brownish green, narrowly ovoid to oblong-ovoid, 7–20 × 3–6 mm, densely many flowered, apex acute. Glumes oblong-ovate, 4–5.5 × ca. 2.5 mm, thinly leathery, apex acuminate with a green costa excurrent into a mucro. Perianth bristles 4 (or 5), longer than nutlet, retrorsely scabrous except at base. Stamens 3; anthers oblong; connective apex slightly evident beyond anthers. Style 2–2.5 mm; stigmas 2. Nutlet blackish brown, broadly ellipsoid, ca. 2.5 mm, plano-convex, ± transversely wrinkled, shiny. Fl. and fr. Aug–Nov.

Wet places, stream margins, river margins, paddy fields; 800–1300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [NE India, Japan, Korea, Malaysia, Myanmar, Philippines, Vietnam].

**18. *Schoenoplectus jingmenensis*** (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, Novon 20: 170. 2010.

荆门水葱 jing men shui cong

*Scirpus jingmenensis* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 222. 1961.

Rhizomes short. Culms tufted, 10–32 cm tall, 2–3 mm thick, terete, smooth, clothed at base with 2 or 3 leaf sheaths. Leaf sheaths 1.5–9 cm, mouth obliquely truncate; apicalmost sheath usually with a slender 1–1.7 cm blade. Involucral bract 1, culmlike, 13–18 cm, sometimes longer than culm, subterete, base dilated, margin hyaline; bractlets pale brown, glumelike, ovate to broadly lanceolate, 4–10 mm. Inflorescence a pseudolateral head, with 5–10 spikelets. Spikelets sessile, oblong to narrowly ovoid, 7–20 × ca. 1 mm, many flowered. Glumes pale brown with brown lines, oblong, ca. 2 mm, membranous, deciduous at nutlet maturity, margin apically ciliate, apex rounded and with a 1–3-veined costa excurrent into a mucro. Perianth bristles 4–6, ± as long as nutlet, retrorsely scabrous. Stamens 1 or 2; anthers ellipsoid, short. Style long; stigmas 2, slender. Nutlet blackish brown, obovoid, ca. 1 mm, plano-convex, indistinctly transversely wrinkled, shiny. Fl. Sep.

• Hubei (Jingmen).

**19. *Schoenoplectus komarovii*** (Roshevitz) Soják, Čas. Nár. Mus., Odd. Přír. 140: 127. 1972.

吉林水葱 ji lin shui cong

*Scirpus komarovii* Roshevitz in Komarov, Fl. URSS 3: 579. 1935; *S. hondoensis* Ohwi var. *leiocarpus* (Komarov) Ohwi; *S. okuyamae* Ohwi; *S. sasakii* Hayata var. *leiocarpus* (Komarov) Kitagawa; *S. supinus* Linnaeus var. *leiocarpus* Komarov.

Rhizomes very short. Culms tufted, 10–50 cm tall, terete, smooth, clothed at base with 2 or 3 bladeless leaf sheaths. Leaf sheaths green, 1–10 cm, base sometimes pale brown, mouth obliquely truncate. Involucral bract 1, culmlike, 8–18 cm, base slightly dilated. Inflorescence a pseudolateral head, with 2–10 or more spikelets. Spikelets sessile, ovoid to oblong-ovoid, 4–7(–10) × 2–3 mm, many flowered. Glumes pale brown with dark brown lines, oblong, ca. 2 mm, membranous, veins obscure, with green 1-veined costa excurrent into a mucro at rounded apex. Perianth bristles 4, ± as long as nutlet, retrorsely scabrous. Stamens 3; anthers narrowly ovoid, short; connective apex slightly evident beyond anthers. Style long; stigmas 2. Nutlet blackish brown, broadly obovoid, 1–1.5 mm, compressed biconvex, obscurely transversely wrinkled, shiny. Fl. and fr. Jun–Oct.

Swamps, wet places, paddy fields; near sea level to 100 m. Heilongjiang, Jilin, Liaoning, NE Nei Mongol [Japan, Korea, Russia (Far East)].

**20. *Schoenoplectus chen-moui*** (Tang & F. T. Wang) Haya-saka, J. Jap. Bot. 84: 49. 2009 [“*chen-mouii*”].

陈谋水葱 chen mou shui cong

*Scirpus chen-moui* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 223. 1961 [“*chen-mouii*”].

Roots fibrous. Culms 10–30 cm tall, ca. 1.5 mm thick, terete, smooth, clothed at base with 2–4 green to pale brown leaf sheaths. Leaf sheaths 1–10 cm, mouth obliquely truncate and sometimes with a setaceous ca. 1 cm blade. Involucral bract 1, erect, culmlike, 10–20 cm, subterete, smooth, base slightly dilated, margin membranous. Inflorescence a pseudolateral head, with 2–10 spikelets. Spikelets oblong-ovoid to oblong, 5–10 × ca. 3 mm, many flowered. Glumes yellow with brown lines, obovate to oblong, membranous, margin ciliate, apex with a green costa excurrent into a mucro. Perianth bristles (5 or)6, longer than nutlet, retrorsely scabrous. Stamens 3; anthers oblong, short; connective apex slightly evident beyond anthers. Style of medium length; stigmas 3. Nutlet yellow when young but turning black at maturity, obovoid to broadly obovoid, 1–1.2 mm, 3-sided, transversely wrinkled. Fl. and fr. Aug–Oct.

- Paddy fields; ca. 1800 m. W Yunnan (Dali).

**21. *Schoenoplectus schoofii*** (Beetle) Soják, Čas. Nár. Muz. Praze, Rada Přír. 148: 194. 1980.

滇水葱 dian shui cong

*Scirpus schoofii* Beetle, Amer. J. Bot. 29: 654. 1942.

Culms tufted, 30–60 cm tall, 2.5–3.5 mm thick, compressed terete to terete, smooth, clothed at base with 2 or 3 bladeless pale brown leaf sheaths. Leaf sheaths 2–16 cm, mouth obliquely truncate and with a mucro. Involucral bract 1, culmlike, 8–30 cm. Inflorescence a pseudolateral head, with 8–20 spikelets. Spikelets ovoid to oblong-ovoid, 3–10 × 2–3 mm, many flowered. Glumes brownish yellowish to brown, elliptic to subobovate, ca. 3 mm, membranous, obscurely many veined, margin ciliate, apex rounded and with a green 1–3-veined costa excurrent into a mucro. Perianth bristles very short, glabrous. Stamens 3; anthers nearly narrowly ovate, short; connective apex evident beyond anthers. Style of medium length; stigmas 3. Nutlet black at maturity, broadly obovoid, ca. 1 mm, 3-sided, densely transversely wrinkled. Fl. and fr. Aug–Sep.

- Wet places along lake margins; ca. 2300 m. Jiangsu, Yunnan.

**22. *Schoenoplectus supinus*** (Linnaeus) Palla, Bot. Jahrb. Syst. 10: 299. 1888.

仰卧秆水葱 yang wo gan shui cong

*Scirpus supinus* Linnaeus, Sp. Pl. 1: 49. 1753; *Schoenoplectiella supina* (Linnaeus) Lye.

Roots fibrous. Culms greenish, tufted, 4–30 cm tall, 1–1.7 mm thick, 3-angled or terete, clothed at base with 2 or 3 leaf sheaths. Leaf sheaths pale green, 2–6 cm, membranous, mouth obliquely truncate and with a mucro; leaf blade present or absent. Involucral bract 1, culmlike, 1.5–12 cm. Inflorescence a pseudolateral head or corymbose with 4 short rays. Spikelets 3–10, narrowly ovoid, ovoid, or oblong, 4–8 × 2–3 mm,

subdensely many flowered, apex subacute. Glumes elliptic and boat-shaped, 1.8–2.5 mm, with a prominent green 3-veined keel, margins membranous, apex ± obtuse and shortly mucronate. Perianth bristles absent or rarely rudimentary. Style ca. 1.5 mm; stigmas 3. Nutlet black at maturity, broadly obovoid, 1–1.3 mm, 3-sided, obscurely or distinctly transversely wrinkled, both ends suddenly contracted, apex mucronate. Fl. and fr. Jul–Sep or Nov–Jan.

Wet places, paddy fields, moist meadows along valleys; 600–2300 m. Anhui, Guangdong, Guangxi, Hainan, S Jiangsu, Taiwan, Xinjiang, Yunnan [Afghanistan, India, Indonesia, Kazakhstan, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Russia, Sri Lanka, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, N Australia, Europe, Madagascar, South America].

*Schoenoplectus supinus* subsp. *supinus* occurs in N Africa, C and SW Asia, and S Europe.

- 1a. Culms 3-angled; basal leaf sheaths with a blade; nutlet sides obscurely transversely wrinkled ..... 22a. subsp. *lateriflorus*
- 1b. Culms terete; basal leaf sheaths bladeless; nutlet sides distinctly transversely wrinkled ..... 22b. subsp. *densicorrugatus*

**22a. *Schoenoplectus supinus*** subsp. *lateriflorus* (J. F. Gmelin) Soják, Čas. Nár. Mus., Odd. Přír. 141: 62. 1972.

稻田仰卧秆水葱 dao tian yang wo gan shui cong

*Scirpus lateriflorus* J. F. Gmelin, Syst. Nat. 1: 127. 1791; *Isolepis oryzetorum* Steudel; *Schoenoplectus lateriflorus* (J. F. Gmelin) Lye; *Scirpus erectogracilis* Hayata; *S. oryzetorum* (Steudel) Ohwi; *S. supinus* var. *lateriflorus* (J. F. Gmelin) T. Koyama.

Culms 7–30 cm tall, 3-angled. Basal leaf sheaths with a blade. Nutlet sides obscurely transversely wrinkled. Fl. and fr. Nov–Jan.

Wet places, paddy fields; ca. 1000 m. Anhui, Guangdong, Guangxi, S Jiangsu, Taiwan, Yunnan [Afghanistan, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Madagascar].

**22b. *Schoenoplectus supinus*** subsp. *densicorrugatus* (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, Novon 20: 171. 2010.

多皱纹果仰卧秆水葱 duo zhou wen guo yang wo gan shui cong

*Scirpus supinus* var. *densicorrugatus* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 223. 1961.

Culms 4–10 cm tall, terete. Basal leaf sheaths bladeless. Inflorescence a pseudolateral head. Spikelets 3–6 mm, in clusters of 2 or 3, sessile. Nutlet sides finely and densely transversely wrinkled. Fl. and fr. Jul–Sep.

- Moist meadows along valleys; 600–2300 m. Xinjiang.

## 11. ELEOCHARIS R. Brown, Prodr. 224. 1810.

荸荠属 bi qi shu

Dai Lunkai (戴伦凯); Mark T. Strong

Herbs, perennial or annual. Rhizomes short or absent; stolons usually present. Culms tufted or single. Leaves bladeless; sheath

apiculate or rarely with a scarious appendage at apex. Inflorescences reduced to a single terminal spikelet, erect, rarely proliferous (bearing plantlets) at base, with few to many bisexual flowers. Glumes spirally imbricate or rarely distichous, oblong, oblong-ovate, lanceolate, or subrounded, firm or membranous, glabrous, usually with a midvein although sometimes indistinct but with lateral veins, margin usually hyaline; basal 1 or 2 glumes usually empty. Perianth bristles (3–)6(–12) or rarely absent, retrorsely spinulose. Stamens 1–3. Style thin; stigmas 2 or 3. Nutlet obovoid, broadly obovoid, or globose-obovoid, 3-sided, biconvex, or plano-convex, smooth, reticulate, cancellate, or rarely pitted; persistent style base expanded, triangular, conic, or variously shaped, sometimes spongy-thickened.

About 250 species: worldwide; 35 species (nine endemic) in China.

- 1a. Spikelet usually cylindrical or narrowly ellipsoid, as wide as culms; culms usually stout, sometimes transversely septate with nodes evident on surface (in *E. dulcis*); leaf sheath mouth oblique; glumes firm, subcartilaginous, rarely subpapery or membranous, midvein obscure or indistinct but with 15 or more prominent to obscure close longitudinal veins.
- 2a. Culms with transverse septa, nodes evident on surface when dry; spikelet with basal 2 glumes empty, rarely 1 with a flower; nutlet surface essentially smooth ..... 1. *E. dulcis*
- 2b. Culms without transverse septa, nodes not evident on surface when dry; spikelet with only basalmost glume empty; nutlet surface cancellate or reticulate.
- 3a. Culms terete ..... 6. *E. ochrostachys*
- 3b. Culms 3-angled, rarely acutely 4- or 5-angled.
- 4a. Culms firm, with pith in center; glumes broadly ovate or subquadrate, as long as wide.
- 5a. Leaf sheath mouth with setaceous appendage; glumes densely imbricate, subquadrate, apex truncate; nutlet apex not constricted; perianth bristles as long as or shorter than nutlet ..... 2. *E. spiralis*
- 5b. Leaf sheath mouth acute but without an appendage; glumes laxly imbricate, broadly ovate, apex rounded; nutlet apex constricted; perianth bristles ca. 2 × as long as nutlet ..... 3. *E. trilateralis*
- 4b. Culms spongy, subhollow; glumes narrowly ovate or broadly lanceolate, ca. 2 × as long as wide.
- 6a. Culms 3-angled, (1–)3–4 mm thick; spikelet 1.5–4 cm × 3–5 mm; glumes broadly ovate, 3–3.5 mm wide, subleathery, apex rounded; nutlet surface shallowly pitted with 13–15 longitudinal rows of transversely oriented, oblong to linear epidermal cells ..... 4. *E. acutangula*
- 6b. Culms acutely 4- or 5-angled, 1.5–2.5 mm thick; spikelet 2–5 cm × 2.5–3 mm; glumes broadly lanceolate, 1.5–2.5 mm wide, membranous, apex obtuse to slightly acute; nutlet surface deeply pitted with 15–20 longitudinal rows of hexagonal epidermal cells ..... 5. *E. philippinensis*
- 1b. Spikelet ovoid to narrowly ovoid, rarely cylindrical, usually wider than culms; culms slender, nodes not evident on surface; leaf sheath mouth truncate or slightly oblique, rarely with a scarious appendage; glumes generally membranous, midvein distinct or rarely obscure.
- 7a. Persistent style base scarcely differentiated from nutlet apex and seemingly a continuation of it.
- 8a. Annuals, neither stoloniferous or rhizomatous; culms often recurved; persistent style base pyramidal-acuminate; nutlet narrowly winged on angles, reticulate to deeply pitted-reticulate with isodiametric epidermal cells ..... 9. *E. retroflexa*
- 8b. Perennials, stoloniferous; culms erect to ascending; persistent style base triangular-subulate or subconic; nutlet not winged on angles, essentially smooth.
- 9a. Culms 1–7 cm tall; spikelets 2–4 mm, 6–10-flowered; persistent style base triangular-subulate; nutlet 0.9–1.5 mm, smooth ..... 7. *E. parvula*
- 9b. Culms 3–30 cm tall; spikelets 4–7 mm, 2–7-flowered; persistent style base subconic to 3-angled-subulate; nutlet 1.9–2.5 mm, appearing smooth but finely cellular-reticulate ..... 8. *E. quinqueflora*
- 7b. Persistent style base differentiated from nutlet apex by a constriction or articulation at junction with it.
- 10a. Stigmas 3.
- 11a. Culms short and very slender; spikelet few flowered; glumes subdistichous at base of spikelet; nutlet terete or nearly so, longitudinally ridged with ridges separated by numerous cross-walls (trabeculae) ..... 10. *E. yokoscensis*
- 11b. Culms elongate and ± stout; spikelet many flowered; glumes spirally imbricate; nutlet 3-sided to compressed 3-sided, essentially smooth.
- 12a. Culms acutely (3 or)4(–6)-angled; spikelet not proliferous at base; nutlet brownish when mature.
- 13a. Glumes 3–4 × 1–1.5 mm, margin narrow and hyaline; nutlet 1.2–1.5 mm and as wide; perianth bristles laxly to densely retrorsely spinulose; persistent style base deltoid, 1/2–2/3 as long as nutlet ..... 11. *E. tetraquetra*
- 13b. Glumes 4–6 × 2–2.5 mm, margin broad and hyaline; nutlet 1.5–2 mm and as wide; perianth bristles plumose with spreading hairs; persistent style base narrowly ovoid, as long and as wide as nutlet or nearly so ..... 12. *E. wichurae*

- 12b. Culms terete; spikelet usually proliferous at base; nutlet olivaceous or yellowish when mature.
- 14a. Glumes ovate-lanceolate, 3–4 mm, apex acute; persistent style base narrowly 3-angled to conic, attenuate to a short caudal tip, ca. 1/2 as long as nutlet; rhizome decumbent or obliquely ascending ..... 13. *E. yunnanensis*
- 14b. Glumes oblong, suboblong, ovate, or elliptic, 1.5–2.5 mm, apex obtuse or rounded; persistent style base 3-angled, pyramidal, deltoid, narrowly ovoid, or subconic, ca. 1/4 as long as nutlet; rhizome absent or present.
- 15a. Persistent style base depressed, deltoid-pyramidal, as wide as nutlet or nearly so ..... 17. *E. attenuata*
- 15b. Persistent style base not depressed, deltoid, narrowly ovoid, or subconic, often shortly attenuate to apex, ca. 1/2 as wide as nutlet.
- 16a. Perianth bristles exceeding tip of style base ..... 18. *E. congesta*
- 16b. Perianth bristles shorter than tip of style base.
- 17a. Annuals; spikelet narrowly ovoid, oblong-ovoid, cylindric, or rarely globose-ovoid, (3–)5–10 mm, several to many flowered; glumes oblong ..... 14. *E. pellucida*
- 17b. Perennials; spikelet ovoid or ovoid-cylindric, 2.5–6 mm, few flowered; glumes ovate or elliptic.
- 18a. Perianth bristles 6, slightly shorter than nutlet; nutlet obovoid, ca. 1 mm ..... 15. *E. maximowiczii*
- 18b. Perianth bristles 2–5, 1/4–1/2 as long as nutlet; nutlet oblong to oblong-obovoid, ca. 1.5 mm ..... 16. *E. setulosa*
- 10b. Stigmas 2.
- 19a. Annuals; persistent style base not spongy-thickened; stolons absent; spikelet ovoid, subglobose, or oblong-ovoid, (2–)3–5(–8) mm.
- 20a. Persistent style base dorsiventrally compressed, deltoid; nutlet brownish at maturity ..... 19. *E. ovata*
- 20b. Persistent style base depressed conic or saucer-shaped; nutlet black at maturity and lustrous.
- 21a. Nutlet 0.7–1.1 mm; perianth bristles 6–8, rust-colored; persistent style base depressed conic, slightly reflexed basally on both sides ..... 20. *E. geniculata*
- 21b. Nutlet 0.3–0.6 mm; perianth bristles 4–6, colorless or white; persistent style base saucer-shaped, not reflexed basally ..... 21. *E. atropurpurea*
- 19b. Perennials; persistent style base spongy-thickened but rarely obscurely so; stolons often present; spikelet narrowly ovoid, narrowly oblong-ovoid, or ellipsoid-cylindric, (3–)7–25 mm.
- 22a. Basalmost glume empty, suborbicular, spathiform, usually completely encircling base of spikelet.
- 23a. Persistent style base large, mitriform, cellular-spongy, ovoid, more than 2/3 to as long as nutlet ..... 30. *E. kamschatica*
- 23b. Persistent style base conic, broadly ovoid, deltoid, 3-angled, or depressed, less than 1/2 as long as nutlet.
- 24a. Persistent style base depressed, subpatelliform (disk-shaped) ..... 31. *E. fennica*
- 24b. Persistent style base shallowly conic-ovoid, obtusely 3-angled, low conic, or shortly 3-angled.
- 25a. Glumes oblong-ovate to oblong-lanceolate; persistent style base shallowly conic-ovoid, nearly as long as wide, nearly 1/2 as long as nutlet ..... 32. *E. uniglumis*
- 25b. Glumes ovate; persistent style base obtusely 3-angled or low conic, shorter than or nearly as long as wide, 1/4–1/3 as long as nutlet.
- 26a. Persistent style base obtusely 3-angled, nearly as long as wide, ca. 1/3 as wide as nutlet; perianth bristles 4, slightly longer than nutlet ..... 33. *E. penchaoi*
- 26b. Persistent style base low conic or shortly 3-angled, shorter than wide, ca. 1/2 as wide as nutlet; perianth bristles 4–6, slightly shorter to slightly longer than nutlet.
- 27a. Culms 8–25 cm tall; spikelet 3–4 mm wide; glumes ovate to broadly ovate, ca. 3 mm, apex acute; perianth bristles as long as or slightly longer than nutlet ..... 34. *E. erhaiensis*

- 27b. Culms 25–30 cm tall; spikelet 2–3 mm wide; glumes ovate to oblong-ovate, ca. 4 mm, apex obtuse; perianth bristles slightly shorter than nutlet ..... 35. *E. qinghaiensis*
- 22b. Basal 2 or 3 glumes empty, basalmost encircling 1/2 or less of spikelet base.
- 28a. Persistent style base oblong-ovoid to oblong-conic, much longer than wide ..... 29. *E. palustris*
- 28b. Persistent style base shortly conic, globose-ovoid, broadly ovoid, subquadrate, or globose, as wide as or wider than long.
- 29a. Leaf sheaths scarious (at least apical ones), mouth with a deep sinus ventrally ..... 26. *E. argyrolepis*
- 29b. Leaf sheaths herbaceous, mouth truncate to obliquely truncate.
- 30a. Spikelet broadly ovoid to oblong, 3–8 mm, few flowered ..... 27. *E. abnormalis*
- 30b. Spikelet oblong to oblong-lanceolate, (7–)10–30 mm, many flowered.
- 31a. Glume apices obtuse to subrounded; persistent style base broadly ovoid, rounded-ovoid, subquadrate, or globose.
- 32a. Glumes ovate to oblong-ovate; nutlet globose-obovoid; persistent style base broadly ovoid ..... 28. *E. valleculosa*
- 32b. Glumes oblong to linear-oblong; nutlet usually ellipsoid; persistent style base globose-ovoid to subquadrate ..... 22. *E. liouana*
- 31b. Glume apices acute to subacute; persistent style base shortly conic, conic, or globose.
- 33a. Persistent style base globose or wider than long, mammiform or mitriform (cap-shaped) ..... 25. *E. mitracarpa*
- 33b. Persistent style base shortly conic to conic.
- 34a. Glumes oblong-lanceolate; nutlet obovoid, 0.7–0.8 mm wide; persistent style base narrowly conic ..... 23. *E. migoana*
- 34b. Glumes ovate to oblong-ovate or ovate-lanceolate; nutlet broadly obovoid to orbicular-obovoid, 1–1.3 mm wide; persistent style base depressed conic or shortly conic ..... 24. *E. ussuriensis*

**1. *Eleocharis dulcis*** (N. L. Burman) Trinius ex Henschel, *Vita Rumphii*, 186. 1833.

荸荠 bi qi

*Andropogon dulcis* N. L. Burman, *Fl. Indica*, 219. 1768; *Eleocharis equisetina* J. Presl & C. Presl; *E. plantaginea* (Retzius) Roemer & Schultes; *E. plantagineiformis* Tang & F. T. Wang; *E. tuberosa* Schultes; *Scirpus plantagineus* Retzius; *S. tuberosus* Roxburgh (1819), not Desfontaines (1798).

Perennials. Stolons slender, often terminated by a tuber. Culms erect, grayish green, tufted, 15–60 cm tall, 1.5–3 mm thick, cylindrical, smooth, glabrous, surface with transverse septa, nodes evident when dry. Leaf sheaths 2 or 3, greenish yellow, purplish red, or brown, 2–20 cm, mouth obliquely truncate, apex acute. Spikelet pale green, cylindrical, 1.5–4 cm × 6–7 mm, many flowered. Basal 2 glumes empty, amplexicaul for whole spikelet base; fertile glumes grayish green, laxly imbricate, broadly oblong to ovate-oblong, 3–5 × 2.5–3.5(–4) mm, subleathery, pale brown punctulate and finely striate, margin pale yellow and membranous, apex obtuse. Perianth bristles 7, ca. 1.5 × as long as nutlet, retrorsely spinulose. Stigmas 3. Nutlet brown when mature, broadly obovoid, ca. 2.5 × 1.8 mm, biconvex, essentially smooth but faintly and finely cancellate with hexagonal to oblong hexagonal epidermal cells, apex not constricted but with an annular thickening; persistent style base triangular-attenuate, flattened, not spongy, base ca. 1/2 as wide as nutlet. Fl. and fr. May–Oct.  $2n = 38$ , ca. 108.

Field margins, lake margins, commonly cultivated; near sea level to 1500 m. Fujian, Guangdong, Guangxi, Hainan, Hubei, W Hunan, Jiangsu, Taiwan [India, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, N Australia, Indian Ocean islands, Madagascar, Pacific islands].

The tuber (water chestnut) is eaten.

Although originating in the Old World tropics, because this species is commonly cultivated for its tubers, the actual distribution is uncertain. As a cultivated plant, it is grown throughout most of China.

**2. *Eleocharis spiralis*** (Rottbøll) Roemer & Schultes, *Syst. Veg.* 2: 155. 1817.

螺旋鳞荸荠 luo xuan lin bi qi

*Scirpus spiralis* Rottbøll, *Descr. Icon. Rar. Pl.* 45. 1773.

Perennials. Stolons slender. Culms erect, pale green, tufted, 50–60 cm tall, 3–4 mm thick, firm, 3-angled, without transverse septa and nodes. Leaf sheaths 3 or 4, 3–21 cm, smooth, slightly shiny; basalmost sheath purplish red to dark brown, ± short; cauline sheaths pale red, elongate, mouth obliquely truncate and parted, apex shortly acuminate with a setaceous appendage. Spikelet pale yellow, cylindrical, 1.5–3 cm × 5–6 mm, many flowered, apex acute to obtuse. Basalmost glume empty, broadly triangular, amplexicaul for whole spikelet base; fertile glumes densely imbricate, subquadrate, ca. 3 × 3 mm, pale and brownish red punctulate striate, medially leathery and with a midvein, margin hyaline and minutely brown punctulate, apex

truncate to subtruncate. Perianth bristles 6, reddish purple, as long as or shorter than nutlet, laxly retrorsely spinulose. Stigmas 3. Nutlet pale yellow turning dark brown when mature, obovoid to broadly obovoid, 1.2–1.5 × ca. 1 mm, compressed biconvex, obscurely cancellate with 17–20 rows of transversely oblong epidermal cells, margin narrow, apex not constricted but with an obscure annular thickening; persistent style base conic, basally gradually narrowed, base ca. 1/2 as wide as nutlet. Fl. and fr. Nov–Jan.

Wet places near seashores; near sea level. Guangdong, Hainan [Bangladesh, Cambodia, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and Australia, Madagascar, Pacific islands].

**3. *Eleocharis trilateralis*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 225. 1961.

三面秆荸荠 san mian gan bi qi

Perennials. Stolons long, slender. Culms erect, grayish yellow, tufted, 30–75 cm tall, ca. 5 mm thick, firm, sharply 3-angled, narrowly winged on angles, smooth, glabrous, without transverse septa. Leaf sheaths 2, 5–18 cm; basalmost sheath dark purple, ± short; cauline sheath pale yellow, ± elongate, tubular, mouth obliquely truncate, apex acute. Spikelet pale brown, cylindrical, 2–4 cm × ca. 5 mm, ± few flowered, apex obtuse. Basalmost glume empty, broadly ovate, amplexicaul for whole spikelet base, apex subrounded; fertile glumes pale brown, laxly imbricate, broadly ovate, ca. 5 × 5 mm, with many purple longitudinal striae, medially reddish brown punctulate, leathery, and with a single midvein, both sides thinner, margin hyaline, apex obtuse-rounded. Perianth bristles 6, pale brown, nearly 2 × as long as nutlet, retrorsely spinulose. Stigmas 3. Nutlet pale yellow, broadly obovoid, ca. 2.5 × 1.5 mm, biconvex, with transverse oblong reticulate striae, apex distinctly constricted into a neck; persistent style base dark brown, attenuate to subdeltoid, compressed, not spongy, base ca. 1/2 as wide as nutlet.

• Marshes; 1800–3300 m. Yunnan.

**4. *Eleocharis acutangula*** (Roxburgh) Schultes, Mant. 2: 91. 1824.

锐棱荸荠 rui leng bi qi

*Scirpus acutangulus* Roxburgh, Fl. Ind. 1: 216. 1820; *Eleocharis fistulosa* Schultes; *S. fistulosus* Poir (1805), not Forsskål (1775).

Perennials. Stolons slender. Culms erect, pale green, tufted, 30–75 cm tall, (1–)3–4 mm thick, sharply 3-angled, smooth, glabrous, without transverse septa. Leaf sheaths 2 or 3; basalmost sheath brown, glumelike; cauline sheaths tubular, 5–15 cm, base dark red to dark purple, mouth obliquely truncate, apex acute. Spikelet pale green, cylindrical, 1.5–4 cm × 3–5 mm, many flowered, apex acuminate. Basalmost glume empty, broadly ovate, amplexicaul for whole spikelet base; fertile glumes laxly imbricate, broadly ovate, ca. 4.5 × 3.5 mm, purplish red punctulate, medially grayish yellow, subleathery, and with several veins including a conspicuous midvein, margin membranous, apex rounded. Perianth bristles 6, longest ca. 1.5

× as long as nutlet, retrorsely spinulose. Stigmas 3. Nutlet pale yellow, broadly obovoid to obovoid, ca. 2 × 1.5 mm, biconvex, shallowly pitted with 13–15 longitudinal rows of transversely oriented oblong to linear epidermal cells, apex slightly constricted and with a conspicuous annular thickening; persistent style base subdeltoid, not spongy, base ca. 3/5 as wide as nutlet. Fl. and fr. Jun–Sep.

Flooded fields, moist areas; 500–1800 m. Fujian, Guangxi, Hainan, Hong Kong, Taiwan [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, America, and Australia, Madagascar].

**5. *Eleocharis philippinensis*** Svenson, Rhodora 31: 155. 1929.

菲律宾荸荠 fei lü bin bi qi

Perennials. Stolons slender. Culms erect, brown, tufted, 30–50 cm tall, 1.5–2.5 mm thick, acutely 4- or 5-angled. Leaf sheaths 2 or 3, reddish brown to dark brown, tubular, 2–8 cm, mouth obliquely truncate, apex acute. Spikelet cylindrical, 1.5–4 cm × 2.5–3 mm. Basalmost glume empty; fertile glumes brownish green, laxly spiraled and in 4 rows, broadly lanceolate, 4–5 × 1.5–2.5 mm, membranous, abaxially purplish red punctulate medially, many veined and with a slightly conspicuous midvein, margin hyaline, apex obtuse to slightly acute. Perianth bristles 7, 3 on outer series as long as nutlet, 4 on inner series as long as style base, retrorsely spinulose. Stigmas 2. Nutlet yellowish brown, obovoid, 1.5–2 × 1–1.2 mm, biconvex, deeply pitted with 15–20 longitudinal rows of hexagonal epidermal cells, apex slightly constricted into a short neck and with a slightly annular thickening; persistent style base long pyramidal, apex attenuate. Fl. and fr. Sep–Oct.

Flooded fields, moist areas. Guangdong, Hainan [India, Indonesia, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam; N Australia, Pacific islands (New Caledonia)].

**6. *Eleocharis ochrostachys*** Steudel, Syn. Pl. Glumac. 2: 80. 1854.

假马蹄 jia ma ti

*Eleocharis variegata* (Poir) C. Presl var. *laxiflora* (Thwaites) Ridley; *Scirpus laxiflorus* Thwaites.

Perennials. Stolons slender. Culms straw-colored, tufted, 37–75 cm tall, 2–3 mm thick, terete but sometimes apically obscurely 3-angled, without transverse septa, longitudinally canaliculate on surface when dry. Leaf sheaths 2 or 3, purplish red, tubular, 6–18 cm, mouth obliquely truncate, apex acute. Spikelet pale, cylindrical, 2–4 cm × ca. 4 mm, few flowered, apex rounded to obtuse. Basalmost glume empty, broadly ovate, amplexicaul for whole spikelet base; fertile glumes straw-colored to pale brown, laxly imbricate, broadly oblong, ca. 5 × 3 mm, subleathery, purple punctulate, many veined with an obscure midvein, margin hyaline, apex rounded to obtuse. Perianth bristles 6 or 7, ca. 2 × as long as nutlet, retrorsely spinulose. Stigmas (2 or)3. Nutlet pale yellow turning brown when mature, broadly obovoid, ca. 2 × 1.5 mm, compressed biconvex, longitudinally striate with 25–32 rows of transversely linear-oblong epidermal cells, apex not constricted but with an annular

thickening; persistent style base narrowly long pyramidal, base ca. 1/2 as wide as nutlet. Fl. and fr. Sep–Oct.

Paddy fields, pond margins, moist areas. Guangdong, Hainan, Taiwan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands].

**7. *Eleocharis parvula*** (Roemer & Schultes) Link ex Bluff, Nees & Schauer, Comp. Fl. German., ed. 2, 1: 93. 1836.

矮秆荸荠 ai gan bi qi

*Scirpus parvulus* Roemer & Schultes, Syst. Veg. 2: 124. 1817.

Perennials, stoloniferous. Rhizomes often terminated by small fusiform tubers. Culms light green, tufted, 1–7 cm tall, capillary. Leaf sheaths 1 (or 2), tubular, short, hyaline, inconspicuous, mouth oblique at orifice, apex obtuse. Spikelet light green, ovoid to ovoid-ellipsoid, 2–4 × 1–2 mm, subcompressed, 6–10-flowered. Basalmost glume empty, ca. 1/2 as long to as long as spikelet, amplexicaul for ca. 2/3 of spikelet base; fertile glume straw-colored to reddish tinged, ovate, 1.4–2.7 mm, membranous, apex subacute to rounded. Perianth bristles 4–6 or rarely absent, usually equaling nutlet to slightly exceeding tubercle, sometimes of different lengths, some ca. 1/2 as long as nutlet, minutely retrorsely spinulose. Stigmas 3. Nutlet straw-colored to pale brown, obovoid to obpyriform, 0.9–1.5 × 0.6–1 mm, 3-sided with plane to concave faces, smooth, apex not constricted; persistent style base triangular-subulate, 0.1–0.3 mm. Fl. and fr. Jul–Oct.

Wet saline or brackish shores; near sea level. Hainan [Indonesia, Japan, Kazakhstan, W Malesia, Russia, Uzbekistan, Vietnam; N Africa, Central, North, and South America, Europe].

**8. *Eleocharis quinqueflora*** (Hartmann) O. Schwarz, Mitt. Thüring. Bot. Ges. 1: 89. 1949.

少花荸荠 shao hua bi qi

*Scirpus quinqueflorus* Hartmann, Prim. Lin. Inst. Bot., ed. 2, 85. 1767; *Eleocharis meridionalis* G. Zinserling; *E. pauciflora* (Lightfoot) Link; *S. pauciflorus* Lightfoot.

Perennials. Stolons ca. 1 mm thick. Culms erect, wavy, or rarely recurved, grayish green, tufted, 3–30 cm tall, ca. 0.5 mm thick, obtusely 5-angled. Leaf sheaths 1 or 2, reddish brown to brown, tubular, 1–4 cm, mouth truncate. Spikelet brownish, ovoid to globose, 4–7 mm, 2–7-flowered. Basalmost glume empty, ca. 1/2 as long to as long as spikelet, amplexicaul for whole spikelet base; fertile glumes brown to dark reddish brown, ovate-lanceolate, ca. 4.5 × 1.7 mm, margin broadly to narrowly hyaline, apex acute. Perianth bristles 0–6, of different lengths, usually ca. 1/2 as long as nutlet or rarely slightly longer, retrorsely spinulose. Stigmas 3. Nutlet yellowish gray, obovoid, 1.9–2.5 × ca. 1 mm, plano-convex, appearing smooth but finely cellular reticulate, apex not constricted; persistent style base not inflated, subconic to 3-angled-subulate, 1/5–1/4 as long as nutlet. Fl. and fr. Jun–Jul.

River and lake margins, marshy areas; 800–4700 m. Gansu, Nei Mongol, Shanxi, Xinjiang, Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbeki-

stan; N Africa, SW Asia, Europe, North and South America].

**9. *Eleocharis retroflexa*** (Poiret) Urban, Symb. Antill. 2: 165. 1900.

贝壳叶荸荠 bei ke ye bi qi

*Scirpus retroflexus* Poiret, Encycl. 6(2): 753. 1804; *Eleocharis chaetaria* Roemer & Schultes.

Annuals. Roots fibrous. Rhizomes and stolons absent. Culms often recurved, tufted, 2–16 cm tall or rarely more, filiform, soft, 5- or nearly 4-angled. Leaf sheaths 1 or 2, pale red, tubular, 2–12 mm; basalmost sheath bladeless; cauline sheaths usually with a glumelike blade at apex. Spikelet purplish red, ovoid, ca. 4 × 2 mm, slightly compressed, few flowered, sometimes proliferous. Basalmost glume empty, subelliptic, amplexicaul for whole spikelet base; fertile glumes green, broadly ovate, 2.8–3 × 1.8–2 mm, herbaceous, with a median keel, edge membranous, margin hyaline, apex acute to obtuse. Perianth bristles 6, nearly as long as nutlet, one on outer series shorter than nutlet, retrorsely spinulose. Stigmas 3. Nutlet yellowish, broadly obovoid, ca. 1.5 × 1 mm, 3-sided, angles prominently costate, reticulate to deeply pitted-reticulate with isodiametric epidermal cells, apex broadly truncate and not constricted; persistent style base pyramidal-acuminate, base as wide as to slightly narrower than nutlet. Fl. and fr. Jul–Nov.

Moist areas in fields. Fujian, Guangdong, Hainan, Yunnan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, N Thailand, Vietnam; Africa, tropical America, NE Australia, Pacific islands].

**10. *Eleocharis yokoscensis*** (Franchet & Savatier) Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 54. 1961.

牛毛毡 niu mao zhan

*Scirpus yokoscensis* Franchet & Savatier, Enum. Pl. Jap. 2: 543. 1878 [“*yokoscensis*”]; *Eleocharis acicularis* (Linnaeus) Roemer & Schultes var. *longiseta* Svenson; *E. acicularis* subsp. *yokoscensis* (Franchet & Savatier) T. V. Egorova; *E. svensonii* G. Zinserling.

Perennials. Stolons slender. Culms densely tufted, 2–12 cm tall, filiform. Leaf sheaths reddish, tubular, 0.5–1.5 cm. Spikelet pale purple, ovoid, ca. 3 × 2 mm, few flowered, apex obtuse. Glumes laxly imbricate, subdistichous at base of spikelet; basalmost glume empty, oblong, ca. 2 × 1 mm, 3-veined, amplexicaul for whole spikelet base, apex obtuse; fertile glumes greenish medially and purple on sides, ovate, ca. 1.8 × 1.2 mm, membranous, margin hyaline, apex acute. Perianth bristles 1–4, ca. 2 × as long as nutlet, retrorsely spinulose. Stigmas 3. Nutlet pale yellow, narrowly oblong, ca. 1 × 0.4–0.5 mm, obscurely 3-sided, longitudinally ridged, ridges separated by numerous cross-walls (trabeculae), apex contracted; persistent style base slightly inflated, conic, base ca. 1/3 as wide as nutlet. Fl. and fr. Apr–Nov.

Flooded fields, pond margins, moist and muddy soil; 300–3000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, N Xinjiang, Yunnan, Zhejiang [India, Indonesia (Sumatra), Japan, Korea, Mongolia, Myanmar, Philippines, Russia (Far East), Vietnam].

J. Kern (Fl. Males., Ser. 1, Spermat. 7(3): 535. 1974) included *Eleocharis yokoscensis* within the circumscription of *E. acicularis* (Linnaeus) Roemer & Schultes as a synonym of *E. acicularis* var. *longisetata*, but we have observed and compared the characters of *E. yokoscensis* and *E. acicularis* and find they differ distinctly in characteristics of the nutlet and perianth bristles. The nutlet of the former has few transverse trabeculae (cross-walls) on the surface, the style base is  $\pm$  long and narrow, and the perianth bristles are ca.  $2 \times$  as long as the nutlet. The nutlet of the latter has many transverse trabeculae on the surface, the style base is  $\pm$  short and broad, and the perianth bristles are shorter than or as long as the nutlet, rarely slightly exceeding the nutlet.

**11. *Eleocharis tetraquetra*** Nees in Wight, Contr. Bot. India, 113. 1834.

龙师草 long shi cao

Perennials. Stolons short or absent. Culms tufted, 25–90(–100) cm tall, ca. 1 mm thick, sharply 4-angled, glabrous. Leaf sheaths 2 or 3, tubular, 7–10 cm, basally purplish red, apically grayish green, mouth truncate, apex shortly triangular and mucronate. Spikelet brownish green, oblong-ovoid,  $\pm$  narrowly ovoid, or oblong, 7–20 cm  $\times$  3–5 mm, slightly oblique, many flowered, apex obtuse to acute. Basal 3 glumes empty; basalmost glume amplexicaul for whole spikelet base; fertile glumes green at middle and pale rust-colored on sides, tightly imbricate, oblong and boat-shaped, 3–4  $\times$  1–1.5 mm, papery, margin narrowly hyaline, apex obtuse. Perianth bristles 6, reddish to brownish, as long as nutlet (including style base), laxly to densely retrorsely spinulose. Stigmas 3. Nutlet pale brown when mature, with a short thick stipe, obovoid to broadly obovoid, ca. 1.2  $\times$  1.5 mm, compressed 3-sided; persistent style base laterally compressed, deltoid, 1/2–2/3 as long and ca. 3/4 as wide as nutlet, surface sometimes mammillate, apex acuminate. Fl. and fr. Sep–Nov.

Pond and ditch margins, riverbanks; 100–1900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Heilongjiang, Henan, Hunan, Jiangsu Jiangxi, Liaoning, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Nepal, Pakistan, Papua New Guinea, Philippines, Russia (Far East), Sri Lanka, Thailand, Vietnam; N Australia].

**12. *Eleocharis wichurae*** Boeckeler, Linnaea 36: 448. 1870.

羽毛荸荠 yu mao bi qi

*Eleocharis petasata* (Maximowicz) G. Zinslerling; *Scirpus petasatus* Maximowicz.

Perennials. Stolons short or absent. Culms grayish green, tufted, 30–60 cm tall, slender, sharply 4-angled, smooth. Leaf sheaths 1 or 2, reddish to purplish, mouth very obliquely truncate. Spikelet brownish at first but becoming pale green, ovoid, narrowly ovoid, or oblong, 8–15  $\times$  3–5 mm, slightly oblique, many flowered, apex acute. Basal 2 glumes empty; basalmost glume amplexicaul for whole spikelet base; fertile glumes pale green medially and rust-colored striate on both sides, tightly spirally imbricate, oblong to elliptic and boat-shaped, 4–6  $\times$  2–2.5 mm, membranous, midvein thin and obscure, margin broadly hyaline, apex obtuse-rounded. Perianth bristles 6, rust-colored, as long as nutlet (including style base), plumose with spreading hairs. Stigmas 3. Nutlet pale olivaceous, turning brownish when mature, shortly stipitate, obovoid to broadly

obovoid, ca. 1.5  $\times$  2 mm, obtusely 3-sided, slightly compressed, both surfaces smooth, apex not constricted; persistent style base very inflated, narrowly ovoid, as long and as wide as nutlet or nearly so, laterally compressed, densely mammillate, apex acute to obtuse. Fl. and fr. Jul–Sep.

Shallow water in valleys, grasslands by water, marshy areas; 900–1700 m. Anhui, SE Gansu, W Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, NE Nei Mongol, S Shaanxi, Shandong, Zhejiang [Japan, Korea, Russia (Far East, Siberia)].

**13. *Eleocharis yunnanensis*** Svenson, Rhodora 41: 559. 1939.

云南荸荠 yun man bi qi

*Eleocharis pauciflora* (Lightfoot) Link var. *rhizomatosa* Handel-Mazzetti.

Perennials. Rhizomes thick, decumbent to obliquely ascending. Culms laxly to densely tufted, 16–40 cm tall, ca. 1 mm thick, terete, longitudinally sulcate. Leaf sheaths 3, basalmost glumelike; cauline sheaths 2, tubular, 2–8 cm, basally purplish red to purple, apically green, mouth slightly obliquely truncate. Spikelet narrowly oblong to oblong, 6–8  $\times$  2–3 mm, few flowered. Basal 2 glumes opposite, 1/2 or more as long as spikelet; basalmost glume usually proliferous but without a flower and next one both proliferous and with a flower; fertile glumes blood-red, spirally imbricate, ovate-lanceolate, 3–4  $\times$  ca. 1.3 mm, midvein conspicuous to obscure, margin pale blood-red and broadly hyaline, apex acute. Perianth bristles 6, pale rust-colored, as long as nutlet, densely retrorsely shortly spinulose. Stigmas 3. Nutlet yellowish green, obovoid, 1.2–1.5  $\times$  0.6–0.8 mm, obtusely 3-sided, sides slightly convex, apex constricted,  $\pm$  narrow, and as wide as base of style; persistent style base pale, narrowly 3-angled to conic, ca. 1/2 as long as nutlet, apex attenuate to a short caudal tip. Fl. and fr. Apr–Aug.

• River margins in valleys; 1800–3300 m. Yunnan.

**14. *Eleocharis pellucida*** J. Presl & C. Presl, Reliq. Haenk. 1: 196. 1828.

透明鳞荸荠 tou ming lin bi qi

Annual or short-lived perennials. Rhizomes absent. Culms tufted to densely tufted, 5–30 cm tall or more, 0.5–1 mm thick, soft, longitudinally sulcate. Leaf sheaths 2, basally  $\pm$  purplish and apically green, tubular, 1.5–4 cm, mouth truncate, apex deltoid dentate. Spikelet narrowly ovoid, oblong-ovoid, cylindrical, or rarely globose-ovoid, (3–)5–10  $\times$  1.5–3 mm, several to many flowered. Basalmost glume empty, amplexicaul for whole spikelet base; fertile glumes pale rust-colored,  $\pm$  laxly spirally imbricate, oblong to suboblong, ca. 2  $\times$  1 mm, midvein greenish, margin hyaline, apex obtuse to rounded. Perianth bristles 6, rust-colored, ca. 1.5  $\times$  as long as nutlet or slightly shorter, densely or laxly retrorsely spinulose. Stigmas 3. Nutlet yellowish to olivaceous, obovoid, 0.8–1.2  $\times$  0.5–0.7 mm, 3-sided, sides convex, narrowly costate on angles; persistent style base pyramidal to conic, 1/4–1/2 as long and ca. 1/2 as wide as nutlet, sometimes spongy-thickened, apex acuminate. Fl. and fr. Mar–Nov.

Pond margins, shallow ponds, paddy fields, shallow water margins, lake banks; 200–1700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning,

Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Malaysia, Myanmar, Philippines, Russia (Far East), Sri Lanka, N Thailand].

- 1a. Spikelet narrowly ovoid, oblong-ovoid, or rarely globose-ovoid, (3–)5–8 mm.  
 2a. Perianth bristles ca.  $1.5 \times$  as long as nutlet, densely retrorsely spinulose; nutlet ca. 1.2 mm ..... 14a. var. *pellucida*  
 2b. Perianth bristles shorter than nutlet, laxly retrorsely spinulose; nutlet 0.8–0.9 mm ..... 14b. var. *japonica*  
 1b. Spikelet cylindrical or globose-ovoid, 8–10 mm or ca. 3 mm.  
 3a. Spikelet cylindrical, 8–10 mm; nutlet ca. 0.5 mm wide; persistent style base conic, ca.  $1/2$  as long as nutlet, not spongy-thickened ..... 14c. var. *sanguinolenta*  
 3b. Spikelet globose-ovoid, ca. 3 mm; nutlet ca. 0.7 mm wide; persistent style base pyramidal, ca.  $1/3$  as long as nutlet, spongy-thickened ..... 14d. var. *spongiosa*

**14a. Eleocharis pellucida** var. *pellucida*

透明鳞荸荠(原变种) tou ming lin bi qi (yuan bian zhong)

*Eleocharis afflata* Steudel; *E. shimadae* Hayata; *Scirpus afflatus* (Steudel) Benth.

Culms 5–30 cm tall, 0.5–1 mm thick. Spikelet narrowly ovoid, oblong-ovoid, or rarely globose, (3–)5–8 mm. Perianth bristles ca.  $1.5 \times$  as long as nutlet, densely retrorsely spinulose. Stigmas 3. Nutlet obovoid, ca.  $1.2 \times 0.7$  mm; persistent style base pyramidal, ca.  $1/4$  as long as nutlet, not spongy-thickened, apex attenuate. Fl. and fr. Apr–Nov.

Rice paddies, pond margins, lake banks; 300–1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang [India Indonesia, Japan, Korea, Malaysia, Myanmar, Philippines, Russia (Far East), Sri Lanka].

**14b. Eleocharis pellucida** var. *japonica* (Miquel) Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 58. 1961.

稻田荸荠 dao tian bi qi

*Eleocharis japonica* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 142. 1865; *Scirpus japonicus* (Miquel) Franchet & Savatier (1877), not (Maximowicz) Fernald (1905).

Culms usually very short, hairlike. Perianth bristles shorter than nutlet, laxly retrorsely spinulose. Nutlet 0.8–0.9 mm; persistent style base usually  $\pm$  elongate. Fl. and fr. Mar–Oct.

Paddy fields, shallow water margins; 200–1700 m. Anhui, Fujian, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan, Korea, N Thailand].

**14c. Eleocharis pellucida** var. *sanguinolenta* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 226. 1961.

血红穗荸荠 xue hong sui bi qi

Spikelet blood-red, cylindrical, 8–10 mm. Nutlet ca. 0.5 mm wide; persistent style base conic, ca.  $1/2$  as long as nutlet.

- Shallow water margins. Guizhou.

**14d. Eleocharis pellucida** var. *spongiosa* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 226. 1961.

海绵基荸荠 hai mian ji bi qi

Spikelet globose-ovoid, ca. 3 mm. Nutlet ca.  $0.9 \times 0.7$  mm; persistent style base pyramidal, ca.  $1/3$  as long as nutlet, spongy-thickened. Fl. and fr. Sep–Nov.

- Shallow ponds; 200–300 m. Jiangxi (Pingxiang).

**15. Eleocharis maximowiczii** G. Zinserling in Komarov, Fl. URSS 3: 588. 1935.

细秆荸荠 xi gan bi qi

*Eleocharis pellucida* J. Presl & C. Presl var. *maximowiczii* (G. Zinserling) Ohwi.

Perennials. Culms ascending or erect, pale green, densely tufted, 8–25 cm tall, thin, 4-angled, sulcate. Leaf sheaths reddish purple. Spikelet ovoid to ovoid-cylindrical, 2.5–6 mm, few flowered, sometimes bearing a second, sterile spikelet in basalmost glume, apex acute to rarely blunt. Basalmost glume empty, amplexicaul for more than  $1/2$  of spikelet base; fertile glumes green in a broad medial band and dark brown on sides, laxly imbricate, ovate to elliptic, ca. 2 mm, margin broadly hyaline, apex obtuse. Perianth bristles 6, slightly shorter than nutlet, densely retrorsely spinulose. Stigmas 3. Nutlet olivaceous, obovoid,  $0.9-1 \times ca. 0.5$  mm, obtusely 3-sided, smooth; persistent style base deltoid to shortly conic,  $1-2 \times ca. 3$  mm. Fl. and fr. Jun–Jul.

Swamps, wet meadows, damp trail margins, paddy fields. Heilongjiang [Russia (Far East)].

**16. Eleocharis setulosa** P. C. Li, Acta Bot. Yunnan. 12: 11. 1990.

短刚毛针蔺 duan gang mao zhen lin

Perennials. Culms 7–11 cm tall, slender, smooth. Leaf sheaths 2, basally reddish brown and apically yellowish, 0.8–1.8 cm, mouth obliquely truncate, apex acuminate. Spikelet ovoid to  $\pm$  narrowly ovoid, 3–4 mm, 4–6-flowered. Basalmost glume empty, amplexicaul for  $1/2$  or more of spikelet base; fertile glumes reddish brown, oblong, 1.9–2.1 mm, membranous, margin white and hyaline, apex obtuse. Perianth bristles 2–5,  $1/4-1/2$  as long as nutlet, retrorsely spinulose. Stigmas 3. Nutlet straw-colored to green, oblong to obovoid-oblong, ca. 1.5 mm, obtusely 3-sided, with longitudinal rows of oblong epidermal cells; persistent style base straw-colored, deltoid, base ca.  $1/2$  as wide as nutlet, apex attenuate.

- Alpine meadows; 3100–3200 m. NW Yunnan (Zhongdian).

**17. Eleocharis attenuata** (Franchet & Savatier) Palla, Monde Pl. 12: 40. 1910.

渐尖穗荸荠 jian jian sui bi qi

Perennials. Rhizomes decumbent or absent. Culms  $\pm$  laxly

to densely tufted, 20–50 cm tall or  $\pm$  short, ca. 1 mm thick, terete, longitudinally sulcate. Leaf sheaths 2, basally blood-red to pale blood-red and apically pale brownish yellow, 2.5–7 cm, mouth truncate, apex shortly aristate to mucronate. Spikelet ovoid, narrowly ovoid, or ellipsoid-ovoid, 6–10  $\times$  ca. 3 mm or longer, densely many flowered, apex acute to obtuse. Basalmost glume empty, amplexicaul for whole spikelet base; fertile glumes pale to slightly rust-colored, tightly imbricate, oblong to suboblong, ca. 2.2  $\times$  1 mm, margin hyaline, apex rounded. Perianth bristles 6, rust-colored, as long as nutlet or slightly shorter, densely to laxly retrorsely shortly spinulose. Stigmas 3. Nutlet dark yellow, obovoid, ca. 1.2  $\times$  0.7 mm, 3-sided, sides convex, smooth; persistent style base depressed deltoid-pyramidal, 1/4–1/3 (to nearly 1/2) as long as nutlet, base cup-shaped and slightly narrower to as wide as nutlet, margin basally slightly involute, apex acute. Fl. and fr. May–Sep.

Paddy fields, pond margins, riverbanks, moist soil; 100–600 m. Anhui, Fujian, Guangxi, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Sichuan, Zhejiang [Japan, S Korea, Papua New Guinea, Russia (Far East), Vietnam].

- 1a. Rhizomes decumbent; culms 20–50 cm tall or more; spikelet 6–10 mm or more; perianth bristles densely retrorsely spinulose ..... 17a. var. *attenuata*  
 1b. Rhizomes absent; culms  $\pm$  short; spikelet  $\pm$  short; perianth bristles laxly retrorsely spinulose ..... 17b. var. *erhizomatosa*

#### 17a. *Eleocharis attenuata* var. *attenuata*

渐尖穗荸荠(原变种) jian jian sui bi qi (yuan bian zhong)

*Scirpus attenuatus* Franchet & Savatier, Enum. Pl. Jap. 2: 543. 1878; *Eleocharis japonica* Miquel var. *major* Nakai; *E. laeviseta* Nakai var. *major* (Nakai) H. Hara.

Rhizomes decumbent. Culms 20–50 cm tall or more. Spikelet ovoid to narrowly ovoid, 6–10 mm or more. Perianth bristles densely retrorsely spinulose. Persistent style base 1/4–1/3 as long as nutlet, slightly narrower than width of nutlet. Fl. and fr. May–Sep.

Paddy fields, pond margins; 100–600 m. Anhui, Fujian, Guangxi, Henan, Hubei, Jiangsu, Shaanxi, Sichuan [Japan, S Korea, Papua New Guinea, Russia (Far East), Vietnam].

#### 17b. *Eleocharis attenuata* var. *erhizomatosa* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 226. 1961.

无根状茎荸荠 wu gen zhuang jing bi qi

Rhizomes absent. Culms usually  $\pm$  short. Spikelet ellipsoid-ovoid, ca. 6 mm. Perianth bristles laxly retrorsely spinulose. Persistent style base ca. 1/3 to nearly 1/2 as long as nutlet, nearly as wide as nutlet. Fl. and fr. Jun–Sep.

• Riverbanks, moist soil; 300–500 m. Fujian, Guangxi, Hunan, Zhejiang.

#### 18. *Eleocharis congesta* D. Don, Prodr. Fl. Nepal. 41. 1825.

密花荸荠 mi hua bi qi

*Eleocharis purpurascens* Boeckeler.

Perennials. Rhizomes decumbent. Culms tufted, 10–40 cm tall, 1–1.5 mm thick, slightly firm, subterete, with several longitudinal thin ribs. Leaf sheaths 2; cauline sheaths blood-red but later becoming pale blood-red apically, 3–8 cm, mouth truncate, apex mucronate to aristate. Spikelet oblong to narrowly oblong-ovoid, 8–11  $\times$  3–4 mm, densely many flowered, sometimes proliferous at spikelet base, apex obtuse to acute. Basalmost glume empty, amplexicaul for whole spikelet base; fertile glumes blood-red but green medially, tightly imbricate, oblong, ca. 2.2  $\times$  0.9 mm, margin very narrowly hyaline, apex subrounded. Perianth bristles 6, longer than nutlet, slightly densely and shortly retrorsely spinulose. Stigmas 3. Nutlet yellowish to olivaceous, obovoid to ellipsoid, ca. 1  $\times$  0.7 mm, 3-sided, sides convex, angles narrowly costate; persistent style base white, half-oblong, 1/4–1/3 as long and ca. 1/2 as wide as nutlet, spongy initially but hardened when dry, base cap-shaped, apex rounded but becoming pyramidal and acute when dry. Fl. and fr. May–Aug.

Forest margins, pond margins, river margins; 1300–1400 m. Yunnan [Bhutan, India, Indonesia, Japan (Ryukyu Islands), Kashmir, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands].

#### 19. *Eleocharis ovata* (Roth) Roemer & Schultes, Syst. Veg. 2: 152. 1817.

卵穗荸荠 luan sui bi qi

*Scirpus ovatus* Roth, Tent. Fl. Germ. 2: 562. 1793; *Eleocharis soloniensis* (Dubois) H. Hara; *S. soloniensis* Dubois.

Annuals. Rhizomes and stolons absent. Culms densely tufted, 4–50 cm tall, slender, terete, smooth, with few longitudinal ribs. Leaf sheaths 1–3, basally slightly red and apically greenish to straw-colored, 0.5–3 cm, tubular, mouth obliquely truncate, apex acute to mucronate. Spikelet ovoid to broadly ovoid, 4–8  $\times$  3–4 mm, densely many flowered, apex acute. Basal 2 glumes empty; basalmost glume amplexicaul for nearly 3/4 to all of spikelet base; fertile glumes greenish medially and blood-red on sides, laxly imbricate, ovate, oblong-ovate, or broadly ovate, ca. 1.5  $\times$  0.5 mm, membranous, margin narrowly hyaline, apex acute to obtuse. Perianth bristles 6, ca. 1.5  $\times$  as long as nutlet (including style base), retrorsely spinulose. Stigmas 2. Nutlet at first white but turning brownish at maturity, obovoid, ca. 0.8  $\times$  0.5 mm, conspicuously convex on dorsal side and slightly convex on ventral side, smooth; persistent style base deltoid, ca. 1/3 as long and ca. 1/2 as wide as nutlet, dorsiventrally compressed, not spongy, surface not mammillate, apex acuminate. Fl. and fr. Aug–Dec.

Marshy areas; 100–3600 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Yunnan [Japan, Kazakhstan, Russia; Europe, North America].

#### 20. *Eleocharis geniculata* (Linnaeus) Roemer & Schultes, Syst. Veg. 2: 150. 1817.

黑籽荸荠 hei zi bi qi

*Scirpus geniculatus* Linnaeus, Sp. Pl. 1: 48. 1753; *Eleocharis capitata* R. Brown; *E. caribaea* (Rottbøll) S. F. Blake; *S. caribaeus* Rottbøll.

Annuals. Rhizomes and stolons absent. Culms tufted to densely tufted, 3–45 cm tall, ca. 0.5 mm thick, soft, with a few longitudinal ribs and sulcate. Leaf sheaths 2, basally reddish and apically straw-colored, 1–1.5 cm, mouth obliquely truncate, apex acuminate. Spikelet globose to ovoid, 3–5 × 3–3.5 mm, densely many flowered, apex obtuse. Basal 3 or 4 glumes empty; basal 2 glumes opposite, amplexicaul for ca. 1/2 of spikelet base; fertile glumes pale rust-colored becoming ± pale, broadly elliptic, 1.6–2 × 1–1.2 mm, midvein obscure, margin narrowly hyaline, apex rounded. Perianth bristles 6–8, rust-colored, slightly shorter than nutlet, laxly and shortly retrorsely spinulose. Stigmas 2. Nutlet dark purple, broadly obovoid to globose-ovoid, 0.7–1.1 × ca. 0.6 mm, biconvex, smooth and shiny; persistent style base pale, depressed conic, 1/5–1/4 as long and 1/7–1/4 as wide as nutlet, slightly reflexed basally on both sides. Fl. and fr. Jan–Apr.  $2n = 30$ .

Shallow water margins at trail edges, sandy coastal habitats; near sea level. Fujian, Guangdong, Hainan, Taiwan [Afghanistan, Bangladesh, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand; Africa, SW Asia, Australia, Central, North, and South America, S Europe, Madagascar, Pacific islands].

**21. *Eleocharis atropurpurea*** (Retzius) J. Presl & C. Presl, Reliq. Haenk. 1: 196. 1828.

紫果蔺 *zi guo lin*

*Scirpus atropurpureus* Retzius, Observ. Bot. 5: 14. 1788.

Annuals. Rhizomes and stolons absent. Culms greenish, tufted, 2–15 cm tall, hairlike, erect, terete, obtusely longitudinally ribbed. Leaf sheaths 1 or 2, basally purplish red and apically greenish, tubular, 0.5–1.5 cm, mouth obliquely truncate, apex obtuse to acute. Spikelet ovoid, globose, or oblong-ovoid, 2–5.5 × 1.5–2.5 mm, many flowered, apex obtuse. Basal 2 glumes empty; basalmost glume amplexicaul for more than 1/2 of spikelet base; fertile glumes green at middle and blood-red on both sides, laxly imbricate, oblong to elliptic, ca. 1 × 0.5 mm, membranous, midvein obscure, margin narrowly hyaline, apex obtuse to subrounded. Perianth bristles 4(–6), colorless to white, slightly longer to shorter than nutlet, laxly retrorsely spinulose. Stigmas 2. Nutlet at first purplish red then becoming dark purple, obovoid to broadly obovoid, 0.3–0.6 × ca. 0.4 mm, biconvex, smooth and shiny; persistent style base patelliform, umbonate at middle, not reflexed basally, ca. 1/6 as long and ca. 1/4 as wide as nutlet. Fl. and fr. Jun–Oct.  $2n = 20$ .

Rice fields, field margins, moist areas; 200–1400 m. Anhui, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Shandong, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Japan, Nepal, Pakistan, Papua New Guinea, Philippines, Vietnam; Africa, Australia, Central, North, and South America, Europe, Indian Ocean islands, Madagascar].

**22. *Eleocharis liouana*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 226. 1961.

刘氏荸荠 *liu shi bi qi*

Perennials, stoloniferous. Culms tufted, 14–36 cm tall, 1–3 mm thick, few ribbed and longitudinally sulcate. Leaf sheaths 2, basally dark blood-red, tubular, 4–7 cm, mouth truncate.

Spikelet oblong, narrowly oblong-ovoid, or sometimes ± narrowly ovoid, 10–20 × 4–5 mm, many flowered, apex obtuse at anthesis. Basal 2 glumes empty; basalmost glume amplexicaul for more than 1/2 of spikelet base; fertile glumes green at middle and dark blood-red on both sides, laxly imbricate, oblong to linear-oblong, ca. 4 × 2 mm or narrower, margin broadly hyaline, apex obtuse to subrounded. Perianth bristles 4(or 5), longer than nutlet, densely and shortly retrorsely spinulose, spinules spreading. Stigmas 2. Nutlet at first yellow then becoming dark brown, usually ellipsoid or sometimes obovoid to subglobose, 1.2–1.5 × 1–1.2 mm, biconvex, apex constricted and not overlain by style base; persistent style base globose-ovoid to subquadrate, ca. 1/3 as long and ca. 2/3 as wide as nutlet, spongy, base rounded, apex attenuate. Fl. and fr. May–Jul.

• Trail margins; ca. 1900 m. Yunnan.

**23. *Eleocharis migoana*** Ohwi & T. Koyama, Bull. Natl. Sci. Mus., Tokyo, n.s., 3: 27. 1956.

江南荸荠 *jiang nan bi qi*

Perennials, stoloniferous. Culms tufted to densely tufted, 20–50 cm tall, 1–2 mm thick, slightly soft, longitudinally ribbed and sulcate, conspicuously transversely septate, ± tuberculate when dry. Leaf sheaths 2, basally reddish brown to brown and apically green, tubular, 3–10 cm, mouth truncate. Spikelet narrowly oblong-ovoid, 10–18 × 3–4.5 mm, many flowered, apex obtuse to subacute. Basal 2 glumes empty; basalmost glume amplexicaul for 1/2 or more of spikelet base; fertile glumes ± pale at middle and blood-red on sides, slightly tightly imbricate, oblong-lanceolate, 3.5–4.5 × 1–1.5 mm, midvein greenish, margin narrowly hyaline, apex subacute. Perianth bristles 4, 1.5–2 × as long as nutlet (including style base), densely and shortly retrorsely spinulose. Stigmas 2. Nutlet yellow to yellowish, obovoid, 1–1.3 × 0.7–0.8 mm, biconvex, smooth; persistent style base narrowly conic, ca. 1/2 as long and ca. 1/3 as wide as nutlet, apex attenuate. Fl. and fr. Apr–Aug.

• Moist grasslands on mountain slopes. Anhui, Jiangsu, Jiangxi, Zhejiang.

**24. *Eleocharis ussuriensis*** G. Zinserling in Komarov, Fl. URSS 3: 581. 1935.

乌苏里荸荠 *wu su li bi qi*

*Eleocharis mamillata* H. Lindberg var. *cyclocarpa* Kitagawa; *E. mamillata* subsp. *ussuriensis* (G. Zinserling) T. V. Egorova.

Perennials, with rhizomes and slender stolons. Culms single or laxly to densely tufted, 7–70 cm tall, 2–4 mm thick, terete, longitudinally ribbed and subsulcate, obscurely transversely septate between longitudinal ribs. Leaf sheaths 1 or 2, basally purplish red, tubular, 5–10 cm, mouth obliquely to transversely truncate. Spikelet ovoid-cylindric to narrowly cylindrical-ovoid, 10–20 × 2–6 mm, many flowered. Basal 2 glumes empty, each amplexicaul for ca. 1/2 of spikelet base; fertile glumes green medially and reddish brown to dark brown on sides, subtightly imbricate, becoming laxly imbricate, oblong-ovate to ovate-lanceolate, 3–4 × 1.3–1.5 mm, apical margin broadly hyaline, apex acute to subacute. Perianth bristles 4

or 5, longer than nutlet, densely spreading and curved retrorsely spinulose. Style less than 1 mm; stigmas 2. Nutlet yellowish initially then brownish when mature, broadly obovoid to globose-obovoid, 1–1.5 × 1–1.3 mm, biconvex, subsmooth, apex constricted; persistent style base submamiform, shortly conic, or depressed conic, slightly wider than long, ca. 1/4 as long and ca. 1/2 as wide as nutlet, subspongy. Fl. and fr. Jun–Jul.

Moist areas, marshes, meadows; 100–1800 m. Hebei, Heilongjiang, Jilin, Liaoning, NE Nei Mongol, Shanxi [Japan, Korea, Russia (Far East, Siberia)].

**25. *Eleocharis mitracarpa*** Steudel, Syn. Pl. Glumac. 2: 77. 1854.

槽秆荸荠 cao gan bi qi

Perennials. Rhizomes creeping. Culms grayish green, 30–100 cm tall, 2–5 mm thick, spongy, easily compressed, smooth, finely longitudinally ribbed and sulcate. Leaf sheaths basally purplish to reddish brown and apically yellowish brown to pale brown, tubular, 1–20 cm, scarious, mouth obliquely truncate. Spikelet oblong-ovoid to narrowly oblong-ovoid, 1.5–3 cm × 4–7 mm, many flowered. Glumes laxly imbricate; basal 2 glumes empty; basalmost glume encircling 1/2 or less of spikelet base, apex obtuse; remaining glumes fertile, greenish medially and sides brown to reddish brown, lanceolate, 3.5–4.5 × ca. 1.3 mm, margin broadly hyaline, apex subacute. Perianth bristles usually 4, pale brown, shorter than to equaling nutlet (including style base). Stigmas 2. Nutlet yellow to brown, 1.3–2 × 1–1.3 mm (excluding style base), obovoid, thickly biconvex, glossy and finely or obscurely reticulate, apex constricted; persistent style base 0.4–0.9 × 0.5–0.8 mm, globose or wider than long, mitriform, ca. 1/4 as long as nutlet body.

Shallow water at lake margins, marshes. Guizhou, Hebei, E Nei Mongol, Shandong, Shanxi, Yunnan [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan; SW Asia, E Europe].

**26. *Eleocharis argyrolepis*** Kierulff ex Bunge, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 7: 518. 1851.

银鳞荸荠 yin lin bi qi

Perennials, stoloniferous. Culms single to few tufted, 15–75 cm tall, 1–3 mm thick but to 4 mm thick at base, shiny, sharply ribbed, transversely septate between ribs and becoming tuberculate when dry. Leaf sheaths 1 or 2, purplish red, 1–8 cm, scarious, mouth obliquely truncate and with a deep slit on ventral side, apex obtuse. Spikelet narrowly cylindrical-ovate to cylindrical, 1–2.5 cm × 2–4 mm, many flowered, apex acuminate. Basal 2 glumes empty, opposite, amplexicaul for 1/2 or more of spikelet base; fertile glumes greenish medially and with a narrow blood-red band on sides, laxly imbricate, sublancoleate to ovate-lanceolate, ca. 3 × 1.5 mm, midvein obscure, margin broadly hyaline, apex acute. Perianth bristles 4, ± as long as nutlet, slightly curved, laxly retrorsely spinulose, sometimes spreading. Stigmas 2. Nutlet yellow, broadly obovoid to globose-obovoid, 1–1.3 × ca. 1 mm, biconvex, smooth; persistent style base shortly conic to half-oblong, as long as or slightly longer than wide, 1/3–1/2 as long and nearly as wide as nutlet, spongy, apex rounded. Fl. and fr. May–Jul.

Lake banks, marshes, meadows, reed thickets; 500–1000 m. Xin-

jiang [Afghanistan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

**27. *Eleocharis abnormalis*** Y. D. Chen, Bull. Bot. Res., Harbin 7(2): 124. 1987.

短刚毛荸荠 duan gang mao bi qi

Perennials. Stolons short to long. Culms tufted, 8–25 cm tall, ca. 1 mm thick, smooth, glabrous. Leaf sheaths 1 or 2, basally purplish brown, 1.2–3.5 cm, mouth obliquely truncate. Spikelet broadly ovoid to oblong, 3–8 × 3–4 mm, few flowered to not more than 10-flowered. Basalmost glume empty, amplexicaul for 1/2 or more of spikelet base; fertile glumes purplish brown, slightly laxly imbricate, ovate to broadly ovate, ca. 3.5 × 2 mm, margin hyaline, apex acuminate. Perianth bristles 4, shorter than nutlet, retrorsely spinulose. Stigmas 2. Nutlet yellowish brown, obovoid, ca. 1.5 × 1.4 mm, biconvex, smooth; persistent style base white basally and dark brown at apex, shortly conic, 1/4–1/3 as long and 1/3–1/2 as wide as nutlet, spongy, apex obtuse to nearly half-oblong. Fl. and fr. Jul–Aug.

• Shallow water at lake margins; ca. 3300 m. Qinghai (Qinghai Hu).

**28. *Eleocharis vallecuculosa*** Ohwi var. *setosa* Ohwi, Acta Phytotax. Geobot. 2: 29. 1933.

具刚毛荸荠 ju gang mao bi qi

*Eleocharis vallecuculosa* f. *setosa* (Ohwi) Kitagawa.

Perennials, with a rhizomes and stolons. Culms single or tufted, 6–50 cm tall, 1–3 mm thick, terete, with a few sharp ribs. Leaf sheaths 1 or 2, basally purplish red, tubular, 3–10 cm, mouth truncate. Spikelet oblong-ovoid to narrowly oblong-ovoid, rarely ellipsoid to oblong, 0.7–2 cm × 2.5–3.5 mm, many flowered. Basal 2 glumes empty, amplexicaul for 1/2–2/3 of spikelet base; fertile glumes greenish to pale medially and with a narrow pale blood-red band on sides, ovate to oblong-ovate, ca. 3 × 1.7 mm, margin broadly hyaline, apex obtuse. Perianth bristles 4, distinctly longer than nutlet, slightly curved and not spreading, densely retrorsely spinulose. Stigmas 2. Nutlet yellowish, globose-obovoid, ca. 1 × 1 mm, biconvex, smooth; persistent style base broadly ovoid, ca. 1/3 as long and ca. 1/2 as wide as nutlet, spongy. Fl. and fr. Jun–Aug.

Shallow water; 100–4300 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Korea].

*Eleocharis vallecuculosa* var. *vallecuculosa* occurs in Japan and Korea and differs by lacking perianth bristles.

**29. *Eleocharis palustris*** (Linnaeus) Roemer & Schultes, Syst. Veg. 2: 151. 1817.

沼泽荸荠 zhao ze bi qi

*Scirpus palustris* Linnaeus, Sp. Pl. 1: 47. 1753; *Eleocharis eupalustris* H. Lindberg; *E. intersita* G. Zinserling.

Perennials. Rhizomes creeping. Culms a few tufted, 10–100 cm tall, 2–3 mm thick, few ribbed and longitudinally sulcate, obscurely tuberculate. Leaf sheaths 1 or 2, basally blood-

red purple, tubular, 3–7 cm, mouth slightly obliquely truncate. Spikelet oblong, narrowly oblong, or ellipsoid, 0.6–2.5 cm × 3–5 mm, many flowered, apex obtuse-rounded. Basal 2 glumes empty; basalmost glume amplexicaul for 1/2 or more of spikelet base; fertile glumes with a narrow green band medially and dark blood-red on sides, ovate to ovate-lanceolate, 3–4 × 1–1.5 mm, membranous, margin broadly hyaline, apex obtuse. Perianth bristles 4–6, shorter to slightly longer than nutlet, slightly curved, spreading outward, densely retrorsely spinulose. Stigmas 2. Nutlet at first yellowish then becoming brownish, obovoid, broadly obovoid, or globose-ovoid, 1.2–1.4 × 0.8–1 mm, unequally biconvex, smooth or rarely slightly prominently reticulate; persistent style base ovoid-oblong to oblong-conic, much longer than wide, 1/2–3/5 as long and ca. 1/2 as wide as nutlet, spongy, apex obtuse to rounded. Fl. and fr. Jun–Jul.  $2n = 15, 16$ .

Shallow water margins in valleys, wet meadows, water of canals; 100–4000 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Afghanistan, Japan, Kazakhstan, Mongolia, Nepal, Russia; N Africa, SW Asia, Atlantic Ocean islands, Europe, North America].

**30. *Eleocharis kamschatica*** (C. A. Meyer) Komarov, Fl. Kamschatka 1: 207. 1927.

大基荸荠 da ji bi qi

*Scirpus kamschaticus* C. A. Meyer, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 1: 198. 1831; *Eleocharis kamschatica* f. *reducta* Ohwi; *E. komarovii* G. Zinserling; *E. mitrata* Makino; *E. sachalinensis* (Meinshausen) Komarov; *E. savatieri* C. B. Clarke ex H. Léveillé; *S. mitratus* Franchet & Savatier (1878), not Grisebach (1864); *S. sachalinensis* Meinshausen.

Perennials. Rhizomes elongate. Culms 20–50 cm tall, 1.5–3 mm thick, terete, conspicuously obtusely ribbed and longitudinally sulcate, surface transversely septate when dry. Leaf sheaths 1 or 2, brownish, tubular, 6–7 cm or more, mouth slightly obliquely truncate, apex triangular mucronate. Spikelet ovoid to narrowly ovoid, 8–20 × 3–5 mm, many flowered, apex obtuse. Basalmost glume empty, amplexicaul for more than 1/2 of spikelet base; fertile glumes pale blood-red to straw-colored and ± with pale blood-red lines, tightly imbricate, oblong to ovate-oblong, ca. 4 × 1 mm, midvein obscure, margin broadly to narrowly hyaline, apex obtuse. Perianth bristles 4 or 5 but sometimes rudimentary or absent, slightly shorter than to as long as nutlet, densely retrorsely spinulose. Stigmas 2. Nutlet at first yellow then becoming tawny, obovoid, broadly obovate, or subglobose, 1–1.5 × ca. 1 mm, biconvex, smooth and shiny; persistent style base ovoid to mitriform, large, cellular spongy, 2/3 or more as long and nearly as wide as nutlet. Fl. and fr. Jul–Oct.  $2n = 38–40, 44, 56$ .

River margins, marshes, wet places, especially in coastal habitats. Hebei, S Liaoning, Sichuan [Japan, Korea, Russia (Far East, E Siberia); North America].

**31. *Eleocharis fennica*** Palla ex Kneucker & G. Zinserling, Allg. Bot. Z. Syst. 7: 212. 1901.

扁基荸荠 bian ji bi qi

Perennials. Rhizomes short. Culms green to grayish green, tufted, 10–50 cm tall, ca. 1 mm thick, few ribbed and longitudinally sulcate. Leaf sheaths 2, blood-red, tubular, 5–10 cm, mouth truncate, apex triangular dentate. Spikelet cylindrical to ovoid-cylindrical, 7–15 × ca. 3 mm, many flowered. Basalmost glume empty, amplexicaul for whole or nearly whole of spikelet base; fertile glumes dark blood-red to dark brown, slightly laxly imbricate, ovate, ca. 3 × 1.5 mm, midvein obscure, margin broadly to narrowly hyaline, apex obtuse. Perianth bristles absent or 4 or 5 and longer than nutlet. Stigmas 2. Nutlet brownish yellow, obovoid to rarely globose, ca. 1.4 × 1 mm to nearly as long as wide, biconvex, smooth; persistent style base white, subpatelliform (disk-shaped), ca. 0.2 × 0.5–0.7 mm, depressed, spongy-thickened, apically slightly concave. Fl. and fr. May–Aug.

River margins, streams in valleys, wet places, coastal habitats, shallow water at lakeshores, swamps; near sea level to 3300 m. Heilongjiang, Nei Mongol, Qinghai, Xinjiang [Kazakhstan, Mongolia, Russia; Europe].

1a. Perianth bristles absent ..... 31a. var. *fennica*  
1b. Perianth bristles 4 or 5 and longer than

nutlet ..... 31b. var. *sareptana*

**31a. *Eleocharis fennica* var. *fennica***

扁基荸荠(原变种) bian ji bi qi (yuan bian zhong)

*Eleocharis uniglumis* (Link) Schultes subsp. *fennica* (Palla ex Kneucker & G. Zinserling) Vestergren.

Perianth bristles absent.

River margins, streams in valleys, wet places, coastal habitats; near sea level to 3100 m. Heilongjiang [Kazakhstan, Mongolia, Russia; Europe].

**31b. *Eleocharis fennica* var. *sareptana*** (G. Zinserling) G. Zinserling in Komarov, Fl. URSS 3: 87. 1935.

具刚毛扁基荸荠 ju gang mao bian ji bi qi

*Eleocharis sareptana* G. Zinserling, Trudy Glavn. Bot. Sada 40: 279. 1929; *E. fennica* f. *sareptana* (G. Zinserling) Tang & F. T. Wang; *E. paradoxa* Y. D. Chen.

Perianth bristles 4 or 5, longer than nutlet.

Shallow water at lakeshores; ca. 3300 m. Qinghai, Xinjiang [Kazakhstan, Mongolia, Russia; Europe].

**32. *Eleocharis uniglumis*** (Link) Schultes, Mant. 2: 88. 1824.

单鳞苞荸荠 dan lin bao bi qi

*Scirpus uniglumis* Link, Jahrb. Gewächsk. 1(3): 77. 1820; *Eleocharis euuniglumis* G. Zinserling; *E. kuoi* Y. D. Chen.

Perennials. Stolons long to short. Culms single or tufted, 10–15 cm tall, ca. 1 mm thick, few ribbed and longitudinally sulcate. Leaf sheaths 2 or 3, basally blood-red and apically yellowish green, 1–4 cm, mouth truncate to slightly obliquely truncate. Spikelet narrowly ovoid, ovoid, or oblong, 3–8 × 1.5–3 mm, 4–10-flowered. Basalmost glume empty, amplexicaul for whole of spikelet base; fertile glumes at first green then becoming brownish at middle and both edges purplish red, laxly

imbricate, oblong-ovate to oblong-lanceolate, ca.  $4 \times 2$  mm, margin apically becoming broadly hyaline, apex obtuse. Perianth bristles 4–6, longer than nutlet, slightly curved, outwardly spreading, densely retrorsely spinulose. Stigmas 2. Nutlet at first yellow then becoming brown, obovoid to broadly ovoid,  $1.4\text{--}1.7 \times$  ca. 1 mm, biconvex, ventral side conspicuously convex and dorsal side slightly convex, sometimes obtusely 3-sided, apex constricted and overlain by style base; persistent style base white, shallowly conic-ovoid, slightly elongate basally, nearly as long as wide, ca.  $1/2$  as long and ca.  $1/2$  as wide as nutlet, spongy, apex rounded to obtuse. Fl. and fr. Apr–Aug.  $2n = 46$ , 60–88.

Lake banks, swamps, meadows, shallow water margins; 100–3300 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Shanxi, Xinjiang, Yunnan [Afghanistan, India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Uzbekistan; N Africa, SW Asia, Europe, North America].

**33. *Eleocharis penchaoi*** Y. D. Chen, Bull. Bot. Res., Harbin 7(2): 119. 1987.

本兆荸荠 ben zhao bi qi

Perennials. Rhizomes elongate. Culms tufted, erect, 25–35 cm tall, ca. 2 mm thick. Leaf sheaths 1(or 2), grayish brown, tubular, 5–7 cm, smooth, glabrous, mouth truncate. Spikelet oblong, ca.  $8 \times 3\text{--}4$  mm, more than 10-flowered. Basalmost glume empty, amplexicaul for more than  $1/2$  of spikelet base; fertile glumes brown, sublaxly imbricate, ovate to narrowly ovate, ca.  $4 \times 2$  mm, margin  $\pm$  broadly hyaline, apex acute to obtuse. Perianth bristles 4, slightly longer than nutlet, retrorsely spinulose. Stigmas 2. Nutlet yellowish, obovoid, ca.  $1.7 \times 1.5$  mm, biconvex, smooth, both sides narrowly margined, apex constricted; persistent style base white but dark brown at apex, obtusely 3-angled, nearly as long and ca.  $1/3$  as wide as nutlet, spongy. Fl. and fr. Jul–Aug.

• Shallow water at lake margins; ca. 3300 m. Qinghai (Qinghai Hu).

**34. *Eleocharis erhaiensis*** Y. D. Chen, Bull. Bot. Res., Harbin 7(2): 122. 1987.

耳海荸荠 er hai bi qi

*Eleocharis callosa* Y. D. Chen.

Perennials. Stolons elongate. Culms tufted, erect, grayish green, 8–25 cm tall, ca. 1 mm thick, smooth, glabrous. Leaf sheaths 1 or 2, basally purplish red to purplish brown, tubular, 1.5–5 cm, mouth obliquely truncate. Spikelet oblong,  $5\text{--}10 \times 3\text{--}4$  mm, 8–15-flowered. Basalmost glume empty, amplexicaul for more than  $1/2$  to nearly whole spikelet base; fertile glumes brown to dark brown but sometimes basally pale,  $\pm$  tightly spirally imbricate, ovate to broadly ovate, ca.  $3 \times 2$  mm, midvein thin or obscure, margin yellowish and broadly hyaline, apex acute. Perianth bristles 4–6, as long as or slightly longer than nutlet (excluding style base), laxly retrorsely spinulose. Stigmas 2. Nutlet yellowish brown, obovoid,  $1.8\text{--}2 \times 1.5\text{--}1.7$  mm, biconvex, smooth; persistent style base dark brown when mature, shortly 3-angled, wider than long, ca.  $1/3$  as long and more than  $1/2$  as wide as nutlet, spongy. Fl. and fr. Jul–Aug.

• Marshes, shallow water, wet places; 3200–3300 m. Qinghai.

**35. *Eleocharis qinghaiensis*** Y. D. Chen, Bull. Bot. Res., Harbin 7(2): 117. 1987.

青海荸荠 qing hai bi qi

Perennials. Rhizomes present; stolons elongate. Culms tufted, erect, grayish green, 25–30 cm tall, ca. 1 mm thick, glabrous. Leaf sheaths 1 or 2, purplish red, 3–4 cm, smooth. Spikelet brown, oblong,  $5\text{--}7 \times 2\text{--}3$  mm, few flowered. Basalmost glume empty, amplexicaul for whole spikelet base; fertile glumes dark brown, ovate to oblong-ovate, ca.  $3.5 \times 2.5$  mm, margin broadly hyaline, apex obtuse. Perianth bristles 5–7, shorter than nutlet, retrorsely spinulose. Stigmas 2. Nutlet greenish yellow, obovoid, ca.  $1.7 \times 1.5$  mm, biconvex, smooth, apex constricted; persistent style base shortly conic, wider than long, ca.  $1/3$  as long and more than  $1/2$  as wide as nutlet, spongy, apex obtuse to subrounded. Fl. and fr. Jul–Aug.

• Shallow water at lake margins; ca. 3300 m. Qinghai (Qinghai Hu).

## 12. FIMBRISTYLIS Vahl, Enum. Pl. 2: 285. 1805, nom. cons.

飘拂草属 piao fu cao shu

Zhang Shuren (张树仁), Liang Songyun (梁松筠 Liang Song-jun); Tetsuo Koyama, David A. Simpson

*Abildgaardia* Vahl; *Cyperus* subg. *Iria* Richard; *Iria* (Richard) R. Hedwig.

Herbs, annual or perennial, medium sized, often rhizomatous. Culms usually tufted, slender, 3- or 5-angled or flattened. Leaves basal, sometimes reduced to a bladeless sheath; ligule if present membranous or a fringe of hairs; leaf blade linear, filiform, or rarely ensiform, usually dorsiventrally compressed and canaliculate, often adaxially cellular-reticulate. Inflorescences terminal, a simple, compound, or decompound anthela, rarely capitate or reduced to 1 terminal spikelet. Spikelets solitary or fascicled, ovoid, ellipsoid, or subglobose, terete or flattened, with several to many flowers. Glumes spirally imbricate, distichous, or only basal ones distichous and apical ones spirally imbricate, often with 1 or more veins forming an abaxial keel and sometimes extending into an apical mucro or arista. Flowers bisexual. Perianth bristles absent. Stamens 1–3. Style not persistent on nutlet, basally enlarged. Nutlet sometimes stipitate, biconvex, 3-sided, or almost terete, either reticulate, verruculose, or both.

Over 200 species: worldwide but mostly subtropical and tropical with center of distribution in SE Asia; 53 species (ten endemic) in China.

Although J. Kern reported *Fimbristylis merrillii* J. Kern from S China (Blumea 8: 135. 1955), no specimen from China has been seen by the present authors, and we doubt that it actually occurs in China.

- 1a. Spikelets ± compressed; glumes distichous at least on basal part of spikelet.
- 2a. Inflorescences reduced to a single spikelet; involucre bracts glumelike.
- 3a. Nutlet obovoid, verruculose, stipes less than 0.5 mm; leaf blade 0.5–1 mm wide ..... 52. *F. ovata*
- 3b. Nutlet globose, with few verrucae, stipes more than 1 mm; leaf blade ca. 0.5 mm wide ..... 53. *F. longistipitata*
- 2b. Inflorescences with 2 to several spikelets; involucre bracts leaflike, setaceous, or very rarely glumelike.
- 4a. Glumes glabrous, not gland-dotted.
- 5a. Nutlet 1–1.2 mm; spikelets often paired or fascicled, rarely solitary at apex of inflorescence rays ..... 44. *F. nigrobrunnea*
- 5b. Nutlet 0.7–0.9 mm; spikelets solitary.
- 6a. Glumes yellowish brown; spikelets 6–10 mm; basalmost involucre bract less than 2 × as long as spikelet; rhizome short ..... 45. *F. eragrostis*
- 6b. Glumes reddish brown; spikelets 3–6 mm; basalmost involucre bract more than 3 × as long as spikelet; rhizome absent ..... 46. *F. disticha*
- 4b. Glumes hairy or gland-dotted.
- 7a. Glumes densely gland-dotted, glabrous; spikelets with 2 or 3 flowers; rays and raylets very slender, glabrous.
- 8a. Leaf blade ca. 1 mm wide, hairy on both surfaces; ligule absent; involucre bracts surpassing inflorescence ..... 47. *F. nanningensis*
- 8b. Leaf blade 3–6 mm wide, glabrous; ligule a fringe of short white hairs; involucre bracts shorter than inflorescence ..... 48. *F. cinnamometorum*
- 7b. Glumes not gland-dotted, hairy; spikelets with more than 3 flowers; rays and raylets thicker, hairy.
- 9a. Glumes awned, awns excurved; stigmas 2 ..... 49. *F. kwantungensis*
- 9b. Glumes shortly tipped, tips not excurved; stigmas 3.
- 10a. Perennials; culms 20–40 cm tall; inflorescence a compound anthela; glumes 4–5 mm; nutlet attenuate to base, sessile; style 4–5 mm ..... 50. *F. fusca*
- 10b. Annuals; culms 5–13 cm tall; inflorescence a simple or rarely compound anthela; glumes 2.5–3 mm; nutlet truncate at base, shortly stipitate; style ca. 2 mm ..... 51. *F. fimbristylodes*
- 1b. Spikelets terete; glumes spirally imbricate.
- 11a. Spikelet solitary; involucre bracts glumelike; leaves with only a bladeless sheath.
- 12a. Nutlet narrowly oblong, base with a ca. 0.7 mm stipe; culms 4-angled ..... 40. *F. tetragona*
- 12b. Nutlet broadly obovoid, sessile; culms flatly cylindrical, subcylindrical, or slightly compressed.
- 13a. Stigmas 3; spikelets narrowly oblong to clavate-oblong, 3.5–4.5 × 1–1.5 mm; glumes pale with short rust-colored lines, oblong to oblong-ovate, apex not mucronate; nutlet white, with sparse verrucae and subhexagonal reticulation ..... 41. *F. pauciflora*
- 13b. Stigmas 2; spikelets ovoid, narrowly ovoid, ellipsoid, or oblong-ovoid, 5–15 × 2–5 mm; glumes brown with short rust-colored lines or greenish white and sometimes laterally with brown specks, apex mucronate; nutlet yellowish white, with transverse wavy reticulation.
- 14a. Spikelets slightly nodding; involucre bracts 2–4.5 mm; glumes brown with short rust-colored lines; stamens 3; nutlet margin verruculose ..... 42. *F. nutans*
- 14b. Spikelets erect; involucre bract absent; glumes greenish white and sometimes laterally with brown specks; stamens 2; nutlet margin not verruculose ..... 43. *F. acuminata*
- 11b. Spikelets (1 or) 2 to many; involucre bracts not glumelike; leaves with a blade.
- 15a. Stigmas 2; style compressed, apically ciliate.
- 16a. Spikelets angular because of keeled glumes, 7 mm or less (but to 12 mm in *F. gracilentia*).
- 17a. Style base with sparse long hairs covering nutlet apex ..... 35. *F. squarrosa*
- 17b. Style base glabrous.
- 18a. Glumes brown; nutlet 0.6–0.8 mm.
- 19a. Nutlet broadly obovoid, with transverse oblong reticulation; leaf sheath greenish yellow or with rust-colored flecks; leaf blade 0.7–1.5 mm wide .. 36. *F. bisumbellata*
- 19b. Nutlet obovoid, almost smooth but sometimes with very indistinct hexagonal reticulation; leaf sheath brown; leaf blade 0.5–1 mm wide ..... 37. *F. aestivalis*
- 18b. Glumes pale brown; nutlet ca. 1 mm.
- 20a. Leaf blade ca. 1 mm wide; spikelet oblong, lanceolate, or linear-lanceolate, 1.5–2 mm wide; rhizomes absent ..... 38. *F. gracilentia*
- 20b. Leaf blade 1.5–3 mm wide; spikelet ovate or narrowly ovate, 2–4 mm wide; rhizomes short ..... 39. *F. simaoensis*
- 16b. Spikelets terete, at least some to 10 mm or more (but only to 8 mm in *F. polytrichoides*).

- 21a. Spikelets 1–3(–6).
- 22a. Nutlet grayish black, with an extremely short stipe, obovoid, with transversely oblong reticulation and verrucae; growing in sandy places; glumes pale white with short brown lines medially, sometimes slightly yellowish brown apically ..... 34. *F. polytrichoides*
- 22b. Nutlet yellowish white or brown, with a distinct stipe, broadly obovoid, with hexagonal reticulation; not growing in sandy places; glumes yellowish white with short brown lines or brown with short rust-colored lines.
- 23a. Glumes yellowish white, ca. 3 mm; nutlet yellowish white, with a short yellowish white stipe ..... 31. *F. schoenoides*
- 23b. Glumes brown, 5–7 mm; nutlet brown or yellowish brown, with a short brown stipe.
- 24a. Spikelets 1 or 2; bract 1 or absent, longer than inflorescence; rhizomes absent; leaf blade ca. 1 mm wide ..... 32. *F. subbispicata*
- 24b. Spikelets 3–6; bract 1, shorter than inflorescence; rhizomes short; leaf blade 1.2–2 mm wide ..... 33. *F. tristachya*
- 21b. Spikelets several to many (in *F. sieboldii* sometimes with only 1–3 spikelets, but glumes only 1-veined, and culm base with leafless sheaths).
- 25a. Spikelets very narrowly ovoid to linear; nutlet with linear-oblong reticulation; rhizome absent ..... 30. *F. hookeriana*
- 25b. Spikelets ovoid, ellipsoid, oblong, oblong-ovoid, narrowly oblong, ovoid-ellipsoid, or narrowly oblong-ovoid; nutlet with subtransverse, oblong, hexagonal, or oblong-hexagonal reticulation or subsmooth; rhizome absent or present.
- 26a. Plants stoloniferous; nutlet with horizontally oblong reticulation, vertical ribs not obvious ..... 28. *F. stolonifera*
- 26b. Plants not stoloniferous; nutlet with hexagonal reticulation (*F. dichotoma* with oblong reticulation, but vertical ribs obvious; in *F. sieboldii* reticulation not obvious).
- 27a. Culm bases with leafless sheaths; glumes 1-veined, apical part abaxially pubescent; leaf blade ca. 1 mm wide; nutlet almost smooth ..... 29. *F. sieboldii*
- 27b. Culm bases without leafless sheaths; glumes with 3 or more veins, abaxially glabrous; leaf blade more than 1 mm wide; nutlet with evident reticulation.
- 28a. Inflorescences inclined to nodding ..... 27. *F. subinclinata*
- 28b. Inflorescences erect.
- 29a. Rhizomes woody, horizontally elongated ..... 26. *F. rigidula*
- 29b. Rhizomes not prominent.
- 30a. Nutlet with hexagonal reticulation, without obvious vertical ribs, not stipitate ..... 25. *F. longispica*
- 30b. Nutlet with transversely oblong reticulation, vertical ribs obvious or not, with a short brown stipe at base.
- 31a. Nutlet obovoid, with obvious vertical ribs, not verruculose; inflorescences 5–9 cm ..... 23. *F. dichotoma*
- 31b. Nutlet ovoid, without vertical ribs, sparsely verruculose; inflorescences 3–4 cm ..... 24. *F. shimadana*
- 15b. Stigmas (2 or)3; style not compressed or rarely slightly compressed, apically not ciliate.
- 32a. Basal part of culms with 1–3 leafless sheaths.
- 33a. Leaf blade bilaterally compressed, ensiform; leaf sheaths compressed; spikelets spherical or subspherical; glumes 1–1.3 mm ..... 16. *F. littoralis*
- 33b. Leaf blade (if present) dorsiventrally flattened but canaliculate, linear; leaf sheaths tubular; spikelets more elongated (but sometimes globose-ellipsoid in *F. umbellaris*); glumes 1.5–2.7 mm.
- 34a. Leaves reduced to a bladeless sheath ..... 18. *F. salbundia*
- 34b. Leaves with a blade.
- 35a. Culms 3-angled to subterete ..... 22. *F. umbellaris*
- 35b. Culms 4- or 5-angled to subterete.
- 36a. Anthelae simple or subcompound (rarely reduced to 1 spikelet); glumes without any dark brown lines ..... 21. *F. diphylloides*

- 36b. Anthelae usually compound; glumes each with 1 or 2 dark brown lines.
- 37a. Glume apices obtuse to rounded and not mucronate or apiculate; nutlet 0.6–0.8 mm; spikelets 2.7–7 mm ..... 17. *F. aphylla*
- 37b. Glume apices mucronate or apiculate or at least acute; nutlet ca. 0.8 mm (or sometimes longer in *F. quinquangularis*); spikelets 2–5 mm.
- 38a. Ligule absent; involucre bracts 4, setaceous; rays 4; nutlet obovoid; stamens 1 or 2 ..... 19. *F. quinquangularis*
- 38b. Ligule a fringe of pubescence; involucre bracts 5–7, leaflike; rays 5–7; nutlet broadly obovoid; stamens 3 .... 20. *F. chingmaiensis*
- 32b. Culm leaves all with a leaf blade.
- 39a. Culms tufted; rhizomes absent.
- 40a. Nutlet oblong; glumes white, straw-yellow, or rust-colored.
- 41a. Glumes white to pale straw-yellow; nutlet papillate laterally but papillae later deciduous; leaf blade 0.2–0.5 mm wide ..... 1. *F. dipsacea*
- 41b. Glumes rust-colored; nutlet not papillate; leaf blade 1–2.5 mm wide ..... 2. *F. stantonii*
- 40b. Nutlet obovoid, broadly obovoid, or ellipsoid-obovoid; glumes usually yellowish green.
- 42a. Stigmas 2; involucre bracts longer or shorter than inflorescence ..... 5. *F. henryi*
- 42b. Stigmas 3; involucre bracts shorter than inflorescence.
- 43a. Spikelets 3–6 × 1–1.5 mm; glumes 2–2.5 mm; nutlet broadly obovoid, 0.7–1 mm ..... 3. *F. autumnalis*
- 43b. Spikelets 2–3 × 1–1.2 mm; glumes 1–1.2 mm; nutlet obovoid, 0.4–0.5 mm ..... 4. *F. microcarpa*
- 39b. Culms not tufted; rhizomes short or plants stoloniferous.
- 44a. Nutlet purplish black, grayish black, or blackish purple (not seen for *F. psammocola*); stigmas 2 or 3.
- 45a. Whole plant covered with dense white silky hairs; rhizomes elongated, branched ..... 12. *F. sericea*
- 45b. Plant glabrous; rhizomes short, not branched.
- 46a. Spikelets 10–20 mm; style 3-sided; stigmas 3 ..... 13. *F. insignis*
- 46b. Spikelets 3–10 mm; style slightly flat or flat; stigmas 2 or 3.
- 47a. Glumes 1.2–2 mm, apex obtuse; spikelets 3–6 × 1.5–2.5 mm ..... 11. *F. cymosa*
- 47b. Glumes 4–5 mm, apex acute; spikelets 6–10 × 2.5–4 mm ..... 15. *F. psammocola*
- 44b. Nutlet white, yellowish white, cream-colored, yellow, or brown; stigmas 3.
- 48a. Glumes densely gland-dotted, margin fimbriate-ciliate, apex often emarginate ..... 14. *F. leptoclada*
- 48b. Glumes not gland-dotted, margin not fimbriate-ciliate, apex not emarginate.
- 49a. Plants stoloniferous; involucre bracts subulate or glumelike ..... 10. *F. pierotii*
- 49b. Plants not stoloniferous; involucre bracts leaflike.
- 50a. Leaf sheaths not compressed; glumes 5–7-veined forming an abaxial obtusely angled keel; nutlet ca. 2 mm ..... 6. *F. thomsonii*
- 50b. Leaf sheaths compressed; glumes 1–3-veined; nutlet 0.7–1.5 mm.
- 51a. Ligule absent; involucre bracts longer than inflorescence ..... 9. *F. dura*
- 51b. Ligule ciliate; involucre bracts shorter than inflorescence
- 52a. Glumes 3–3.5 mm, herbaceous, 1-veined; nutlet 1–1.5 mm ..... 7. *F. complanata*
- 52b. Glumes 2–2.5 mm, membranous, 3-veined; nutlet 0.7–0.8 mm ..... 8. *F. tainanensis*

**1. *Fimbristylis dipsacea*** (Rottbøll) Benth., Gen. Pl. 3: 1049. 1883.

起绒飘拂草 *qi rong piao fu cao*

Annuals. Rhizomes absent. Culms tufted, 2.5–15 cm tall, slender, smooth. Leaves as long as or shorter than culm; sheath rust-colored, thinly membranous, glabrous, mouth obliquely split; leaf blade capillary, 2.5–15 cm × 0.2–0.5 mm, involute to nearly flat. Involucre bracts 3–10, setaceous, basal 1 or 2 some-

times surpassing inflorescence. Inflorescence a simple or sub-compound anthela, with fewer to numerous spikelets; rays 3–10, slender, unequal, spreading. Spikelets solitary, rarely 2 clustered, oblong, oblong-ovoid, or subglobose, 3–6 × 2–6 mm, many flowered. Glumes white or pale straw-yellow, oblong, oblong-ovate, or elliptic, ca. 1 mm (excluding awn), thinly membranous, 1-veined forming an abaxial green keel, apex blunt and awned. Stamens 1 or 2; anthers narrowly ovoid to oblong. Style basally slightly thickened; stigmas 2. Nutlet brown, ob-

long, shiny, with transversely hexagonal reticulation or sublinear horizontal lines, each edge bearing 5–9 caducous clavate glandular cells. Fl. and fr. Mar–Nov.

Field margins, wet grassy places by rivers, swampy places, pond margins; below 100 m. Anhui, Guangdong, Guangxi, Hainan, Heilongjiang, Hunan, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Laos, Myanmar, Papua New Guinea, Philippines, Russia, Sri Lanka, Thailand, Vietnam; Africa, N Australia, South America].

- 1a. Glume apices with a long excurved awn ..... 1a. var. *dipsacea*  
 1b. Glume apices with a short straight awn ..... 1b. var. *verrucifera*

**1a. *Fimbristylis dipsacea* var. *dipsacea***

起绒飘拂草(原变种) qi rong piao fu cao (yuan bian zhong)

*Scirpus dipsaceus* Rottbøll, Descr. Icon. Rar. Pl. 56. 1773.

Leaves often as long as or shorter than culm. Glumes white, elliptic, apex with a long excurved awn. Stamens 1 or 2. Fl. and fr. Mar–Nov.  $2n = 10$ .

Field margins, wet grassy places by rivers, swampy places, pond margins; below 100 m. Guangdong, Guangxi, Hainan, Yunnan [India, Indonesia, Laos, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, South America].

**1b. *Fimbristylis dipsacea* var. *verrucifera* (Maximowicz) T. Koyama, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 8: 118. 1961.**

疣果飘拂草 you guo piao fu cao

*Isolepis verrucifera* Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 300. 1859; *Fimbristylis verrucifera* (Maximowicz) Makino.

Leaves shorter than culm. Glumes white to pale straw-yellow, oblong to oblong-ovate, apex with a short straight awn. Stamen 1. Fl. and fr. Aug–Nov.

Field margins, wet places, water margins. Anhui, Heilongjiang, Hunan, Zhejiang [Japan, Korea, Russia (Far East)].

**2. *Fimbristylis stauntonii* Debeaux & Franchet, Actes Soc. Linn. Bordeaux 31: 31. 1877.**

烟台飘拂草 yan tai piao fu cao

Annuals. Rhizomes absent. Culms tufted, 4–40 cm tall, erect or rarely curved, flatly 3-angled, striate, glabrous, with fewer leaves at base. Leaves shorter than culm; sheath pale brown, 0.5–7 cm, adaxially membranous, mouth obliquely split; ligule very short, ciliate, apex truncate; leaf blade 1–2.5 mm wide but apically attenuate, flat, glabrous, apex acute. Involucral bracts 2 or 3, leaflike, slightly longer to shorter than inflorescence; bractlets subulate or glumelike, base dilated, apex awned. Inflorescence a simple or compound anthela, 1–7 × 1.5–7 cm; rays few, 1–7 cm, slender, ± spreading. Spikelets solitary, broadly ovoid to oblong, 3–7 × 1.5–2.5 mm, many flowered, base cuneate, apex acute, obtuse, or rounded. Glumes rust-colored, oblong-lanceolate, membranous, 1-veined forming an abaxial green keel, apex with a straight mucro. Stamen 1; anther ca. 0.4 mm, apex apiculate. Style subcylindric, glabrous, basally slightly inflated to spherical; stigmas 2 or 3. Nutlet yellowish

white, oblong, ca. 1 mm, subterete, with transverse oblong reticulation. Fl. and fr. Jul–Oct.

Cultivated fields, wet sandy places, among grasses; near sea level to 700 m. Anhui, S Gansu, Hebei, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shaanxi, Shandong, Sichuan, Zhejiang [Japan, Korea].

**3. *Fimbristylis autumnalis* (Linnaeus) Roemer & Schultes, Syst. Veg. 2: 97. 1817.**

秋飘拂草 qiu piao fu cao

*Scirpus autumnalis* Linnaeus, Mant. Pl. Alt. 180. 1771; *Fimbristylis wukungshanensis* Tang & F. T. Wang.

Annuals. Rhizomes absent. Culms tufted, 6–20 cm tall, 1.5–2 mm wide, 3-angled, striate, glabrous, with 1 or 2 leaves at base. Leaves shorter than culm; sheath membranous, tinged rusty brown on ventral side, mouth obliquely truncate; ligule truncate, ciliate; leaf blade 1–2.5 mm wide, glabrous, gradually narrowed to an acute apex. Involucral bracts subulate, shorter than inflorescence. Inflorescence a simple to decompound anthela, 2–7 cm, lax; rays 3–6, 0.6–4 cm, spreading. Spikelets solitary, narrowly ovoid to oblong-ovoid, 3–6 × 1–1.5 mm, 7–16-flowered. Glumes pale brownish to yellowish, lanceolate-ovate, 2–2.5 mm, margin broadly hyaline, strongly folded by a 3-veined keel with veins projecting into a mucro. Stamen 1. Stigmas 3. Nutlet broadly obovoid, 0.7–1 × ca. 0.5 mm, 3-sided, finely cancellate with transversely oblong epidermal cells, sparsely verruculose; persistent style base conic. Fl. and fr. Sep.

Cultivated ground, grasslands; below 600 m. Jiangxi (Wugong Shan), Liaoning, Taiwan [Japan; Central, North, and South America].

**4. *Fimbristylis microcarya* F. Mueller, Fragm. 1: 200. 1859.**

台北飘拂草 tai bei piao fu cao

*Fimbristylis autumnalis* (Linnaeus) Roemer & Schultes subsp. *taiwanica* (Ohwi) T. Koyama; *F. taiwanica* Ohwi.

Annuals. Culms densely tufted, 10–30 cm tall, 0.7–1.3 mm thick, flatly 3-angled, smooth. Leaves basal, few; sheath light straw-colored to pale brown; ligule ciliate; leaf blade linear, to 18 cm × 1.5–5 mm, flat, apical margin scabrid. Involucral bracts 3 or 4, basalmost leaflike and to 4 cm. Inflorescence a decompound anthela, 3–6 × 3–6 cm, lax; primary rays 2–5, 1–5 cm, unequal, apically scabrous. Spikelets numerous per inflorescence, solitary, rust-colored, narrowly ovoid, 2–3 × 1–1.2 mm, slightly angular, subclaxly 5–10-flowered, apex acute. Glumes numerous, spirally imbricate, light rust-colored with pale brownish margins, ovate, 1–2 mm, membranous, 3-veined forming an abaxial keel, apex mucronate. Stamens 1 or 2; anthers 0.2–0.3 mm. Style 3-sided, glabrous, basally dilated; stigmas 3. Nutlet sessile, light straw-colored, obovoid, 0.4–0.5 × 0.3–0.4 mm, ± smooth or with scattered verrucae and slightly cancellate with transversely oblong cells.

Open wet places. Taiwan [India, Indonesia, Kashmir, Papua New Guinea, Philippines, Vietnam; Africa, Australia].

**5. *Fimbristylis henryi* C. B. Clarke, J. Linn. Soc., Bot. 36: 237. 1903.**

宜昌飘拂草 yi chang piao fu cao

*Fimbristylis unicolor* Ohwi & T. Koyama.

Annuals. Rhizomes absent. Culms tufted, 3–20 cm tall, 3-angled, striate, glabrous, with ca. 2 leaves at base. Leaves longer than culm; sheath rust-colored, 1–3.5 cm, adaxially membranous, mouth obliquely split; ligule ciliate, apex truncate; leaf blade 1–3 mm wide but apically attenuate, flat, glabrous, apex acute. Involucral bracts 2 or 3 (or 4), leaflike, longer to shorter than inflorescence; bractlets subulate, broad at basal part, margin membranous. Inflorescence a simple, compound, or decomposed anthela, 1–5 cm in diam.; rays 2–4, 0.5–3 cm. Spikelets solitary, narrowly oblong, narrowly ellipsoid, or rarely ovoid, 3–8 × 1–1.5 mm, with 8–10 or more flowers, apex obtuse to subacute. Glumes yellowish green to pale brown, ovate to ovate-lanceolate, ca. 2 mm (including mucro), 3-veined forming an abaxial green keel, margin broadly hyaline. Stamen 1; anther oblong, ca. 0.5 mm, 1/5–1/4 as long as filament, apex apiculate. Style basally inflated to conic; stigmas 2, ca. 1/2 as long as style. Nutlet pale yellow, ellipsoid-obovoid, obovoid, or ellipsoid, less than 1 mm, flat-convex, with transversely oblong reticulation but not verruculose. Fl. and fr. Aug–Nov.

• Cultivated fields, on rocks, marshes, riversides; 100–2000 m. Anhui, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, SE Yunnan, Zhejiang.

**6. *Fimbristylis thomsonii* Boeckeler, Linnaea 37: 37. 1871.**

西南飘拂草 xi nan piao fu cao

Perennials. Rhizomes short. Culms tufted, (11–)25–70 cm tall, flatly and obtusely 3-angled, striate, with many leaves at base. Leaves slightly shorter than culms to 1/4–1/2 as long as culm; sheaths brown, abaxially membranous and rust-colored, apex truncate; leaf blade 2–4.5 mm wide, flat, stiff, margin finely toothed, apex acute. Involucral bracts 2 or 3, leaflike, much shorter than inflorescence; bractlets subulate, broader at base. Inflorescence a compound or decomposed anthela; rays 2–4, 0.7–3.5 cm, slightly compressed. Spikelets solitary, oblong-ovoid to ellipsoid, 5–10 × 2–3 mm, 7–10-flowered or more, apex acute. Glumes chestnut-brown, ovate, 2.2–3.5 mm, 5–7-veined forming an abaxial obtuse keel, midvein green and excurrent into a mucro, margin membranous, apex acute. Stamens 3; anthers narrowly oblong, ca. 2 mm, ca. 2 × as long as filaments. Ovary oblong, nearly 3-sided, base slightly narrowed; style 3-sided, not ciliate, basally inflated to oblong-conic; stigmas 3, slightly longer than style. Nutlet yellowish white to yellow, obovoid, ca. 2 mm, obtusely 3-sided, with transversely oblong reticulation and verrucae. Fl. and fr. May–Jun.

Grassy slopes; 100–3100 m. Guangdong, Guangxi, Hainan, Taiwan, S Yunnan [India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**7. *Fimbristylis complanata* (Retzius) Link, Hort. Berol. 1: 292. 1827.**

扁鞘飘拂草 bian qiao piao fu cao

Perennials. Rhizomes long, short, or almost absent. Culms tufted, (10–)20–70 cm tall, flatly 3- or 4-angled, striate, sometimes apically winged, with many leaves at base. Leaves shorter than culm; sheath bilaterally compressed, abaxially membranous and rust-colored, adaxially keeled, mouth obliquely split

and ciliate; ligule very short, ciliate; leaf blade 1–5 mm wide, flat, thickly papery, margin apically finely serrulate, apex acute. Involucral bracts 2–4, suberect, much shorter than inflorescence; bractlets setaceous, broader at base. Inflorescence a simple, compound, or decomposed anthela, 7.5–10.5 × 4–7 cm; rays 3 or 4, 1–7 cm, compressed, scabrid. Spikelets many per inflorescence, solitary, oblong, ovoid, or narrowly ovoid, 5–9 × 1.2–2 mm, 5–13-flowered, apex acute. Glumes brown, ovate, ca. 3 mm, 1-veined forming an abaxial yellowish green keel excurrent into a mucro, apex acute. Stamens 3; anthers oblong, 1 mm or longer, ca. 1/4 as long as filament, apex acute. Ovary oblong, 3-sided; style 3-sided, glabrous, basally inflated to conic; stigmas 3, ± as long as style. Nutlet white or yellowish white, obovoid to broadly obovoid, ca. 1.5 mm, obtusely 3-sided, with transverse oblong reticulation. Fl. and fr. Jun–Oct.

Wet places in valleys, grasslands, streamsides, open fields, slopes, ditches, swampy places, along ravines; 100–3000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, SW Asia (Yemen), N Australia, Central and South America, Indian Ocean islands, Pacific islands].

- 1a. Culms 50–70 cm tall, robust; rhizomes long to short; leaf blade 3–5 mm wide; inflorescence a decomposed anthela ..... 7a. var. *complanata*  
 1b. Culms (10–)20–50 cm tall, slender; rhizomes short to almost absent; leaf blade 1–2.5 mm wide; inflorescence a simple or compound anthela ..... 7b. var. *exaltata*

**7a. *Fimbristylis complanata* var. *complanata***

扁鞘飘拂草(原变种) bian qiao piao fu cao (yuan bian zhong)

*Scirpus complanatus* Retzius, Observ. Bot. 5: 14. 1788.

Rhizomes long or short, sometimes nearly diageotropic. Culms 50–70 cm tall, robust. Leaf blade 3–5 mm wide. Inflorescence a decomposed anthela. Fl. and fr. Jul–Oct.

Wet places in valleys, grasslands, streamsides; 500–3000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, SW Asia (Yemen), N Australia, Central and South America, Indian Ocean islands, Pacific islands].

**7b. *Fimbristylis complanata* var. *exaltata* (T. Koyama) Y. C. Tang ex S. R. Zhang & T. Koyama, stat. nov.**

矮扁鞘飘拂草 ai bian qiao piao fu cao

Basionym: *Fimbristylis complanata* f. *exaltata* T. Koyama, Bull. Arts Sci. Div. Ryukyuu Univ. 3: 70. 1959.

Rhizomes short to almost absent, slender. Culms (10–)20–50 cm tall, slender. Leaf blade 1–2.5 mm wide. Inflorescence a nearly simple or compound anthela. Fl. and fr. Jun–Sep.

Streamsides, water margins, open fields, slopes, ditches, swampy places, along ravines; 100–800 m. Anhui, Fujian, Guangdong, Guangxi,

Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Taiwan, Zhejiang [Japan, Korea].

The name *Fimbristylis complanata* var. *kraussiana* (Hochstetter ex Steudel) C. B. Clarke was used by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 81. 1961), but the type of the basionym, *F. kraussiana* Hochstetter ex Steudel, belongs to *F. consanguinea* Kunth, which does not occur in China. T. Koyama proposed the new name *F. complanata* f. *exaltata* based on a different type. Because of the morphological differences and the more northern distribution, we are raising this form to a variety.

**8. *Fimbristylis tainanensis*** Ohwi, J. Jap. Bot. 14: 547. 1938.

台南飘拂草 tai nan piao fu cao

*Fimbristylis autumnalis* (Linnaeus) Roemer & Schultes subsp. *tainanensis* (Ohwi) T. Koyama; *F. microcarya* F. Mueller var. *tainanensis* (Ohwi) H. Y. Liu.

Perennials. Rhizomes short, ascending. Culms laxly tufted, 40–60 cm tall, compressed 3-sided or apically  $\pm$  2-angled, basally leaved. Leaf sheath  $\pm$  2-ranked, pale or tinged brown, mouth obliquely truncate and with a fringe of short pubescence; ligule short, ciliate; leaf blade 3–5 mm wide,  $\pm$  flat, subrigid, scabrous toward subabruptly acute apex. Involucral bracts 2–4, basal one linear and equaling inflorescence. Inflorescence a compound or in part decompound anthela, 3–4 cm, with many dense spikelets; rays many, 1–2 cm, compressed. Spikelets solitary or in groups of 2 or 3, chestnut-brown to light brown, oblong to narrowly ovoid, 4–6  $\times$  1.5–2 mm, 5–10-flowered, apex subacute. Glumes pale brown with chestnut-brown striae on both surfaces, oblong to oblong-ovate, 2–2.5  $\times$  1–1.2 mm, 3-veined, apex with an acute costa. Stamens 3. Nutlet pale yellow, obovoid to broadly ovoid, 0.7–0.8  $\times$  ca. 0.7 mm, 3-sided, indistinctly cancellate, verruculose; persistent style ca. 2 mm, base conically thickened.

- Lowland marshes, paddy fields. Taiwan.

**9. *Fimbristylis dura*** (Zollinger & Moritz) Merrill, Philipp. J. Sci., C, 11: 53. 1916.

类扁鞘飘拂草 lei bian qiao piao fu cao

*Isolepis dura* Zollinger & Moritz in Moritz, Syst. Verz. 97. 1846.

Perennials. Rhizomes short. Culms solitary or tufted, 45–75 cm, 2–4 mm wide, compressed, striate, apically scabrous. Leaves shorter than or as long as culm, subdistichous; sheath slightly bilaterally compressed, abaxially membranous and brown, mouth obliquely split; ligule absent; leaf blade linear, 3–8 mm wide, flat, margin apically scabrous, apex acute. Involucral bracts 3 or 4, linear, basal 1 or 2 longer than inflorescence. Inflorescence a compound anthela, to 20  $\times$  10 cm, lax; rays many, to 10 cm, slightly compressed. Spikelets solitary, oblong to oblong-ovoid, 4–10  $\times$  1–1.5 mm. Glumes brown, ovate to oblong-ovate, 1.5–2 mm, 3-veined forming an abaxial yellowish green keel excurrent into a mucro, apex acute; apical glumes often abnormal, to 4  $\times$  1.5 mm. Stamens (2 or)3; anthers oblong. Style 0.5–1 mm, 3-sided, glabrous or apically slightly ciliate, basally inflated; stigmas 3. Nutlet yellowish white to grayish brown, ellipsoid to oblong-obovoid, ca. 1  $\times$  0.5 mm, obtusely 3-sided, with distinct transverse oblong reticulation,

sparsely verruculose. Fl. and fr. autumn.

Riversides, shady moist places in woods. Hainan [India, Indonesia, Malaysia, Thailand, Vietnam].

**10. *Fimbristylis pierotii*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 145. 1865.

东南飘拂草 dong nan piao fu cao

Perennials. Rhizomes to 2 mm in diam., creeping, covered with ovate scales. Culms solitary, 13–35 cm tall, flatly 3-angled, apical part scabrid, with 4–6 leaves and 2 nearly leafless sheaths at base. Leaves shorter than to nearly as long as culm; sheath rust-colored, adaxially membranous, not ciliate, mouth obliquely split; ligule absent; leaf blade 1.2–2 mm wide, margin flat to incurved and finely serrulate, apex acute. Involucral bracts 1–3, subulate or glumelike, shorter than inflorescence, apex with a long awns. Inflorescence a simple anthela, 1.5–2.5 cm, with 2–7 spikelets. Spikelets oblong, ellipsoid, or ovoid, 6–10  $\times$  2.5–4 mm, 9-flowered, apex acute. Glumes chestnut-brown, broadly ovate, ca. 4 mm, 3-veined forming an abaxial green keel, margin membranous and white, apex obtuse to subacute; basal 2 glumes with an apical short hard mucro. Stamens 3; anthers linear-oblong, ca. 2 mm, ca. 1/4 as long as filaments. Ovary oblong, 3-sided, basally slightly narrower; style 3-sided, not ciliate, basally conic; stigmas 3, nearly as long as style. Nutlet brown, broadly obovoid, ca. 1 mm or more, flat to convex, finely verruculose. Fl. and fr. May–Sep.

Roadsides, coniferous forests, sunny dry places on mountain summits; near sea level to 3000 m. Anhui, Fujian, SE Henan, Jiangsu, Shandong, Yunnan, Zhejiang [Japan, Kashmir, Korea, Nepal, Philippines].

**11. *Fimbristylis cymosa*** R. Brown, Prodr. 228. 1810.

黑果飘拂草 hei guo piao fu cao

Perennials. Rhizomes short. Culms tufted, 10–60 cm tall, flatly and obtusely 3-angled, sometimes thick at base, with many leaves. Leaf blade 1–4 mm wide, thick, flat, extremely rigid, margin finely serrulate, apex acute. Involucral bracts 1–3, shorter than inflorescence. Inflorescence a simple or decompound anthela, headlike with a few short rays or open with several elongated rays. Spikelets numerous, solitary or clustered, oblong to ovoid, 3–6  $\times$  1.5–2.5 mm, densely many flowered, apex obtuse. Glumes brown, ovate to broadly ovate, 1.2–2 mm, membranous, abaxially 3-veined, margin broadly hyaline, apex obtuse. Stamens 3; anthers linear. Style slender, not ciliate, basally slightly thickened; stigmas 2 or 3. Nutlet purplish black when mature, obovoid to broadly obovoid, 0.7–1 mm, 3-sided or biconvex, indistinctly verruculose and with square or transversely oblong reticulation but sometimes subsmooth. Fl. and fr. Jun–Oct.

Dry sandy places along roads, coastal rocky places, gravelly places along rivers, sandy seashores; near sea level to 400 m. Fujian, Guangdong, Guangxi, Hainan, Nansha Qundao, Taiwan, Zhejiang [India, Indonesia, Japan, Laos, Malaysia, Sri Lanka, Thailand, Vietnam; Africa, Australia].

- 1a. Nutlet 3-sided; stigmas 3; anthelae headlike with a few short rays; spikelets many congested together ..... 11a. var. *cymosa*

- 1b. Nutlet biconvex or rarely 3-sided; stigmas 2(or 3); antherae open with several elongated rays; spikelets solitary or a few fascicled ..... 11b. var. *spathacea*

**11a. *Fimbristylis cymosa* var. *cymosa***

黑果飘拂草(原变种) *hei guo piao fu cao* (yuan bian zhong)

Culms flatly and obtusely 3-angled, thick at base. Leaves extremely rigid, 1.5–4 mm wide. Antherae congested to a head with a few short rays. Spikelets clustered. Stigmas 3. Nutlet broadly obovoid, 3-sided. Fl. and fr. Jun–Sep.  $2n = 10$ .

Dry sandy places along roads, coastal rocky places; near sea level. Nansha Qundao, Taiwan [Indonesia, Japan; Australia].

**11b. *Fimbristylis cymosa* var. *spathacea* (Roth) T. Koyama, J. Jap. Bot. 46(3): 66. 1971.**

佛焰苞飘拂草 *fo yan bao piao fu cao*

*Fimbristylis spathacea* Roth, Nov. Pl. Sp. 24. 1821; *F. formosensis* C. B. Clarke; *F. kankaoensis* Hayata; *F. wightiana* Nees.

Culms obtusely 3-angled, not thick at base. Leaves rigid, 1–3 mm wide. Antherae open with several elongated rays. Spikelet solitary or 2 or 3 clustered. Stigmas 2(or 3). Nutlet obovoid to broadly obovoid, biconvex or rarely 3-sided. Fl. and fr. Jul–Oct.  $2n = 32$ .

Gravelly places along rivers, sandy seashores; near sea level to 400 m. Fujian, Guangdong, Guangxi, Hainan, Nansha Qundao, Taiwan, Zhejiang [India, Japan, Laos, Malaysia, Sri Lanka, Thailand, Vietnam; Africa].

**12. *Fimbristylis sericea* R. Brown, Prodr. 228. 1810.**

绢毛飘拂草 *juan mao piao fu cao*

*Fimbristylis decora* Nees & Meyen.

Perennials. Rhizomes obliquely to horizontally elongated, branched, covered with often blackish brown fibers from old leaf sheaths. Culms widely spaced, 15–30 cm tall, obtusely 3-angled, with white silky hairs, bearing leaves at base. Leaf sheath adaxially membranous and rust-colored, mouth obliquely split; ligule absent; leaf blade 1.5–3.2 mm wide, curved, flat, both surfaces with dense white silky hairs, apex acute. Involucral bracts 2 or 3, leaflike, shorter than inflorescence, both surfaces with white silky hairs. Inflorescence a simple anthera; rays 2–4, 0.7–2.5 mm, sometimes extremely short, compressed, with white silky hairs. Spikelets 3–15 in capitate heads, oblong-ovoid to oblong, 6–10 × 2–3.5 mm, apex acute. Glumes ovate, ca. 3 mm, both surfaces with reddish purplish lines, midvein white pilose, margin broad and white, apex obtuse with a hard mucro. Stamens 3; anthers narrowly oblong, ca. 3 mm. Ovary oblong, biconvex; style slightly compressed, basally slightly inflated and hairy, apically slightly pubescent; stigmas 2, slightly shorter than style. Nutlet yellowish white to brown when young but blackish purple when mature, ellipsoid-obovoid to obovoid, ca. 1.5 mm, biconvex. Fl. and fr. Aug–Oct.

Sandy places, sand dunes along seashores; near sea level to 400 m. Fujian, Guangdong, S Guangxi, Hainan, Jiangsu, Taiwan, Zhejiang

[India, Indonesia, Japan, Korea, Malaysia, Thailand, Vietnam; Africa, Australia].

**13. *Fimbristylis insignis* Thwaites, Enum. Pl. Zeyl. 349. 1864.**

硬穗飘拂草 *ying sui piao fu cao*

Perennials. Rhizomes short. Culms 20–40 cm tall, ± stiff, cylindrical but sometimes slightly compressed on apical part, deeply striate, smooth, glabrous, basal sheaths bladed. Leaves 1/3–1/2 as long as culm; sheath less than 5 cm, leathery; ligule absent; leaf blade 1–2.5 mm wide, flat, subleathery, margin finely serrulate, apex acute to slightly obtuse. Involucral bracts 2 or 3, erect, leaflike, shorter than inflorescence, base slightly dilated. Inflorescence a simple or compound anthera, with 3–5 rays and 10 or more spikelets; rays flatly cylindrical, 2–4 cm, slightly rigid. Spikelets solitary, narrowly oblong-ovoid, 10–20 × ca. 4 mm, subterete, with basal 2 or 3 glumes empty, apex acute. Glumes densely spirally imbricate, oblong, ca. 6 mm, midvein distinct and forming an abaxial keel, apex mucronate. Stamens 3; anthers linear-oblong, ca. 2 mm. Style 4–5 mm, 3-sided, basally inflated, apically ciliate; stigmas 3. Nutlet grayish black when mature, broadly obcordate, ca. 1.5 mm, 3-sided, verruculose with hexagonal reticulation. Fl. and fr. Jun.

Dry slopes, poor soil. Guangdong, Hainan [Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

**14. *Fimbristylis leptoclada* Benth, Fl. Hongk. 393. 1861.**

细茎飘拂草 *xi jing piao fu cao*

Perennials, rhizomatous. Culms tufted, 15–60 cm tall, 0.2–1.5 mm thick, 3-angled, smooth to scabrid. Leaves basal, few; sheath pale hyaline to light brown, 1.5–4 cm, apex oblique; ligule absent; leaf blade filiform, 10–30 cm × 0.3–0.5 mm, margin ± incurved, apex obtuse. Involucral bracts 1–3, glumelike or setaceous, basalmost 0.5–2 cm. Inflorescence a simple anthera or capitate, 5–20 × 5–8 mm; rays (when present) to 2 cm. Spikelets 3–12 per inflorescence, in clusters of 2–8, ellipsoid, 2.2–3.5 × 1.5–2 mm. Glumes 10–15 per spikelet, spirally imbricate, brown, broadly ovate, 1–1.5 × 0.7–1.3 mm, densely gland-dotted, apically fimbriate ciliate, 3-veined forming an abaxial obtusely angled pale brown keel, margin membranous with a pale hyaline edge, apex rounded-truncate to shallowly emarginate and mucronulate. Stamens 1 or 2; anthers ca. 0.5 mm. Stigmas 3. Nutlet cream-colored, obovoid, 0.7–0.9 × 0.5–0.7 mm, 3-sided, verruculose. Fl. and fr. Jul–Oct.

Dry sandy places, grasslands along roads; near sea level. Fujian, Guangdong [Indonesia, Japan (Ryukyu Islands), Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

**15. *Fimbristylis psammocola* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 227. 1961.**

砂生飘拂草 *sha sheng piao fu cao*

Perennials. Rhizomes short, woody. Culms solitary, 5–16 cm tall, obtusely 3-angled to subterete, striate, basally leaved, base covered with blackish brown often fibrous old leaf sheaths. Leaves slightly shorter than to equaling culm; sheath adaxially membranous and brown, mouth obliquely split; ligule absent; leaf blade 1–2.5 mm wide, stiff, slightly scabrid, margin slightly

involute, apex acute. Involucral bracts 2–4, subulate, shorter to slightly longer than inflorescence. Inflorescence a simple or compound anthela, 2–4 × 1.2–2.5 cm, with 1–14 spikelets; rays 3–5, subcylindric, 0.6–2.5 mm. Spikelets solitary, narrowly ellipsoid, 6–10 × 2.5–4 mm, densely many flowered, apex acute. Glumes grayish green, triangular-ovate, 4–5 mm, abaxially slightly pubescent at middle, 3-veined forming an abaxial keel and excurrent into a hard mucro, midvein green, lateral veins brown, margin broadly hyaline, apex acute. Stamens 3; anthers linear, ca. 2.5 mm, ca. 1/2 as long as filaments, apex acute. Style ca. 2 mm, compressed, not ciliate, basally slightly inflated; stigmas ± as long as style. Nutlet not seen. Fl. May.

• Sandy places along rivers; 500–600 m. S Yunnan (Xishuangbanna).

**16. *Fimbristylis littoralis*** Gaudichaud, Voy. Uranie 10: 413. 1829.

水虱草 shui shi cao

Annuals or short-lived perennials. Rhizomes absent. Culms tufted, (1.5–)10–60 cm tall, flatly 4-angled, striate, bearing 1–3 bladeless sheaths at base. Basal leaf sheaths (1.5–)3.5–9 cm, sometimes setaceous, compressed bilaterally, attenuate apically, mouth obliquely split. Leaves shorter to longer than culm; sheath bilaterally compressed, abaxially with a membranous and rust-colored margin, adaxially keeled, mouth obliquely split; ligule absent; leaf blade ensiform, (1–)1.5–2 mm wide, bilaterally compressed, margin sparsely and finely serrulate, apically attenuate into a setaceous tip. Involucral bracts 2–4, setaceous, base dilated, margin rust-colored and membranous. Inflorescence a compound, decompound, or rarely simple anthela, subdense, with many spikelets; rays 3–6, 0.8–5 cm, slender, scabrid. Spikelets solitary, globose to subglobose, 1.5–5 × 1.5–3 mm, apex rounded. Glumes chestnut-brown or dark brown, ovate, 1–1.3 or 3.5–6 mm, membranous, 3-veined forming an abaxial keel, midvein green, lateral veins brown, apex obtuse. Stamens 2; anthers oblong, ca. 0.7 mm, ca. 1/2 as long as filaments, apex obtuse. Style 3-sided, not ciliate, basally slightly inflated; stigmas 3, ca. 1/2 as long as style. Nutlet straw-yellow, obovoid to broadly obovoid, ca. 1 mm, obtusely 3-sided, verruculose with transversely oblong reticulation. Fl. and fr. May–Oct.

Field margins, open slopes, muddy places near water, grasslands, paddy fields, paddy field margins; 100–2000 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, SE Qinghai, S Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Vietnam; Africa, SW Asia, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific islands].

1a. Glumes chestnut-brown, 1–1.3 mm ..... 16a. var. *littoralis*

1b. Glumes dark brown, 3.5–6 mm ..... 16b. var. *koidzumiana*

**16a. *Fimbristylis littoralis* var. *littoralis***

水虱草(原变种) shui shi cao (yuan bian zhong)

*Fimbristylis miliacea* (Linnaeus) Vahl, nom. rej.; *Scirpus miliaceus* Linnaeus, nom. rej.

Glumes chestnut-brown, 1–1.3 mm. Fl. and fr. May–Oct.

Field margins, open slopes, muddy places near water, grasslands, paddy field margins; 100–2000 m. Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, SE Qinghai, S Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Vietnam; Africa, SW Asia, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific islands].

**16b. *Fimbristylis littoralis* var. *koidzumiana*** (Ohwi) T. Koyama, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 8: 108. 1961.

小泉氏飘拂草 xiao quan shi piao fu cao

*Fimbristylis koidzumiana* Ohwi, Acta Phytotax. Geobot. 1: 78. 1932; *F. miliacea* subsp. *koidzumiana* (Ohwi) T. Koyama.

Culms apically scabrous. Glumes dark brown, 3.5–6 mm.

Paddy fields. Taiwan [Japan, Vietnam; Pacific islands].

**17. *Fimbristylis aphylla*** Steudel, Syn. Pl. Glumac. 2: 114. 1855.

无叶飘拂草 wu ye piao fu cao

*Fimbristylis aphylla* var. *gracilis* Tang & F. T. Wang; *F. globulosa* (Retzius) Kunth var. *aphylla* (Steudel) Miquel.

Perennials. Rhizomes short, woody. Culms densely tufted, 30–100 cm tall, slender, 5-angled, smooth, bearing a few bladeless sheaths at base. Basal leaf sheaths cylindrical, margin brown and membranous, apically attenuate, mouth obliquely truncate. Leaves on vegetative shoots often with only blades; leaf blade linear, margins involute. Involucral bracts 3–5, needlelike, 0.6–2.5 cm, much shorter than inflorescence, margin scabrid. Inflorescence a decompound anthela, spreading; rays 5–8, to 7 cm, slender. Spikelets solitary, oblong to ellipsoid, 2.5–7 × 1.2–3 mm. Glumes densely spirally imbricate, rust-colored to yellowish brown, broadly ovate to subelliptic, ca. 2.5 mm, membranous, prominently 3-veined forming an abaxial keel, veins yellow to greenish yellow and often dark brown between lateral veins, margin paler, apex obtuse to rounded and apiculate. Stamens 3; anthers linear. Style short and flat, not ciliate, basally slightly inflated; stigmas 3, longer than style, densely ciliate. Nutlet pale brown, shortly stipitate, obovoid, 0.6–0.8 mm, 3-sided, transversely wavy verruculose. Fl. Jul, fr. Dec.

Swamps, wet places along streams or in valleys; 400–2400 m. Yunnan [India, Indonesia, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa].

**18. *Fimbristylis salbundia*** (Nees) Kunth, Enum. Pl. 2: 230. 1837.

芒苞飘拂草 mang bao piao fu cao

*Trichelostylis salbundia* Nees in Wight, Contr. Bot. India, 105. 1834; *Fimbristylis haspaniformis* T. Koyama.

Perennials, rhizomatous. Culms crowded along rhizome, 30–80 cm tall, 1–3 mm thick, acutely 4- or 5-angled, smooth. Leaves bladeless; sheath dusky or cinnamon brown, 1–17 cm, apex lanceolate; ligule absent. Involucral bracts 2–5, setaceous with lanceolate base, longest to 1.5 cm. Inflorescence a com-

pound or decompound anthela, 2–6 × 2–6 cm, open; primary rays 6–8, to 5 cm. Spikelets ovoid to ovoid-ellipsoid, 3–5 × ca. 2 mm. Glumes many, spirally imbricate, light brown, ovate, 2–2.3 × ca. 1.5 mm, membranous, margin hyaline, 1-veined forming an abaxial pale brown obtuse keel, apex obtuse. Stamens (2 or)3; anthers 0.7–1 mm. Stigmas 3. Nutlet whitish to yellowish brown, broadly obovoid, 0.8–1 × 0.6–0.8 mm, 3-sided, smooth to sparsely verruculose, with 9–14 longitudinal rows of epidermal cells on each side. Fl. and fr. Sep.

Swampy places; 1700–1800 m. Yunnan [India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, N Thailand, Vietnam].

**19. *Fimbristylis quinquangularis*** (Vahl) Kunth, Enum. Pl. 2: 229. 1837.

五棱秆飘拂草 wu leng gan piao fu cao

*Scirpus quinquangularis* Vahl, Enum. Pl. 2: 279. 1805; *Fimbristylis fauriei* Ohwi; *F. quinquangularis* var. *bistaminifera* Tang & F. T. Wang; *F. quinquangularis* var. *elata* Tang & F. T. Wang.

Annuals or short-lived perennials. Rhizomes absent or very short. Culms tufted, 14–120 cm tall, 5-angled, bearing 0–3 bladeless sheaths. Basal leaf sheaths 3–17 cm, cylindrical, mouth oblique. Leaves on vegetative shoots with only blades, shorter than to subequaling culm; leaf blade 2–3 mm wide, flat. Involucral bracts 4, setaceous, much shorter than inflorescence, margin finely serrulate. Inflorescence a decompound anthela, 5–9 × 3–6 cm; rays 4, 1–4 cm, scabrid. Spikelets solitary, ovoid, 2–5 × 1.2–1.5 mm, apex acute to subobtusely. Glumes chestnut-brown, ovate, ca. 2 mm, 3-veined forming an abaxial keel, lateral 2 veins dark brown, margin paler, apex obtuse and apiculate. Stamens 1 or 2; anthers oblong, ca. 0.5 mm, ca. 1/3 as long as filament. Style 3-sided, basally slightly inflated, apically slightly pubescent; stigmas 3, slightly longer than style. Nutlet obovoid, 0.8 mm or longer, 3-sided, verruculose and with transverse linear reticulation. Fl. and fr. Aug–Oct.  $2n = 10$ .

Swamps; 800–2100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Afghanistan, India, Indonesia, Kazakhstan, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Indian Ocean islands, Madagascar].

**20. *Fimbristylis chingmaiensis*** S. M. Huang, Fl. Hainan. 4: 536. 1977.

澄迈飘拂草 cheng mai piao fu cao

Annuals. Rhizomes absent. Culms tufted, 30–60 cm tall, 1–1.2 mm thick, slender, 5-angled, smooth, glabrous, bearing 1–3 bladeless sheaths at base. Leaves basal, shorter than culm; sheath pale brown, to 13 cm, margins membranous; ligule shortly ciliate; leaf blade linear, ca. 2 mm wide, midvein distinct, margins involute, apex acute. Involucral bracts 5–7, leaf-like, ca. 3 cm, apex acuminate. Inflorescence a compound anthela, 3–5 cm; rays 5–7, to 3.5 cm, slender, unequal, 5-angled. Spikelets solitary, ovoid to oblong-ovoid, 2–2.5 × 1–1.2 mm, 7–9-flowered, apex acute. Glumes 7–11, spirally imbricate, overall pale chestnut-brown, ovate to broadly ovate, ca. 1.5 × 1–1.2 mm, membranous, abaxially keeled, midvein distinct and yellowish green, each side of midvein dark brown, margin apically hyaline, apex acute or mucronate. Stamens 3; anthers oblong, ca. 0.5 mm. Style 3-sided, not ciliate, basally inflated; stigmas 3. Nutlet white or pale brown, shortly stipitate, broadly obovoid, ca. 0.8 mm, obtusely 3-sided, with indistinct transverse oblong reticulation. Fl. autumn.

lowish green, each side of midvein dark brown, margin apically hyaline, apex acute or mucronate. Stamens 3; anthers oblong, ca. 0.5 mm. Style 3-sided, not ciliate, basally inflated; stigmas 3. Nutlet white or pale brown, shortly stipitate, broadly obovoid, ca. 0.8 mm, obtusely 3-sided, with indistinct transverse oblong reticulation. Fl. autumn.

• Deserted paddy fields. Fujian, Hainan (Chengmai).

**21. *Fimbristylis diphyloides*** Makino in Makino & Nemoto, Fl. Jap. 1389. 1925.

拟二叶飘拂草 ni er ye piao fu cao

Annuals or short-lived perennials. Rhizomes absent or very short. Culms tufted, 15–50 cm tall, thin, flatly 4-angled, striate, bearing 1 or 2 bladeless sheaths at base. Basal leaf sheaths 2.5–6.5 cm, cylindrical, covered with fibers from old sheaths, mouth obliquely truncate, apex acute. Leaves shorter than to subequaling culm; sheath adaxially membranous and rust-colored, mouth obliquely split; ligule absent; leaf blade 1.2–2.2 mm wide, flat, margin finely toothed, apex acute. Involucral bracts 4–6, setaceous, much shorter than inflorescence, base dilated, margin finely serrulate. Inflorescence a simple or subcompound anthela, 1.5–6 × 2–6 cm; rays 4–8, 0.6–4 cm, scabrid. Spikelets solitary, obovoid to oblong-obovoid, 2.5–7.5 × 1.5–2.5(–3) mm, densely many flowered, apex obtuse to subacute. Glumes reddish brown or straw-yellow, broadly ovate or oblong-ovate, ca. 2 mm or slightly longer, membranous, 3-veined forming a slight abaxial keel, veins green, margin hyaline, apex extremely obtuse. Stamens 2; anthers oblong, ca. 0.8 mm, ca. 1/2 as long as filaments, apex obtuse. Style not ciliate, basally slightly inflated; stigmas 2 or 3, subequaling to slightly longer than style. Nutlet brown, broadly obovoid, ca. 1 mm, 3-sided or biconvex, with sparsely verruculose and with transversely oblong reticulation. Fl. and fr. Jun–Sep.

Paddy fields, streamsides, wet places in valleys, ponds; 100–2100 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Zhejiang [Japan, Korea].

1a. Glumes brown to reddish brown, broadly ovate, ca. 2 mm ..... 21a. var. *diphyloides*

1b. Glumes straw-yellow, oblong-ovate, longer than 2 mm ..... 21b. var. *straminea*

**21a. *Fimbristylis diphyloides* var. *diphyloides***

拟二叶飘拂草(原变种) ni er ye piao fu cao (yuan bian zhong)

*Fimbristylis brevicollis* Kükenthal.

Glumes brown to reddish brown, broadly ovate, ca. 2 mm. Fl. and fr. Jun–Sep.

Paddy fields, streamsides, wet places in valleys, ponds; 100–2100 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, S Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Zhejiang [Japan, Korea].

**21b. *Fimbristylis diphyloides* var. *straminea*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 227. 1961.

黄鳞二叶飘拂草 huang lin er ye piao fu cao

Glumes straw-yellow, oblong-ovate, longer than 2 mm. Fl. and fr. Sep.

- Jiangxi (Lushan).

One of us (Simpson) questions whether these varieties should be recognized.

**22. *Fimbristylis umbellaris* (Lamarck) Vahl, Enum. Pl. 2: 291. 1805.**

伞形飘拂草 san xing piao fu cao

*Scirpus umbellaris* Lamarck, Tabl. Encycl. 1: 141. 1791; *Fimbristylis globulosa* (Retzius) Kunth; *F. globulosa* var. *austrojaponica* Ohwi; *F. globulosa* var. *torresiana* (Gaudichaud) C. B. Clarke; *F. torresiana* Gaudichaud; *Scirpus globulosus* Retzius.

Perennials. Rhizomes short, horizontal, covered with brownish scales. Culms densely tufted, 17–90 cm tall, 1–5 mm thick, obtusely 3-angled, smooth or striate, glabrous, with 2 or 3 bladeless sheaths at base. Leaves of vegetative shoot usually shortly bladed; sheaths cylindric, 2–19 cm, mouth obliquely truncate; ligule reduced to a circle of hairs or absent; blade linear, 7–25 cm × 1–2 mm. Involucral bracts 2 or 3, narrowly lanceolate to lanceolate, longest 5–11 mm, margin scabrid. Inflorescence a simple or compound anthela, 1.5–10 × 1.3–7 cm; primary rays 2–10, 0.7–5 cm, unequal. Spikelets 3–40 per inflorescence, solitary, ovoid, broadly ovoid, broadly ellipsoid, or globose-ellipsoid, 3–8 × 3–4 mm, terete, densely many flowered, apex obtuse. Glumes numerous, spirally imbricate, yellowish rust-colored, or brown, ovate to ovate-elliptic, 1.8–2.7 × 1–1.5 mm, membranous, 3-veined but abaxially scarcely keeled, apex obtuse to mucronate. Stamens 2 or 3; anthers ca. 0.5 mm. Style 3-sided or 3-cleft, glabrous, basally dilated; stigmas (2 or)3. Nutlet yellowish, shortly stipitate or sessile, obovoid to obovoid-globose, 0.8–1 × 0.5–0.7 mm, 3-sided to sometimes slightly compressed, obscurely cancellate with transversely oblong cells or rarely sparsely verruculose. Fl. and fr. Aug–Oct.  $2n = 6$ .

Marshy places, paddy fields, wet grasslands; 100–800 m. Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan [India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands].

**23. *Fimbristylis dichotoma* (Linnaeus) Vahl, Enum. Pl. 2: 287. 1805.**

两歧飘拂草 liang qi piao fu cao

Annuals or short-lived perennials. Culms tufted, 5–50(–100) cm tall, glabrous or sparsely pubescent. Leaves slightly shorter to longer than culm; sheaths leathery, margin pale brown, broad, and membranous, apex subtruncate; leaf blade linear to setaceous, pubescent or glabrescent, apex acute to obtuse. Involucral bracts 3 or 4, leaflike, usually 1 or 2 longer than inflorescence, glabrous or hairy. Inflorescence a compound or rarely simple anthela, 5–9 × 3–6 cm, lax or compact. Spikelets solitary, ovoid, ellipsoid, or oblong, 4.5–14 × ca. 2.5 mm, many flowered. Glumes brown, ovate, oblong-ovate, or oblong, 2.2–4.2 mm for fertile ones, shiny, 3–5-veined, midvein excurrent into a mucro. Stamens 1 or 2; filament short. Style longer than stamen, compressed, apically ciliate; stigmas 2. Nutlet with brown stipe, obovoid to broadly so, globose, or ± obdel-

toid, 0.6–1.3 mm, biconvex, with 7–9 obvious vertical ribs, reticulation nearly transversely oblong. Fl. and fr. Jul–Oct.

Paddy fields, open grasslands, shallow water in marshes, farmlands, open wastelands; near sea level to 2100 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xisha Qundao, SE Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Korea, Kyrgyzstan, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific islands].

*Fimbristylis depauperata* R. Brown (*F. dichotoma* f. *depauperata* (R. Brown) Ohwi; *F. dichotoma* subsp. *depauperata* (R. Brown) J. Kern) has been mistakenly treated as a form or subspecies of *F. dichotoma* (Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 90. 1961; J. Kern, Fl. Males. 7: 576. 1974), but it is a distinct species that occurs in N Australia, W Indonesia, and Papua New Guinea.

- 1a. Spikelets 4.5–8.5 mm; fertile glumes 2.2–3 mm; nutlet obovoid to broadly so, 0.6–1.2 mm, with 5–11 vertical rows of transversely oblong epidermal cells, apex rounded to obtuse ..... 23a. subsp. *dichotoma*
- 1b. Spikelets (8–)9–14 mm; fertile glumes 3.8–4.2 mm; nutlet obovoid, globose, or ± obdeltooid, 1.2–1.3 mm, with 15–24 vertical rows of transversely oblong-rectangular epidermal cells, apex obtuse to subtruncate ..... 23b. subsp. *podocarpa*

**23a. *Fimbristylis dichotoma* subsp. *dichotoma***

两歧飘拂草(原亚种) liang qi piao fu cao (yuan ya zhong)

*Scirpus dichotomus* Linnaeus, Sp. Pl. 1. 50. 1753; *Fimbristylis annua* (Allioni) Roemer & Schultes; *F. dichotoma* f. *annua* (Allioni) Ohwi; *F. dichotoma* var. *tikushiensis* (Hayata) T. Koyama; *F. dichotoma* f. *tomentosa* (Vahl) Ohwi; *F. diphylla* (Retzius) Vahl; *F. diphylla* var. *annua* (Allioni) C. B. Clarke; *F. tikushiensis* Hayata; *F. tomentosa* Vahl; *S. annuus* Allioni; *S. diphyllus* Retzius.

Culms (5–)15–50 cm. Leaves slightly shorter to sometimes slightly longer than culm; leaf blade linear, 1–2.5 mm wide. Inflorescence a compound or rarely simple anthela. Spikelets 4.5–8.5 mm. Fertile glumes 2.2–3 mm. Nutlet obovoid to broadly so, 0.6–1.2 mm, with 5–11 vertical rows of transversely oblong epidermal cells, apex rounded to obtuse. Fl. and fr. Jul–Oct.  $2n = 10, 20$ .

Paddy fields, open grasslands, shallow water in marshes; near sea level to 2100 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, E Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xisha Qundao, SE Xizang, Yunnan, Zhejiang [Afghanistan, India, Japan, Korea, Kyrgyzstan, Nepal, Pakistan, Papua New Guinea, Sri Lanka, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific islands].

Within *Fimbristylis dichotoma* subsp. *dichotoma* two varieties could be recognized in China, i.e., *F. dichotoma* var. *dichotoma* and *F.*

*dichotoma* var. *tikushiensis*. The latter can be separated by its mostly single spikelets that are 7.5–8.5 mm in contrast to var. *dichotoma* with spikelets clustered and 5.5–8 mm. In var. *tikushiensis* styles of the fruiting state are elongated exposing them beyond the glume apex, but in var. *dichotoma* styles at the fruiting state are still enclosed by the subtending glume. In typical subsp. *dichotoma* plants tend to be biennials or short-lived perennials often with a very short rhizome, whereas in var. *tikushiensis* plants are typically annual without a rhizome.

In NE China, Korea, and Japan another annual phase of *Fimbristylis dichotoma* subsp. *dichotoma* occurs, in which spikelets are as a rule solitary and stems and leaves tend to be hairy and softer. This annual plant has been named *F. dichotoma* var. *tentsuki* T. Koyama and if recognized as a variety has often been misidentified as *F. annua* (e.g., by Nakai, Bot. Mag. (Tokyo) 36: 20. 1922; Kükenthal, Acta Horti Gothob. 5: 109. 1930) and also misidentified as *F. depauperata* as mentioned above. It is quite possible that this annual plant does not constitute a real taxon but may possibly be a fruiting plant of a first-year seedling of var. *dichotoma*. It appears in the northern part of the geographical area of subsp. *dichotoma*, where it cannot survive through the winter and only occurs as an annual. In southern areas it may become biennial or a short-lived perennial developing a short rhizome and is treated as subsp. *dichotoma* (*F. dichotoma* var. *floribunda* Miquel). For more exhaustive treatment of the nomenclature, as well as misapplication of the various names in Asia, see T. Koyama (J. Jap. Bot 63: 86–95, t. I-III. 1988).

**23b. *Fimbristylis dichotoma* subsp. *podocarpa* (Nees) T. Koyama, Micronesica 1: 87. 1964.**

绒毛飘拂草 rong mao piao fu cao

*Fimbristylis podocarpa* Nees in Wight, Contr. Bot. India, 98. 1834; *F. dichotomoides* Tang & F. T. Wang; *F. diphylla* var. *podocarpa* (Nees) Kükenthal.

Culms 5–100 cm tall, often densely pubescent. Leaves shorter than culm; leaf blade narrowly linear, 0.5–2 mm wide, both surfaces often pilose. Spikelets (0.8–)0.9–1.4 cm. Fertile glumes 3.8–4.2 mm. Nutlet obovoid, globose, or ± obdeltoid, 1.2–1.3 mm, cancellate with 15–24 vertical rows of transversely oblong-rectangular epidermal cells, apex obtuse to subtruncate. Fl. and fr. Jul.  $2n = 30$ .

Farmlands, shallow water, open wastelands, grasslands on slopes; 100–2100 m. Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, Yunnan [Bhutan, India, Indonesia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and Australia, Pacific islands].

**24. *Fimbristylis shimadana* Ohwi, Acta Phytotax. Geobot. 5: 184. 1936.**

白穗飘拂草 bai sui piao fu cao

Annuals or short-lived perennials, without a conspicuous rhizome. Culms tufted, 20–40 cm tall, angular, smooth but basally scabrid. Leaves equaling to slightly shorter than culm; sheath 2–5 cm, ventral side dark straw-colored and membranous, mouth obliquely truncate; ligule a fringe of short hairs; leaf blade linear, ± flat but margin slightly incurved, herbaceous, smooth except for scabrid apical margins, glabrous to sparsely pilose. Involucral bracts 3 or 4, basalmost leaflike and ± as long as inflorescence. Inflorescence a simple or compound anthela, 3–4 × 2.5–3 cm, lax; primary rays 1–3, 2–4 cm, flattened. Spikelets many per inflorescence, light rust-colored,

ovoid to oblong-ovoid, 5–10 × 2.2–2.5 mm, terete, slightly shiny, densely many flowered, apex acute. Glumes many per spikelet, pale and tinged rust-colored, broadly ovate, ca. 2 mm, membranous, 3-veined with lateral pair not reaching apex, apex obtuse. Anthers ca. 0.3 mm. Style flat, basally slightly dilated, apical margin ciliate; stigmas 2. Nutlet brownish, shortly stipitate, broadly ovoid, ca. 1 mm, biconvex, sparsely verruculose and finely cancellate with several rows of transversely oblong cells. Fl. and fr. Mar–Nov.

• Grassy vegetation at margin of evergreen broad-leaved forests, wet areas; below 100–200 m. Taiwan.

**25. *Fimbristylis longispica* Steudel, Syn. Pl. Glumac. 2: 118. 1855.**

长穗飘拂草 chang sui piao fu cao

*Fimbristylis didrichsenii* Boeckeler.

Perennials. Rhizomes short. Culms tufted, 25–60 cm tall. Leaves shorter than culm; leaf blade 1.5–2.5 mm wide, nearly glabrous, margins often involute, apex obtuse. Involucral bracts 2 or 3, leaflike, basalmost usually longer than inflorescence, apex obtuse. Inflorescence a compound, decompound, or simple anthela; rays 3–6. Spikelets solitary, narrowly oblong, oblong, oblong-ovoid, or ovoid, 0.6–2 cm, apex acute to obtuse. Glumes broadly ovate and boat-shaped, ca. 3 mm, glabrous, with 3–5 brown to pale brown veins, apex mucronate. Stamens 3. Style slightly longer than nutlet, basally slightly broader, apically ciliate; stigmas 2. Nutlet pale brown to brown, sessile, globose-obovoid, 1.2–1.5 mm, biconvex, with hexagonal reticulation. Fl. and fr. Aug–Sep.

Wet places on seashores, base of hills; near sea level to 600 m. Fujian, Guangdong, Guangxi, Jiangsu, Liaoning, Shaanxi, Shandong, Yunnan, Zhejiang [Japan, Korea, Myanmar].

**26. *Fimbristylis rigidula* Nees in Wight, Contr. Bot. India, 99. 1834.**

结壮飘拂草 jie zhuang piao fu cao

Perennials. Rhizomes short, thick, woody, diageotropic. Culms sparsely tufted, 15–50 cm tall, flatly cylindrical, striate, thicker at base, often covered with old sheaths. Leaves shorter than culm; leaf blade grayish green, 2–3 mm wide, flat, both surfaces sparsely pubescent. Involucral bracts 3–5, leaflike, shorter than or rarely equaling inflorescence. Inflorescence a compound or rarely simple anthela; rays 3–6, longest to 3 cm, unequal. Spikelets solitary, ovoid to ellipsoid, 5–10 × 3–4 mm, many flowered, apex acute to obtuse. Glumes densely arranged, reddish brown, ovate to broadly ovate, ca. 4 mm, adaxially with several veins, apex obtuse and mucronate; basal 2 glumes empty, smaller than fertile glumes and with a slightly longer mucro. Stamens 3; anthers linear, ca. 1.5 mm. Style long and compressed, basally slightly broader, apically ciliate; stigmas 2. Nutlet broadly obovoid to subellipsoid, 1.2–1.5 mm, with fine hexagonal reticulation. Fl. and fr. Apr–Jun.

Slopes, roadsides, grasslands, forests; 300–2600 m. Anhui, N Guangdong, Guangxi, S Guizhou, Henan, Hubei, Hunan, S Jiangsu, N Jiangxi, S Sichuan, Yunnan, Zhejiang [Bangladesh, N India, Kashmir, Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam].

**27. *Fimbristylis subinclinata*** T. Koyama, Bot. Mag. (Tokyo) 80: 353. 1967.

知本飘拂草 zhi ben piao fu cao

Perennials. Rhizomes short, sometimes subglobose. Culms tufted. Leaves clustered at base of culm; sheath brownish, mouth ciliate; ligule a fringe of short hairs; leaf blade linear, 5–15 cm × 1–2.5 mm, glaucous, apex mucronate. Involucral bracts 1 or 2, basalmost 1.5–4 cm, much shorter than inflorescence. Inflorescence a compound anthela, 3–7 cm, inclined to nodding, with 4–23 spikelets; primary rays 3–6, 1.5–5 cm. Spikelets yellowish brown, ovoid to ovoid-ellipsoid, 8–12 × 3–4 mm, terete. Glumes yellowish brown and brown striate, ovate to broadly elliptic, 2–3.2 × 1.7–2 mm, thinly papery, 1-veined or obscurely 3-veined, margin hyaline, apex acute and mucronate. Anthers ca. 1.3 mm. Style liguliform, flat, apical margin densely fimbriate; stigmas 2. Nutlet brownish when mature, globose-obovoid, ca. 3 × 3 mm, biconvex, slightly cancellate with ca. 20 rows of transversely oblong-hexagonal epidermal cells, apex rounded to subtruncate. Fl. and fr. Aug–Oct.

• Dry sandy grasslands along rivers; near sea level. E Taiwan.

**28. *Fimbristylis stolonifera*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 637. 1893.

匍匐茎飘拂草 pu fu jing piao fu cao

Perennials, stoloniferous. Culms 30–70 cm tall. Leaves ca. 1/3 as long as culm; leaf blade linear, 1.5–2 mm wide, flat, both surfaces hairy, midvein abaxially prominent, apex acute. Involucral bracts 2 or 3, leaflike, usually shorter than or rarely equaling inflorescence, apex acute. Inflorescence a simple or subcompound anthela; rays 3–6. Spikelets solitary, ovoid to oblong-ovoid, 7–13 × 3–4 mm, with basal 1 or 2 glumes empty. Fertile glumes chestnut-brown, oblong-ovate, 3–4 mm, shiny, abaxially with 5–7 veins, midvein excurrent into a mucro. Stamens 3. Style compressed, ciliate, basally slightly inflated; stigmas 3. Nutlet white or pale brown, obovoid, ca. 1.3 mm, biconvex, with transversely oblong reticulation, inconspicuous vertical ribs, and sometimes verruculose. Fl. and fr. Aug–Sep.

Ditch sides on slopes; ca. 1000 m. Chongqing, Guangdong, Guangxi, Guizhou, Hebei, Yunnan, Zhejiang [Bhutan, N India, Nepal].

**29. *Fimbristylis sieboldii*** Miquel ex Franchet & Savatier, Enum. Pl. Jap. 2: 118. 1877 [*"sieboldii"*].

锈鳞飘拂草 xiu lin piao fu cao

Perennials. Rhizomes short or well developed and horizontally creeping, woody. Culms grayish green, tufted, 10–65 cm tall, slender, flatly 3-angled, smooth, base thicker, with few leaves. Basal leaves with sheaths only and grayish brown. Leaves apically on culm with a blade, 1/3 or less as long as culm; leaf blade often linear, ca. 1 mm wide, folded. Involucral bracts 2 or 3, shorter to slightly longer than inflorescence, suberect, base slightly broader. Inflorescence a simple or rarely subcompound anthela; rays less than 10 mm. Spikelets solitary, oblong-ovoid, oblong, or narrowly oblong-ovoid, 10–17 × 3–4 mm, terete, densely many flowered, apex acute to rarely obtuse. Glumes grayish brown with dark brown lines at middle, ovate to elliptic, 3–4 mm, submembranous, apically with grayish

white hairs, abaxially prominently keeled, margin ciliate, apex obtuse and apiculate. Stamens 3; anthers linear. Style long and flat, basally broader; stigmas 2. Nutlet brown to blackish brown when mature, shortly stipitate, obovoid to broadly obovoid, 1.2–1.5 mm, flatly biconvex, subsmooth. Fl. and fr. Jun–Aug.

Seashores and sunny wet places at seashores, salty marshes; near sea level. Anhui, Fujian, Guangdong, Hainan, Jiangsu, Shandong, Taiwan, Xisha Qundao, Zhejiang [Japan, Korea].

*Fimbristylis sieboldii* has often been misidentified as *F. ferruginea* (Linnaeus) Vahl (e.g., D. A. Simpson & T. Koyama, Fl. Thailand 6(4): 317. 1998) or treated as a variety of *F. ferruginea* (e.g., Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 93. 1961). *Fimbristylis ferruginea*, originally described from Jamaica, differs from *F. sieboldii* by having ovoid spikelets, broader nutlets, and distribution in the tropics.

- 1a. Leaves with a blade ..... 29a. var. *sieboldii*  
1b. Leaves mostly reduced to a bladeless sheath ..... 29b. var. *anpinensis*

**29a. *Fimbristylis sieboldii* var. *sieboldii***

锈鳞飘拂草(原变种) xiu lin piao fu cao (yuan bian zhong)

*Fimbristylis aginkotensis* Hayata; *F. ferruginea* (Linnaeus) Vahl var. *sieboldii* (Miquel ex Franchet & Savatier) Ohwi.

Rhizomes short. Culms 20–65 cm tall, thin, stiff. Leaves with a blade. Fl. and fr. Jun–Aug.

Seashores, salty marshes; near sea level. Anhui, Fujian, Guangdong, Hainan, Jiangsu, Shandong, Taiwan, Xisha Qundao, Zhejiang [Japan, Korea].

**29b. *Fimbristylis sieboldii* var. *anpinensis*** (Hayata) T. Koyama, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 8: 115. 1961.

安平飘拂草 an ping piao fu cao

*Fimbristylis anpinensis* Hayata, Icon. Pl. Formosan. 6: 108. 1916; *F. ferruginea* var. *anpinensis* (Hayata) H. Y. Liu; *F. sieboldii* subsp. *anpinensis* (Hayata) T. Koyama.

Rhizomes well developed, horizontally creeping. Culms ca. 60 cm tall, 1–1.5 mm thick, densely tufted or closely arranged in a row along a ± horizontal knotty rhizome. Leaves mostly reduced to a bladeless sheath but apicalmost sheaths with a setaceous short blade.

Sunny wet places at seashores; near sea level. Taiwan [Japan (Bonin Islands, Ryukyu Islands)].

**30. *Fimbristylis hookeriana*** Boeckeler, Linnaea 37: 22. 1871.

金色飘拂草 jin se piao fu cao

*Fimbristylis chalarocephala* Ohwi & T. Koyama; *F. fordii* C. B. Clarke.

Annuals or short-lived perennials. Rhizomes absent. Culms tufted, 5–40 cm tall. Leaves slightly shorter than to equaling culm; leaf blade 1–2.5 mm wide, glabrous, midvein abaxially prominent or not, apex acuminate. Involucral bracts 2–5, leaflike, usually longer than inflorescence, ca. 1 mm wide, apex acuminate to acute. Inflorescence a simple or compound anthela. Spikelets digitately clustered or solitary, very narrowly ovoid to linear, 7–17 × ca. 2 mm. Glumes straw-yellow to

greenish yellow, oblong-ovate, 2.5–5 mm, sometimes hairy, abaxially with 3 or more veins, margin hyaline, apex obtuse and mucronate or awned. Stamens usually 2 or 3. Style very long, compressed, basally slightly inflated, apically ciliate; stigmas 2. Nutlet white, very shortly stipitate, obovoid, 1–1.2 mm, biconvex, verruculose with transversely oblong reticulation. Fl. and fr. Aug–Oct.

Among rocks along streams, slopes, grassy areas; ca. 1000 m. Fujian, Guangdong, Hunan, Jiangsu, Jiangxi, Zhejiang [N India, Laos, Philippines, Thailand, Vietnam].

**31. *Fimbristylis schoenoides*** (Retzius) Vahl, Enum. Pl. 2: 286. 1805.

少穗飘拂草 shao sui piao fu cao

*Scirpus schoenoides* Retzius, Observ. Bot. 5: 14. 1788; *Fimbristylis kagiensis* Hayata.

Perennials. Rhizomes very short. Culms tufted, 5–40 cm tall, slender, slightly compressed, smooth, striate, with leaves at base. Leaves shorter than culm; leaf blade 0.5–1 mm wide, glabrous, margins often involute and apical part ciliate. Involucral bracts absent or 1 or 2, linear, to 2.5 cm. Inflorescence a reduced anthela, with only 1 or 2 (or 3) spikelets. Spikelets sessile or stipitate, broadly ovoid, ovoid, or oblong-ovoid, 5–12(–16) × 3–4 mm, many flowered. Glumes densely arranged, yellowish white with short brown lines, broadly ovate, membranous, abaxially with many veins but not keeled, apex rounded and not mucronate or sometimes midvein excurrent into a ca. 3 mm mucro. Stamens 3; anthers linear. Style long, compressed, basally inflated, apical half ciliate; stigmas 2. Nutlet yellowish white, globose-obovoid to subglobose, ca. 1.5 mm (including short stipe), biconvex, with hexagonal reticulation. Fl. Aug–Sep, fr. Oct–Nov.

Wet places along streams, ditches, roads, paddy fields; 300–800 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, S Yunnan, S Zhejiang [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, N Australia].

**32. *Fimbristylis subbispicata*** Nees & Meyen, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1): 75. 1843.

双穗飘拂草 shuang sui piao fu cao

*Fimbristylis crassipes* Palla (1909), not Boeckeler (1858); *F. gynophora* C. B. Clarke.

Annuals. Culms grayish green, tufted, 7–60 cm tall, slender, flatly 3-angled, smooth, striate, with few leaves at base. Leaves shorter than culm; leaf blade ca. 1 mm wide, flat but sometimes involute, slightly stiff, margin apically ciliate. Involucral bracts absent or only 1, linear, 0.7–10 cm, erect, longer than inflorescence. Inflorescences reduced to 1 (or 2) terminal spikelet. Spikelet ovoid, oblong-ovoid, or narrowly oblong-ovoid, 8–30 × 4–8 mm, terete, many flowered. Glumes spirally imbricate, brown with short rust-colored lines, ovate, broadly ovate, or subelliptic, 5–7 mm, membranous, abaxially with many veins, not keeled, apex obtuse and mucronate. Stamens 3; anthers linear, 2–2.5 mm. Style long, compressed, ciliate, basally

slightly inflated; stigmas 2. Nutlet brown, stipitate, globose-obovoid, 1.5–1.7 mm, flatly biconvex, slightly shiny and with hexagonal reticulation. Fl. Jun–Aug, fr. Sep–Oct.  $2n = 10$ .

Slopes, valleys, marshes, streamsides, watersides, seashores, salt marshes; near sea level to 1200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, W Hunan, Jiangsu, Liaoning, Shaanxi, Shandong, Shanxi, Taiwan, Xisha Qundao, Zhejiang [Japan, Korea, Vietnam].

**33. *Fimbristylis tristachya*** R. Brown, Prodr. 266. 1810.

三穗飘拂草 san sui piao fu cao

Perennials. Rhizomes short. Culms densely tufted, 20–90 cm tall, 1–1.5 mm wide, flatly 3-angled, smooth, striate, with few leaves at base. Leaves shorter than culm; leaf blade 1.5–2 mm wide, stiff, involute, margin apically ciliate. Involucral bract 1, leaflike, much shorter than inflorescence, erect, margin ciliate. Inflorescence a simple anthela, with 3–6 spikelets. Spikelets ovoid to oblong-ovoid, 8–22 × 4–6 mm, terete, many flowered. Glumes spirally imbricate, brown with short rust-colored lines, ovate to broadly ovate, 5–6 × 4–4.5 mm, subleathery, with many veins, abaxial midvein slightly keeled, apex obtuse and mucronate. Stamens 3; anthers linear, 2–2.5 mm. Style ca. 3.5 mm, compressed, ciliate, basally slightly inflated; stigmas 2. Nutlet yellowish brown, stipitate, obovoid, ca. 2 mm, flatly biconvex, slightly shiny and with hexagonal reticulation. Fl. and fr. Jun–Oct.

Slopes, valleys, streamsides, fields, salt marine marshes. Guangdong, Hainan [Bangladesh, India, Indonesia, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam; NE Australia, Pacific islands].

**34. *Fimbristylis polytrichoides*** (Retzius) Vahl, Enum. Pl. 2: 248. 1805.

细叶飘拂草 xi ye piao fu cao

*Scirpus polytrichoides* Retzius, Observ. Bot. 4: 11. 1786.

Annuals or short-lived perennials. Rhizomes very short or absent, with many remnant fibers from old leaves. Culms densely tufted, 5–25 cm tall, slender, cylindrical, smooth, striate, with fewer leaves at base. Leaves shorter than culm; sheath yellowish brown, short, glabrous; leaf blade nearly *Juncus*-like, ca. 1 mm in diam., smooth. Involucral bract (0 or) 1, 5–12 mm, needlelike, basally broadened, margin membranous. Inflorescences with a single terminal spikelet, ellipsoid to oblong, 5–8 × 3–3.5 mm, 10- to many flowered, apex obtuse to rounded. Glumes densely spirally imbricate, pale white and translucent with short brown lines at middle, sometimes apically slightly yellowish brown laterally, oblong, ca. 3 mm, membranous, 1-veined, not keeled, apex rounded and without or with only a very short hard mucro. Stamens 3; anthers linear, short. Style long, slightly compressed, basally inflated, apical half ciliate; stigmas 2. Nutlet grayish black, obovoid, ca. 1 mm, biconvex, sparsely verruculose and with transversely oblong reticulation. Fl. and fr. Mar–Sep.  $2n = 10$ .

Wet salty places by sea, paddy fields; near sea level. Fujian, Guangdong, Hainan, Taiwan [Bangladesh, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia, Madagascar].

**35. *Fimbristylis squarrosa*** Vahl, Enum. Pl. 2: 289. 1805.畦畔飘拂草 *qi pan piao fu cao*

Annuals. Culms densely tufted, 6–25 cm tall, slender, compressed, with few leaves at base. Leaves shorter than culm; sheath pale brown, densely pilose; leaf blade less than 1 mm wide, flat, both surfaces pubescent. Involucral bracts 3–7, leaf-like, shorter to slightly longer than inflorescence. Inflorescence a simple, compound, or decompound anthela; rays few to many, to 3 cm. Spikelets solitary, ovoid, narrowly ovoid, or oblong, 3–7 × 1.2–3 mm, many flowered, squarrose or not. Glumes spirally imbricate, yellowish brown, oblong to oblong-ovate, 1.5–2 mm (including awn), membranous, 3-veined forming an abaxial green keel, apex obtuse and awned, awn either long and recurved or short and straight or slightly recurved. Stamen 1; anther oblong, apex apiculate. Style long and compressed, basally inflated with long filiform pendent hairs covering top of nutlet, apically ciliate; stigmas 2. Nutlet yellowish white, shortly stipitate, obovoid, 0.5–1 mm, biconvex, almost smooth or with very indistinct hexagonal reticulation. Fl. Sep.

Watersides, wet places; 100–2200 m. Anhui, Fujian, Guangdong, S Guangxi, NW Guizhou, Hainan, Hebei, Heilongjiang, Henan, Jiangsu, Shandong, Taiwan, SE Xizang, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Laos, Myanmar, Nepal, Philippines, Thailand, Vietnam; Africa, SW Asia, Australia, S Europe, Pacific islands (New Zealand)].

*Fimbristylis squarrosa* was treated as a synonym of *F. aestivalis* by D. A. Simpson and T. Koyama (Fl. Thailand 6(4): 333–334. 1998).

- 1a. Glume midvein often excurrent into a recurved 1–1.8 mm awn, ca. 1/2 as long as glume; spikelets squarrose ..... 35a. var. *squarrosa*  
 1b. Glume midvein ending in a short and straight or slightly recurved awn, ca. 1/5 as long as glume; spikelets not squarrose ..... 35b. var. *esquarrosa*

**35a. *Fimbristylis squarrosa* var. *squarrosa***畦畔飘拂草(原变种) *qi pan piao fu cao (yuan bian zhong)*

Culms 6–20 cm tall. Anthelae simple or compound. Spikelets squarrose, 3–6 × 2–3 mm. Glume midvein often excurrent into a recurved 1–1.8 mm awn, ca. 1/2 as long as glume. Nutlet ca. 1 mm, almost smooth. Fl. Sep.  $2n = 20$ .

Watersides, wet places; 100–2200 m. Anhui, Fujian, Guangdong, S Guangxi, NW Guizhou, Hebei, Heilongjiang, Henan, Jiangsu, Shandong, Taiwan, SE Xizang, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Myanmar, Nepal, Philippines; Africa, SW Asia, Australia, S Europe, Pacific islands].

**35b. *Fimbristylis squarrosa* var. *esquarrosa*** Makino, Bot. Mag. (Tokyo) 17: 47. 1903.短尖飘拂草 *duan jian piao fu cao**Fimbristylis makinoana* Ohwi; *F. velata* R. Brown.

Culms 10–25 cm tall. Anthelae compound or decompound, spreading. Spikelets 3–7 × 1.2–2 mm. Glume midvein ending in a short and straight or slightly recurved awn, ca. 1/5 as long as glume. Nutlet ca. 0.5 mm, almost smooth or with very indistinct hexagonal reticulation. Fl. Sep.

Watersides, wet places. Fujian, Hainan, Hebei, Heilongjiang, Jiangsu, Shandong, Taiwan, Yunnan [Indonesia, Japan, Korea, Laos, Philippines, Thailand, Vietnam; Australia, Pacific islands (New Zealand)].

**36. *Fimbristylis bisumbellata*** (Forsskål) Bubani, Dodecanthea, 30. 1850.复序飘拂草 *fu xu piao fu cao**Scirpus bisumbellatus* Forsskål, Fl. Aegypt.-Arab. 15. 1775.

Annuals. Culms densely tufted, 4–20 cm tall, slender, flatly 3-angled, smooth, with few leaves at base. Leaves shorter than culm; sheath yellowish green with rust-colored flecks, short, white pilose; leaf blade 0.7–1.5 mm wide, flat, margin apically ciliate, abaxially sometimes sparsely hairy. Involucral bracts 2–5, leaflike, suberect, basal 1 or 2 equaling or longer than inflorescence. Inflorescence a compound or decompound anthela, lax; rays 4–10, to 4 cm, slender. Spikelets solitary, oblong-ovoid, ovoid, or oblong, 2–7 × 1–1.8 mm, 10–20-flowered, apex acute. Glumes spirally imbricate, brown, broadly ovate, 1.2–2 mm, membranous, 3-veined forming an abaxial green keel. Stamens 1 or 2; anthers narrowly oblong-ovoid. Style long and compressed, ciliate, basally inflated; stigmas 2. Nutlet yellowish white, very shortly stipitate, broadly obovoid, ca. 0.8 mm, biconvex, with transversely oblong reticulation. Fl. and fr. Jul–Sep(–Nov).  $2n = 10, 16, 20$ .

Along rivers, streams, sandy or marshy places, wet places on slopes; 100–1500 m. Anhui, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Afghanistan, India, Indonesia, Japan, Laos, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Turkmenistan, Vietnam; Africa, SW Asia, Australia, Europe, Indian Ocean islands].

**37. *Fimbristylis aestivalis*** (Retzius) Vahl, Enum. Pl. 2: 288. 1805.夏飘拂草 *xia piao fu cao**Scirpus aestivalis* Retzius, Observ. Bot. 4: 12. 1786.

Annuals. Rhizomes absent. Culms densely tufted, 3–25 cm tall, slender, flatly 3-angled, smooth, with few leaves at base. Leaves shorter than culm; leaf blade filiform, 0.5–1 mm wide, flat, both surfaces sparsely pubescent, margin slightly involute; sheath brown, short, white pilose. Involucral bracts 3–5, filiform, shorter to longer than inflorescence, sparsely hairy. Inflorescence a compound anthela, lax; rays 3–7, to 3 cm, slender. Spikelets solitary, ovoid, oblong-ovoid, or narrowly ovoid, 2.5–6 × 1–1.5 mm, many flowered. Glumes spirally imbricate, reddish brown, ovate to oblong, ca. 1 mm, membranous, 3-veined forming an abaxial green keel, apex mucronate. Stamen 1; anther narrowly ovoid. Style long and compressed, basally inflated, apically ciliate; stigmas 2, short. Nutlet yellow, subsessile, obovoid, ca. 0.6 mm, biconvex, almost smooth or sometimes with very indistinct hexagonal reticulation. Fl. May–Aug.

Grasslands, marshy places, paddy fields; 400–2200 m. Anhui, S Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Heilongjiang, Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, S Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Laos, Nepal, Papua New Guinea, Philippines, Russia (Far East), Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

**38. *Fimbristylis gracilentia*** Hance, J. Bot. 6: 89. 1868.

纤细飘拂草 xian xi piao fu cao

Annuals. Culms tufted, 3–25 cm tall, slender, flatly 3-angled, striate, glabrous, with few leaves at base. Leaves shorter than culm; sheath brown, densely pubescent; leaf blade ca. 1 mm wide, flat, both surfaces sparsely pubescent, margin sometimes slightly involute. Involucral bracts 5 or 6, needlelike, shorter than inflorescence, pubescent. Inflorescence a simple or occasionally compound anthela; rays 5–8, to 5 cm, slender, densely pubescent. Spikelet solitary, oblong, narrowly ovoid, or narrowly linear-ovoid, 4–12 × 1.5–2 mm, with several to 10 or more flowers. Glumes spirally imbricate, pale brown, ovate-lanceolate, ca. 2 mm, membranous, 3-veined forming an abaxial keel, midvein excurrent into a mucro. Stamens 2; anthers dark red, linear-oblong. Style long and compressed, basally inflated, apically ciliate; stigmas 2, short, with papillae. Nutlet brown, shortly stipitate, obovoid, ca. 1 mm, biconvex, almost smooth with indistinct hexagonal reticulation. Fl. Jun–Jul.

Open places. Guangdong [Indonesia (N Sumatra), Thailand, Vietnam].

**39. *Fimbristylis simaoensis*** Y. Y. Qian, Bull. Bot. Res., Harbin 17: 128. 1997.

思茅飘拂草 si mao piao fu cao

Rhizomes short. Culms tufted, 30–60 cm tall, slender, flatly 3-angled, striate, glabrous, with few leaves at base. Leaves shorter than culm; sheath pale yellow, glabrous; leaf blade 1.5–3 mm wide, flat, adaxially sparsely hairy, margin involute. Involucral bracts 3–6, leaflike, longer than inflorescence, margin ciliate. Inflorescence a compound anthela; rays 2–7, 0.5–7 cm, glabrous. Spikelets solitary, ovoid to narrowly ovoid, 4–10 × 2–4 mm, with 6–20 flowers. Glumes spirally imbricate, brown, elliptic, 2.2–2.4 mm, membranous, 3-veined forming an abaxial keel, midvein excurrent into a mucro. Stamen 1; anther yellow, oblong. Style long and compressed, basally inflated, apically ciliate; stigmas 2. Nutlet dark brown, shortly stipitate, broadly obovoid, 1–1.2 mm, biconvex, with hexagonal reticulation. Fl. Aug–Sep.

- Moist grasslands; ca. 1300 m. S Yunnan (Simao Diqu).

**40. *Fimbristylis tetragona*** R. Brown, Prodr. 226. 1810.

四棱飘拂草 si leng piao fu cao

*Fimbristylis cylindrocarpa* Kunth.

Annuals or short-lived perennials. Rhizomes poorly developed. Culms densely tufted, (8–)18–50(–60) cm tall, 4-angled, smooth, with few leaf sheaths at base. Leaves bladeless; sheath margin brown membranous, mouth obliquely truncate. Involucral bracts absent. Inflorescences reduced to a single terminal spikelet, ovoid to ellipsoid, 5–10 × 3–6 mm, many flowered, apex obtuse to rounded. Glumes densely spirally imbricate, pale brownish yellow, oblong, 3.5–5 mm, membranous, many veined, middle 3 veins thicker but abaxially not forming a keel, base sometimes narrower, apex not mucronate. Stamens 3; anthers linear, 1.2–1.5 mm. Style long and compressed, sparsely ciliate, basally gradually broader and nearly as wide as nutlet;

stigmas 2 or 3. Nutlet pale brown, with a ca. 0.7 mm stipe, narrowly oblong, ca. 2.5 mm, biconvex, shiny and with obvious hexagonal reticulation. Fl. and fr. Sep–Oct.

Marshes; below 100–200 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [India, Indonesia, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

**41. *Fimbristylis pauciflora*** R. Brown, Prodr. 225. 1810.

海南飘拂草 hai nan piao fu cao

*Fimbristylis hainanensis* Tang & F. T. Wang.

Perennials. Rhizomes hardly developed. Culms densely tufted, 5–18 cm tall, slender, short, flatly cylindrical, smooth, glabrous, with few leaf sheaths at base. Leaves bladeless; sheath brown, cylindrical, apically attenuate, margin membranous, mouth obliquely truncate. Involucral bracts absent. Inflorescences reduced to a single terminal spikelet, narrowly oblong to clavate-oblong, 3.5–4.5 × 1–1.5 mm, few flowered, with basalmost glume empty. Glumes pale with rust-colored short lines, oblong to oblong-ovate, 3–3.2 mm, 7–9-veined, midvein abaxially green, apex obtuse and not mucronate. Stamens 3; anthers linear. Style long and compressed, sparsely ciliate, basally slightly broader; stigmas 3, with sparse papillae. Nutlet white, obovoid, ca. 0.8 mm, nearly 3-sided, with sparse verruculose and sub-hexagonal reticulation. Fl. and fr. Aug–Sep.

Wet places by ponds; low elevations. Hainan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Thailand, Vietnam; Australia, Pacific islands].

**42. *Fimbristylis nutans*** (Retzius) Vahl, Enum. Pl. 2: 285. 1805.

垂穗飘拂草 chui sui piao fu cao

*Scirpus nutans* Retzius, Observ. Bot. 4: 12. 1786.

Annuals or short-lived perennials. Rhizomes extremely short or absent. Culms densely tufted, 15–85 cm tall, subcylindrical, stiff, striate, smooth, glabrous, with leaf sheaths at base. Leaves bladeless; leaf sheath brown, basal ones glumelike and apical ones cylindrical, margins membranous, apex obliquely truncate. Involucral bract 1, glumelike, ovate, 2–4.5 mm, apex mucronate. Inflorescences reduced to a single terminal spikelet, ovoid, ellipsoid, or oblong-ovoid, 5–15 × 2–5 mm, slightly nodding, 10- to many flowered. Glumes rather densely spirally imbricate, brown with short rust-colored lines, broadly ovate to subelliptic, 3–5 mm, papery, veins many but abaxially faint, apex rounded and mucronate. Stamens 3; anthers linear. Style long and compressed, basally slightly inflated, apically sparsely ciliate; stigmas 2, short. Nutlet white with a very short brown stipe, obovoid, 1.2–1.5 mm, flatly biconvex to sometimes nearly flat-convex, with transverse wavy reticulation and verruculose margins. Fl. and fr. Jul–Aug.

Wet places. S Fujian, Guangdong, Guangxi, Hainan, S Hunan, Taiwan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Australia].

**43. *Fimbristylis acuminata*** Vahl, Enum. Pl. 2: 285. 1805.

披针穗飘拂草 pi zhen sui piao fu cao

Annuals or short-lived perennials. Rhizomes absent.

Culms sparsely tufted, 6–35 cm tall, thin, slightly compressed, striate, smooth, glabrous. Leaves bladeless; basal sheaths glumelike; apical sheaths cylindric, apex obliquely truncate. Involucral bracts absent. Inflorescences reduced to a single terminal spikelet, ovoid to narrowly ovoid, 5–10 × 2–3 mm, with several to 10 or more flowers. Glumes laxly spirally imbricate, greenish white and sometimes laterally with brown specks, broadly ovate to elliptic, 2.8–4 mm, thickly papery, with several faint veins forming an abaxial green keel, apex obtuse and mucronate. Stamens 2; anthers linear. Style long and compressed, sparsely ciliate, basally inflated; stigmas 2, straight. Nutlet with a short brown stipe, globose-obovoid, ca. 1.5 mm, biconvex, with transverse wavy reticulation. Fl. and fr. Jul–Aug.

Open wet places, sandy soil grasslands, watersides, grasslands by water; low elevations. Fujian, Guangdong, Hainan [India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

**44. *Fimbristylis nigrobrunnea*** Thwaites, Enum. Pl. Zeyl. 434. 1864.

褐鳞飘拂草 he lin piao fu cao

*Fimbristylis eragrostis* (Nees & Meyen) Hance var. *nigrobrunnea* (Thwaites) S. S. Hooper; *F. pycnostachya* Hance.

Perennials. Rhizomes short. Culms tufted, 10–45 cm tall, slightly scabrid, with radical leaves at base. Leaves 1/4–1/3 as long as culm; sheath leathery, obliquely split at apex, mouth membranous and pale brown; leaf blade linear, 1–2.5 mm wide, apex acute and apiculate or not. Involucral bracts 2–4, leaflike, 2–13 mm, apically attenuate. Inflorescence a simple or rarely compound anthela or sometimes reduced to a single terminal spikelet; rays few, 0.5–3 cm, slender. Spikelets solitary, oblong to ovoid, 6–8 × ca. 2.5 mm, many flowered, sometimes with basal glumes ± distichous. Glumes brown without brown spots, broadly ovate and boat-shaped, 2–3 mm, papery, 1-veined, margin hyaline, apex mucronate. Stamens 3; anthers linear-oblong, 1–1.5 mm. Ovary narrowly oblong; style 3-sided, glabrous, basally inflated; stigmas 3. Nutlet white, obovoid, 1–1.2 mm, flatly 3-sided, verruculose with subhexagonal reticulation. Fl. and fr. Apr–Jul.

Marshes, along rivers, among rocks in valleys; 100–2500 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Sri Lanka].

**45. *Fimbristylis eragrostis*** (Nees & Meyen) Hance, J. Linn. Soc., Bot. 13: 132. 1873.

知风飘拂草 zhi feng piao fu cao

*Abildgaardia eragrostis* Nees & Meyen in Wight, Contr. Bot. India, 95. 1834.

Perennials. Rhizomes short. Culms tufted, 20–50 cm tall, with fewer radical leaves at base. Leaf sheath leathery, apex obliquely split, mouth margins membranous and pale brown; leaf blade slightly falcate, 10–20 cm × 1–2.5 mm, glabrous, apex acute and apiculate. Involucral bracts 2–4, nearly leaflike, 3–15 mm, apically attenuate; bractlets pale brown, 2–3 mm. Inflorescence a compound anthela; rays 2 to many. Spikelets solitary, oblong, oblong-ovoid, or ovoid, 6–10 × 2–3 mm, many

flowered, with basal 1 or 2 glumes empty. Fertile glumes yellowish brown, broadly ovate to subtriangular, 2.5–3.5 mm, shiny, 1-veined forming an abaxial keel, apex mucronate. Stamens 3. Ovary white, cylindric, striate; style brown, 3-sided, basally inflated; stigmas 3. Nutlet white or slightly brownish, broadly obovoid, 0.7–0.8 mm, 3-sided, verruculose. Fl. and fr. Jun–Sep.

Grasslands; near sea level to 1100 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Nansha Qundao, Taiwan [India, Indonesia, Laos, Malaysia, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Australia].

**46. *Fimbristylis disticha*** Boeckeler, Linnaea 38: 393. 1874.

红鳞飘拂草 hong lin piao fu cao

*Fimbristylis rufoglumosa* Tang & F. T. Wang.

Annuals. Culms tufted, 10–30 cm tall. Leaf 1/4–1/3 as long as culm; sheath apex obliquely split, mouth margins membranous and pale brown; leaf blade linear, 1–2.5 mm wide, slightly curved, both surfaces scabrous with appressed short pubescence or glabrescent, apex acute. Involucral bracts 3 or 4, leaflike, to 2.8 cm, basalmost ca. 3 × as long as glumes, apically attenuate. Inflorescence a compound anthela; rays many. Spikelets solitary, ovoid to oblong-ovoid, 3–6 × 1.5–2.5 mm, slightly compressed, with basal 1 or 2 glumes empty. Glumes reddish brown, broadly ovate, ca. 2.5 mm, not shiny, glabrous, 1-veined forming an abaxial keel, apex mucronate. Stamens 3. Style 3-sided, not ciliate, basally inflated; stigmas 3. Nutlet white, obovoid, ca. 0.7 mm, 3-sided, verruculose. Fl. and fr. Aug–Sep.

Grasslands, slopes. Fujian, Guangdong, Guangxi [Cambodia, Indonesia, Laos, Myanmar, Thailand, Vietnam; Indian Ocean islands].

**47. *Fimbristylis nanningensis*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 229. 1961.

南宁飘拂草 nan ning piao fu cao

?Annuals. Culms tufted, 18–55 cm tall, slender, with many radical leaves. Leaves usually shorter than or rarely as long as culm; leaf blade narrowly linear, ca. 1 mm wide, both surfaces scabrous with appressed short pubescence, apically attenuate. Involucral bracts leaflike, much longer than inflorescence, less than 1 mm wide, scabrous with appressed pubescence, apex acuminate. Inflorescence a compound anthela, slightly lax, with many rays and spikelets; rays slender, glabrous. Spikelets solitary, narrowly ovoid, ca. 5 × 1 mm, slightly compressed, with only 2 or 3 flowers. Glumes ovate-lanceolate to lanceolate, ca. 3 mm, membranous, densely gland-dotted, 2- or 3-veined, midvein abaxially forming a slight keel, apex acuminate. Stamens 3. Ovary white, cylindric, slightly 3-sided; style very long, 6–8 × as long as ovary, basally slightly inflated; stigmas 3, often curly. Fl. and fr. Jul.

• Grasslands, slopes. Guangxi.

**48. *Fimbristylis cinnamometorum*** (Vahl) Kunth, Enum. Pl. 2: 229. 1837.

腺鳞飘拂草 xian lin piao fu cao

*Scirpus cinnamometorum* Vahl, Enum. Pl. 2: 278. 1805; *Fimbristylis cyperoides* R. Brown.

Perennials or rarely annuals. Rhizomes  $\pm$  creeping. Culms moderately tufted to lax, (10–)20–50 cm tall, 0.5–1 mm thick, 3-angled, smooth. Leaves basal, 2-ranked; sheath 1.5–5 cm, apex obliquely truncate and ciliate; ligule a fringe of short white hairs; leaf blade filiform, 4–22 cm  $\times$  0.3–0.6 mm, canalliculate, margin involute, apex subacute. Involucral bracts 2 or 3, leaflike, longest 1–5 cm, shorter than inflorescence. Inflorescence a compound or decomposed anthela of 10–90 spikelets, 2–7  $\times$  2–7 cm, open; primary rays 3–6, 0.8–5 cm. Spikelets solitary, light brown to deep reddish brown,  $\pm$  narrowly ovoid, 4–8  $\times$  1.2–1.5 mm, flattened. Glumes densely gland-dotted, 1–3-veined forming an acute abaxial keel, margin membranous, apex acuminate. Stamens 3; anthers 1.5–2 mm. Stigmas 3. Nutlet narrowly obovoid to obovoid-oblong, 0.8–1  $\times$  0.3–0.5 mm, 3-sided to nearly subterete, transversely ridged and cancellate with 4 or 5 rows of linear epidermal cells. Fl. Jul, fr. Sep.

Swampy grasslands, wet savannah forests; below 1300 m. Hainan [India, Indonesia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

**49. *Fimbristylis kwantungensis*** C. B. Clarke, J. Linn. Soc., Bot. 36: 238. 1903.

广东飘拂草 *guang dong piao fu cao*

Perennials. Rhizomes very short. Culms tufted, 30–50 cm tall, 0.5–1 mm wide. Leaf blade linear, 1/4–1/2 as long as culm, 2–3 mm wide, often falcately curved, both surfaces hairy, apex acute. Involucral bracts 2–4, leaflike, 5–15 mm wide, hairy, apically attenuate. Inflorescence a compound anthela; rays 3–5, slender, slightly hairy or glabrous. Spikelets solitary, brown, narrowly ovoid, 6–10  $\times$  ca. 3 mm, 8–10-flowered, with basal 2 glumes empty. Glumes brown, ovate-lanceolate to lanceolate, 3.5–4  $\times$  ca. 2 mm, hairy, 1-veined forming an abaxial keel, margin sometimes hyaline, apex with an excurved awn. Stamens 2. Style ca. 3 mm, slender; stigmas 2. Nutlet grayish yellow or white, ellipsoid, ca. 1  $\times$  0.6 mm, 3-sided, verruculose. Fl. summer.

- Grasslands along rivers. Guangdong (Lianzhou).

**50. *Fimbristylis fusca*** (Nees) C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 649. 1893.

暗褐飘拂草 *an he piao fu cao*

*Abildgaardia fusca* Nees in Wight, Contr. Bot. India, 95. 1834; *Fimbristylis fusca* var. *cantoniensis* C. B. Clarke.

Perennials, rhizomatous. Culms tufted, 20–40 cm tall, with radical leaves. Leaf blade linear, 5–35 cm  $\times$  1–3 mm, both surfaces hairy, apex acute. Involucral bracts 2–4, leaflike, 0.8–1.5 cm, hairy, base much broader, apex attenuate and apiculate. Inflorescence a compound anthela; rays many, hairy. Spikelets solitary, narrowly ovoid to narrowly oblong-ovoid, 6–10 mm, apex attenuate, with basal 2 or 3 glumes empty. Fertile glumes brown to nearly blackish brown, ovate-lanceolate, 4–5 mm, thickly papery, hairy, 1-veined forming an abaxial keel, margin sometimes hyaline, apex apiculate. Stamens 3. Style 4–5 mm, basally inflated; stigmas 3. Nutlet pale brown or white, almost sessile, obovoid, ca. 0.9 mm, 3-sided, verruculose. Fl. and fr. Jun–Sep.

Mountain summits, grassy slopes, grasslands, cultivated fields; 100–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Taiwan, Yunnan, Zhejiang [India, Japan, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Thailand, Vietnam; N Australia].

**51. *Fimbristylis fimbristylodes*** (F. Mueller) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 4: 623. 1917.

矮飘拂草 *ai piao fu cao*

*Abildgaardia fimbristylodes* F. Mueller, Fragm. 8: 273. 1874; *Fimbristylis nanofusca* Tang & F. T. Wang.

Annuals. Culms tufted, 5–13 cm tall, with radical leaves. Leaves slightly more than 1/2 as long as culm; leaf blade linear, 1–1.5 mm wide, slightly curved, margin ciliate, apex acute. Involucral bracts 2 or more, leaflike, 0.5–1.8 cm, less than 1 mm wide, hispid, apex acuminate. Inflorescence a simple or rarely subcompound anthela; rays 1–3 cm, hairy. Spikelets solitary, ovoid to broadly ovoid, 4–5  $\times$  ca. 1.5 mm, slightly compressed, with basal 1–3 glumes empty. Glumes brown, ovate, 2.5–3 mm, membranous, not densely gland-dotted, hairy, midvein abaxially forming a slight keel and excurrent into a mucro; empty glumes shorter than fertile ones, with longer awns. Stamens 3. Ovary white, cylindrical, 3-sided; style pale brown, ca. 2 mm, basally inflated; stigmas 3. Nutlet pale yellow to nearly white, very shortly stipitate, obovoid, 3-sided, verruculose, base truncate. Fl. and fr. Aug.

Slopes. Guangdong, Guangxi, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan (Ryukyu Islands), Korea, Malaysia, Myanmar, Nepal, Papua New Guinea, Thailand, Vietnam; N Australia].

**52. *Fimbristylis ovata*** (N. L. Burman) J. Kern, Blumea 15: 126. 1967.

独穗飘拂草 *du sui piao fu cao*

*Carex ovata* N. L. Burman, Fl. Indica, 194. 1768; *Abildgaardia monostachyos* (Linnaeus) Vahl; *A. ovata* (N. L. Burman) Kral; *Cyperus monostachyos* Linnaeus; *Fimbristylis monostachyos* (Linnaeus) Haaskarl; *Iria monostachyos* (Linnaeus) Kuntze.

Perennials. Rhizomes short. Culms tufted, 15–35 cm tall, slender. Leaves 1/2–2/3 as long as culm; leaf blade 0.5–1 mm wide, apex acute. Involucral bracts 1–3, glumelike but basal-most sometimes leaflike, 0.5–1.8 cm, apex with a 2–3 mm awn. Inflorescences reduced to a single terminal spikelet, ovoid, ellipsoid, or oblong-ovoid, 7–13  $\times$  ca. 5 mm, slightly compressed, with basal glumes distichous and apical ones spirally imbricate. Glumes yellowish green, broadly ovate to ovate, 3–6 mm, leathery, shiny, abaxially 3-veined, midvein prominent and excurrent into a mucro. Stamens 3. Style 3-sided, basally inflated; stigmas 3. Nutlet shortly stipitate, obovoid, ca. 2 mm, 3-sided, prominently verruculose. Fl. and fr. Jun–Sep.  $2n = 10$ .

Grasslands, roadsides, waste fields, open moist hillsides, stream-sides, sunny dry slopes, grassy slopes; 100–1400 m. Fujian, Guangdong, Guangxi, S Guizhou, Hainan, S Hunan, NE Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Laos, Malaysia, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, SW Asia (Yemen), Central and South America, Pacific islands].

**53. *Fimbristylis longistipitata*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 229. 1961.

长柄果飘拂草 chang bing guo piao fu cao

Perennials, rhizomatous. Culms tufted, 15–30 cm tall, slender. Leaves ca. 1/2 as long as to equaling culm; leaf blade narrowly linear, ca. 0.5 mm wide, apex acuminate. Involucral bracts 2 or 3, glumelike, 0.5–1.8 cm, apex with a longer hairy awn. Inflorescences reduced to a single terminal spikelet, ovoid

to oblong-ovoid, 8–13 × ca. 4 mm. Glumes yellowish green with fine brown spots, broadly ovate to oblong-ovate, ca. 4 mm, shiny, 3-veined forming an abaxial slight keel, midvein prominent, apex mucronate. Stamens 3. Style 3-sided, ciliate, basally inflated; stigmas 3. Nutlet with a ca. 0.8 mm stipe, flatly globose, ca. 1.5 mm, 3-sided, very sparsely verruculose. Fl. and fr. Jun–Oct.

• Stream-sides, open woods, field margins, scrub by seashores; near sea level to 600 m. Guangdong, Hainan.

### 13. *BULBOSTYLIS* Kunth, Enum. Pl. 2: 205. 1837, nom. cons., not Steven (1817), nor Candolle (1836).

球柱草属 qiu zhu cao shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker

Herbs, annual [or perennial]. Culms tufted, very slender. Leaves with a leaf blade or rarely reduced to a bladeless sheath, mouth with lax white hairs; leaf blade filiform to linear, margin often involute. Involucral bracts leaflike or setaceous. Inflorescence a terminal simple or compound anthela or capitate, sometimes reduced to a single spikelet. Spikelets ovoid to ellipsoid, many flowered. Glumes spirally arranged or rarely distichous, herbaceous or membranous, deciduous, subtending a flower but basal 1 or 2 empty. Flowers bisexual. Perianth bristles absent. Stamens (1 or)2(or 3). Style filiform, base thickened, bulbous, and persistent in fruit; stigmas 3. Nutlet obovoid to obpyriform, 3-sided.

About 100 species: tropical to temperate regions worldwide with high concentration of species in tropical Africa and tropical America; three species in China.

- 1a. Spikelets 2–15, sessile in a capitate inflorescence; glumes brownish to yellowish green, apex with a recurved short awn ..... 3. *B. barbata*  
 1b. Spikelet single, in a simple to compound anthela; glumes brownish to brown, apex mucronate.  
 2a. Glumes glabrous, apex obtuse; nutlet irregularly puncticulate ..... 1. *B. densa*  
 2b. Glumes pubescent, apex acute; nutlet undulate-corrugate ..... 2. *B. puberula*

**1. *Bulbostylis densa*** (Wallich) Handel-Mazzetti, Vegetationsbilder 20(7): 16. 1930.

丝叶球柱草 si ye qiu zhu cao

*Scirpus densus* Wallich in Roxburgh, Fl. Ind. 1: 231. 1820; *Bulbostylis capillaris* (Linnaeus) Kunth ex C. B. Clarke var. *trifida* (Kunth) C. B. Clarke; *Isolepis densa* (Wallich) Schultes; *I. tenuissima* D. Don; *I. trifida* Kunth.

Rhizomes absent. Culms tufted, 7–35 cm tall, slender, smooth. Leaf sheath pale, membranous, mouth long pilose; leaf blade filiform, 5–10(–13) × ca. 0.6 mm, papery, abaxially sparsely pilose, margin entire and slightly revolute, apex acuminate. Involucral bracts 2 or 3, setaceous to glumelike, 0.8–1.5 cm, much shorter than inflorescence, apex acuminate. Inflorescence a simple or subcompound anthela, with 4–7 spikelets; rays 3–5, 2–5 cm. Spikelets solitary or clustered, oblong-ovoid to ovoid, 3–6 × ca. 1.5 mm, 5–18-flowered, base rounded, apex acute. Glumes brown, ovate to broadly ovate, 1.5–2 × 1–1.5 mm, membranous, 1–3-veined, base rounded, margin ciliate, apex obtuse to rarely acute; empty glumes yellowish green, apex sometimes mucronate. Stamens 2; anthers oblong-ovoid to ovoid, base cuneate, apex acute. Style filiform; stigmas 3. Nutlet grayish purple at maturity, obovoid, ca. 0.8 × 0.5–0.6 mm, 3-sided, inconspicuously undulate-corrugate and puncticulate, apex contracted with a persistent depressed bulbous style base. Fl. and fr. Apr–Dec. 2n = 64.

Sandy wet places, waste slopes, trail margins, coniferous forests; 100–3200 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hebei, S Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Sichuan, Taiwan, E Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Kashmir, Myanmar, Nepal, Papua New Guinea, Philippines, Russia (Far East), Sri Lanka, Thailand, Vietnam; tropical Africa, Australia, Pacific islands].

**2. *Bulbostylis puberula*** Kunth, Enum. Pl. 2: 213. 1837.

毛鳞球柱草 mao lin qiu zhu cao

*Scirpus puberulus* Poiret (1805), not Michaux (1803).

Rhizomes absent. Culms tufted, 10–30 cm tall, slender, smooth. Leaf sheath straw-colored to brownish, thinly membranous, pubescent; leaf blade capillary, 4–6 cm × 0.4–0.8 mm, abaxially pubescent, margin entire and slightly revolute, apex acuminate. Involucral bracts 2 or 3, setaceous, ca. 8 mm, base membranous, margin ciliate. Inflorescence a simple or compound anthela, with 1–3 or more spikelets, often congested to almost capitate, sometimes reduced to a single spikelet. Spikelets ovoid-oblong to ovoid, 3–6 × 1–2 mm, 7–21-flowered, base obtuse to rounded, apex acute. Glumes brownish to dark brown, ovate to broadly ovate, 1.5–2 × 1–1.5 mm, keeled, membranous, abaxially pubescent, margin ciliate, apex with a 1–3-veined yellowish green costa excurrent into a recurved mucro. Stamen 1; anther oblong, apex acute. Style filiform, base depressed globose; stigmas 3. Nutlet white to grayish yellow, obovoid, ca. 0.8 × 0.5–0.6 mm, 3-sided, apex contracted with a

persistent depressed bulbous style base. Fl. and fr. Feb–Jun.  $2n = 20$ .

Sandy areas. S Fujian, Guangdong, Hainan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam; tropical Africa, Indian Ocean islands, Madagascar].

**3. *Bulbostylis barbata*** (Rottbøll) C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 651. 1893.

球柱草 qiu zhu cao

*Scirpus barbatus* Rottbøll, Descr. Icon. Rar. Pl. 27. 1773; *Bulbostylis disticha* Ohwi & T. Koyama; *Isolepis barbata* (Rottbøll) R. Brown.

Rhizomes absent. Culms densely tufted, 0.6–3 cm tall, 0.5–0.8 mm thick, erect, smooth. Leaf sheath brownish, 0.5–2 cm, thinly membranous, glabrous, mouth white hyaline and with scattered long hairs; leaf blade filiform, 4–10 cm × 4–8 mm, abaxially glabrous or sometimes sparsely pilose, margin entire, apex acuminate. Involucral bracts 2 or 3, setaceous, 1–2.5 cm or ± short, very slender, abaxially glabrous or with scat-

tered hairs. Inflorescences terminal, capitate, 5–12 mm thick, with 3–15 sessile spikelets. Spikelets narrowly ovoid, 3–6.5 × 1–1.5 mm, angular, 7–13-flowered, base obtuse to subrounded, apex acute. Glumes brownish to yellowish green turning eventually pale brownish, ovate to nearly broadly ovate, 1.5–2 × 1–1.5 mm, keeled, membranous, apically occasionally pubescent, margin ciliolate, apex with a recurved short awn. Stamens 1 (or 2); anther oblong, apex acute. Style filiform; stigmas 3. Nutlet pale brown to yellowish, obovoid-globose, ca. 0.8 × 0.5–0.6 mm, 3-sided, obscurely tuberculate with transversely rectangular cells, apex rounded to emarginate; persistent style base depressed globose. Fl. and fr. Jun–Nov.  $2n = 10$ .

Sandy beaches, sometimes beside cultivated fields; 100–2000 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shandong, Taiwan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Korea, Laos, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Africa, Atlantic Ocean islands, Australia, Indian Ocean islands].

This species is naturalized in North and South America.

## 14. ISOLEPIS R. Brown, Prodr. 221. 1810.

细莞属 xi guan shu

Liang Songyun (梁松筠 Liang Song-jun); A. Muthama Muasya, David A. Simpson

Herbs, annual or rarely perennial. Rhizomes present or absent. Culms tufted, terete. Leaves all basal; sheath green to straw-colored, sometimes nearly reddish; ligule absent; leaf blade often much reduced. Involucral bract leaflike, spreading to erect. Inflorescences capitate, with few to many spikelets or reduced to a single spikelet, rarely an anthela. Spikelets with few to many spirally arranged mostly deciduous glumes. Glumes each subtending a flower but basalmost sometimes empty. Flowers bisexual. Perianth bristles absent. Stamens 1–3. Style linear, persistent, base not or slightly thickened, apex 2- or 3-cleft. Nutlet mostly obovoid, biconvex or 3-sided, papillose or longitudinally ribbed.

About 70 species: worldwide, especially Africa and Australia; one species in China.

**1. *Isolepis setacea*** (Linnaeus) R. Brown, Prodr. 222. 1810.

细莞 xi guan

*Scirpus setaceus* Linnaeus, Sp. Pl. 1: 49. 1753; *Schoenoplectus setaceus* (Linnaeus) Palla.

Rhizomes creeping. Culms 3–12 cm tall, ca. 5 mm thick, terete, grooved. Leaves sometimes with only a sheath; leaf blade linear, usually shorter than culm, 0.2–0.5 mm wide, sometimes very short and deltoid or absent. Involucral bract 1 (or 2), ovate-lanceolate, 3–10 (–12) mm, spreading to erect, both surfaces dark red at base, apex long awned or mucronate. Inflorescence a pseudolateral head with 1–3 spikelets. Spikelets ovoid, 2.5–4 mm, many flowered. Glumes ovate to subelliptic, ca. 1.5 mm, both surfaces dark purple to purple, midvein greenish to

straw-colored, apex rounded to obtuse. Perianth bristles absent. Stamens 2; filaments short, thick, with brown minute spots; anthers oblong, 0.3–0.5 mm; connective apex evident beyond anthers. Style short; stigmas (2 or) 3, slender. Nutlet pale brown to orangish brown, broadly obovoid to subspherical, ca. 0.5 mm, plano-convex to compressed 3-sided, each surface prominently longitudinally ribbed, with many fine transverse ridges. Fl. and fr. Jun–Aug.  $2n = 28$ .

Stream margins, pond margins, moist grassy slopes, floodplains; 1800–4600 m. Gansu, Jiangxi, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India (Sikkim), Kashmir, Kazakhstan, Kyrgyzstan, Myanmar, Nepal, Pakistan, Russia, Tajikistan, Thailand, Uzbekistan; Africa, SW Asia, Atlantic Ocean islands, Australia, Europe, North America].

## 15. CYPERUS Linnaeus, Sp. Pl. 1: 44. 1753.

莎草属 suo cao shu

Dai Lunkai (戴伦凯); Gordon C. Tucker, David A. Simpson

*Cyperus* sect. *Juncellus* Grisebach; *Juncellus* (Grisebach) C. B. Clarke; *Mariscus* Vahl; *Torulinium* Desvaux ex Hamilton.

Herbs, annual or perennial, with rhizomes or stolons. Culms caespitose or solitary, erect, usually 3-angled or acutely triquetrous,

sometimes compressed triquetrous, stout or slender, leafy at basal part or at base. Leaves basal, 3-ranked, rarely without a blade; ligule absent. Involucral bracts leaflike, usually 2–10(–20 or more), at base of inflorescence. Inflorescences terminal, a simple or compound anthela, with several to many rays and usually with raylets (secondary rays); rays and raylets unequal or rarely equal in length or inflorescence capitate. Spikelets few to many in spikes, digitate clusters, or a capitulum at apex of rays, rarely single; rachilla not articulate at base, persistent, usually with narrow wings. Glumes distichous, rarely spirally imbricate; basal 1 or 2 glumes without a flower; remaining glumes each with a bisexual flower. Perianth bristles or scales absent. Stamens (1–)3. Style base not swollen; stigmas (2 or)3, deciduous at maturity. Nutlet 3-sided, smooth, punctulate, tuberculate, or rarely reticulately striate.

About 600 species: temperate, subtropical, and tropical regions worldwide; 62 species (eight endemic, four introduced) in China.

- 1a. Spikelets digitate or fasciculate on a very short rachis, or inflorescences capitate or globose.
- 2a. Inflorescences capitate or anthelate, with very short rays (rarely with 1 or 2 elongated rays).
- 3a. Spikelets 1–5-flowered, falling from rachis as a single unit while glumes remain attached to winged rachilla; culm base swollen into a bulb shape, enclosed by dark brown or brown leaf sheaths.
- 4a. Spikelets 1-flowered; glumes inconspicuously veined ..... 58. *C. monospermus*
- 4b. Spikelets 2–5-flowered; glumes conspicuously veined.
  - 5a. Spikelets narrowly ovoid, 3–5-flowered; glumes broadly ovate, densely brown punctulate, 15–17-veined; nutlet obovoid to ellipsoid ..... 56. *C. dubius*
  - 5b. Spikelets ovoid-ellipsoid, 2- or 3-flowered; glumes ovate, brownish to straw-colored and laxly reddish punctulate at base and apex, 9–13-veined; nutlet oblong ..... 57. *C. hainanensis*
- 3b. Spikelets 3–8-flowered or more, rachilla remaining attached to rachis as glumes and nutlets fall with maturity; culm base not bulbous.
  - 6a. Spikelets 3- or 4-flowered; nutlet with spongy base of style extending downward along angles of nutlet ..... 19. *C. cephalotes*
  - 6b. Spikelets 8-flowered or more; nutlet without enlarged spongy apex.
    - 7a. Culms usually tall; spikelets several to more than 20, laxly fascicled; glumes conspicuously distichous, ca. 4 mm, apex obtuse and mucicous.
    - 8a. Leaves usually longer than culm; spikelets 5–8 mm, 6–10-flowered; nutlet oblong ..... 17. *C. szechuanensis*
    - 8b. Leaves usually shorter than culm; spikelets 7–25 mm, 8–48-flowered; nutlet obovoid ..... 18. *C. niveus*
    - 7b. Culms dwarf; spikelets numerous, very densely arranged; glumes spirally imbricate or obscurely distichous, ca. 2 mm, apex recurved mucronate.
      - 9a. Spikelets ovoid to narrowly ovoid, 3–4 × ca. 1.5 mm; glumes spirally imbricate ..... 20. *C. michelianus*
      - 9b. Spikelets narrowly oblong-ovoid, oblong, or rarely narrowly ovoid, 3–8 × 1.5–2 mm; glumes distichous but sometimes obscurely so.
        - 10a. Spikelets very numerous, congested into capitulum, 4–5 mm; glumes oblong-lanceolate, apex slightly long mucronate; stigmas 2(or 3); nutlet narrowly oblong to oblong, nearly 3-sided ..... 21. *C. pygmaeus*
        - 10b. Spikelets many, congested with short or slightly elongate rays, 3–8 mm; glumes ovate or broadly ovate, apex shortly mucronate; stigmas 2; nutlet ellipsoid, plano-convex.
          - 11a. Inflorescences capitate, sometimes with 1 ray to 2 cm; glumes broadly ovate, white on both surfaces or rusty brown striate; nutlet oblong ..... 22. *C. nipponicus*
          - 11b. Inflorescence a simple anthela, with 3–6 rays to 6 cm; glumes ovate, pale on both surfaces but medially green; nutlet ellipsoid ..... 23. *C. hilgendorffianus*
  - 2b. Inflorescences anthelate, with elongate rays, sometimes with secondary (compound) and tertiary (decompound) branching.
    - 12a. Nutlet lenticular, with face toward rachilla.
      - 13a. Annuals; spikelets compressed, usually ca. 1.5 mm wide; glumes 1–2 mm; stamens 1 or 2, anthers ellipsoid ..... 61. *C. limosus*
      - 13b. Perennials; spikelets slightly turgid, (2.5–)3–5 mm wide; glumes 2.5–3 mm; stamens 3, anthers linear.
        - 14a. Culms 35–100 cm tall; leaf blade 3–10 mm wide; inflorescence a simple or compound anthela, usually with long rays and 5–17 spikelets arranged into spikes ..... 59. *C. serotinus*
        - 14b. Culms 4–20 cm tall; leaf blade ca. 1 cm wide; inflorescences capitate, usually with 1–8 spikelets ..... 60. *C. pannonicus*
    - 12b. Nutlet 3-sided (sometimes dorsiventrally compressed).
      - 15a. Perennial herbs; glumes ca. 2 mm; nutlet 0.7–1.5 mm.
      - 16a. Spikelets slightly turgid; glumes 7-veined or more.
        - 17a. Culms 1.5–5 cm tall; anthela rays much longer than culm ..... 6. *C. radicans*
        - 17b. Culms 35–70 cm tall; anthela rays much shorter than culm.

- 18a. Culms 3-angled but not winged; involucre bracts 6–12; inflorescence rays 6–16 cm ..... 4. *C. diffusus*
- 18b. Culms 3-angled and winged; involucre bracts 3–5; inflorescence rays 2.5–5.5 cm ..... 5. *C. trialatus*
- 16b. Spikelets compressed; glumes 3–5-veined.
- 19a. Culms and rays with retrorse prickles ..... 7. *C. surinamensis*
- 19b. Culms and rays smooth or with spreading or ascending prickles.
- 20a. Culms compressed triquetrous, with leaves at basal part; leafy involucre bracts 5–12, unequal in length.
- 21a. Culms scabrid on angles; raylets present; stamens 3 per flower; nutlet compressed ..... 3. *C. platystylis*
- 21b. Culms smooth; raylets absent; stamen 1 per flower; nutlet not compressed ..... 24. *C. eragrostis*
- 20b. Culms obtusely 3-angled to subterete, with bladeless sheaths basally; leafy involucre bracts 15–20, nearly equal in length.
- 22a. Involucre bracts flexuose, drooping; apex of glumes acute; nutlet not stipitate ..... 1. *C. involucreatus*
- 22b. Involucre bracts rigid; apex of glumes acuminate; nutlet stipitate ..... 2. *C. alternifolius*
- 15b. Annual or perennial herbs; glumes ca. 1(–1.5) mm; nutlet 0.2–0.3 mm.
- 23a. Leaves very narrow, adaxially canaliculate, margin involute; glumes papery, apex truncate and with a recurved awn; nutlet oblong-obovoid to oblong.
- 24a. Glumes with a (0.5–)0.6–1 mm awn; nutlets 0.5–0.6 mm ..... 15. *C. cuspidatus*
- 24b. Glumes with a 0.2–0.5 mm awn; nutlets 0.7–0.9 mm ..... 16. *C. castaneus*
- 23b. Leaves flat; glumes membranous, apex obtuse and mucronate or muticous; nutlet obovoid or ellipsoid.
- 25a. Perennials or rarely annuals; culms with few leaves or with bladeless sheaths only; stamens (1–)3; nutlet less than 1/2 as long as subtending glume.
- 26a. Leafy involucre bracts usually longer than inflorescence; glumes laxly imbricate, with recurved apex; anther apices not white setose; nutlet 0.2–0.3 mm wide ..... 13. *C. tenuispica*
- 26b. Leafy involucre bracts usually shorter than inflorescence; glumes densely imbricate, apex straight; anther apices white setose; nutlet 0.4–0.5 mm wide ..... 14. *C. haspan*
- 25b. Annuals without stolons (except *C. duclouxii*); culms usually leafy; stamens 1 or 2(or 3); nutlet 1/2 or more as long as subtending glume.
- 27a. Perennials, with stolons; culms scattered; spikelets 3–10, digitately arranged ..... 8. *C. duclouxii*
- 27b. Annuals, with fibrous roots; culms tufted; spikelets many, congested into a capitulum or capitate heads.
- 28a. Spikelets numerous, densely congested into a dense capitulum ..... 12. *C. difformis*
- 28b. Spikelets (?solitary) several to more than 10, congested into a lax capitulum.
- 29a. Glumes lax, orbicular-ovate to suborbicular, spreading when mature, apex mucronate ..... 9. *C. nigrofuscus*
- 29b. Glumes slightly dense, broadly ovate or compressed orbicular, not spreading at maturity, apex muticous.
- 30a. Spikelets ca. 1.5 mm wide; glumes broadly ovate, purplish brown to brown and yellowish green between both lateral veins ..... 10. *C. fuscus*
- 30b. Spikelets ca. 1.8 mm wide; glumes ovate-lanceolate, blackish purple ..... 11. *C. nanellus*
- 1b. Spikelets in spikes terminating rays (rachis (0.5–)1–6 cm, usually visible, sometimes covered by bases of spikelets in pressed specimens).
- 31a. Rachilla not winged or only with very narrow white hyaline margins; style short.
- 32a. Perennials, with long stolons; spikelets slightly turgid; glumes abaxially not keeled or rarely keeled, margin involute, apex obtuse or rounded and usually muticous or rarely mucronate.
- 33a. Culms with long sheaths at basal part, sheaths with short blade or nearly bladeless; rachis of spikes glabrous; spikelets linear; glumes elliptic to oblong ..... 42. *C. malaccensis*
- 33b. Culms with long blades; rachis of spikes hispidulous, rarely glabrous; spikelets narrowly ovoid; glumes ovate or broadly ovate.
- 34a. Rachis of spikes laxly hispidulous, sometimes glabrous; spikelets ca. 3 mm wide; glumes obtuse and muticous at apex ..... 44. *C. procerus*

- 34b. Rachis of spikes slightly densely hispidulous; spikelets 1.5–2.5 mm wide; glumes mucronate or mucicous at apex.
- 35a. Inflorescence a compound anthela; glumes with inconspicuous keel and not spinulose ..... 43. *C. pilosus*
- 35b. Inflorescence a simple anthela; glumes with conspicuous keel and spinulose ..... 45. *C. babakia*
- 32b. Annuals, without rhizomes or stolons, with fibrous roots only; spikelets ± compressed; glumes abaxially keeled, margin not involute, apex mucronate to cuspidate.
- 36a. Dried plants with odor like curry; stamen 1; glumes 7–9-veined, apex cuspidate ..... 53. *C. squarrosus*
- 36b. Dried plants odorless; stamens 3; glumes 3–7-veined, apex obtuse, mucronulate, or cuspidate.
- 37a. Rachis of spikes short; spikelets densely arranged, subcapitate; glumes densely imbricate; nutlet ca. 1/2 as long as subtending glume ..... 50. *C. compressus*
- 37b. Rachis of spikes long; spikelets laxly arranged; glumes laxly imbricate; nutlet nearly as long as subtending glume.
- 38a. Inflorescence a compound anthela; spikelets erect or obliquely spreading.
- 39a. Rachilla not winged; glumes retuse and very shortly mucronate at apex; successive glumes 0.7–0.9 mm apart on same side of rachilla ..... 46. *C. iria*
- 39b. Rachilla wings white hyaline and narrow; glumes orbicular and slightly long mucronate at apex; successive glumes 1–1.5 mm apart on same side of rachilla ..... 47. *C. microiria*
- 38b. Inflorescence a simple anthela; spikelets subspreading.
- 40a. Rachis glabrous; glumes reddish brown, apex slightly excurved mucronate ... 48. *C. amuricus*
- 40b. Rachis white hispidulous on angles; glumes dark blood-red, apex rounded and mucicous ..... 49. *C. orthostachyus*
- 31b. Rachilla winged; style usually long or medium, rarely short.
- 41a. Mature spikelets disarticulating at base of each glume, with each nutlet clasped by rachilla wings; rachilla wings yellowish spongy ..... 62. *C. odoratus*
- 41b. Mature spikelets either falling as a unit or rachilla remaining attached to rachis and glumes falling; rachilla wings hyaline and not spongy.
- 42a. Spikes ± cylindric, with numerous spikelets.
- 43a. Mature spikelets not deciduous with glumes and nutlets falling from rachilla.
- 44a. Spikelets linear, terete or subterete; rachilla broadly winged, wings lanceolate and ± deciduous.
- 45a. Spikes broadly cylindric, 1.5–2 cm wide; spikelets spreading; anther connective minute ..... 25. *C. digitatus*
- 45b. Spikes narrowly cylindric, 0.8–1.2 cm wide; spikelets ascending; anther connective prominent and subulate ..... 26. *C. elatus*
- 44b. Spikelets narrowly oblong-ovoid, compressed; rachilla narrowly winged, wings linear and persistent.
- 46a. Spikes ± pedunculate; spikelets ± distichous, laxly arranged; anthers linear ..... 27. *C. exaltatus*
- 46b. Spikes not pedunculate; spikelets in several rows, densely arranged; anthers oblong.
- 47a. Involutral bracts 8–15; anthela with 12–15 rays; spikes 1.5–11 cm; glumes oblong-obovate, 2.2–2.5 mm, apex straight mucronate; nutlet oblong to obovoid-oblong ..... 28. *C. simaoensis*
- 47b. Involutral bracts 3–5; anthela with 6–10 rays; spikes 1.5–4 cm; glumes broadly ovate, ca. 1.5 mm, apex curved mucronate; nutlet obovoid to ellipsoid ..... 29. *C. imbricatus*
- 43b. Mature spikelets deciduous and falling from rachis with glumes and nutlets attached.
- 48a. Spikelets 1–3(or 4)-flowered; glumes tightly included around nutlet.
- 49a. Spikes cylindric, (1–)2–3.5 × 0.6–1 cm, with parallel sides; anthers (0.6–)0.8–1 mm; nutlet ca. 0.5 mm wide; leaf blade margin smooth ..... 54. *C. cyperoides*
- 49b. Spikes shortly cylindric, oblong, or ovoid, 1.2–1.8 × 0.8–1.2(–1.5) cm, with sides narrowed toward base; anthers 1–1.5 mm; nutlet 0.6–0.9 mm wide; leaf blade margin scabrous ..... 55. *C. cyperinus*
- 48b. Spikelets 4–10-flowered; glumes not tightly included around nutlet.
- 50a. Annuals; glumes with a recurved mucro at apex; stamens 1 ..... 53. *C. squarrosus*
- 50b. Perennials; glumes without mucro at apex; stamens 3.
- 51a. Spikelets subulate, 5–18 mm, slightly less than 1 mm wide, arranged into a globose to half-globose spike; culms and anthela rays not papillose; nutlet linear-oblong; leaf sheath purplish red ..... 51. *C. compactus*

- 51b. Spikelets narrowly oblong-ovoid, 4.5–7 × 1.8–2.5 mm, arranged into a cylindrical spike; culms and anthera rays papillose; nutlet broadly ellipsoid to obovoid-ellipsoid; leaf sheath blackish brown ..... 52. *C. javanicus*
- 42b. Spikes broadly ovoid, turbinate, ellipsoid, oblong, orbicular, or rarely cylindrical, with up to 10 spikelets (rarely more in *C. glomeratus* and *C. eleusinoides*).
- 52a. Rhizomes short or surculose, without stolons or tubers; glumes laxly spreading.
- 53a. Culms slender; spikes broadly ovoid; spikelets subquadrangular, obliquely spreading to spreading at maturity; glumes ca. 4 mm ..... 37. *C. tenuiculmis*
- 53b. Culms stout; spikes oblong, cylindrical, ellipsoid, globose, or rarely broadly ovoid; spikelets slightly compressed, suberect or rarely spreading; glumes ca. 2 mm.
- 54a. Spikelets laxly arranged, spreading after anthesis, 0.8–4 cm × ca. 1 mm; glumes dark blood-red ..... 38. *C. distans*
- 54b. Spikelets densely or very densely arranged, suberect, not spreading after anthesis, 0.4–1.1 cm × 1.5–2 mm; glumes reddish brown or yellowish brown.
- 55a. Annuals, without rhizomes but with fibrous roots; glumes mucous at apex ..... 41. *C. glomeratus*
- 55b. Perennials; rhizomes short; glumes mucronate at apex.
- 56a. Anthela raylets radially spreading; spikes 6 cm or more; spikelets 1–1.5 mm wide ..... 39. *C. nutans*
- 56b. Anthela raylets suberect; spikes less than 6 cm; spikelets ca. 2 mm wide ..... 40. *C. eleusinoides*
- 52b. Rhizomes creeping or with stolons and tubers; glumes ± densely imbricate.
- 57a. Culms stout; sheaths bladeless or apicalmost with short blade only; glumes oblong, concave, margin involute; spikelets slightly compressed, rachilla with reddish brown wings ..... 30. *C. pangorei*
- 57b. Culms slightly slender; sheaths with blade; glumes ovate, broadly ovate, or ovate-elliptic, margin not involute.
- 58a. Spikes ovoid; glumes laxly imbricate, spreading at maturity ..... 36. *C. esculentus*
- 58b. Spikes broadly ovoid, obdeltoid, or obovoid; glumes densely imbricate, not spreading at maturity (laxly imbricate and spreading at maturity in *C. mitis* but spikes obovoid).
- 59a. Rachilla narrowly winged; glumes laxly imbricate, spreading at maturity; involucre bracts subulate, shorter than inflorescence ..... 35. *C. mitis*
- 59b. Rachilla broadly winged; glumes densely imbricate, not spreading at maturity; involucre bracts leaflike, usually longer than inflorescence.
- 60a. Leaves and involucre bracts slightly narrow, usually plicate; anthera rays erect or suberect, less than 2 cm.
- 61a. Stolons short; culms laxly tufted; rays of antherae erect; spikelets laxly arranged into spikes, linear, ca. 1 mm wide; anthers ellipsoid; nutlet oblong ..... 31. *C. linearispiculatus*
- 61b. Stolons long; culms scattered; rays of antherae slightly obliquely spreading; spikelets nearly digitately arranged at apex of ray, oblong-lanceolate to lanceolate, 2–3 mm wide, slightly turgid; anthers linear; nutlet obovoid to ellipsoid ..... 32. *C. stoloniferus*
- 60b. Leaves and involucre bracts slightly broad, usually flat; anthera rays obliquely spreading, slender, mostly to 12 cm.
- 62a. Glumes dark blood-red, ovate to oblong-ovate ..... 33. *C. rotundus*
- 62b. Glumes straw-colored to brownish yellow, broadly ovate to elliptic ..... 34. *C. tuberosus*

**1. *Cyperus involucratus*** Rottbøll, Descr. Pl. Rar. 22. 1772.

风车草 feng che cao

*Cyperus alternifolius* Linnaeus subsp. *flabelliformis* Kükenthal; *C. flabelliformis* Rottbøll, nom. illeg. superfl.

Perennials. Roots ± thick, fibrous. Rhizomes short, thick. Culms 30–150 cm tall, slightly stout, obtusely 3-angled, base with bladeless sheaths, apically scabrid. Basal leaf sheaths yellowish brown and cataphylloid; apical leaf sheaths pale green and mostly to 20 cm. Involucre bracts 14–24, leaflike, ca. 2 ×

as long as inflorescence, subequal in length, to 30 cm, 0.5–17 mm wide, margin scabridulous, basally  $\pm$  horizontal, apically flexuose and  $\pm$  drooping. Inflorescence a decompound anthela; rays numerous, 3–10 cm, each with 4–10 raylets; raylets 1–1.5 cm, each with 3–9 spikelets. Spikelets clustered at apex of raylets, narrowly ovoid or oblong, 3–12  $\times$  1.5–3 mm, flattened, radially spreading, 8–36-flowered; rachilla straight, wingless. Glumes densely imbricate, ovate, ca. 2 mm, membranous, rusty brown punctate, 3–5-veined, apex acute. Stamens 3; anthers linear, ca. 1 mm, apex setose. Style ca. 1 mm; stigmas 3, ca. 1 mm. Nutlet brown at maturity, not stipitate, broadly ellipsoid, 0.5–0.6 mm, 1/4–1/3 as long as subtending glume, 3-sided, apex not apiculate. Fl. and fr. May–Dec.  $2n = 32$ .

Cultivated as an ornamental in China, sometimes escaped and naturalized along streams and in wet thickets and disturbed areas; below 400 m. Guangdong, Hunan, Taiwan [native to E Africa and SW Asia (Arabian Peninsula)].

*Cyperus involucratus* is widely cultivated as an ornamental and sometimes naturalized in tropical and subtropical areas worldwide.

**2. *Cyperus alternifolius*** Linnaeus, Syst. Nat., ed. 12, 2: 82; Mant. Pl. 28. 1767.

野生风车草 ye sheng feng che cao

Perennials. Roots  $\pm$  thick, fibrous. Rhizomes short, thick. Culms 0.5–1.5(–3) m tall, slightly stout, obtusely 3-angled to subterete, base with bladeless sheaths, apically scabrid. Basal leaf sheaths yellowish brown; apical leaf sheaths pale green and mostly to 20 cm. Involucral bracts 11–18, leaflike, ca. 2  $\times$  as long as inflorescence, subequal in length, 1–14 mm wide,  $\pm$  horizontal, stiff, margin scabrous. Inflorescence a decompound anthela; rays 8–18, 3–10 cm, each with 1–4 raylets; raylets 1–1.5 cm, each with 3–9 spikelets. Spikelets clustered at apex of raylets, linear to narrowly linear-ovoid, 5–20  $\times$  1–1.5 mm, flattened, 10–40-flowered; rachilla straight, wingless. Glumes pale green, densely imbricate, ovate, ca. 2 mm, membranous, 3-veined, apex acuminate. Stamens 3; anthers linear, ca. 1 mm, apex setose. Style ca. 1 mm; stigmas 3, ca. 1 mm. Nutlet brown at maturity, stipitate, ellipsoid to ovoid, ca. 0.8 mm, 1/3–1/2 as long as subtending glume, compressed 3-sided, apex apiculate.  $2n = 32$ .

Naturalized in wetlands along rivers; below 100–300 m. Taiwan [native to Madagascar].

*Cyperus alternifolius* is naturalized in many tropical areas worldwide.

**3. *Cyperus platystylis*** R. Brown, Prodr. 214. 1810.

宽柱莎草 kuan zhu suo cao

Perennials. Roots  $\pm$  thick. Rhizomes very short. Culms 1(–3 and tufted), 30–90 cm tall, stout, triquetrous, scabrid on apical angles, leaved at basal part. Leaves equaling culm; sheath brownish, basal ones bladeless; leaf blade 5–12 mm wide,  $\pm$  stiff,  $\pm$  flat plicate, margin scabrous. Involucral bracts 5–12, longer than inflorescence, basal few to 60 cm, spreading to deflexed after anthesis. Inflorescence a compound or decompound anthela; rays many (to 17), 2–8 cm,  $\pm$  slender, each with 4–16 raylets; raylets 1–4 cm, each with 3–7 spikelets. Spikelets digitately arranged at apex of raylets, narrowly oblong-ovoid,

5–8  $\times$  ca. 2.5 mm, oblique or spreading, densely 15–35-flowered; rachilla straight, wingless. Glumes broadly ovate, 2–2.5 mm, thickly membranous, inconspicuously 3-veined, keel abaxially greenish, apex acute to obtuse and mucronate. Stamens 3, short. Style long, flattened, margin pilose; stigmas 3, short. Nutlet brownish glaucous, ellipsoid to ovoid-ellipsoid, compressed 3-sided, with concave sides, shiny, angles pale brown and markedly spongy-thickened.

Ponds, lakes; below 500 m. Taiwan, SE Xizang [Bangladesh, India, Indonesia, Malaysia, Myanmar, Nepal, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Australia].

**4. *Cyperus diffusus*** Vahl, Enum. Pl. 2: 321. 1805.

多脉莎草 duo mai suo cao

Perennials. Rhizomes short, hardened. Culms 25–80 cm tall, slightly thick, triquetrous, smooth, several leaved at basal part. Leaves equaling or shorter than culm; sheath pale green and eventually reddish brown; leaf blade 0.3–2 cm wide, flat, margin scabrous. Involucral bracts 6–12, leaflike, longer than inflorescence, 0.6–1.6(–1.9) cm wide. Inflorescence a decompound anthela; rays many, mostly 12–16 cm, each with 2–8 raylets. Spikelets 1–5, sessile, sometimes more than 3 at apex of raylets or tertiary raylets, oblong to linear-oblong, 3–7(–14)  $\times$  1.5–2 mm, slightly turgid, 6–12(–22)-flowered; rachilla narrowly winged. Glumes reddish brown or rusty brown on both surfaces but middle abaxially green or grayish green, lax, broadly ovate to orbicular-ovate, ca. 2 mm, 7–11-veined, keel prominent, apex rounded and with recurved mucro. Stamens 3; anthers linear, apex with white setae. Style very short; stigmas 3. Nutlet dark brown, ellipsoid, ca. 3/4 as long as subtending glume, 3-sided. Fl. and fr. Jun–Sep.

Forests in valleys, grasslands on mountain slopes, wet places by rivers, along trails, paddy fields; 100–1700 m. Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, S Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; NE Australia, Indian Ocean islands, Pacific islands].

This was referred to as *Cyperus laxus* Lamarck by D. A. Simpson and T. Koyama (Fl. Thailand 6(4): 366. 1998), but G. C. Tucker (Syst. Bot. Mongr. 43: 44. 1994) noted a distinction between neotropical and paleotropical material, with the latter being recognized as *C. diffusus*, which we accept here.

- 1a. Leaves 0.3–1.2 cm wide; involucral bracts 0.6–1.2 cm wide; spikelets (1 or)2 or 3 digitately arranged at raylets or tertiary raylets, 3–6 mm, 6–12-flowered; glumes reddish brown on both surfaces, middle abaxially green ..... 4a. var. *diffusus*
- 1b. Leaves 0.8–2 cm wide; involucral bracts 1–1.6(–1.9) cm wide; spikelets (1 or)2–5 digitately arranged at raylets or tertiary raylets, 7–14 mm, 10–22-flowered; glumes rusty brown on both surfaces, middle abaxially grayish green ..... 4b. var. *latifolius*

**4a. *Cyperus diffusus* var. *diffusus***

多脉莎草(原变种) duo mai suo cao (yuan bian zhong)

*Cyperus bancanus* Miquel; *C. diffusus* subsp. *bancanus* (Miquel) Kükenthal; *C. diffusus* var. *multispicatus* S. M. Huang.

Leaves 0.3–1.2 cm wide. Involucral bracts 0.6–1.2 cm wide. Spikelets (1 or) 2 or 3 digitately arranged at raylets or tertiary raylets, 3–6 mm, 6–12-flowered. Glumes reddish brown on both surfaces, middle abaxially green. Fl. and fr. Jun–Sep.  $2n = 38$ .

Forests in valleys, grasslands on mountain slopes, wet places by rivers, along trails, paddy fields; 100–1700 m. Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, S Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; NE Australia, Indian Ocean islands, Pacific islands].

**4b. *Cyperus diffusus* var. *latifolius*** L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 232. 1961.

宽叶多脉莎草 kuan ye duo mai suo cao

Leaves 0.8–2 cm wide. Involucral bracts 1–1.6(–1.9) cm wide. Spikelets (1 or) 2–5 digitately arranged at raylets or tertiary raylets, 7–14 mm, 10–22-flowered. Glumes rusty brown on both surfaces, middle abaxially grayish green. Fl. and fr. Aug–Sep.

- Wet places, grasslands. Guangdong.

*Cyperus diffusus* var. *latifolius* appears to be well differentiated from other variants of this widespread paleotropical species.

**5. *Cyperus trialatus*** (Boeckeler) J. Kern, Reinwardtia 3: 32. 1954.

三翅秆砖子苗 san chi gan zhuan zi miao

*Scirpus trialatus* Boeckeler, Flora 42: 445. 1859; *Cyperus turgidulus* C. B. Clarke; *Mariscus trialatus* (Boeckeler) Tang & F. T. Wang.

Perennials. Rhizomes short, hardened. Culms 35–70 cm tall, compressed triquetrous, smooth, winged at angles, with several leaves at basal part. Leaves shorter to slightly longer than culm; leaf blade 0.8–1.2 cm wide, flat, smooth. Involucral bracts 3–5, leaflike, basal 2 or 3 longer than inflorescence, subspreading. Inflorescence a compound or sometimes simple anthela; rays 8–10, to 5.5 cm, each with 2–7(–16) raylets; raylets mostly to 1.5 cm. Glomerules of 5–18 spikelets densely arranged at apex of rays and raylets, 5–8 mm in diam. Spikelets ovoid to oblong-ovoid, 3–5.5 × 1.8–2.5 mm, slightly turgid, 6–10-flowered; rachilla wingless. Glumes brown to brownish on both surfaces, densely imbricate, broadly ovate, 2–2.5 mm, membranous, concave, 13–15-veined, keel abaxially green, apex excurved mucronate. Stamens 3; anthers broadly linear, ca. 0.8 mm. Style ca. 0.2 mm; stigmas 3, ca. 1 mm. Nutlet dark brown, sessile, ovoid, ca. 1.8 mm, 3-sided, densely punctate, apex subacute. Fl. and fr. Jun–Jul.

Shaded places under sparse forests or scrub, grasslands by water, field margins; 100–500 m. Guangdong, Hainan [Indonesia, Malaysia, Thailand, Vietnam].

**6. *Cyperus radicans*** Nees & Meyen ex Kunth, Enum. Pl. 2: 95. 1837.

辐射穗砖子苗 fu she sui zhuan zi miao

*Cyperus radicans* var. *floribundus* (E. G. Camus) Kükenthal; *C. sinensis* Debeaux; *C. sinensis* var. *floribundus* E. G.

Camus; *Mariscus radicans* (Nees & Meyen ex Kunth) Tang & F. T. Wang; *M. radicans* var. *floribundus* (E. G. Camus) S. M. Huang.

Perennials. Rhizomes very short. Culms tufted, 1.5–5[–8] cm tall, 3-angled, smooth. Leaves longer than culm; sheath purplish brown, very short; leaf blade 2–8 mm wide, stiff, usually folded. Involucral bracts 3–7, leaflike, equaling or shorter than inflorescence. Inflorescence a simple or compound anthela; rays 3–8, mostly 15–18 cm, sometimes with raylets; raylets usually less than 1 cm or mostly 2–3 cm. Capitulum of 8–30 spikelets congested at apex of rays or raylets, globose, 0.8–2.5 cm in diam. Spikelets ovoid, narrowly ovoid, or narrowly oblong-ovoid, 5–12 × 2–5 mm, 4–20-flowered; rachilla wingless. Glumes pale and purplish striate or purplish red on both surfaces, densely imbricate, broadly ovate, 3.5–4 mm, papery, 11–13-veined, keel abaxially green, apex recurved mucronate. Stamens 3; anthers broadly linear. Style long; stigmas 3. Nutlet blackish brown, broadly ellipsoid, ca. 1/2 as long as subtending glume, triquetrous, slightly concave on 3 sides, with dense punctate processes. Fl. and fr. Jul–Oct.

Sands at seashores, wastelands by seashores; near sea level to below 100 m. Fujian, Guangdong, Hainan, Shandong, Taiwan, Zhejiang [Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

**7. *Cyperus surinamensis*** Rottbøll, Descr. Pl. Rar. 20. 1772.

苏里南莎草 su li nan suo cao

Annuals (?or short-lived perennials). Rhizomes absent. Culms tufted, (10–)35–80 cm tall, 3-angled, scaberulose with retrorse prickles. Leaves shorter than culm, flat or V-shaped; leaf blade 5–8(–12) mm wide. Involucral bracts 3–8, horizontal to ascending at ca. 30°, 3–30(–50) cm × 1.5–8(–12) mm, flat or sometimes V-shaped. Inflorescences globose heads, 1–2 cm in diam.; rays 4–12, 1–6(–9) cm, scaberulose with retrorse prickles; raylets often present. Spikelets (6–)15–40(–65), linear to linear-oblong, 4–12 × 1.5–2.5 mm, compressed. Glumes 10–50, pale yellow, light brown, or reddish brown, lanceolate, 1–1.5 mm, medially 3-veined, laterally veinless but distinctly reticulate, basally 2-keeled, apically often scaberulose, apex mucronulate. Stamen 1; anthers ca. 0.5 mm. Nutlets slightly stipitate, brown to reddish brown, narrowly ellipsoid, 0.7–0.9 mm, 3-sided, papillate or obscurely reticulate to rugulose, apex apiculate. Fl. and fr. Mar–Sep.

Pond shores, roadsides; below 200 m. Naturalized in N Taiwan [native to Caribbean and Central, North, and South America].

*Cyperus surinamensis* is also naturalized in Indonesia (Borneo).

**8. *Cyperus duclouxii*** E. G. Camus, Notul. Syst. (Paris) 1: 244. 1910.

云南莎草 yun nan suo cao

Perennials. Rhizomes and stolons ± long, soft, scaly. Culms scattered, 15–65 cm tall, 3-angled, smooth, basally few leaved. Leaves usually shorter than culm but sometimes apical leaves longer than culm; sheath reddish brown; leaf blade 0.5–1.5 cm wide, flat. Involucral bracts (2 or) 3–5, leaflike, longer than inflorescence, 0.6–1.6 cm wide, margin scabrous. Inflorescence a compound anthela; rays 4–8, mostly to 3.5 cm, some with ray-

lets. Spikelets 3–6(–10), digitately arranged at apex of rays or raylets, ovoid to narrowly ovoid, 4–6 × 1.5–2 mm, compressed, 6–14-flowered; rachilla wingless. Glumes dark purple on both surfaces but middle yellowish green, densely imbricate, orbicular-ovate to suborbicular, ca. 1.5 mm, membranous, 3-veined, abaxially slightly keeled, margin apically white hyaline, apex rounded and sometimes mucronulate. Stamens 2; anthers oblong, ca. 0.3 mm; connective not prolonged. Style 0.2–0.3 mm; stigmas 3, 0.3–0.5 mm. Nutlet yellowish, oblong to ellipsoid, ca. 2/3 as long as subtending glume, 3-sided, apex mucronate. Fl. and fr. Jun–Nov.

- Wet grasslands on mountain slopes, water margins; (1100–) 1800–2600 m. E Guizhou, Sichuan, Yunnan.

**9. *Cyperus nigrofuscus*** L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 232. 1961.

黑穗莎草 *hei sui suo cao*

Annuals. Roots fibrous. Culms tufted, 2–12 cm tall, slightly soft, compressed triquetrous, winged at angles, smooth, base with leaves. Leaves shorter to longer than culm; sheath brownish, short; leaf blade 2–4 mm wide, flat, midvein abaxially slightly wing-shaped, margin smooth or sometimes spinulose. Involucral bracts 2–4, leaflike, longer than inflorescence. Inflorescence a simple or compound anthela; rays 4–7, mostly to 1.5 cm, sometimes short, each with 7–15 densely arranged spikelets. Spikelets at apex of rays, digitately arranged, linear-oblong to linear, 4–10 × ca. 1.8 mm, 12–30-flowered; rachilla straight, wingless, with successive glumes 0.5–0.7 mm apart. Glumes dark purple to blackish brown on both surfaces but middle yellowish green, lax, orbicular-ovate to suborbicular, ca. 1 mm but extended after anthesis, membranous, prominently longitudinally striate, 3-veined, apex rounded and mucronate. Stamens 2; anthers oblong; connective prominent beyond anthers. Style of medium length; stigmas 3. Nutlet at first yellowish but brownish when mature, ellipsoid to obovoid-ellipsoid, nearly as long as subtending glume, 3-sided, smooth, apex long mucronate. Fl. and fr. Sep–Oct.

- Wet places, shallow water; 1500–3000 m. N Sichuan, Yunnan.

Collections from Yunnan have a compound anthelate inflorescence, have nearly all spikelets solitary, and come from higher elevations than those from Sichuan. Further specimens might show that they merit taxonomic recognition.

**10. *Cyperus fuscus*** Linnaeus, Sp. Pl. 1: 46. 1753.

褐穗莎草 *he sui suo cao*

*Cyperus fuscus* f. *palescens* Husnot; *C. fuscus* f. *virescens* (Hoffmann) Vahl; *C. virescens* Hoffmann.

Annuals. Roots fibrous. Culms tufted, 6–30 cm tall, slender, compressed triquetrous, soft, smooth, basally few leaved. Leaves shorter than to sometimes subequaling culm; leaf blade 2–4 mm wide, flat, sometimes folded, margin not scabrous. Involucral bracts 2 or 3, leaflike, longer than inflorescence. Inflorescence a compound or sometimes simple anthela; rays 3–5, most to 3 cm, apex of each ray or raylet with 5 to more than 10 densely arranged spikelets. Spikelets very narrowly ovoid to linear, 3–10 × ca. 1.5 mm, slightly compressed, 8–24-flowered;

rachilla wingless. Glumes purplish brown, brownish, brown, or pale yellowish on both surfaces but middle yellowish green, slightly laxly imbricate, broadly ovate, ca. 1 mm, obscurely 3-veined, apex obtuse. Stamens 2; anthers ellipsoid; connective not prominent beyond anthers. Style short; stigmas 3. Nutlet ellipsoid, ca. 2/3 as long as subtending glume, 3-sided, base barely stipitate to cuneate, apex apiculate. Fl. and fr. Jun–Oct.  $2n = 36$ .

Swamps, water margins, ditch margins, river margins, shaded places in valleys, along trails, wet places, paddy fields; 100–2000 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan [Afghanistan, India, Kashmir, Kazakhstan, Kyrgyzstan, Laos, Mongolia, Pakistan, Russia, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; N Africa, SW Asia, Atlantic Ocean islands, Europe].

*Cyperus fuscus* is naturalized in North America.

**11. *Cyperus nanellus*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 232. 1961.

汾河莎草 *fen he suo cao*

Annuals. Roots fibrous. Rhizomes absent. Culms 1–3 cm tall, half-terete, basally usually with 1 or 2 bladeless or bladed sheaths. Leaves shorter than culm; sheath brownish, short, scarious at 1 side; leaf blade ca. 2 mm wide, flat or folded, margin not scabrous. Involucral bracts 2, leaflike, shorter to slightly longer than inflorescence, adaxially ± blackish purple, base ± wide. Inflorescence a simple anthela to almost capitate; rays few, very short, each with a few spikelets densely arranged at apex. Spikelets oblong to linear-oblong, 3–7 × 1.2–1.8 mm, compressed, 8–22-flowered; rachilla wingless, with successive glumes ca. 0.7 mm apart. Glumes blackish purple but adaxially pale yellowish or green at middle, slightly densely imbricate, ovate-lanceolate, ca. 1 mm, membranous, conspicuously longitudinally striate, obscurely 3-veined, margin apically white hyaline and usually involute, apex muticous. Stamens 2; anthers oblong, apex rounded to truncate, muticous, and mucronate. Style short; stigmas 3, longer than style. Nutlet yellowish, ellipsoid, ca. 1 × 0.5 mm, as long as subtending glume, stipitate, apiculate, 3-sided, smooth. Fl. and fr. Oct.

- Sandy stream margins; 800–1500 m. Shanxi.

**12. *Cyperus difformis*** Linnaeus, Cent. Pl. 2: 6. 1756.

异型莎草 *yi xing suo cao*

Annuals. Roots fibrous. Culms tufted, 2–65 cm tall, slightly thick or flaccid, compressed triquetrous, smooth, few leaved at basal part. Leaves shorter than culm; sheath brown, slightly long; leaf blade 2–6 mm wide, flat or folded. Involucral bracts 2(or 3), leaflike, longer than inflorescence. Inflorescence a simple or rarely compound anthela; rays 3–9, mostly to 3(–5) cm, unequal in length, each with many spikelets at apex densely aggregated into a capitulum. Capitulum of spikelets globose, 0.5–1.5 cm in diam. Spikelets narrowly ovoid to linear, 2–8 × 1–1.2 mm, compressed orbicular, 8–28-flowered; rachilla wingless. Glumes dark reddish purple to dark grayish brown on both surfaces but middle yellowish, less than 1 mm, slightly spreading, obscurely 3-veined, margin white hyaline, apex rounded. Stamens (1 or)2; anthers ellipsoid; connective not

prominent beyond anthers. Style very short; stigmas 3, short. Nutlet yellowish, obovoid-ellipsoid, nearly as long as subtending glume, 3-sided. Fl. and fr. Jul–Oct.  $2n = 18, 28, 32, 34, 36$ .

Grasslands at mountain slopes, shallow water, water margins, lake margins, wet places in grasslands, along trails, paddy fields; below 100–2000 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Afghanistan, Bangladesh, Bhutan, India, Indonesia, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia, Sri Lanka, Tajikistan, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Europe, Indian Ocean islands, Madagascar, Pacific islands].

*Cyperus difformis* is naturalized in Central, North, and South America.

**13. *Cyperus tenuispica*** Steudel, Syn. Pl. Glumac. 2: 11. 1854.

窄穗莎草 zhai sui suo cao

Annuals. Roots fibrous. Culms tufted, 3–30 cm tall, flaccid, compressed triquetrous, smooth, base clothed with a few bladeless sheaths, apical sheaths with short blade. Leaves shorter than culm, 2–3 mm wide, flat; sheath reddish brown to purplish brown, 2–6 cm. Involucral bracts usually 2 (or 3), leaf-like, usually basalmost equaling or longer than inflorescence. Inflorescence a compound or sometimes simple anthela; rays 4–10, mostly to 7 cm, unequal in length, each with 2–9 raylets. Spikelets 3–12, digitately arranged at apex of raylets or rays, linear, 3–12 × ca. 1 mm, 10–40-flowered; rachilla wingless. Glumes dark brown on both surfaces but middle abaxially yellowish green, lax, elliptic to suboblong, 0.8–1 mm, membranous, slightly spreading after anthesis, veins inconspicuous, apex obtuse to truncate, slightly excurved, and mucicous. Stamens 1 or 2; anthers not setose at apex. Style long; stigmas 3. Nutlet yellowish, obovoid, ca. 0.3 mm, tuberculate. Fl. and fr. Sep–Nov.  $2n = 16$ .

Sparse forests, along trails, wet places, paddy fields; below 100–500 m. Anhui, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, SE Xizang, Zhejiang [Bhutan, India, Indonesia, S Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Tajikistan, Thailand, Uzbekistan, Vietnam; tropical Africa, Australia, Indian Ocean islands].

*Cyperus tenuispica* is naturalized in Central and South America.

**14. *Cyperus haspan*** Linnaeus, Sp. Pl. 1: 45. 1753.

畦畔莎草 qi pan suo cao

*Cyperus haspan* var. *flaccidissimus* Kükenthal; *C. haspan* var. *juncoides* Kükenthal.

Perennials or annuals. Roots fibrous when annual. Rhizomes short to slightly long. Culms tufted or scattered, 10–60 cm tall, slender, compressed triquetrous, smooth. Leaves shorter than culm, sometimes sheathed only and bladeless; sheath pale green, base purplish brown to reddish purple, 2–10 cm; leaf blade 2–3 mm wide. Involucral bracts usually 2, leaflike, shorter to rarely longer than inflorescence. Inflorescence a simple, compound, or decomposed anthela; rays 8–12, mostly 17–

30 cm, unequal in length, each with several raylets; raylets less than 2 cm, usually with 1–6(–14) spikelets at apex. Spikelets digitately arranged or sometimes solitary, linear to narrowly linear-ovoid, 5–12 × 1–1.5 mm, 6–28-flowered; rachilla wingless. Glumes purplish brown, pale brown, or straw-colored but middle pale brownish to pale green, densely imbricate, oblong-ovate to subelliptic, ca. 1.5 mm, membranous, 3-veined, abaxially keeled, apex rounded to subtruncate and mucronate. Stamens 1–3; anthers narrowly oblong, apex white setose. Style of medium length; stigmas 3. Nutlet yellowish, whitish, or reddish brown, broadly obovoid, 0.5–0.6(–0.7) mm, ca. 1/3 as long as subtending glume, 3-sided, tuberculate. Fl. and fr. over a long period, different in each region.  $2n = 26$ .

Sparse forests, grasslands on mountain slopes, sand by river margins, swamps, ditch margins in valleys, wastelands, wet places, along trails, dry fields, paddy fields; near sea level to 1600 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, S Henan, Hubei, Hunan, S Jiangsu, Jiangxi, Taiwan, SE Xizang, S Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, tropical America, SW Asia, Australia, Indian Ocean islands, Madagascar, North America, Pacific islands].

**15. *Cyperus cuspidatus*** Kunth in Humboldt et al., Nov. Gen. Sp. 1, ed. 4<sup>o</sup>: 204. 1816.

长尖莎草 chang jian suo cao

Annuals. Roots fibrous. Culms tufted, 3–15 cm tall, flaccid, 3-angled, smooth, base with few leaves (often withered by flowering time). Leaves shorter than culm; leaf blade 1–2 mm wide, usually folded. Involucral bracts 2 or 3, linear, longer than inflorescence. Inflorescence a simple anthela; rays 2–6, mostly to 2 cm. Spikelets 5 to many, digitately arranged at apex of ray, linear, 4–12 × ca. 1.5 mm, 8–26-flowered; rachilla wingless. Glumes purplish red to brown on both surfaces, ± laxly imbricate, oblong, 1–1.5 mm, 3-veined, apex truncate and with a recurved (0.5–)0.6–1 mm awn. Stamens 3; anthers ellipsoid, ca. 0.1(–0.2) mm. Style (0.2–)0.4–0.6 mm; stigmas 3, 0.3–0.5 mm. Nutlet dark brown, oblong-obovoid to oblong, 0.5–0.6 mm, ca. 1/2 as long as subtending glume, 3-sided, with many tubercles. Fl. and fr. Jun–Sep(–Oct).

Sand at river margins, grasslands at water margins, seashores, along trails, wastelands, mountain slopes, forests, fields; near sea level to 2000 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Kashmir, Laos, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Central, North, and South America, Indian Ocean islands, Madagascar].

**16. *Cyperus castaneus*** Willdenow, Sp. Pl. 1: 278. 1797.

长板栗莎草 chang ban li suo cao

Annuals. Roots fibrous. Culms tufted, 3–15 cm tall, 3-angled, smooth, base with few leaves but often withered by flowering time. Leaves shorter than culm; leaf blade 0.4–1 mm wide, folded. Involucral bracts 2–5, linear, longer than inflorescence. Inflorescence a simple anthela; rays 1–4, to 3 cm. Spikelets 5–30, digitately or stellately arranged at apex of ray, linear, 5–20 × 1–1.8 mm, 8–26-flowered; rachilla wingless. Glumes purplish red, ± laxly imbricate, oblong to oblong-lanceolate,

1.2–1.7 mm, 3-veined, apex subobtusate to emarginate and with a recurved 0.2–0.5 mm awn. Stamens 2 or 3; anthers ellipsoid, 0.1(–0.2) mm. Nutlets brown, narrowly oblong, 0.7–0.9 mm, 3-sided, surface minutely punctate. Fl. and fr. Jun–Sep.  $2n = 40$ .

Sand at river margins, roadsides, fields; below 300 m. Guangdong, Guangxi, Guizhou, Hunan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; S Africa, N Australia].

**17. *Cyperus szechuanensis*** T. Koyama, Jap. J. Bot. 15: 182. 1956.

四川莎草 *si chuan suo cao*

Perennials. Roots long, fibrous. Rhizomes short. Culms densely tufted, 16–26 cm tall, 3-angled, smooth, base swollen into a bulb shape and with several leaves. Leaves usually longer than culm; sheath dark brown, long; leaf blade 2.5–4 mm wide, flat. Involucral bracts 3, leaflike, longer than inflorescence. Inflorescence a simple anthela, contracted into a capitulum, globose, 1.2–1.6 cm in diam., with many spikelets. Spikelets ovoid to ellipsoid, 5–8 × ca. 3 mm, compressed, 6–10-flowered; rachilla wingless. Glumes yellowish white, adaxially pale rusty brown and shortly striate, densely arranged, ovate, ca. 4 mm, membranous, veins several, prominently keeled, margin white hyaline, apex mucronate. Stamens 3; anthers linear, slightly long; connective dark red, prominent beyond anthers. Style short; stigmas 3, long. Nutlet oblong, 3-sided (not mature).

• Wet places. Sichuan.

**18. *Cyperus niveus*** Retzius, Observ. Bot. 5: 12. 1788.

南沙草 *nan suo cao*

Perennials. Rhizomes short, thickened. Culms tufted, 10–70 cm tall, 3-angled, smooth, base slightly swollen into a bulb shape. Leaves shorter than or sometimes as long as culm; leaf blade 2–3 mm wide, usually folded but sometimes flat. Involucral bracts 2 or 3, leaflike, longer than inflorescence. Inflorescences capitate, 2–3 cm in diam., with 6 to more than 20 spikelets. Spikelets narrowly oblong-ovoid to narrowly ovoid, 0.7–2(–2.5) cm × 3–5 mm, compressed, 8–48-flowered; rachilla wingless. Glumes yellowish white to pale straw-colored on both surfaces but adaxially usually pale rusty brown and with short striae, densely imbricate, ovate-lanceolate, 4–4.5 × ca. 2 mm, papery, conspicuously many veined, midvein green, apex subobtusate. Stamens 3; anthers linear; connective not prominent beyond anthers. Style long; stigmas 3, shorter than style. Nutlet broadly obovoid, ca. 1/3 as long as subtending glume, triquetrous. Fl. and fr. Sep–Oct.  $2n = 64, 68, 74$ .

Sand at stream margins, mountain slopes, wet places; 500–2100 m. Sichuan, SE Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, N Myanmar, Nepal, Pakistan, Thailand, Vietnam; tropical Africa, SW Asia].

**19. *Cyperus cephalotes*** Vahl, Enum. Pl. 2: 311. 1805.

少花穗莎草 *shao hua sui suo cao*

Perennials, stoloniferous. Culms single or laxly tufted, 10–50 cm tall, apically 3-angled to triquetrous, smooth. Leaves shorter than to equaling culm; leaf blade 0.5–4 mm wide, basally folded, apically becoming flat. Involucral bracts 3–5,

leaflike, longer than inflorescence, spreading or longest erect. Inflorescences capitate, conic to globose, 5–10 mm in diam., with 5–30 spikelets. Spikelets ovoid to ± narrowly ovoid, 4–10 × 3–4 mm, slightly compressed, 3- or 4-flowered; rachilla wingless. Glumes yellowish brown tinged with dark brown, densely imbricate, ovate, 3–4 × ca. 2 mm, leathery, 3–5-veined and green, midvein scabrid, margin pale, apex acute and mucronate. Stamens 3; anthers linear, 1–1.5 mm; connective apex not prolonged beyond anthers. Style 3–4 mm, gradually widened to a 3-angled or winged base; stigmas 3, much shorter than style. Nutlet ovoid, ca. 1.5 mm, 1/3–1/2 as long as subtending glume, 3-sided, dorsiventrally flattened, scabrid angled, with spongy base of style extending downward along angles of nutlet, apex acute and beaklike. Fl. and fr. ?summer.

Lakes and rivers, rooted on floating mats of *Pistia*, *Salvinia*, and decayed water plants; near sea level. Fujian (Xiamen) [India, Indonesia, Myanmar, Papua New Guinea, Sri Lanka, Thailand, Vietnam; NE Australia, Indian Ocean islands].

**20. *Cyperus michelianus*** (Linnaeus) Link, Hort. Berol. 1: 303. 1827.

旋鳞莎草 *xuan lin suo cao*

*Scirpus michelianus* Linnaeus, Sp. Pl. 1: 52. 1753.

Annuals. Roots many, fibrous. Culms densely tufted, 2–25 cm tall, compressed 3-angled, smooth, few leaved, base not swollen. Leaves shorter to slightly longer than culm; sheath purplish red, short; leaf blade 1–2.5 mm wide, flat or folded. Involucral bracts 3–6, leaflike, much longer than inflorescence, base broad. Inflorescences capitate, pyramidal-ovoid, ovoid, or subglobose, 0.5–1.5 cm in diam., with numerous spikelets. Spikelets densely aggregated at apex of short rays, ovoid to narrowly oblong-ovoid, 3–4 × ca. 1.5 mm, 10–20-flowered or more. Glumes yellowish white but sometimes middle yellowish brown to reddish brown striate, spirally imbricate, oblong-lanceolate, ca. 2 mm, slightly hyaline, 3–5-veined, keel green, apex elongated into a recurved mucro. Stamens (1 or)2; anthers oblong. Style long; stigmas 2(or 3), usually yellow papillate. Nutlet narrowly oblong, ca. 1 mm, 3-sided or plano-convex, margin with white hyaline cells. Fl. and fr. Jun–Sep.

Wet places at water margins or river margins, paddy fields; near sea level to 300 m. Anhui, Fujian, Guangdong, Guangxi, Hebei, Heilongjiang, Henan, E Hubei, Hunan, Jiangsu, Jilin, Liaoning, Shandong, N Xinjiang, SE Xizang, N and NW Yunnan, Zhejiang [India, Japan, Kashmir, Kazakhstan, Korea, Laos, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia, Thailand, Vietnam; Africa, SW Asia, Australia, Europe].

**21. *Cyperus pygmaeus*** Rottbøll, Descr. Icon. Rar. Pl. 20. 1773.

矮莎草 *ai suo cao*

*Cyperus michelianus* (Linnaeus) Link subsp. *pygmaeus* (Rottbøll) Ascherson & Graebner.

Annuals. Roots fibrous. Culms tufted, 12–18 cm tall, compressed triquetrous, slightly concave on 3 sides, few leaved basally. Leaves shorter than culm; sheath reddish brown, short; leaf blade 2–2.5 mm wide, flat, apical margin and midvein abaxially spinulose. Involucral bracts 4–7, leaflike, longer than inflorescence, ± horizontal to sometimes downward reflexed.

Inflorescences capitate, with numerous spikelets. Spikelets densely aggregated, narrowly oblong-ovoid to suboblong, 4–5 × ca. 1.5 mm, 10–15-flowered. Glumes yellowish white but middle rusty brown and shortly striate, distichous, oblong-lanceolate, ca. 2 mm, 3-veined, midvein green and apically forming a slight keel, apex acute and excurved mucronate. Stamen usually 1; anther short, linear; connective slightly prominent beyond anthers. Style short; stigmas 2(or 3), longer than style. Nutlet oblong, 1–1.2 mm, 2/3–3/4 as long as subtending glume, lenticular with one flat and one convex side, minutely papillose. Fl. and fr. Oct–Nov.  $2n = 76$ .

Pond margins, water margins, wet places in sand; ca. 100 m. Anhui, Guangdong, Guangxi, Hainan, Henan, Hubei, Taiwan, Zhejiang [Afghanistan, India, Indonesia, Japan, Kashmir, Korea, Laos, Myanmar, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia, S Europe, Indian Ocean islands, Madagascar].

**22. *Cyperus nipponicus*** Franchet & Savatier, Enum. Pl. Jap. 2: 537. 1878.

白鳞莎草 bai lin suo cao

Annuals. Roots many, slender, fibrous. Culms densely tufted, 5–20 cm tall, flaccid, compressed 3-angled, smooth, few leaved basally. Leaves usually shorter than to sometimes equaling culm; sheath reddish brown to purplish brown, submembranous; leaf blade 1.5–2 mm wide, flat or folded. Involucral bracts 3–5, leaflike, several times as long as inflorescence, basally slightly widened. Inflorescences usually capitate, globose, 1–2 cm in diam., sometimes with a 1–2 cm ray, with many densely arranged spikelets. Spikelets narrowly oblong-ovoid to ovoid-oblong, 3–8 × 1.5–2 mm, compressed, 8–30-flowered; rachilla wings white, hyaline. Glumes white on both surfaces but sometimes sparsely rusty brown shortly striate, slightly spreading, broadly ovate, ca. 2 mm, hyaline, several veined, midvein green, apex mucronate. Stamens 2; anthers linear-oblong. Style elongate; stigmas 2. Nutlet yellowish brown, oblong, ca. 1 mm, plano-convex, sometimes nearly concave-convex. Fl. and fr. Aug–Sep.

Mountain slopes, along trails, sunny places in fields; below 100–1000 m. Anhui, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Shanxi, Zhejiang [Japan, Korea, Russia (Far East)].

**23. *Cyperus hilgendorffianus*** Boeckeler, Bot. Jahrb. Syst. 5: 501. 1884.

山东白鳞莎草 shan dong bai lin suo cao

*Cyperus nipponicus* Franchet & Savatier f. *hilgendorffianus* (Boeckeler) Kükenthal; *C. shandongense* F. Z. Li.

Annuals. Roots fibrous. Culms tufted, 10–35 cm tall, 3-angled, basally with 1–3 leaves. Leaves shorter to rarely longer than culm; leaf blade 2–4 mm wide. Involucral bracts 5–9, leaflike, several times as long as inflorescence. Inflorescence a simple anthela; rays 3–6, longest 4–6 cm. Spikelets many, densely aggregated at apex of each ray, narrowly ovoid to oblong, 4–6 × ca. 1.5 mm, compressed, 10–20-flowered; rachilla wings white, narrow, hyaline. Glumes pale on both surfaces but middle green, slightly laxly imbricate, ovate, ca. 2 mm, several veined, apex mucronate. Stamens 2; anthers narrowly oblong. Style ca.

1 mm; stigmas 2. Nutlet yellowish brown, ellipsoid, ca. 1 mm, plano-convex or concave-convex.

Wet places at water margins; ca. 100 m. S Heilongjiang, Shandong (Tai'an) [Japan].

**24. *Cyperus eragrostis*** Lamarck, Tabl. Encycl. 1: 146. 1791.

密穗莎草 mi sui suo cao

*Cyperus vegetus* Willdenow.

Perennials, rhizomatous. Culms caespitose, (25–)40–60(–90) cm tall, 3-angled to terete, smooth. Leaf blade (10–)25–50 cm × 5–8(–12) mm, flat or V-shaped. Involucral bracts 4–8, horizontal to ascending at 15–30°. Inflorescence an anthela, flat or sometimes V-shaped, 3–30(–50) cm × 1.5–8(–12) mm; rays (0–)3–10, 2.5–5(–12) cm; raylets usually absent. Globose head of (20–)30–50(–70) spikelets at apex of each ray, (1–)2–4 cm in diam. Spikelets oblong, 0.5–2 cm × 2.2–3 mm, compressed. Glumes (12–)20–30(–50), whitish to golden brown, ovate-deltoid, 2–2.3 × 1–1.4 mm, basally 2-keeled, laterally veinless. Stamen 1; anther 1–1.2 mm. Style 1–1.2 mm; stigmas 3, ca. 0.5 mm. Nutlet black to dark brown, with a ca. 0.1 mm stipe, broadly ellipsoid, 1.2–1.4 mm, 3-sided, punctulate, apex apiculate with a 0.2–0.3 mm beak. Fl. and fr. Jul–Aug.  $2n = 42$ .

Damp grasslands, shores; below 200 m. Naturalized in N Taiwan [native to North and South America and Pacific islands (Easter Island)].

*Cyperus eragrostis* is naturalized in S Africa, Australia, and Europe.

This species is reported here for the first time from China, based on two collections: Taiwan: Taipei, *Huang Chien-I 1640* (HAST); Yilan, Dongshan Xiang, *Liong Wai-Chao 3809* (HAST).

**25. *Cyperus digitatus*** Roxburgh, Fl. Ind. 1: 209. 1820.

长小穗莎草 chang xiao sui suo cao

*Cyperus digitatus* var. *laxiflorus* L. K. Dai; *C. digitatus* var. *pingbienenensis* L. K. Dai.

Perennials. Rhizomes woody, very short. Culms tufted, 0.5–1.5 m tall, stout, triquetrous, smooth, basally with leaves. Leaves nearly as long as culm; sheath purplish brown, long; leaf blade 4–15 mm wide, flat or folded, subleathery. Involucral bracts 5–7, leaflike, longer than inflorescence. Inflorescence a compound or decompound anthela; rays 6–10, usually to 18 cm, each with 4–7 raylets; raylets unequal in length. Spikes at apical part of raylets, cylindrical, 3–6 × 0.4–2 cm, without a peduncle, with many laxly arranged spikelets. Spikelets subdistichous, linear to narrowly ovoid, 3–12 × 1–1.5 mm, slightly compressed to compressed, spreading to obliquely spreading, 4–40-flowered; rachilla winged, wings lanceolate and laterally detaching from rachilla with nutlet maturation, with successive glumes 0.9–1.2 mm apart. Glumes straw-colored, reddish brown, or golden-yellow on both surfaces, densely imbricate, ovate to elliptic, 3–5-veined, keel greenish, apex mucronate. Stamens 3; anthers yellow, linear, ca. 0.5 mm; connective not prominent beyond anther apex. Style long; stigmas 3, shorter than style. Nutlet dark gray at maturity, oblong-ellipsoid, 1/2–3/5 as long as subtending glume, 3-sided, punctulate. Fl. Jul–Oct, fr. Aug–Dec.  $2n = 84, 104, 108$ .

Open areas in forests, ditches, wet places; near sea level to 1800 m. Guangxi, Hainan, Hong Kong, Taiwan, SE Xizang, Yunnan [Bangladesh, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, tropical America and Australia, North America, Pacific islands].

If subspecies are recognized, plants in Asia would belong to *Cyperus digitatus* subsp. *digitatus*. *Cyperus digitatus* subsp. *auricomus* (Sieber ex Sprenger) Kükenthal occurs in Africa.

**26. *Cyperus elatus* Linnaeus, Cent. Pl. 2: 5. 1756.**

黄翅莎草 huang chi suo cao

Perennials. Rhizomes short, slightly thick, hardened. Culms laxly caespitose, to 3 m tall, stout, smooth, basally subterete, apically 3-angled. Leaves basal, nearly as long as culm; sheath purple; leaf blade 0.8–1.2 cm wide, flat, subleathery, midvein and margin scabrous. Involucral bracts 5–8, leaflike, shorter to longer than inflorescence. Inflorescence a decompound anthela; rays 4–10, to 25 cm, unequal in length, each with 4–7 raylets; raylets usually to 8 cm, apex with 3–5 spikes. Spikes suberect to obliquely spreading, cylindrical, 3–6 × 0.8–1.2 cm, with many spikelets. Spikelets obliquely spreading to suberect, linear, 4–7 × ca. 1 mm, subterete to obscurely quadrate, 10–14-flowered; rachilla wings yellow, lanceolate, easily deciduous. Glumes yellowish to golden yellow on both surfaces but middle green, densely imbricate, oblong to elliptic, ca. 1.5 mm, 3–5-veined, apex mucronate. Stamens 3; anthers oblong, ca. 1.5 mm; connective prominent and subulate beyond anther apex, prominent part ca. 1/3 as long as anther, apex setose. Style slender; stigmas 3. Nutlet dark gray at maturity, oblong-ellipsoid, ca. 1/2 as long as subtending glume, densely punctulate. Fl. Jun–Aug.

Pond and stream margins; near sea level to 1500 m. Hainan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam].

**27. *Cyperus exaltatus* Retzius, Observ. Bot. 5: 11. 1788.**

高秆莎草 gao gan suo cao

Perennials. Roots many, fibrous. Rhizomes short. Culms 1–1.5 m tall, stout, 3-angled, smooth, basally with leaves. Leaves nearly as long as culm; sheath purplish brown, long; leaf blade 6–10 mm wide, margin scabrous. Involucral bracts 3–6, basal ones longer than inflorescence. Inflorescence a compound or decompound anthela; rays 5–10, to 18 cm, unequal in length, each with several raylets. Spikes 1–3 at raylet apex, cylindrical or narrowly cylindrical, 2–5 cm × 2.5–10 mm, with many spikelets. Spikelets subdistichous, densely or laxly arranged, narrowly oblong-ovoid, 2–6 × 1–1.5 mm, compressed, obliquely spreading, 4–25-flowered; rachilla wings white, linear, narrow, hyaline. Glumes dark grayish brown to yellowish brown, slightly densely imbricate, ovate, 1.5–1.6 mm, slightly shiny, 3–5-veined, keel green, apex obtuse, mucronate, and not excurved. Stamens 3; anthers linear, ca. 1 mm; connective prominent beyond anther apex. Style slender; stigmas 3. Nutlet obovoid to ellipsoid, less than 1/2 as long as subtending glume, 3-sided, smooth. Fl. and fr. Jun–Nov.

Grasslands, pond margins, sandy soil, moist or wet places; near sea level to 1100 m. Anhui, Fujian, Guangdong, S Guizhou, Hainan, E

Hubei, Jiangsu, Jilin, Shandong, Taiwan, Zhejiang [Bangladesh, India, Indonesia, Japan, Kashmir, Korea, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia, Indian Ocean islands].

- 1a. Spikes narrowly cylindrical, 2–4 cm × 2.5–4 mm; spikelets, 2–3 mm, 4–6-flowered ..... 27d. var. *tenuispicatus*
- 1b. Spikes cylindrical, 2–5 cm × 7–10 mm; spikelets 4–6 mm, 6–25-flowered.
  - 2a. Spikelets very densely arranged, to 14 mm, 12–25-flowered ..... 27c. var. *megalanthus*
  - 2b. Spikelets ± laxly arranged, 3–6 mm, 6–16-flowered.
    - 3a. Spikelets slightly laxly arranged, 4–6 mm, 6–16-flowered ..... 27a. var. *exaltatus*
    - 3b. Spikelets very laxly arranged, 3–4 mm, 6–8-flowered ..... 27b. var. *hainanensis*

**27a. *Cyperus exaltatus* var. *exaltatus***

高秆莎草(原变种) gao gan suo cao (yuan bian zhong)

Spikes cylindrical, 2–5 cm × 7–10 mm. Spikelets slightly laxly arranged, 4–6 × 1–1.5 mm, 6–16-flowered. Fl. and fr. Jun–Aug. *2n* = 96.

Moist or wet places; (near sea level to) 500–1100 m. Anhui, Fujian, Guangdong, S Guizhou, Hainan, E Hubei, Jiangsu, Jilin, Shandong, Taiwan, Zhejiang [Bangladesh, India, Indonesia, Japan, Kashmir, Korea, Malaysia, Myanmar, Pakistan, Papua New Guinea, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia, Indian Ocean islands].

*Cyperus exaltatus* var. *exaltatus* has been introduced to South America. It is similar to the Mexican endemic *Cyperus semiochraceus* Boeckeler.

The culms are used for making mats.

**27b. *Cyperus exaltatus* var. *hainanensis* L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 230. 1961.**

海南高秆莎草 hai nan gao gan suo cao

Spikelets very laxly arranged, 3–4 × ca. 1 mm, 6–8-flowered. Fl. Aug.

- Grasslands, pond margins, sandy soil. Hainan.

**27c. *Cyperus exaltatus* var. *megalanthus* Kükenthal, Repert. Spec. Nov. Regni Veg. 27: 107. 1929.**

长穗高秆莎草 chang sui gao gan suo cao

Spikelets very densely arranged, to 1.4 cm, 12–25-flowered. Fl. and fr. Sep–Nov.

- Moist places; ca. 100 m. Anhui, Fujian, Jiangsu, Zhejiang.

**27d. *Cyperus exaltatus* var. *tenuispicatus* L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 230. 1961.**

广东高秆莎草 guang dong gao gan suo cao

Inflorescence a decompound anthela. Spikes narrowly

cylindric, 2–4 cm × 2.5–4 mm. Spikelets ± densely arranged, oblong, 2–3 mm, 4–6-flowered. Fl. Sep.

- Guangdong.

**28. *Cyperus simaoensis*** Y. Y. Qian, Bull. Bot. Res., Harbin 21: 335. 2001.

思茅莎草 *si mao suo cao*

Perennials. Roots many, fibrous. Rhizomes short. Culms tufted, 0.7–1.3 m tall, stout, obtusely 3-angled, smooth, with 3–5 leaves, basally enclosed by leaf sheaths. Leaves shorter than culm; sheath reddish brown but base dark brown, 10–35 cm; leaf blade 0.8–1.2 cm wide, basally folded, apically flat. Involucral bracts 8–15, leaflike, mostly to 1.3 m, usually longer than inflorescence. Inflorescence a compound anthela; rays 12–15, mostly to 25 cm, unequal in length, usually 8–12 each with 2–11 raylets; raylets radially spreading. Spikes cylindric, 1.5–11 × 0.7–1.3 cm, usually not pedunculate but rarely pedunculate. Spikelets numerous, in 3–5 rows, densely arranged, narrowly oblong-ovoid, 4–8 × 1–1.5 mm, obliquely spreading, 4–10-flowered; rachilla wings white, narrow, hyaline, persistent. Glumes brownish yellow on both surfaces, densely imbricate, oblong-obovate, 2.2–2.5 mm, slightly shiny, obscurely 3–5-veined, midvein forming a greenish keel, apex straight and mucronate. Stamens 3; anthers oblong. Style long; stigmas 3. Nutlet narrowly ellipsoid to sometimes subobovoid, 1.2–1.3 mm, 3-sided, smooth. Fl. and fr. Sep.

- River margins; ca. 1200 m. S Yunnan (Simao Diqu).

**29. *Cyperus imbricatus*** Retzius, Observ. Bot. 5: 12. 1788.

迭穗莎草 *die sui suo cao*

*Cyperus densespicatus* Hayata; *C. imbricatus* var. *densespicatus* (Hayata) Ohwi; *C. imbricatus* subsp. *elongatus* (Boeckeler) T. Koyama; *C. imbricatus* var. *elongatus* (Boeckeler) Kükenthal; *C. mediorubescens* Hayata; *C. radiatus* Vahl; *C. radiatus* var. *elongatus* Boeckeler.

Perennials. Rhizomes short. Roots many, fibrous. Culms 7–15 cm tall, stout, obtusely 3-angled, smooth, basally clothed by several leaf sheaths. Leaves basal, shorter than culm; sheath reddish brown to dark brown, long; leaf blade 0.5–1.5 cm wide, basally folded, apically flat. Involucral bracts 3–5, leaflike, longer than inflorescence. Inflorescence a compound anthela; rays 6–10, to 16 cm, unequal in length, each with 3–10 raylets; raylets radially spreading. Spikes 3–6 fasciculate at apex of raylet, sessile or subsessile, densely arranged, cylindric, 1.5–4 × 0.6–1.4 cm, with many spikelets. Spikelets in several rows, narrowly ovoid to narrowly oblong-ovoid, 4–12 × 1.5–2 mm, slightly compressed, obliquely spreading, 8–30-flowered; rachilla wings white, narrow, hyaline, persistent; successive glumes 0.4–0.5 mm apart. Glumes brownish yellow to straw-colored, densely imbricate, broadly ovate, 1–1.2 mm (excluding mucro), shiny, 3–5-veined, keel greenish ending in a straight to slightly excurved 0.3–0.5 mm mucro. Stamens 3; anthers oblong, 0.2–0.5 mm; connective prominent beyond anther apex. Style long; stigmas 3. Nutlet obovoid to subellipsoid, ca. 1/2 as long as subtending glume, 3-sided, smooth. Fl. and fr. Sep–Oct.

Shallow water of ponds, shady moist places; 100–1400 m. Guang-

dong, Guangxi, Hainan, Taiwan [Afghanistan, Bangladesh, India, Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Thailand, Vietnam; tropical Africa and America, SW Asia, Indian Ocean islands, Madagascar].

**30. *Cyperus pangorei*** Rottbøll, Descr. Pl. Rar. 18. 1772.

红翅莎草 *hong chi suo cao*

Perennials. Rhizomes short, creeping. Culms 50–90 cm tall, stout, obtusely 3-angled, smooth. Leaves basally with a brown long sheath, apically bladeless or with a short blade. Involucral bracts 3–5, leaflike, longer than inflorescence. Inflorescence a decomposed or compound anthela; rays 5–7, to 5 cm, unequal, each with 3–8 raylets. Spikes broadly ovoid, 1–2 × 1–2 cm, with 4–15 spikelets. Spikelets ± laxly arranged, linear, 8–20 × ca. 1.5 mm, slightly compressed, obliquely spreading, 6–30-flowered; rachilla wings reddish brown, linear-oblong. Glumes reddish brown on both surfaces but middle green, lax, oblong, 2–3 mm, papery, 3–5-veined, not keeled, margin slightly revolute at maturity, apex obtuse to rounded. Stamens 3; anthers linear; connective prominent beyond anther, apex sometimes setiferous. Style of medium length; stigmas 3. Nutlet dark brown, obovoid-oblong, ca. 1/2 as long as subtending glume, 3-sided, densely punctulate. Fl. and fr. Nov–Jan.  $2n = 208$ .

River margins, water margins; near sea level to 400 m. Hainan, Hunan, Sichuan [NE India, Myanmar, Nepal, Pakistan, Sri Lanka].

*Cyperus pangorei* is cultivated in India for making mats and may possibly be used for the same purpose in China.

**31. *Cyperus linearispiculatus*** L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 230. 1961.

线状穗莎草 *xian zhuang sui suo cao*

Perennials. Roots fibrous. Stolons ± short. Culms laxly tufted, 12–15 cm tall, thin, obtusely 3-angled, base swollen into a tuber, leaved at basal part. Leaves shorter to longer than culm; leaf blade 2–4 mm wide, usually plicate. Involucral bracts 3–5, leaflike, longer than inflorescence, suberect. Inflorescence a simple anthela; rays 4–7, erect. Spikes oblong, 2–4 cm × 3–4 mm, with several to 10 or more spikelets. Spikelets laxly arranged, erect, linear, 5–12 × ca. 1 mm, 8–22-flowered; rachilla wings lanceolate. Glumes pale to brownish yellow but middle brown striate, densely imbricate, ovate, 1.5–2 mm, membranous, 3–5-veined, not keeled, apex obtuse to retuse. Stamens 3; anthers ellipsoid; connective slightly prominent beyond anthers. Style of medium length; stigmas 3, longer than style. Nutlet brown when mature, oblong, ca. 2/5 as long as subtending glume, 3-sided. Fl. and fr. Apr–May.

- Wet places by streams. S Yunnan (Xishuangbanna).

**32. *Cyperus stoloniferus*** Retzius, Observ. Bot. 4: 10. 1786.

粗根茎莎草 *cu gen jing suo cao*

Perennials. Rhizomes long, ± thick, ± hardened, base of shoot with ellipsoid to ovoid tubers. Culms solitary, 8–22 cm tall, 3-angled, smooth, basal sheaths usually disintegrating into fibers. Leaves usually shorter than culm to rarely longer; leaf blade medium green, 2–4 mm wide, usually folded, rarely flat.

Involucral bracts 2 or 3, ± erect, leaflike, basal 2 longer than inflorescence. Inflorescence a simple anthela; rays 3 or 4, 0.5–3 cm, each with 3–8 congested spikelets. Spikelets narrowly oblong-ovoid to narrowly ovoid, 6–12 × 2–3 mm, slightly thickened, 10–18-flowered; rachilla narrowly winged. Glumes yellow to brownish yellow on both surfaces variegated with brownish blood-red but middle green, densely imbricate, broadly ovate, ca. 3 mm, papery, 5–7-veined, keel obtuse, margin broadly white hyaline, apex acute to subobtuse. Stamens 3; anthers linear, ca. 1.5 mm; connective apex 0.1–0.2 mm. Style of medium length; stigmas 3. Nutlet dark brown when mature, ellipsoid to subobovoid, ca. 2/3 as long as subtending glume, 3-sided. Fl. and fr. Jul.

Swamps, open grasslands, moist places along seashores; near sea level. Fujian, Guangdong, Hainan, Taiwan, Xisha Qundao [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; NE Australia, Indian Ocean islands, Madagascar, Pacific islands].

**33. *Cyperus rotundus* Linnaeus, Sp. Pl. 1: 45. 1753.**

香附子 *xiang fu zi*

*Cyperus rotundus* var. *quimoyensis* L. K. Dai.

Perennials. Stolons slender, with ellipsoidal tubers. Culms solitary, rarely 2 laxly tufted, 15–90 cm tall, slightly slender, triquetrous, smooth, base swollen into a tuber, leaved at basal part. Leaves equaling or shorter than culm; sheath brown, usually disintegrating into fibers; leaf blade bluish green, 2–5 mm wide, ± flat. Involucral bracts 2 or 3(–5), longer to sometimes shorter than inflorescence. Inflorescence a simple or compound anthela; rays (2 or) 3–10, mostly to 12 cm, unequal in length, spreading. Spikes obdeltoid, with 3–10 slightly laxly arranged spikelets. Spikelets obliquely spreading, linear, 1–3 cm × 1.5–2 mm, 8–28-flowered; rachilla wings white, slightly broad, hyaline. Glumes blood-red to purplish brown on both surfaces but middle green, subdensely imbricate, ovate to oblong-ovate, ca. 3 mm, 5–7-veined (fading some distance before margin), apex acute to obtuse and mucicous. Stamens 3; anthers linear; connective prominent beyond anthers. Style long; stigmas 3, longer than style, exerted from glume. Nutlet obovoid-oblong, 1/3–2/5 as long as subtending glume, 3-sided, punctulate. Fl. and fr. May–Nov.  $2n = 80, 84, 96, 100, 104, 108, 110, 112, 116, 124, 132, 138, 160$ , ca. 200.

Grasslands, wet or dry areas on mountain slopes, stream margins, along trails, sandbanks, ditch margins, water margins in valleys, paddy field margins; near sea level to 2100 m. Anhui, Chongqing, Dongsha Qundao, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Liaoning, Nansha Qundao, S Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xisha Qundao, SE Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Tajikistan, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Central, North, and South America, Europe, Indian Ocean islands, Madagascar, Pacific islands].

The tubers are used as a Chinese medicine. The species is generally considered to be one of the world's worst weeds.

**34. *Cyperus tuberosus* Rottbøll, Descr. Pl. Rar. 18. 1772.**

假香附子 *jia xiang fu zi*

*Cyperus rotundus* Linnaeus subsp. *tuberosus* (Rottbøll) Kükenthal.

Perennials. Rhizomes stoloniferous; stolons long and creeping, terminated by a tuber. Culms solitary, rarely few laxly tufted, 20–55 cm tall, slender, triquetrous, smooth, basally with several leaves. Leaves shorter than culm; sheath reddish brown, eventually disintegrating into fibers; leaf blade medium green, 3–6 mm wide, base flat or slightly folded. Involucral bracts 2 or 3, leaflike, shorter than or equaling inflorescence. Inflorescence a simple or rarely compound anthela; rays 2–6, to 8 cm, unequal in length. Spikes obdeltoid, with 2–11 laxly arranged spikelets. Spikelets linear, 0.8–2 cm × 1.5–2 mm, obliquely spreading, 8–20-flowered; rachilla wings white, broad, hyaline. Glumes brownish yellow to straw-colored on both surfaces but keel green, broadly ovate to elliptic, 3.5–4 mm, membranous, conspicuously 7-veined (nearly reaching margin), margin white hyaline, apex rounded. Stamens 3; anthers linear; connective slightly prominent beyond anthers. Style of medium length; stigmas 3. Nutlet oblong-obovoid, ca. 1/2 as long as subtending glume, 3-sided, punctulate. Fl. and fr. Jun–Jul.

Open grasslands, along trails, sandy shores, gardens; below 1700 m. Sichuan, Taiwan, Yunnan [India, Japan (Ryukyu Islands), Malaysia, Sri Lanka; Africa, SW Asia (Yemen), Indian Ocean islands].

**35. *Cyperus mitis* Steudel, Syn. Pl. Glumac. 2: 316. 1855.**

疏鳞莎草 *shu lin suo cao*

*Cyperus stenostachyus* Bentham var. *indicus* C. B. Clarke; *C. subcapitatus* C. B. Clarke; *C. tenuifolius* L. K. Dai (1961), not (Steudel) Dandy (1944).

Perennials. Rhizomes creeping, sometimes with tubers. Culms solitary, 40–50[–80] cm tall, acutely triquetrous, smooth, with 1 or 2 leaves, basalmost part ± swollen. Leaves much shorter than culm; sheath brown, equaling or longer than leaf blade; leaf blade 1–1.5 mm wide. Involucral bracts 2 or 3, subulate, usually shorter than inflorescence, longest erect. Inflorescence a simple anthela, lax; rays 3 or 4, mostly to 8 cm, slender, smooth. Spikes obovoid, with 2–6 spikelets. Spikelets linear to linear-oblong, 1–2.5 cm × ca. 2 mm, 12–26-flowered; rachilla wings white, linear, hyaline. Glumes reddish brown, very lax, eventually extended, oblong-ovate, 2.5–3 mm, papery, 5–7-veined with middle 3 green and conspicuous, not keeled, apex obtuse to rounded and mucicous. Stamens 3; anthers linear, 1–1.3 mm; connective ± long and prominent beyond anthers. Style ± long to medium long; stigmas 3, ± slender. Nutlet straw-colored, narrowly obovoid, ca. 1.2 mm, ca. 2/3 as long as subtending glume, 3-sided, minutely punctate. Fl. and fr. Oct–Nov.

Ditch margins; 700–800 m. Yunnan (Mengla, Zhenxiong) [India, Myanmar, Sri Lanka, Thailand; Indian Ocean islands, Madagascar].

**36. *Cyperus esculentus* Linnaeus var. *sativus* Boeckeler, Linnaea 36: 290. 1870.**

油莎草 *you suo cao*

Perennials. Root fibrous. Stolons several, apex swollen into a tuber; tubers ellipsoid to globose, 10–18 × 5–8 mm, conspic-

uously nodose, gray tomentose when old. Culms solitary, 10–40 cm tall, triquetrous, smooth, with several leaves at basal part. Leaves ± congested, longer to shorter than culm; sheath reddish brown; leaf blade yellowish green to light green, 3–6 mm wide, margin flat or revolute. Involucral bracts 3–6, basal 2 longer than inflorescence. Inflorescence a simple or compound anthela; rays 5–10, to 12 cm, base sometimes ramose. Spikes ovoid, with 5–14 laxly arranged spikelets. Spikelets distichous, linear to oblong, 1–1.5 cm × 1.6–1.8(–2) mm, subcompressed, divaricate after anthesis, 10–20-flowered; rachilla broadly winged. Glumes yellowish to golden or pale brown, ± laxly imbricate, extended at maturity, ovate to ovate-elliptic, 2.2–2.6 mm, 7-veined, margin apically white hyaline, apex truncate and mucronate. Stamens 3; anthers linear; connective prominent beyond anthers into small ovoid appendage. Style long; stigmas 3, ± long. Nutlet brownish gray, ellipsoid, ca. 1/2 as long as subtending glume, 3-sided, shiny, densely punctulate.

Cultivated in Guangxi, Heilongjiang, Liaoning, Xinjiang, and Yunnan; collected as a naturalized plant in Shandong, Taiwan, and perhaps elsewhere [native to Mediterranean region].

*Cyperus esculentus* var. *esculentus* occurs in the Mediterranean region and differs by having globose to ovoid tubers, anthela rays to 4 cm, and ellipsoid nutlets. *Cyperus esculentus* var. *sativus* was introduced to China before the 1970s and is now grown as an oil plant. The oil is used as an edible or industrial oil. The tubers could be used as a starch source. This herb grows and reproduces quickly and is good for soil conservation.

### 37. *Cyperus tenuiculmis* Boeckeler, Linnaea 36: 286. 1870.

四稜穗莎草 si leng sui suo cao

Perennials. Rhizomes short, woody. Culms laxly tufted, 40–75 cm, slender, triquetrous, smooth, basally with several leaves, base slightly swollen. Leaves shorter than culm; sheath brown, ± long; leaf blade 2–6 mm wide, margin revolute. Involucral bracts (2 or)3, leaflike, basalmost longer than inflorescence. Inflorescence a simple or rarely compound anthela; rays 3–7, 1–10 cm. Spikes ovoid, with 3–14 spikelets. Spikelets laxly arranged, narrowly linear-ovoid to linear, 1–2 cm × 1.5–2 mm, subquadrangular, obliquely spreading but subspreading after anthesis, 6–14-flowered; rachilla flexuose, wings blackish brown and caducous. Glumes yellow to yellowish brown on both surfaces, slightly lax, elliptic, ca. 4 mm, membranous, 7–9-veined, keel green, apex obtuse. Stamens 3; anthers linear; connective slightly prominent beyond anthers. Style long; stigmas 3. Nutlet black, ellipsoid to obovoid, 3-sided, concave on 3 sides, ca. 1/2 as long as subtending glume, densely punctulate. Fl. and fr. May–Nov.  $2n = 88$ .

Mountain slopes, open grasslands, streamsides, wet places under sparse forests, fields; 200–1600 m. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, S Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and Australia, Pacific islands].

*Cyperus tenuiculmis* was misidentified as *C. zollingeri* Steudel by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 137. 1961).

### 38. *Cyperus distans* Linnaeus f., Suppl. Pl. 103. 1782.

疏穗莎草 shu sui suo cao

Perennials. Rhizomes short, surculose. Culms 35–110 cm tall, slightly stout, compressed triquetrous, smooth, base slightly swollen. Leaves shorter than or equaling culm; sheath brown, long; leaf blade 4–6 mm wide, flat or slightly folded, margin scabrid. Involucral bracts 4–6, leaflike, basal 2 or 3 longer than inflorescence, remaining ones shorter than inflorescence. Inflorescence a compound or decompound anthela; rays 6–10, to 15 cm, each with 3–5 raylets; raylets to 7 cm, ± thin. Spikes broadly ovoid, with 8–18 spikelets. Spikelets laxly distichous, linear, 0.8–4 cm × less than 1 mm, subterete, oblique to spreading, 6–32-flowered; rachilla thin, flexuose, wings white, hyaline, caducous. Glumes dark blood-red on both surfaces, lax, elliptic, ca. 2 mm, membranous, 3–5-veined, keel green, margin apically white hyaline, apex rounded. Stamens 3; anthers linear; connective prominent beyond anthers. Style short; stigmas 3. Nutlet blackish brown, oblong, ca. 2/3 as long as subtending glume, 3-sided, slightly prominently punctate. Fl. and fr. Jul–Aug.

Forests, swamps, grasslands, slightly dry or wet places on slopes, river margins, along trails; near sea level to 1800 m. Guangdong, Guangxi, Hainan, Taiwan, Xisha Qundao, Yunnan [Bhutan, Cambodia, India, Indonesia, Japan (Ryukyu Islands), Kashmir, Laos, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and Australia, Central, North, and South America, Indian Ocean islands, Madagascar].

### 39. *Cyperus nutans* Vahl, Enum. Pl. 2: 363. 1805.

垂穗莎草 chui sui suo cao

Perennials. Rhizomes short, hardened. Culms scattered, 75–110 cm tall, stout, compressed 3-angled, smooth, with leaves at basal part. Leaves shorter than culm; leaf blade 6–12 mm wide, flat, margin scabrous. Involucral bracts 4–8, leaflike, basal 3 or 4 usually longer than inflorescence, to 1.2 cm wide, abaxially serrulate apically on 2 lateral veins, margin scabrous. Inflorescence a compound anthela; rays 8–10, to 16 cm, each with 4–10 raylets. Spikes cylindric, 2–5 cm × 4–7 mm, with laxly arranged spikelets. Spikelets linear to narrowly linear-ovoid, 5–11 × ca. 1.5 mm, suberect, 6–10-flowered; rachilla flexuose, wings white and hyaline. Glumes yellowish on both surfaces and rusty brown striate, lax, elliptic, ca. 2 mm, spreading after anthesis, membranous, 7–9-veined, keel reddish brown, apex mucronate. Stamens 3; anthers linear-oblong; connective prominent beyond anthers. Style very short; stigmas 3, slender, exerted. Nutlet dark brown when mature, oblong to obovoid-oblong, ca. 2/3 as long as subtending glume, 3-sided, densely and slightly prominently punctate. Fl. and fr. May–Oct.  $2n = 56$ .

Sparse forests, grasslands on mountain slopes, water margins in valleys, wet places, river margins, fields; below 100–1600 m. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Nepal, Papua New Guinea, Sri Lanka, Thailand, Vietnam; Africa, Australia].

### 40. *Cyperus eleusinoides* Kunth, Enum. Pl. 2: 39. 1837.

稊穗莎草 can sui suo cao

*Cyperus nutans* Vahl subsp. *eleusinoides* (Kunth) T. Koyama; *C. nutans* var. *eleusinoides* (Kunth) Haines.

Perennials. Rhizomes short, surculose. Culms to 1 m tall, stout, 3-angled, smooth, base swollen into a tuber shape, with leaves at basal part. Leaves shorter than culm; sheath long, brown; leaf blade 6–12 mm wide, flat, margin scabrous. Involucral bracts 5 or 6, basal 2 or 3 longer than inflorescence. Inflorescence a compound or decompound anthela; rays 6–12, to 18 cm, each with 3–6 raylets; raylets mostly to 4 cm, unequal in length. Spikes oblong to cylindrical, 1–3 cm × 4–10 mm, with very many spikelets. Spikelets densely arranged in several rows, linear-oblong, 4–8 × ca. 2 mm, 6–12-flowered; rachilla wings white, hyaline, caducous. Glumes pale and brown striate or brown, lax, ovate-elliptic, ca. 2 mm, membranous, 5–7-veined, keel green, apical margin white hyaline, apex mucronate. Stamens 3; anthers linear; connective prominent beyond anthers. Style short; stigmas 3, ± long. Nutlet dark brown, obovoid, 3-sided, ca. 2/3 as long as subtending glume, densely and slightly prominently punctate. Fl. and fr. Aug–Dec.  $2n = 64$ .

Forests, mountain slopes, sunny water margins, wet places in valleys; 200–2500 m. Fujian, Guangdong, Guangxi, Taiwan, Yunnan [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Kashmir, Laos, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, SW Asia, tropical Australia].

**41. *Cyperus glomeratus* Linnaeus, Cent. Pl. 2: 5. 1756.**

头状穗莎草 *tou zhuang sui suo cao*

Annuals. Roots fibrous. Culms scattered, 30–60(–90) cm tall, stout, obtusely 3-angled, smooth, basally with leaves, base slightly swollen. Leaves few, shorter to slightly longer than culm; sheath reddish brown, long; leaf blade 4–8 mm wide, margin smooth. Involucral bracts 3 or 4, leaflike, longer than inflorescence. Inflorescence a compound anthela; rays 3–8, mostly to 12 cm, unequal in length; raylets lacking. Spikes subglobose, ellipsoid, or oblong, 1–3 × 0.6–1.7 cm, not pedunculate, with very many spikelets. Spikelets very densely arranged in several rows, narrowly linear-ovoid to linear, 5–10 × 1.5–2 mm, slightly compressed, 8–16-flowered; rachilla wings white, narrow, hyaline. Glumes reddish brown, lax, suboblong to oblong-lanceolate, ca. 2 mm, slightly spreading, veins very obscure, not keeled, margin involute, apex obtuse. Stamens 3; anthers short, oblong; connective prominent beyond anthers. Style slightly long; stigmas 3, ± short. Nutlet dark gray, narrowly oblong, ca. 1/2 as long as subtending glume, 3-sided, conspicuously reticulately striate. Fl. and fr. Jun–Oct.

Wet grasslands along trails, sandy soil at water margins, river margins, lake banks, paddy fields; 100–1300 m. Anhui, S Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Zhejiang [Japan, Kashmir, Kazakhstan, Korea, Russia, Tajikistan, Uzbekistan; SW Asia, Europe].

**42. *Cyperus malaccensis* Lamarck, Tabl. Encycl. 1: 146. 1791.**

茳茳 *jiang du*

Perennials. Rhizomes long, woody, rarely with thin stolons. Culms 0.5–1.5 m tall, 4–6 mm thick, acutely triquetrous, smooth, base brown and with a bladeless sheath, apical 1 or 2 sheaths with a blade. Leaf blade absent or to 3 cm × 4–8 mm, flat. Involucral bracts 3 or 4, leaflike, to 20 cm, longer to

shorter than inflorescence. Inflorescence a simple or compound anthela; rays 6–10, mostly to 9 cm. Spikes broadly ovoid, with 5–10 spikelets; rachis strict, glabrous. Spikelets laxly arranged, linear, 0.8–2.5(–3) cm × ca. 1.5 mm, slightly turgid, spreading, 10–42-flowered; rachilla wings white, narrow, hyaline. Glumes reddish brown but margin yellowish to straw-colored, lax, oblong to elliptic, 2–2.5 mm, papery, inconspicuously 7–9-veined, margin involute at maturity, apex obtuse to rounded. Stamens 3; anthers linear; connective prominent beyond anthers. Style short; stigmas 3, slender. Nutlet blackish brown when mature, narrowly oblong, 1.7–2 mm, almost as long as subtending glume, 3-sided, minutely punctate. Fl. and fr. Jun–Nov.

River margins, ditch margins, water margins, shallow water, ocean beaches, salt marsh margins, forest margins, fields (usually cultivated); near sea level to 700 m. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; SW Asia, N Australia].

The culms are used for making mats and hats.

- 1a. Apicalmost leaf with an elongated blade; basal involucral bracts longer than inflorescence, spreading; glumes incurved ..... 42a. subsp. *malaccensis*
- 1b. Leaves with short to very short blades, sometimes basalmost sheath bladeless; involucral bracts shorter than inflorescence; glumes not incurved ..... 42b. subsp. *monophyllus*

**42a. *Cyperus malaccensis* subsp. *malaccensis***

茳茳(原亚种) *jiang du* (*yuan ya zhong*)

Apicalmost leaf with an elongated blade. Basal involucral bracts longer than inflorescence, spreading. Glumes slightly incurved. Fl. and fr. Jun–Oct.

River margins, ditch margins (usually cultivated); below 100 m. Hainan, Taiwan [India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; SW Asia, N Australia].

**42b. *Cyperus malaccensis* subsp. *monophyllus* (Vahl) T. Koyama, Fl. Taiwan 5: 266. 1978.**

短叶茳茳 *duan ye jiang du*

*Cyperus monophyllus* Vahl, Enum. Pl. 2: 352. 1805; *C. malaccensis* var. *brevifolius* Boeckeler.

Leaves with short to very short blades, sometimes basalmost sheath bladeless. Involucral bracts shorter than inflorescence. Glumes not incurved. Fl. and fr. Jun–Nov.

Ocean beaches, river margins, shallow water, fields (usually cultivated), forest margins, salt marsh margins; near sea level to 700 m. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Indonesia, Japan, Vietnam].

**43. *Cyperus pilosus* Vahl, Enum. Pl. 2: 354. 1805.**

毛轴莎草 *mao zhou suo cao*

*Cyperus obliquus* Nees; *C. pilosus* var. *obliquus* (Nees) C.

B. Clarke; *C. pilosus* var. *pauciflorus* L. K. Dai; *C. pilosus* var. *purpurascens* L. K. Dai.

Perennials. Rhizomes with slender stolons. Culms scattered, 25–85 cm tall, stout, acutely triquetrous, smooth or scabrid on angles of apical part. Leaves shorter than culm; sheath brownish, short; leaf blade 6–8 mm wide, flat, margin serrulate scabrid. Involucral bracts 3–5, basal 2 or 3 longer than inflorescence, margin serrulate scabrid. Inflorescence a compound or decompound anthela; rays 3–10, mostly to 14 cm, unequal in length, each with 3–7 raylets broadly triangular in outline. Spikes ovoid to oblong, 2–3 × 1–2 cm, with 10–20 or more spikelets; rachis densely hispid. Spikelets laxly distichous, narrowly linear-ovoid to linear, 2.5–14 × 1–2.5 mm, slightly turgid, spreading, 4–26-flowered; rachilla wings white, narrow, hyaline. Glumes pale, brown, reddish brown, or dark purple on both surfaces but middle green, slightly lax, broadly ovate, 1.8–2.5 mm, thinly papery, 5–7-veined, keel inconspicuous, margin white hyaline, apex mucronate or mucicous. Stamens 3; anthers linear-oblong, 0.5–0.8 mm; connective prominent beyond anthers. Style ca. 0.6 mm; stigmas 3, ca. 1 mm. Nutlet nearly black when mature, broadly ellipsoid to obovoid, 1/2–3/5 as long as subtending glume, 3-sided, apex mucronate. Fl. and fr. Aug–Nov. *2n* = 36, 68.

Sparse forests, forest margins, grasslands on slopes, marshes, meadows, river margins, wet places, paddy fields, water margins, along trails, parks; near sea level to 2100 m. Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shanxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands].

*Cyperus pilosus* is naturalized in North America.

**44. *Cyperus procerus*** Rottbøll, Descr. Icon. Rar. Pl. 29. 1773.

拟毛轴莎草 ni mao zhou suo cao

Perennials. Rhizomes with long stolons. Culms 45–85 cm tall, stout, compressed triquetrous. Leaves basal, equaling or slightly longer than culm; sheath reddish brown; leaf blade 5–10 mm wide, ± flat. Involucral bracts 3, leaflike, basal 1 or 2 longer than inflorescence. Inflorescence a simple or compound anthela; rays 3–7, mostly to 15 cm, unequal in length, obliquely spreading, smooth. Spikes 1–5, broadly ovoid, with 4–16 spikelets; rachis hispidulous or glabrous. Spikelets laxly arranged, narrowly linear-ovoid to linear-ovoid, 10–25 × ca. 3 mm, slightly turgid, obliquely spreading to spreading, 14–36-flowered; rachilla wings white, narrow, hyaline. Glumes yellowish brown and reddish brown punctate but middle greenish, slightly densely imbricate, broadly ovate, 2.5–3 mm, membranous, 7–9-veined, keeled, margin white hyaline and undulate, apex obtuse. Stamens 3; anthers linear-oblong, 1.2–1.8 mm; connective slightly prominent beyond anthers. Style short; stigmas 3. Nutlet brown, obovoid, 1.3–1.5 mm, ca. 1/2 as long as subtending glume, 3-sided, essentially smooth. Fl. and fr. Jun–Oct. *2n* = 18, 64.

Fields, water margins, wet places, often in sandy soil; below 100 m. Guangdong, Hainan, Taiwan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Madagascar].

**45. *Cyperus babakan*** Steudel, Syn. Pl. Glumac. 2: 6. 1854.

刺鳞莎草 ci lin suo cao

*Cyperus babakensis* Steudel ex Miquel; *C. pilosus* Vahl var. *babakensis* (Steudel ex Miquel) C. B. Clarke.

Perennials. Rhizomes stoloniferous. Culms 60–80 cm tall, slightly stout, compressed triquetrous, smooth. Leaves basal, slightly shorter than or subequaling culm; sheath brown and purplish red striate, basalmost bladeless; leaf blade ca. 8 mm wide, with short and transverse septate nodes, midvein and margin scabrous, basally folded, apically flat. Involucral bracts 3 or 4, leaflike, much longer than inflorescence, longest to 25 cm. Inflorescence a simple anthela; rays 3–5, 2.5–12 cm, each with a spike; raylets absent. Spikes ovoid to ellipsoid, ca. 2.5 × 1.8 cm, with several to many spikelets; rachis slightly densely yellowish brown hispidulous. Spikelets slightly densely arranged, spreading, narrowly linear-ovoid to linear-oblong, 0.8–1.2 cm × ca. 2.5 mm, subturgid, 12–30(–40)-flowered; rachilla wings white, narrow, hyaline. Glumes yellowish on both surfaces with purple striae, slightly densely arranged, ovate, 2.5–3 mm, membranous, 7–9-veined, keel green and spinulose especially distally, margin white hyaline, apex obtuse and mucronate. Stamens 3; anthers oblong, 0.7–1 mm; connective prominent beyond anthers. Style short; stigmas 3, ± longer than style. Nutlet black when mature, broadly obovoid to broadly ellipsoid, ca. 1/2 as long as subtending glume, 3-sided, densely punctulate. Fl. and fr. Jun–Oct.

Wet places, paddy fields; below 300 m. Hainan, SE Xizang [NE India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam].

**46. *Cyperus iria*** Linnaeus, Sp. Pl. 1: 45. 1753.

碎米莎草 sui mi suo cao

Annuals. Roots fibrous. Culms tufted, 8–80 cm tall, slender to slightly stout, compressed triquetrous, base few leaved. Leaves much shorter than culm; sheath reddish brown to brownish purple; leaf blade 2–5 mm wide, slightly folded or flat. Involucral bracts 3–5, leaflike, lowermost 2 or 3 longer than inflorescence. Inflorescence a compound or rarely simple anthela; rays 4–9, mostly to 12 cm, each with 5–10 or more spikes. Spikes ovoid to oblong-ovoid, 1–4 cm, with 5–20 or more spikelets. Spikelets laxly arranged, ascending to slightly spreading, narrowly ovoid, very narrowly ovoid, or oblong, 4–10 × ca. 2 mm, compressed, 6–22-flowered; rachilla almost wingless, with successive glumes 0.7–0.9 mm apart. Glumes yellow to straw-colored, lax, broadly obovate, ca. 1.5 mm, membranous, 3–5-veined, keel middle abaxially green, margin apically white hyaline, apex retuse and mucronulate. Stamens 2(or 3); anthers ellipsoid; connective not prominent beyond anthers. Style very short; stigmas ± short. Nutlet dark brown, obovoid to subellipsoid, 1.2–1.4 mm, nearly as long as subtending glume, 3-sided, densely prominently punctulate. Fl. and fr. Jun–Oct. *2n* = 108, 112, 116, 128.

Forest margins, under shrubs or forests, grasslands by water, mountain slopes, along trails in valleys, river margins, wet places, paddy fields; below 100–2000 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan,

Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, S Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, SE Xizang, Yunnan, Zhejiang [Afghanistan, Bangladesh, Bhutan, India, Indonesia, Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Turkmenistan, Uzbekistan, Vietnam; tropical Africa, SW Asia, Australia, Indian Ocean islands, Madagascar, Pacific islands].

*Cyperus iria* is naturalized in Central, North, and South America.

**47. *Cyperus microiria* Steudel, Syn. Pl. Glumac. 2: 23. 1854.**

具芒碎米莎草 *ju mang sui mi suo cao*

*Cyperus amuricus* Maximowicz var. *japonicus* Kükenthall (1936), not Miquel (1866).

Annuals. Roots fibrous. Culms tufted, 20–60 cm tall, slightly slender, acutely triquetrous, smooth, base several leaved. Leaves shorter than or equaling culm; sheath purplish brown; leaf blade ca. 2.5 mm wide, flat. Involucral bracts 3 or 4 (or more), leaflike, longer than inflorescence. Inflorescence a compound or decompound anthela; rays 5–9, mostly to 13 cm, unequal in length. Spikes ovoid, broadly ovoid, or subconic, 2–4 × 1–3 cm, with many spikelets. Spikelets slightly laxly arranged, linear to very narrowly linear-ovoid, 0.6–1.5 cm × ca. 1.5 mm, obliquely spreading to spreading, 8–24-flowered; rachilla wings white, narrow, straight, hyaline; successive glumes on rachilla 1–1.5 mm apart. Glumes straw-colored to pale, lax, broadly obovate, ca. 1.5 mm, membranous, 3–5-veined and green, keel abaxially extended beyond apex into a mucro, apex rounded. Stamens 2 (or 3); anthers oblong, 0.2–0.4 mm. Style very short; stigmas 3, ± short. Nutlet dark brown, oblong-obovoid, 1.2–1.5 mm, nearly as long as subtending glume, 3-sided, densely prominently punctulate. Fl. and fr. Aug–Oct.

Forests, under shrubs, grasslands on mountain slopes, wet places by river margins, ditch margins, water margins, seashores, along trails, paddy fields; near sea level to 3800 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Jilin, Liaoning, NE Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, E Yunnan, Zhejiang [India, Japan, Korea, Thailand, Vietnam].

*Cyperus microiria* is naturalized in S Australia and North America.

**48. *Cyperus amuricus* Maximowicz, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 296. 1859.**

阿穆尔莎草 *a mu er suo cao*

Annuals. Roots fibrous. Culms tufted, 10–60 cm tall, slender, compressed triquetrous, smooth, base with several leaves. Leaves shorter than culm; leaf blade 2–5 mm wide, flat, scabrid on apical margin and smooth on other parts. Involucral bracts 3–5, leaflike, basal 2 usually longer than inflorescence. Inflorescence a simple anthela; rays 4–10, mostly to 12 cm, each with 1 spike. Spike broadly ovoid to oblong, 1–3 × 0.8–3 cm, with several to many spikelets. Spikelets laxly arranged, linear to narrowly linear-ovoid, 0.5–1.5 cm × 1–2 mm, obliquely spreading but spreading after anthesis, 8–20-flowered; rachilla wings white, narrow, hyaline, persistent; successive glumes on rachilla ca. 0.5 mm apart. Glumes purplish red to brown on both surfaces but middle green, slightly lax, broadly obovate to

suborbicular, 1–1.5 mm, membranous, slightly shiny, 5-veined, midvein forming a keel, apex with an excurved mucro ca. 0.4 mm. Stamens 3; anthers ellipsoid, 0.2–0.4 mm; connective prominent beyond anthers. Style very short; stigmas 3, ± short. Nutlet blackish brown, obovoid to oblong, nearly as long as subtending glume, 3-sided, densely prominently punctulate, apex mucronate. Fl. and fr. Jul–Oct.

Grasslands on mountain slopes, seashores, wet places in ditches, river margins, along trails, fields; below 100–2500 m. Anhui, Chongqing, Fujian, N Guangxi, N Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Jilin, Liaoning, SE Shaanxi, Shandong, Shanxi, Taiwan, E Xizang, Yunnan, Zhejiang [Japan, Korea, Russia (Far East)].

*Cyperus amuricus* is naturalized in North America.

**49. *Cyperus orthostachyus* Franchet & Savatier, Enum. Pl. Jap. 2: 539. 1878.**

三轮草 *san lun cao*

Annuals. Roots fibrous. Culms slender, 8–65 cm tall, compressed triquetrous, smooth, with few leaves at basal part. Leaves shorter than or equaling culm; sheath brownish, ± long; leaf blade 3–6 mm wide, flat, margin scabrous. Involucral bracts 3 or 4, leaflike, very much longer than inflorescence or basal 1 or 2 longer than inflorescence, margin scabrous. Inflorescence a simple or rarely compound anthela; rays 5–11, mostly to 15(–20) cm, unequal in length, each with 1(–5) spike. Spike ovate-oblong, broadly ovate, or oblong-cylindric, 1–3.5 × 1–3 cm, with 5–32 or many spikelets; rachis white hispidulous on angles. Spikelets slightly laxly or densely arranged, obliquely spreading to suberect, sometimes divergent after anthesis, narrowly ovoid to linear, 0.3–2.5 cm × 1–2 mm, 6–46-flowered; rachilla wings white, narrow, hyaline; successive glumes on rachilla ca. 1 mm apart. Glumes purplish red on both surfaces, slightly lax, broadly ovate to elliptic, 1.4–1.5 mm, membranous, obscurely 5–7-veined, keel abaxially green, margin apically white hyaline, apex rounded to retuse and mucicous. Stamens 3; anthers ellipsoid, short; connective prolonged. Style short; stigmas 3, slightly short. Nutlet brown, obovoid, nearly as long as subtending glume, 3-sided, punctulate, apex mucronate. Fl. and fr. Jul–Oct.

Mountain slopes, river margins, ditch margins, grasslands, along trails, wet places, paddy fields, swamps; 300–1500 m. Anhui, Chongqing, Fujian, NE Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Zhejiang [Japan, Korea, Russia (Far East, E Siberia), Vietnam].

- 1a. Basal 1 or 2 involucral bracts longer than inflorescence; spikes ovoid-oblong to broadly ovoid, with 5–32 spikelets; spikelets slightly laxly arranged, 4–25 × 1.5–2 mm, obliquely spreading but divergent after anthesis, 10–46-flowered ..... 49a. var. *orthostachyus*
- 1b. Involucral bracts very much longer than inflorescence; spikes oblong to oblong-cylindric, with many spikelets; spikelets densely arranged, 3–6 × ca. 1 mm, suberect, 6–12-flowered ..... 49b. var. *longibracteatus*

**49a. *Cyperus orthostachyus* var. *orthostachyus***

三轮草(原变种) san lun cao (yuan bian zhong)

*Cyperus truncatus* Turczaninow var. *orthostachyus* (Franchet & Savatier) C. B. Clarke.

Involucral bracts basal 1 or 2 longer than inflorescence. Spikes ovoid-oblong to broadly ovoid, with 5–32 spikelets. Spikelets slightly laxly arranged, 4–25 × 1.5–2 mm, obliquely spreading but divergent after anthesis, 10–46-flowered. Fl. and fr. Jul–Oct.

Mountain slopes, river margins, ditch margins, grasslands, along trails, wet places, paddy fields; 300–1500 m. Anhui, Chongqing, Fujian, NE Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Zhejiang [Japan, Korea, Russia (Far East, E Siberia), Vietnam].

**49b. *Cyperus orthostachyus* var. *longibracteatus* L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 231. 1961.**

长苞三轮草 chang bao san lun cao

Involucral bracts much longer than inflorescence. Spikes oblong to oblong-cylindric, with many spikelets. Spikelets densely arranged, 3–6 × ca. 1 mm, suberect, 6–12-flowered. Fl. Aug–Sep.

- Swamps. Heilongjiang, Liaoning.

**50. *Cyperus compressus* Linnaeus, Sp. Pl. 1: 46. 1753.**

扁穗莎草 bian sui suo cao

Annuals. Roots fibrous. Culms tufted, 5–35 cm tall, ± slender, triquetrous, smooth, base with leaves. Leaves shorter than or sometimes equaling culm; sheath purplish brown; leaf blade 1.5–4 mm wide, flat, sometimes slightly plicate. Involucral bracts 3–5, leaflike, longer than inflorescence. Inflorescence a simple anthela; rays 2–7, 0.8–5 cm, each with 1 spike. Spike broadly ovoid to in outline sublabeliform, with 3–10 spikelets; rachis 2–5 mm. Spikelets densely and nearly digitately arranged, narrowly linear-ovoid, 1–2.5(–4) cm × 3–4 mm, basal ones spreading and apical ones obliquely spreading, 10–20-flowered; rachilla wings white, narrow, hyaline. Glumes pale to straw-colored on both surfaces and sometimes with rusty brown striae but middle green, tightly imbricate, ovate, 3–3.5 mm, thinly leathery, strongly folded, 9–13-veined, keeled, apex acute and with a straight and slightly long mucro. Stamens 3; anthers linear, 0.6–0.7 mm; connective apex reddish, ovate, ca. 0.1 mm. Style 0.9–1.3 mm; stigmas 3, 0.5–0.8 mm. Nutlet dark brown, obovoid, ca. 1/3 as long as subtending glume, 3-sided, slightly concave on 3 sides, punctulate. Fl. and fr. Jul–Dec.  $2n = \text{ca. } 98, 112, 114, 128$ .

Grasslands, seashores, along trails, lake margins, forests, stony clefts, wet sandy riverbanks, open fields, paddy field margins; near sea level to 900(–1600) m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nansha Qundao, Shandong, Shanxi, Sichuan, Taiwan, Xisha Qundao, Xizang, Yunnan, Zhejiang [Afghanistan, Bangladesh, Bhutan, India, Indonesia, Japan, Kashmir, Laos, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific Ocean islands].

**51. *Cyperus compactus* Retzius, Observ. Bot. 5: 10. 1788.**

密穗砖子苗 mi sui zhuan zi miao

*Cyperus compactus* var. *macrostachys* (Boeckeler) Kükenthal; *C. dilutus* Vahl; *C. dilutus* var. *macrostachys* Boeckeler; *Mariscus compactus* (Retzius) Druce; *M. compactus* var. *macrostachys* (Boeckeler) F. C. How; *M. microcephalus* J. Presl & C. Presl.

Perennials. Rhizomes short. Culms scattered or sparsely tufted, 50–90 cm tall, stout, terete, with conspicuously transverse veins, basally with leaves, base slightly swollen. Leaves longer to slightly shorter than culm; sheath purplish red, cylindrical, mostly to 10 cm, usually splitting from membranous part; leaf blade 5–9 mm wide, flat, with conspicuously transverse veins, abaxial midvein and margin spinulose. Involucral bracts 3–5, leaflike, much longer than inflorescence, obliquely spreading, abaxially midvein and margin spinulose. Inflorescence a compound anthela, lax to slightly dense; rays 7–9, suberect, mostly to 15 cm, unequal in length, stiff, each with 5–10 raylets; raylets obliquely spreading, usually ± short, mostly to only 2 cm. Spikes with many spikelets congested into nearly a globose to half-globose spike at apex of raylets, 0.8–3.5 cm in diam. Spikelets many, radially spreading, subulate, 0.5–1.8 cm × less than 1 mm, 3–12-flowered; rachilla wings white, hyaline. Glumes blood-red to reddish brown on both surfaces but abaxially green at middle, narrowly oblong, 3–4 mm, slightly shiny, 5–7-veined, apex obtuse to acute. Stamens 3; anthers broadly linear; connective prominent beyond anthers. Style of long to medium length; stigmas 3, slender. Nutlet yellowish brown to brownish, narrowly oblong, 1/2–3/5 as long as subtending glume, 3-sided, densely punctulate, apex mucronate. Fl. and fr. Jun–Dec.

Grasslands, swamps, wet places, shaded places in sparse forests, river margins, along trails, valleys, open field margins, paddy fields, coastal marshes; near sea level to 1000 m. Fujian, Guangdong, Guangxi, S Guizhou, Hainan, Taiwan, SE Xizang, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Indian Ocean islands, Madagascar].

**52. *Cyperus javanicus* Houttuyn, Nat. Hist. 13: t. 88. 1782.**

羽状穗砖子苗 yu zhuang sui zhuan zi miao

*Cyperus pennatus* Lamarck; *Mariscus albescens* Gaudichaud; *M. javanicus* (Houttuyn) Merrill & F. P. Metcalf; *M. pennatus* (Lamarck) Domin.

Perennials. Rhizomes short, thick, woody. Culms scattered, 30–105 cm tall, stout, obtusely 3-angled, papillose, basally with leaves, base swollen. Leaves longer than culm; sheath blackish brown; leaf blade 5–10 mm wide, leathery, base folded, apically gradually flattened, conspicuously transverse veined, midvein and margin spinulose. Involucral bracts 4–6, obliquely spreading, leaflike, much longer than inflorescence. Inflorescence a compound anthela; rays 6–10, obliquely spreading, mostly to 10 cm, papillose, each with 3–7 raylets. Spikes cylindrical, 1.5–3 × 0.8–1.2 cm, with many spikelets. Spikelets slightly densely arranged, spreading to downward reflexed, narrowly oblong-ovoid, 4.5–7 × 1.8–2.5 mm, slightly turgid, 4–6-flow-

ered; rachilla broadly winged. Glumes brownish to straw-colored and rusty brown striate, slightly densely imbricate, broadly ovate, ca. 3 mm, subleathery, concave, 7–9-veined, not keeled, margin white hyaline, apex acute and not mucronate. Stamens 3; anthers broadly linear. Style long; stigmas 3. Nutlet blackish brown, broadly ellipsoid to obovoid-ellipsoid, ca. 1/2 as long as subtending glume, 3-sided, with dense punctate processes. Fl. and fr. Jul–Sep.

Coastal sandy areas, salt marshes, water margins; near sea level. Guangdong, Hainan, Taiwan, Xisha Qundao [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Indian Ocean islands, Madagascar, Pacific islands].

**53. *Cyperus squarrosus*** Linnaeus, Cent. Pl. 2: 6. 1756.

具芒鳞砖子苗 ju mang lin zhuan zi miao

*Cyperus aristatus* Rottbøll, nom. illeg. superfl.; *Mariscus aristatus* Chermeson (1938), nom. illeg. superfl., not (Benth) Kuntze (1891); *M. squarrosus* (Linnaeus) C. B. Clarke; *Scirpus intricatus* Linnaeus.

Annuals. Roots fibrous. Culms densely tufted, 2–10 cm tall, compressed triquetrous, smooth, leaved at basal part. Leaves longer to slightly shorter than culm; sheath purplish brown; leaf blade ca. 2 mm wide, flat, smooth. Involucral bracts 3–5, leaflike, longer than inflorescence, obliquely spreading. Inflorescence a simple anthela; rays 2–5(–7), to 2.5 cm. Spikes ovoid to oblong-ovoid, 1–1.5 cm × 6–8 mm, with many spikelets. Spikelets densely arranged, linear-oblong to oblong, 4–5 × ca. 1.5 mm (excluding length of arista), slightly compressed, divergent, 8–10-flowered; rachilla wingless, caducous. Glumes reddish brown to brown, lax, ovate-oblong, ca. 2.5 mm (including length of awn), membranous, deciduous at maturity, 7-veined, keel abaxially conspicuous, apex with a 0.5–1(–1.3) mm arista. Stamen 1; anther ellipsoid, 0.2–0.3 mm. Style 0.3–0.5 mm; stigmas 3, 0.4–0.7 mm. Nutlet dark grayish brown, obovoid-oblong, 0.7–0.8(–1.1) mm, 3-sided, with punctate processes, apex truncate and apiculate. Fl. and fr. Sep–Oct.  $2n = 98$ .

Grasslands in forests, wet places at river margins, mountain slopes, wet sandy areas, along trails and roadsides, field margins; 1200–4000 m. Sichuan, E and S Xizang, Yunnan [Afghanistan, Bangladesh, Bhutan, India, Indonesia, Kashmir, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; Africa, SW Asia (Arabian Peninsula), Australia, Central, North, and South America, Europe, Madagascar].

**54. *Cyperus cyperoides*** (Linnaeus) Kuntze, Revis. Gen. Pl. 3: 333. 1898.

砖子苗 zhuan zi miao

*Scirpus cyperoides* Linnaeus, Mant. Pl. Alt. 181. 1771; *Cyperus cyperoides* var. *microstachys* Kükenthal; *C. cyperoides* var. *subcompositus* (C. B. Clarke) Kükenthal; *C. subumbellatus* Kükenthal; *C. umbellatus* Benth, nom. illeg. superfl.; *Kyllinga sumatrensis* Retzius; *K. umbellata* Rottbøll, nom. illeg. superfl.; *Mariscus cyperoides* (Linnaeus) Urban (1900), not (Roxburgh) A. Dietrich (1832); *M. philippensis* Steudel; *M. sieberianus* Nees ex C. B. Clarke; *M. sieberianus* var. *evolutior* C. B. Clarke; *M. sieberianus* var. *khasianus* C. B. Clarke; *M. sieberianus* var. *subcompositus* C. B. Clarke; *M. sumatrensis*

(Retzius) J. Raynal; *M. sumatrensis* var. *evolutior* (C. B. Clarke) C. Y. Wu ex Karthikeyan; *M. sumatrensis* var. *khasianus* (C. B. Clarke) C. Y. Wu ex Karthikeyan; *M. sumatrensis* var. *microstachys* (Kükenthal) L. K. Dai; *M. sumatrensis* var. *subcompositus* (C. B. Clarke) Karthikeyan; *M. umbellatus* Vahl, nom. illeg. superfl.; *M. umbellatus* var. *evolutior* (C. B. Clarke) E. G. Camus; *M. umbellatus* var. *microstachys* (Kükenthal) Tang & F. T. Wang; *M. umbellatus* var. *sieberianus* (Nees ex C. B. Clarke) E. G. Camus; *M. umbellatus* var. *subcompositus* (C. B. Clarke) Tang & F. T. Wang.

Perennials. Rhizomes short, hardened. Culms laxly tufted, 10–60 cm tall, acutely triquetrous, smooth, base swollen and with more leaves. Leaves shorter than to equaling culm; sheath brown to reddish brown; leaf blade 3–6(–8) mm wide, folded at basal part but apically gradually flattened, margin not scabrous. Involucral bracts 5–8, obliquely spreading, leaflike, longer than inflorescence. Inflorescence a simple or subcompound anthela; rays several, 6–12 or sometimes more, short or 6–14 cm, unequal in length, each with 1–5 spikes. Spikes cylindric, 1–2.5[–5] cm × 5–10 mm or sometimes narrower, with many dense spikelets. Spikelets narrowly linear-ovoid, 3–7 × ca. 0.7 mm or sometimes shorter, spreading to reflexed, each (1 or) 2- or 3-flowered; rachilla wings white, lanceolate, broad, hyaline. Glumes yellow, yellowish green, or greenish, oblong, ca. 3 mm, veins several with middle 3 green and conspicuous, margin involute, apex obtuse and not mucronate. Stamens 3; anthers broadly linear, 0.8–1 mm; connective prominent beyond anthers. Style short; stigmas 3, slender. Nutlet straw-colored at first but dark brown when mature, narrowly oblong, 1.8–2.2 × ca. 0.5 mm, ca. 2/3 as long as subtending glume, 3-sided, minutely punctate. Fl. and fr. Apr–Dec.  $2n = 82, 88, 134, 220, 224$ .

Sunny places on mountain slopes, grasslands along trails, ditch margins, river margins, wet places, forests, among herbs, sometimes in dry places; 100–1000(–3200) m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xisha Qundao, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Atlantic Ocean islands, N Australia, Indian Ocean islands, Madagascar, Pacific islands].

*Cyperus cyperoides* is naturalized in tropical America.

This widespread species occurs nearly throughout the tropical and warm-temperate regions of the Old World. Numerous varieties have been recognized in China, which may be identical with subspecies and varieties named in Africa (e.g., R. W. Haines & Lye, *Sedges & Rushes* E. Afr. 204–206. 1983) and S Asia (Karthikeyan, *Fl. Ind. Enumerat. Monocot.* 64. 1989). Such varieties were based on differences in ray and bract length, number of spikes per ray, and number of fertile glumes per spikelet. Intergradations have been noted by Haines and Lye (q.v.) and characterize some specimens from S China and SE Asia. D. A. Simpson and T. Koyama (*Fl. Thailand* 6(4): 382. 1998) noted variability in this species (as well as the following species) and recognized no infraspecific taxa. We follow their broad concept for this species and for *C. cyperinus*.

**55. *Cyperus cyperinus*** (Retzius) J. V. Suringar, *Cyperus*, 154. 1898.

莎状砖子苗 suo zhuang zhuan zi miao

*Kyllinga cyperina* Retzius, *Observ. Bot.* 6: 21. 1791;

*Cyperus cyperinus* var. *bengalensis* (C. B. Clarke) Kükenthal; *C. cyperoides* (Linnaeus) Kuntze subsp. *cyperinus* (Retzius) Kükenthal; *C. umbellatus* Bentham f. *cyperinus* (Retzius) C. B. Clarke; *Mariscus cyperinus* (Retzius) Vahl; *M. cyperinus* var. *bengalensis* C. B. Clarke; *M. umbellatus* Vahl var. *cyperinus* (Retzius) E. G. Camus.

Perennials. Rhizomes short. Culms scattered, 15–70 cm tall, slightly stout, acutely triquetrous, smooth, base many leaved. Leaves shorter than culm; sheath purplish red; leaf blade 5–7 mm wide, slightly flaccid or stiff, folded at basal part and spreading at apical part, abaxially midvein and margin scabrous. Involucral bracts 6–10, leaflike, longer to slightly shorter than inflorescence, margin scabrous. Inflorescence a simple anthela; rays 6–10, short or to 4.5 cm, unequal in length, with a single spike at apex. Spikes oblong-obovoid, often appearing to taper toward base or rarely cylindric, 1–1.8[–3] × 0.8–1.2 cm, with many densely arranged spikelets, base cuneate to subtruncate. Spikelets erect to erect-spreading, narrowly linear-ovoid to linear-oblong, 4–6.5 × ca. 1 mm, each (1 or) 2–4-flowered; rachilla wings lanceolate, broad. Glumes crowded, brownish to purplish red on both surfaces, elliptic, ca. 3.5 mm, papery, veins several with middle 3 conspicuous and green, keeled, apex obtuse to acute and not mucronate. Stamens 3; anthers broadly linear, 1–1.5 mm; connective prominent beyond anthers. Style of medium length; stigmas 3. Nutlet dark grayish brown, narrowly oblong, 2–2.5 × 0.6–0.9 mm, ca. 2/3 as long as subtending glume, 3-sided, slightly curved in dorsiventral view, with dense punctate processes. Fl. and fr. Apr–Sep.

Dense forests, wet places on mountain slopes, grasslands, river margins, water margins, valleys; (near sea level to) 300–700(–1800) m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; SW Asia (Yemen), NE Australia, Indian Ocean islands, Pacific islands].

**56. *Cyperus dubius*** Rottbøll, Descr. Icon. Rar. Pl. 20. 1773.

鳞茎砖子苗 lin jing zhuan zi miao

*Mariscus dregeanus* Kunth; *M. dubius* (Rottbøll) Kükenthal.

Perennials. Rhizomes short. Culms densely tufted, 15–30 cm tall, slender, compressed triquetrous, longitudinally sulcate, base swollen into a bulb shape and clothed with many brown rudimentary leaf sheaths. Leaves shorter than to subequaling culm; sheath brownish membranous; leaf blade 2–4 mm wide, flaccid, flat. Involucral bracts 3–5, leaflike, longer than inflorescence, pendent after anthesis. Inflorescences capitate, subglobose, 8–16 × 5–12 mm, with 1–3 spikes. Spikes dense, with many spikelets. Spikelets ovoid to narrowly ovoid, 3–4 × 1.2–2 mm, slightly turgid, 3–5-flowered; rachilla broadly winged. Glumes pale to greenish on both surfaces but middle green, densely arranged, broadly ovate, ca. 2.5 mm, densely brown punctate, 15–17-veined. Stamens (2 or) 3; anthers linear-oblong, ca. 0.5 mm; connective prominent beyond anthers. Style of medium length. Nutlet dark grayish brown, obovoid to ellipsoid, ca. 1.5 × 1 mm, 3-sided, densely punctate. Fl. and fr. Sep–Nov.  $2n = 112$ .

Sandy areas at seashores; near sea level. Hainan [India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, SW Asia (Yemen), Indian Ocean islands, Madagascar, Pacific islands].

*Cyperus dubius* is naturalized in SE Australia.

**57. *Cyperus hainanensis*** (Chun & F. C. How) G. C. Tucker, **comb. nov.**

海南砖子苗 hai nan zhuan zi miao

Basionym: *Mariscus hainanensis* Chun & F. C. How, Acta Phytotax. Sin. 7: 87. 1958.

Perennials. Rhizomes short. Culms tufted, 15–25 cm tall, slender, compressed, base swollen into an oblong bulb shape and clothed with brown fibers from old leaf sheaths. Leaves much longer than culm; sheath brownish and usually purple maculate; leaf blade 3–4 mm wide. Involucral bracts 4 or 5, leaflike, much longer than inflorescence, slightly broad. Inflorescences capitate; rays very short, with 4 or 5 spikes. Spikes subovoid to oblong-ovoid, with many spikelets. Spikelets densely arranged, ovoid-ellipsoid, 3–4 × 1–1.5 mm, 2- or 3-flowered. Glumes brownish to yellowish green, purple punctulate on apical part, and green on abaxial middle, ovate, 2.5–3 mm, 9–13-veined, apex mucronate. Stamens 3; anthers linear-oblong, ca. 0.5 mm; connective not prominent beyond anthers. Nutlet oblong, 1/3–1/2 as long as subtending glume, ca. 1 mm wide, 3-sided, densely punctulate. Fl. and fr. Jul–Oct.

• Sandy areas at seashores; near sea level. Hainan.

**58. *Cyperus monospermus*** (S. M. Huang) G. C. Tucker, **comb. nov.**

单子砖子苗 dan zi zhuan zi miao

Basionym: *Mariscus monospermus* S. M. Huang, Fl. Hainan. 4: 537. 1977.

Perennials. Rhizomes short. Culms few, tufted, 10–16 cm tall, slender, compressed triquetrous, longitudinally sulcate, glabrous, base swollen into an ovoid to oblong-ovoid bulb shape and clothed with brown to dark brown fibers from old leaf sheaths. Leaves basal, shorter than to equaling culm; sheath brownish; leaf blade 1–2.5 mm wide, flat, margin scabrid. Involucral bracts 3–5, subspreading but pendent after anthesis, leaflike, mostly to 6 cm, base slightly broad. Inflorescences capitate, 6–8 mm in diam., with 2 or 3 spikes. Spikes with many spikelets. Spikelets densely arranged, ovoid-oblong, 2.5–3 mm, 1-flowered. Glumes yellowish to brownish on both surfaces, ovate to narrowly ovate, ca. 3 mm, membranous, usually purple punctate, tightly including nutlet, apex acuminate. Stamens 2; anthers oblong, ca. 1 mm. Style short. Nutlet brown, oblong-obovoid to oblong, ca. 1.8 × 0.7 mm, compressed 3-sided, with dense punctulate processes. Fl. and fr. Jul–Oct.

• Waste grasslands at seashores; near sea level. Hainan.

**59. *Cyperus serotinus*** Rottbøll, Descr. Icon. Rar. Pl. 31. 1773.

水莎草 shui suo cao

Perennials. Rhizomes with long stolons. Culms 35–100 cm tall, stout, compressed triquetrous, smooth, few leaved at

basal part. Leaves shorter to sometimes longer than culm; leaf blade 3–10 mm wide, smooth, midvein abaxially forming a keel, base folded, apically flat. Involucral bracts 3(or 4), leaf-like, longer than inflorescence, unequal in length, mostly to 8 mm wide. Inflorescence a compound or simple anthela; rays 4–7, obliquely spreading, mostly to 16 cm, each with 1–5 raylets; raylets each with a spike. Spikes with 5–17 spikelets; rachis laxly hispidulous or smooth. Spikelets laxly arranged, subspreading, narrowly ovoid to linear-oblong, 0.8–2.5 cm × ca. 3 mm, 10–34-flowered; rachilla wings white, hyaline. Glumes reddish brown to dark reddish brown on both surfaces, densely imbricate at first but slightly lax after anthesis, broadly ovate, ca. (2–)2.5 mm, papery, 5–7-veined, midvein green, margin yellowish and hyaline, apex obtuse to rounded and sometimes emarginate. Stamens 3; anthers linear. Style short; stigmas 2, long. Nutlet brown, broadly ellipsoid, subglobose, or broadly obovoid, ca. 2 mm, plano-convex, slightly shiny, prominently punctulate, apex apiculate. Fl. and fr. Jul–Nov.

Swamps, river margins, sandy places by water, shallow water, along trails, shady places, fields; below 100–1300(–2500) m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Taiwan, Xinjiang, Yunnan, Zhejiang [Afghanistan, India, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan, Vietnam; SW Asia, Europe].

- 1a. Spikelets 0.8–2 cm; spike rachis laxly hispidulous; nutlet broadly ellipsoid to obovoid ..... 59a. var. *serotinus*  
 1b. Spikelets ca. 2.5 cm; spike rachis smooth; nutlet broadly obovoid to subglobose ..... 59b. var. *inundatus*

#### 59a. *Cyperus serotinus* var. *serotinus*

水莎草(原变种) shui suo cao (yuan bian zhong)

*Cyperus serotinus* f. *depauperatus* Kükenthal; *Juncellus serotinus* (Rottbøll) C. B. Clarke; *J. serotinus* f. *depauperatus* (Kükenthal) L. K. Dai.

Spike rachis laxly hispidulous. Spikelets 0.8–2 cm. Nutlet broadly ellipsoid to ovoid. Fl. and fr. Jul–Oct.

River margins, sandy places by water, shallow water, along trails, fields; 400–1300(–2500) m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Taiwan, Xinjiang, Yunnan, Zhejiang [Afghanistan, India, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan, Vietnam; SW Asia, Europe].

*Cyperus serotinus* var. *serotinus* is naturalized in E North America.

#### 59b. *Cyperus serotinus* Rottbøll var. *inundatus* Kükenthal in Engler, Pflanzenr. 101(IV. 20): 318. 1936.

广东水莎草 guang dong shui suo cao

*Cyperus inundatus* Roxburgh (1832), not R. Brown (1810); *Juncellus serotinus* var. *inundatus* (Kükenthal) L. K. Dai.

Spike rachis smooth. Spikelets to 2.5 cm. Nutlet broadly obovoid to subglobose. Fl. and fr. Oct–Nov.

Swamps, shady places; below 100 m. Fujian, Guangdong [India].

#### 60. *Cyperus pannonicus* Jacquin, Fl. Austriac. 5: 29. 1778.

花穗水莎草 hua sui shui suo cao

*Juncellus pannonicus* (Jacquin) C. B. Clarke.

Perennials. Roots many, fibrous. Rhizomes short. Culms densely tufted, 4–20 cm tall, compressed 3-angled, smooth, base with 1 leaf. Leaf sheath slightly long; leaf blade mostly to only 2.5 cm, ca. 1 mm wide. Involucral bracts 3, leaflike, usually 2 longer than inflorescence and 1 shorter; basalmost bract erect, culmlike, elongated, basally ± broad. Inflorescences capitate, with 1–8 spikelets. Spikelets ovoid-oblong to oblong, 0.5–1.5 cm × 2–5 mm, slightly turgid, 10–32-flowered; rachilla subquadrangular, slightly broad. Glumes dark blood-red on both surfaces but middle yellowish green, adaxially reddish brown striate, densely imbricate, orbicular-ovate, ca. 3 mm, subpapery, veins several, apex obtuse and sometimes with a very short mucro. Stamens 3; anthers linear; connective prominent beyond anthers. Style long; stigmas 2. Nutlet brownish yellow, subglobose, ellipsoid, or obovoid, ca. 2 mm, plano-convex, slightly shiny, reticulately striate. Fl. and fr. Aug–Sep.

Swamps, river margins, ditch margins, saline soil; 100–1300 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; SW Asia, C Europe].

#### 61. *Cyperus limosus* Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 294. 1859.

沼生水莎草 zhao sheng shui suo cao

*Juncellus limosus* (Maximowicz) C. B. Clarke; *Pycereus limosus* (Maximowicz) Schischkin.

Annuals. Roots fibrous. Culms tufted, 10–30 cm tall, compressed triquetrous, smooth, with few leaves. Leaves usually shorter to rarely slightly longer than culm; sheath slightly long; leaf blade 2–3 mm wide, usually folded, sometimes flat. Involucral bracts 3 or 4, leaflike, several times as long as inflorescence. Inflorescence a simple anthela, subcapitate; rays 3–6, very short, each with many spikelets congregated into a small capitulum. Spikelets narrowly oblong to oblong, 3–4 × ca. 1.5 mm, 10–18-flowered; rachilla wingless. Glumes straw-colored to sometimes pale rusty brown on both surfaces, slightly laxly imbricate, oblong, ca. 1 mm, membranous, 3-veined, apex obtuse and mucronate. Stamens 2; anthers ellipsoid, short. Style long; stigmas 2, exerted. Nutlet yellowish, oblong, ± as long as subtending glume, plano-convex. Fl. and fr. Aug–Sep.

Wet sandy places at river or lake margins. Heilongjiang [Russia (Far East), Vietnam].

#### 62. *Cyperus odoratus* Linnaeus, Sp. Pl. 1: 46. 1753.

断节莎 duan jie suo

*Cyperus conglobatus* Link; *C. ferax* Richard; *C. ferax* var. *conglobatus* (Link) Kükenthal; *Mariscus ferax* (Richard) C. B.

Clarke; *Torulium confertum* Desvaux ex Hamilton; *T. ferax* (Richard) Hamilton [“*feroci*”]; *T. odoratum* (Linnaeus) S. S. Hooper.

Annuals or short-lived perennials. Rhizomes short, with fibrous roots. Culms 30–120 cm tall, stout, 3-angled, ± longitudinally sulcate, smooth, basally with leaves, base swollen into tuber. Leaves shorter than culm; sheath purplish brown, long; leaf blade 4–10 mm wide, flat, slightly stiff. Involucral bracts 6–8, obliquely spreading, usually longer than inflorescence. Inflorescence a compound or decompound anthela; rays 5–12, mostly to 20 cm, slightly stiff, each with several raylets; raylets 0–2 cm. Spikes oblong-cylindric, 2–3 × ca. 1.5 cm, with many spikelets. Spikelets slightly laxly arranged, spreading to downward reflexed, linear-cylindric, 0.8–2.5 cm × ca. 1 mm, 10–25-flowered; rachilla with several to 10 or more articulations,

wings broadly elliptic with a revolute margin, corky, and yellowish in maturity. Glumes yellowish brown, straw-colored, or slightly reddish on both surfaces but middle abaxially green, slightly lax, ovate-elliptic, 2–3.5 mm, concave, shiny, 7–9-veined, abaxially broadly rounded (not keeled), apex obtuse. Stamens 3; anthers broadly linear. Style of medium length; stigmas 3. Nutlet at first red but black when mature, oblong to obovoid-oblong, ca. 2/3 as long as subtending glume, slightly curved, 3-sided, included by wing of rachilla but apical part exserted. Fl. and fr. Aug–Oct(–Mar).

Riverbanks, streambeds, paddy field margins; near sea level to 700 m. Shandong, Taiwan, Zhejiang [Japan, Korea, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; tropical Africa, E Australia, Central, North, and South America, Madagascar, Pacific islands].

## 16. COURTOISINA Soják, Čas. Nár. Muz. Praze, Rada Přír. 148: 193. 1980.

翅鳞莎属 *chi lin suo shu*

Dai Lunkai (戴伦凯); Gordon C. Tucker, David A. Simpson

*Courtoisia* Nees, Linnaea 9: 286. 1834, not L. Marchand (1830); *Indocourtoisia* Bennet & Raizada, nom. illeg. superfl.; *Pseudomariscus* Rauschert, nom. illeg. superfl.

Herbs, annual or short-lived perennial. Roots fibrous. Culms scattered, with leaves basally. Leaves basal, 3-ranked; ligule absent. Involucral bracts several, leaflike, usually longer than inflorescence. Inflorescence a compound anthela; rays unequal in length, with several ± short raylets. Spikes at apex of ray or raylet, globose, with numerous spikelets. Spikelets densely arranged, each 1- or 2-flowered; rachilla articulate near base, deciduous at articulation when mature. Glumes distichous, persistent on and deciduous with rachilla, basalmost without a flower, remaining ones each with a bisexual flower, keel broadly winged. Flowers without hypogynous bristles or scalelike perianth parts. Style base not swollen, deciduous; stigmas 3. Nutlet 3-sided, one side toward rachilla.

Three species: Africa, Asia, Indian Ocean islands, Madagascar; one species in China.

**1. *Courtoisia cyperoides*** (Roxburgh) Soják, Čas. Nár. Muz. Praze, Rada Přír. 148: 193. 1980.

翅鳞莎 *chi lin suo*

*Kyllinga cyperoides* Roxburgh, Fl. Ind. 1: 187. 1820; *Cyperus pseudokyllingioides* Kükenthal; *Mariscus cyperoides* (Roxburgh) A. Dietrich.

Culms 8–38(–80) cm tall, slightly slender, compressed cylindric, sometimes obtusely 3-angled at apical part, smooth. Leaves several, basal, shorter than to equaling culm; sheath short, usually split; leaf blade 2–3 mm wide, flat, apical margin spinulose. Involucral bracts 3–5, leaflike, basal 2 or 3 longer than inflorescence. Inflorescence a compound anthela; rays 3–7, mostly to 4.5 cm, unequal in length, each with (0–)3–6 raylets;

raylets less than 1.5 cm. Spikes globose, 5–9 mm in diam., with 6–15 densely clustered spikelets. Spikelets broadly ellipsoid to ellipsoid, ca. 3 × 1.5–2 mm, strongly compressed, 1- or 2-flowered. Glumes yellowish brown, boat-shaped, 3.5–4 mm, membranous, laterally 1-veined, keel glaucous, broadly winged, and extending into an apical mucro. Stamens 3; anthers oblong. Style short; stigmas 3, slightly longer than style, laxly papilliferous. Nutlet dark reddish brown, narrowly oblong, 3-sided with sharp angles, 2.7–3 mm, densely punctulate, apex acuminate. Fl. and fr. Jun–Sep.  $2n = 10$ .

Grasslands on mountain slopes, ditch margins, along trails; 1000–1700(–1800) m. SE Xizang, C and S Yunnan [Bhutan, India, Laos, Myanmar, Nepal, Thailand, Vietnam; Africa, Indian Ocean islands, Madagascar].

## 17. REMIREA Aublet, Hist. Pl. Guiane 1: 44. 1775.

海滨莎属 *hai bin suo shu*

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker

Herbs, perennial. Rhizomes long, creeping. Culms 1 to few, 3-angled, smooth. Leaves many, aggregated on basal part of culm; ligule absent; leaf blade linear, stiff. Involucral bracts leaflike, spreading. Inflorescences spicate, sessile, with 2 to several clusters of spikelets. Spikelets falling as a unit when mature. Glumes subdistichous; basal 3 glumes veined, without a flower; apicalmost glume thickened, without veins, subtending a bisexual flower. Hypogynous bristles absent. Stamens 3; anthers linear-oblong; connective apex evident beyond anthers. Ovary oblong, 3-sided; stigmas 3. Nutlet long ellipsoid, 3-sided, apex without a beak.

One species: pantropical.

**1. *Remirea maritima*** Aublet, Hist. Pl. Guiane 1: 45. 1775.

海滨莎 hai bin suo

*Mariscus pedunculatus* (R. Brown) T. Koyama; *Miegia maritima* (Aublet) Willdenow; *Remirea pedunculata* R. Brown.

Rhizomes slender, long creeping, branching, rigid. Culms 6–15 cm tall, 1–2 mm thick, 3-angled, smooth, basally clothed with brown sheaths and their fibrous remnants and buried in sand. Leaves 3–15, covering base and lower culm, usually slightly longer than culm; sheath pale brown; leaf blade lanceolate, 4.5–6.5 mm wide, leathery, abaxial surface prominently keeled. Involucral bracts leaflike, longer than inflorescence. Inflorescences terminal, capitate, usually with 2–7 clusters, oblong-ellipsoid to ovoid-oblong, 1–2 × 0.7–1 cm, with many spikelets. Spikelets dense, fusiform-ellipsoid, ca. 5 mm; bract-

lets glumelike, ovate-lanceolate, ca. 3 mm, with brown lines, 1-veined, apex acute. Basal 3 glumes without a flower; basalmost glume broadly ovate, ca. 2 mm, 2-veined and with brown lines, apex rounded; second glume ovate, ca. 4 mm, 7-veined, apex rounded; third glume slightly longer than second one; fourth glume fleshy, ca. 3 mm, veinless, with brown minute spots, margin involute, apex slender. Stamens 3; anthers ca. 2 mm. Ovary oblong, 3-sided; style short; stigmas 3, slender, ± as long as style. Nutlet blackish brown, sessile, cylindrical-ellipsoid, 2–2.5 mm, compressed 3-sided. Fl. and fr. Sep–Dec.

Moist sandy beaches; near sea level. Guangdong, Hainan, Taiwan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and America, N Australia, Indian Ocean islands, Madagascar, SE North America, Pacific islands].

**18. PYCREUS** P. Beauvois, Fl. Oware 2: 48. 1816.

扁莎属 bian suo shu

Dai Lunkai (戴伦凯); Gordon C. Tucker, David A. Simpson

Herbs, annual or perennial. Rhizomes present or absent. Culms usually tufted, 3-angled or compressed 3-angled, rarely triquetrous. Leaves basal, 3-ranked; ligule absent; leaf blade usually present. Involucral bracts (1 or) 2–5(–8), leaflike, rarely very thin. Inflorescences terminal, a simple or rarely compound anthela; rays several, long or very short, or inflorescence capitate. Spikelets few to many, arranged into a short spike or capitulum at apex of rays, or fascicled; rachilla not articulate at base, persistent, wingless or narrowly winged. Glumes distichous, gradually deciduous from base to apex of rachilla at maturity, basal 1 or 2 usually without a flower but remaining ones each with a bisexual flower. Flowers without hypogynous bristles or scalelike perianth parts. Stamens 1–3; connective apex prominent or not prominent beyond anthers. Style base not swollen; stigmas 2, deciduous at maturity. Nutlet biconvex, slightly compressed or slightly turgid, one margin facing rachilla, punctulate and reticulately striate or transversely undulately striate.

More than 70 species: Africa, America, Asia, Europe, oceanic islands; 11 species (three endemic) in China.

- 1a. Cells on nutlet surface transversely oblong with an elevated margin resulting in nutlet surface transversely undulately striate or scabrously rugose.
- 2a. Culms 10–35 cm tall; spikelets narrowly oblong-ovoid to narrowly linear-ovoid, 0.8–2 cm × 3–3.5 mm, 16–30-flowered; glumes brown to dark brown ..... 9. *P. diaphanus*
- 2b. Culms 3–15 cm tall; spikelets ovoid, oblong-ovoid, or narrowly ovoid, 5–15 cm × 2.5–4 mm, 8–16-flowered; glumes straw-colored, yellowish brown, or purplish red.
- 3a. Culms slender; leaves 0.3–1.5 mm wide; anthela rays very short; spikelets 1 to several per ray, nearly fascicled; glumes purplish red to reddish brown on both surfaces ..... 10. *P. setiformis*
- 3b. Culms slightly thick; leaves 1–3 mm wide; anthela rays mostly to 2.5 cm; spikelets 3–8 per ray, congested; glumes straw-colored to yellowish brown ..... 11. *P. pseudolatespicatus*
- 1b. Cells on nutlet surface hexagonally reticulately striate or punctulate.
- 4a. Glumes broadly sulcate on both surfaces ..... 8. *P. sanguinolentus*
- 4b. Glumes not broadly sulcate on both surfaces.
- 5a. Glume apices truncate to emarginate and excurved mucronate to awned ..... 7. *P. pumilus*
- 5b. Glume apices obtuse or acute and not excurved mucronate.
- 6a. Spikelets narrowly linear-ovate, narrowly ovoid, narrowly oblong-ovoid, or oblong-ovoid; glumes densely imbricate, ca. 3 mm or more; stamens 3.
- 7a. Spikelets ca. 2.5(–3) mm wide; glumes blackish brown ..... 1. *P. delavayi*
- 7b. Spikelets 3–5 mm wide; glumes straw-colored or yellowish brown ..... 2. *P. unioides*
- 6b. Spikelets linear, linear-oblong, narrowly linear-ovoid, or narrowly ovoid; glumes slightly laxly imbricate or rarely densely imbricate, 1.5–2 mm; stamens 1 or 2.
- 8a. Nutlet oblong, both surfaces concave sulcate; stamen 1 ..... 6. *P. sulcinus*
- 8b. Nutlet obovoid-oblong or obovoid, both surfaces not concave sulcate; stamens (1 or) 2.
- 9a. Anthelae with very short rays; spikelets narrowly ovoid to narrowly linear-ovoid; glumes subelliptic, abaxially not conspicuously keeled ..... 5. *P. lijiangensis*
- 9b. Anthelae simple, lax, usually with slightly long or rarely very short rays; spikelets linear-oblong or linear; glumes oblong-ovate or subovate, abaxially keeled.

- 10a. Spikelets radiately arranged; rachilla 4-angled, with trabeculae in both lateral sulculi; glumes brown to dark brown, laxly imbricate, apex obtuse; anthers oblong ..... 3. *P. flavidus*  
 10b. Spikelets suberect; rachilla flexuose, narrowly winged; glumes straw-colored to rarely pale brown, densely imbricate, apex sometimes mucronate; anthers linear ..... 4. *P. polystachyos*

**1. *Pycreus delavayi*** C. B. Clarke, J. Linn. Soc., Bot. 36: 203. 1903.

黑鳞扁莎 he i lin bian suo

*Cyperus delavayi* (C. B. Clarke) Kükenthal.

Perennials. Roots fibrous. Rhizomes short. Culms tufted, 40–60 cm tall, slender, acutely triquetrous, with a few leaves basally. Leaves shorter than culm; leaf blade 1–2 mm wide, usually folded. Involucral bracts 2, subulate, longer than inflorescence. Inflorescence a simple anthela; rays 2 or 3, mostly to only 2 cm, sometimes very short and inflorescence almost capitate, each with 2–10 spikelets. Spikelets laxly arranged, narrowly linear-ovoid to narrowly ovoid, 0.6–1.6 cm × 2.5–3 mm, obliquely spreading, 6–16-flowered; rachilla 4-angled, wingless, with successive glumes ca. 1.2 mm apart. Glumes blackish brown on both surfaces, slightly laxly imbricate, ovate, 2.7–3 mm, subleathery, veins 3 and straw-colored, apex acute. Stamens 3; anthers linear, 1–1.2 mm. Style slightly short; stigmas 2, slender. Nutlet black, oblong-obovoid, ca. 1.2 mm, ca. 1/2 as long as subtending glume, biconvex, densely prominently punctulate, apex mucronate. Fl. and fr. Jun.

• Swamps, boggy seepages, shallow water; 2000–3000 m. Yunnan.

**2. *Pycreus unioides*** (R. Brown) Urban, Symb. Antill. 2: 164. 1900.

禾状扁莎 he zhuang bian suo

*Cyperus unioides* R. Brown, Prodr. 216. 1810; *Pycreus chekiangensis* Tang & F. T. Wang.

Perennials. Rhizomes short. Culms tufted, 40–90 cm tall, slender, stiff, 3-angled, smooth, with a few leaves basally. Leaves shorter than culm; sheath reddish brown, to 8 cm; leaf blade 3–4 mm wide, folded or flat, somewhat rigid. Involucral bracts 2–4, leaflike, basal 1 or 2 longer than inflorescence. Inflorescence a simple anthela; rays 2–6, mostly to 6 cm, sometimes short, each with 3–12 spikelets arranged into a spike. Spikelets narrowly oblong-ovoid, narrowly ovoid, or oblong-ovoid, 0.6–1.8 cm × 3–5 mm, compressed, spreading to downward reflexed at basal part at maturity, (6–)10–22-flowered; rachilla flexuose, wingless. Glumes straw-colored, yellowish brown, or sometimes slightly reddish brown on both surfaces, slightly densely to slightly laxly imbricate, ovate, 4–5 mm, subleathery, veins 3 and green, apex acute. Stamens 3; anthers linear; connective prominent beyond anthers. Style long; stigmas 2, slightly shorter than style. Nutlet yellowish when young but black when mature, broadly obovoid to globose-obovoid, 1/4–1/3 as long as subtending glume, compressed biconvex, densely prominently punctulate. Fl. and fr. Jun–Oct.

Wet places, river margins in valleys; 200–2200 m. Guangdong, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Myanmar, Nepal, Papua New Guinea, Philippines, Thailand, Vietnam; Africa, E Australia, Central, North, and South America, Madagascar].

*Pycreus chekiangensis* appears to be based on immature plants of *P. unioides*. Although the glumes are lighter, this variation can be found in *P. unioides* in various parts of its pantropical range.

**3. *Pycreus flavidus*** (Retzius) T. Koyama, J. Jap. Bot. 51: 316. 1976.

球穗扁莎 qiu sui bian suo

Perennials. Roots fibrous. Rhizomes short. Culms tufted, 2–50 cm tall, obtusely 3-angled, smooth, with a few leaves basally. Leaves shorter or longer than culm; sheath reddish brown at basal part, long; leaf blade 1–2 mm wide, folded or flat. Involucral bracts 2–4, longer than inflorescence, slender. Inflorescence a simple anthela; rays 1–6, mostly to 6 cm, unequal in length, sometimes very short, each with many to rarely few spikelets. Spikelets congested at apex of rays, linear-oblong to linear, 0.3–1.8 cm × 1–3 mm, strongly compressed, radially spreading and forming a globose spike, 6–34(–66)-flowered; rachilla straight, 4-angled, with trabeculae in both lateral sulculi. Glumes yellowish brown, reddish brown, dark purplish red, dark grayish brown, or purplish brown on both surfaces, lax or dense, oblong-ovate, 1.5–2 mm, 3-veined, keel abaxially green, margin narrowly white hyaline, apex obtuse. Stamens 2; anthers oblong, ca. 0.5 mm. Style of medium length; stigmas 2, slender. Nutlet brown to dark grayish brown, obovoid, 0.8–1.2 mm, ca. 1/3 as long as subtending glume, slightly compressed, biconvex, prominently punctulate, apex mucronate. Fl. and fr. Jun–Nov.

Swamps, shallow water, river margins, shady wet places, meadows, water margins, ditch margins, paddy field margins; below 100–3400 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, SE Xizang, Yunnan, Zhejiang [Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Kazakhstan, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; Africa, SW Asia, Australia, S Europe, Indian Ocean islands, Madagascar].

- 1a. Culms 2–3 cm tall; inflorescence a simple anthela, with only 1 ray and 3–9 spikelets ..... 3d. var. *minimus*  
 1b. Culms 7–50 cm tall; inflorescence a simple anthela, with 2–6 rays each with many or rarely few spikelets.  
 2a. Leaves usually longer than culm; spikelets 3–8 × 1–1.5 mm, 6–14-flowered ..... 3c. var. *strictus*  
 2b. Leaves shorter than culm; spikelets 6–18 × 1.5–3 mm or narrower, 12–34(–66)-flowered.  
 3a. Spikelets 1.5–3 mm wide; glumes yellowish brown, reddish brown, or dark purplish red, lax ..... 3a. var. *flavidus*

- 3b. Spikelets less than 1.5 mm wide; glumes dark grayish brown to purplish brown, dense ..... 3b. var. *nilagiricus*

### 3a. *Pycurus flavidus* var. *flavidus*

球穗扁莎(原变种) qiu sui bian suo (yuan bian zhong)

*Cyperus flavidus* Retzius, Observ. Bot. 5: 13. 1788; *C. globosus* Allioni (1789), not Forsskål (1775); *Pycurus globosus* Reichenbach.

Culms tufted, 7–50 cm tall. Leaves shorter than culm. Inflorescence a simple anthela; rays 2–6, each with many to rarely few spikelets. Spikelets 0.6–1.8 cm × 1.5–3 mm, 12–34(–66)-flowered. Glumes yellowish brown, reddish brown, or dark purplish red, lax. Fl. and fr. Jun–Nov.

Wet places at river margins, ditch margins, herbaceous along trails, field margins; below 100–3400 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, SE Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Kazakhstan, Korea, Laos, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Russia, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; SW Africa, SW Asia, Australia, S Europe, Indian Ocean islands, Madagascar].

3b. *Pycurus flavidus* var. *nilagiricus* (Hochstetter ex Steudel) C. Y. Wu ex Karthikeyan, Fl. Ind. Enumerat. Monocot. 65. 1989.

小球穗扁莎 xiao qiu sui bian suo

*Cyperus nilagiricus* Hochstetter ex Steudel, Syn. Pl. Glumac. 2: 2. 1854; *C. globosus* var. *nilagiricus* (Hochstetter ex Steudel) C. B. Clarke; *Pycurus globosus* var. *nilagiricus* (Hochstetter ex Steudel) C. B. Clarke.

Culms ± tall. Leaves shorter than culm. Inflorescence a simple anthela. Spikelets less than 1.5 mm wide. Glumes dark grayish brown to purplish brown, densely arranged. Fl. and fr. Jul–Sep.

Swamps, shallow water, river margins, shady wet places; 100–3000 m. Fujian, Gansu, Guangdong, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan, Zhejiang [India, Japan, Kazakhstan, Korea, Malaysia, Myanmar, Philippines, Russia, Sri Lanka, Uzbekistan, Vietnam; E Africa, Madagascar].

3c. *Pycurus flavidus* var. *strictus* C. Y. Wu ex Karthikeyan, Fl. Ind. Enumerat. Monocot. 65. 1989.

直球穗扁莎 zhi qiu sui bian suo

*Cyperus strictus* Roxburgh, Fl. Ind. 1: 203. 1820, not Lamarck (1791); *C. globosus* var. *strictus* C. B. Clarke; *Pycurus globosus* var. *strictus* C. B. Clarke.

Culms ± tall, slightly stiff. Leaves usually longer than culm. Spikelets 3–8 × 1–1.5 mm, 6–14-flowered. Glumes brown to brownish yellow but sometimes more pale. Fl. and fr. Jun–Aug.

Meadows, swamps, river margins, water margins, shallow water, ditch margins, shady wet places, paddy field margins; 200–1400 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Japan, Kashmir, Nepal; SW Asia (Iran), Australia, Indian Ocean islands, Madagascar].

3d. *Pycurus flavidus* var. *minimus* (Kükenthal) L. K. Dai, comb. nov.

矮球穗扁莎 ai qiu sui bian suo

Basionym: *Cyperus globosus* f. *minimus* Kükenthal, Acta Horti Gothob. 5: 108. 1930; *Pycurus globosus* var. *minimus* (Kükenthal) Tang & F. T. Wang.

Culms 2–3 cm tall. Leaves longer than culm. Inflorescences with 1 ray and 3–9 spikelets. Spikelets arranged into a spike. Glumes dark purplish brown. Fl. and fr. Sep–Oct.

- Shady wet places; ca. 800 m. Shanxi.

4. *Pycurus polystachyos* (Rottbøll) P. Beauvois, Fl. Oware 2: 48. 1816.

多枝扁莎 duo zhi bian suo

*Cyperus polystachyos* Rottbøll, Descr. Pl. Rar. 21. 1772; *Pycurus polystachyos* var. *brevispiculatus* How ex Y. F. Deng.

Annuals or short-lived perennials. Roots fibrous. Rhizomes short. Culms densely tufted, 8–60 cm tall, compressed 3-angled, stiff, smooth. Leaves shorter than culm; sheath brown at basal part, long; leaf blade 2–4 mm wide, flat, sometimes folded, slightly rigid. Involucral bracts 4–6, leaflike, longer than inflorescence. Inflorescence a simple or almost capitate anthela; rays 5–8, mostly to 3.5 cm but sometimes short, each with many spikelets. Spikelets linear to linear-oblong, (0.5–)0.7–1.8 cm × 1.5–2 mm, congested into a globose spike, 6–30-flowered or more; rachilla flexuose, narrowly winged. Glumes on both surfaces straw-colored, reddish brown, dark grayish brown, or blackish dark grayish brown, densely imbricate, ovate-oblong, ca. 2 mm, membranous, 3-veined, keel abaxially green, apex sometimes mucronate. Stamens (1 or)2; anthers linear; connective prominent beyond anthers. Style long; stigmas 2, slender. Nutlet suboblong to ovoid-oblong, ca. 1/2 as long as subtending glume, biconvex, punctulate, apex mucronate. Fl. and fr. May–Oct.

Wet places, sandy areas at seashores, water margins, shady areas in wet sand, paddy field margins; near sea level to 300 m. Fujian, Guangdong, E Guangxi, Hainan, Jiangsu, S Liaoning, Taiwan, Xisha Qundao, Zhejiang [Cambodia, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Pakistan, Philippines, Russia (Far East), Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia, Central, North, and South America, S Europe, Indian Ocean islands, Madagascar, Pacific islands].

Plants with anthela rays short or nearly absent occur sporadically throughout the range of this pantropical and warm-temperate species. Such plants have been collected in S China (Guangdong) and given the name *Pycurus polystachyos* var. *brevispiculatus*. When the species is revised on a worldwide basis, it may be appropriate to provide a formal designation for these plants with a capitulum-like inflorescence.

**5. *Pycreus lijiangensis*** L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 233. 1961.

丽江扁莎 li jiang bian suo

Perennials. Roots few, fibrous. Rhizomes very short. Culms scattered, (5–)15–40 cm tall, slightly slender, stiff, obtusely 3-angled or sometimes nearly half-cylindric, smooth, with a few leaves basally. Leaves shorter than culm; sheath grayish brown, ± short; leaf blade 1–2 mm wide, usually folded, apical margin scabrous. Involucral bracts 3, leaflike, longer than inflorescence. Inflorescence a simple anthela; rays very short, rarely to 1.5 cm, with 7 to many spikelets clustered into a globose capitulum. Spikelets narrowly to very narrowly ovoid, 4.5–11 × 1.5–2.2 mm, 10–26-flowered; rachilla 4-angled, with trabeculae in both lateral sulculi. Glumes dark purplish red on both surfaces, slightly laxly imbricate, elliptic to ovate-elliptic, 1.8–2 mm, membranous, veins 3 and greenish yellow, keel inconspicuous, apex obtuse and mucous. Stamens 2; filaments ca. 1.2 mm; anthers linear, ca. 0.5 mm; connective barely prolonged beyond anthers. Style short; stigmas 2, slender. Nutlet dark grayish brown, oblong to obovoid-oblong, ca. 0.9 mm, 2/5–1/2 as long as subtending glume, compressed biconvex, densely punctulate. Fl. and fr. Jun.

• Wet places at river and pond margins; 2000–3000 m. SW Sichuan, NW Yunnan.

**6. *Pycreus sulcinus*** (C. B. Clarke) C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 593. 1893.

槽果扁莎 cao guo bian suo

*Cyperus sulcinus* C. B. Clarke, J. Linn. Soc., Bot. 21: 56. 1884; *Pycreus substellatus* E. G. Camus.

Annuals. Roots fibrous. Culms tufted, 5–40 cm tall, slender, 3-angled, smooth, with a few leaves basally. Leaves shorter than culm; sheath purplish brown; leaf blade 0.5–2 mm wide, usually folded, apical margin scabrous. Involucral bracts 3–5, spreading, leaflike, usually basal 1 or 2 longer than inflorescence. Inflorescence a simple anthela; rays 3–8, mostly to 7 cm, slender, each with 3–15 spikelets arranged into a spike. Spikelets spreading, linear, 0.5–1.5[–3.5] cm × 1–1.5 mm, compressed, 8–20-flowered; rachilla flexuose, narrowly winged. Glumes straw-colored to brownish yellow on both surfaces, lax, ovate to oblong-ovate, ca. 1.8 mm, medially veins 3 and green, laterally membranous and veinless, margin narrowly white hyaline, apex obtuse and mucronate. Stamen 1; anther oblong, ca. 0.3 mm. Style of medium length; stigmas 2. Nutlet blackish brown, oblong, 1.2–1.3 mm, ca. 2/3 as long as subtending glume, slightly compressed, both surfaces concave sulcate and punctulate. Fl. and fr. Jun–Aug.

Under sparse forests in valleys, along trails on mountain slopes; 100–500 m. Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; N Australia, Pacific islands].

**7. *Pycreus pumilus*** (Linnaeus) Nees, Linnaea 9: 283. 1834.

矮扁莎 ai bian suo

*Cyperus pumilus* Linnaeus, Cent. Pl. 2: 6. 1756; *C. nitens* Retzius.

Annuals. Roots fibrous. Culms tufted, 2–20[–35] cm tall, slightly slender, compressed 3-angled, smooth, with a few leaves basally. Leaves shorter to longer than culm; leaf blade 1–2 mm wide, folded or flat. Involucral bracts 3–5, leaflike, longer than inflorescence. Inflorescence a simple anthela; rays 3–6, mostly to 2 cm, sometimes very short into a capitulum, each with 10–20 or more spikelets congested into a subglobose spike. Spikelets oblong to linear-oblong, 3–15 × 1.5–2 mm, compressed, 8–30(–40)-flowered; rachilla straight, wingless. Glumes pale to yellowish white, densely imbricate, ovate to ovate-elliptic, 1.2–1.5 mm, 3–5-veined, keel abaxially green, laterally membranous and veinless, apex truncate-emarginate and with a 0.3–0.5 mm mucro. Stamens 1 or 2; anthers oblong, ca. 0.2 mm. Style ca. 0.5 mm; stigmas 2, ca. 0.3 mm. Nutlet grayish brown, obovoid to oblong, ca. 0.6 mm, 1/3–2/5 as long as subtending glume, biconvex, densely prominently punctulate, apex obtuse. Fl. and fr. Aug–Nov.

Water margins, wet places in fields; below 100–500 m. Fujian, Guangdong, SE Guangxi, Hainan, Hunan, Jiangxi, S Taiwan [Bangladesh, Bhutan, India, Indonesia, Kashmir, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Indian Ocean islands, Madagascar].

*Pycreus pumilus* is naturalized in North and South America.

**8. *Pycreus sanguinolentus*** (Vahl) Nees ex C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 590. 1893.

红鳞扁莎 hong lin bian suo

*Cyperus sanguinolentus* Vahl, Enum. Pl. 2: 351. 1805, nom. cons.; *C. eragrostis* Lamarck var. *cyrtostachys* Miquel; *C. eragrostis* var. *humilis* Miquel; *C. eragrostis* f. *melanocephalus* (Miquel) J. V. Suringar; *C. flavescens* Linnaeus f. *rubromarginatus* Schrenk; *C. korshinskii* Meinshausen; *C. melanocephalus* Miquel; *C. sanguinolentus* f. *humilis* (Miquel) Kükenthal; *C. sanguinolentus* f. *melanocephalus* (Miquel) Kükenthal; *C. sanguinolentus* f. *rubromarginatus* (Schrenk) Kükenthal; *Pycreus korshinskii* (Meinshausen) V. I. Kreczetowicz; *P. sanguinolentus* var. *cyrtostachys* (Miquel) L. K. Dai; *P. sanguinolentus* f. *humilis* (Miquel) L. K. Dai; *P. sanguinolentus* f. *melanocephalus* (Miquel) L. K. Dai; *P. sanguinolentus* f. *rubromarginatus* (Schrenk) L. K. Dai.

Annuals. Roots fibrous. Culms densely tufted, 5–50 cm tall, compressed 3-angled, smooth, with several leaves basally. Leaves several, usually shorter than culm to rarely longer; sheath usually reddish brown, short; leaf blade 2–4 mm wide or less, flat, apical margin denticulate. Involucral bracts 2–5, leaflike, longer than inflorescence, subspreading. Inflorescence a simple anthela; rays 3–5, mostly to 4.5 cm to sometimes very short and inflorescence a capitulum, each with 4–12 or more spikelets congregated into a short spike or nearly a capitulum. Spikelets radially spreading, narrowly ovoid to narrowly oblong-ovoid, 0.5–1.8 cm × 2.5–3 mm, 6–24-flowered; rachilla straight, 4-angled, wingless. Glumes straw-colored, brownish yellow, or blackish brown on both surfaces but middle yellowish green, slightly laxly imbricate, ovate, ca. 2 mm, membranous, medially 3–5-veined, often distinctly furrowed on both sides of keel, margin dark blood-red to dark brownish red, apex obtuse. Stamens (2 or)3; anthers linear, 0.7–1 mm. Style long;

stigmas 2, exerted, slender. Nutlet black at maturity, globose-obovoid to broadly ellipsoid, 1–1.3 mm, 1/2–3/5 as long as subtending glume, biconvex, slightly turgid, minutely punctate. Fl. and fr. Jul–Dec.  $2n = 48, 50$ .

Sparse forest margins, grasslands on mountain slopes, meadows, swamps, lake margins, sunny places at river margins or shallow water, valleys, wet places along trails, field margins, old fields; below 100–3400 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, S and SE Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Pacific islands].

*Pycurus sanguinolentus* is naturalized in North America.

**9. *Pycurus diaphanus*** (Schrader ex Schultes) S. S. Hooper & T. Koyama, J. Jap. Bot. 51: 316. 1976.

宽穗扁莎 kuan sui bian suo

*Cyperus diaphanus* Schrader ex Schultes, Mant. 2: 477. 1824; *C. latespicatus* Boeckeler; *C. latespicatus* var. *diaphanus* (Schrader ex Schultes) Kükenthal; *Pycurus latespicatus* (Boeckeler) C. B. Clarke.

Annuals. Roots fibrous. Culms densely tufted, 10–35 cm tall, slightly slender, obtusely 3-angled, smooth, with a few leaves basally. Leaves shorter than culm; leaf blade 1.5–2.5 mm wide, apical margin denticulate. Involucral bracts 2 or 3 (or 4), leaflike, longer than inflorescence. Inflorescence a simple anthela; rays 2–4, mostly to 7 cm but sometimes short, each with 3–6 spikelets arranged into a spike. Spikelets radiate spreading, narrowly oblong-ovoid to narrowly linear-ovoid, 0.8–2 cm × 3–3.5 mm, compressed, 16–36-flowered; rachilla slightly flexuose, wingless. Glumes dark grayish brown to brown on both surfaces, densely imbricate, broadly ovate, ca. 3 mm, membranous, shiny, 3-veined, keel abaxially green, margin with broad whitish undulate border, apex obtuse. Stamens 2; anthers oblong, 0.8–1 mm. Style long; stigmas 2, shorter than style. Nutlet grayish black, broadly obovoid, 1–1.3 mm, ca. 1/3 as long as subtending glume, biconvex, turgid, transversely undulately striate. Fl. and fr. Sep–Oct.

Water margins, wet places; 600–1800 m. Guizhou, Hainan, Jiangxi, Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Korea, Nepal, Philippines, Russia (Far East), Thailand, Vietnam].

**19. KYLLINGA** Rottbøll, Descr. Icon. Rar. Pl. 12. 1773, nom. cons., not *Killinga* Adanson (1763).

水蜈蚣属 shui wu gong shu

Dai Lunkai (戴伦凯); Gordon C. Tucker, David A. Simpson

Herbs, perennial or rarely annual, with rhizomes or only fibrous roots. Culms tufted or scattered, usually slightly slender, rarely slightly stout. Leaves basal, 3-ranked; ligule absent; leaf blade elongated or reduced. Involucral bracts spreading, leaflike. Inflorescences terminal, capitate, with 1–3 spikes. Spikes sessile, capitate, with densely numerous spikelets. Spikelets short, compressed, each usually with 1 or 2(–5) bisexual flowers; rachilla articulate near base, deciduous at articulation when mature. Glumes distichous, persistent on rachilla and deciduous with it, basal 2 without a flower, apicalmost rarely with a male flower, remaining ones

**10. *Pycurus setiformis*** (Korshinsky) Nakai, Bot. Mag. (Tokyo) 26: 201. 1912.

东北扁莎 dong bei bian suo

*Cyperus setiformis* Korshinsky, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 405. 1892.

Annuals. Roots fibrous. Culms tufted, 5–30 cm tall, slender, 3-angled, smooth, with a few leaves basally. Leaves shorter than culm; sheath slightly reddish brown; leaf blade 0.3–1.5 mm wide, flat. Involucral bracts 1–3, usually longer than inflorescence, spreading, sometimes basalmost bract erect. Inflorescence a simple anthela; rays very short, each with 1 to several spikelets. Spikelets obliquely spreading, oblong to narrowly oblong-ovoid, 0.5–1.5 cm × 3–4 mm, compressed, 8–16-flowered; rachilla flexuose, narrowly winged. Glumes purplish red to reddish brown on both surfaces, slightly densely imbricate, ovate, ca. 2.5 mm, 3-veined, keel green, margin white hyaline, apex obtuse. Stamens 2; anthers linear; connective apex prominent beyond anthers. Style long; stigmas 2, slightly short. Nutlet black, broadly obovoid, ca. 1.5 mm, biconvex, inconspicuously transversely undulately striate to nearly reticulately striate, apex mucronate. Fl. and fr. Jul–Sep.

Meadows, wet sandy areas. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Russia (Far East)].

**11. *Pycurus pseudolatespicatus*** L. K. Dai in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 233. 1961.

似宽穗扁莎 si kuan sui bian suo

Annuals. Culms 3–15 cm tall, 3-angled, smooth, base with leaves. Leaves shorter to longer than culm; sheath reddish brown, short, usually split; leaf blade 1–3 mm wide, flat, margin laxly denticulate. Involucral bracts 3 or 4, spreading, leaflike, longer than inflorescence. Inflorescence a simple anthela; rays 3–5, mostly to 2.5 cm, each with 3–8 spikelets arranged into a short spike. Spikelets congregated near apex of ray, oblong-ovoid to subovoid, 6–10 × ca. 2.5 mm, radially spreading, 8–14-flowered; rachilla substrict, wingless. Glumes straw-colored to yellowish brown, slightly laxly imbricate, ovate, ca. 3 mm, concave, slightly thick, 3-veined, apex obtuse and mucous. Stamens 2; anthers broadly linear; connective slightly prominent beyond anthers. Style long; stigmas 2. Nutlet brownish, obovoid, ca. 1/3 as long as subtending glume, slightly turgid, conspicuously and transversely undulately striate. Fl. and fr. Aug–Sep.

• Paddy field margins; 1500–2100 m. Guizhou, Sichuan.

each with a bisexual flower. Flowers without perianth bristles or scalelike perianth parts. Style base not swollen, deciduous; stigmas 2. Nutlet compressed biconvex, one angle toward rachilla.

About 75 species: tropics and warm temperate regions worldwide; seven species (one introduced) in China.

1a. Glumes abaxially keeled.

2a. Perennials, with rhizomes; glumes with membranous spiny denticulate wings ..... 6. *K. nemoralis*

2b. Annuals, with fibrous roots; glumes with papery broadly dentate wings shaped like a cockscomb ..... 7. *K. squamulata*

1b. Glumes not abaxially keeled.

3a. Rhizomes short; culms tufted; spikes (1–)3; glume abaxial keel without spinules.

4a. Middle spike broadly ovoid, 5–6 mm; lateral spikes globose, 3–4 mm; spikelets oblong, 1-flowered; glumes greenish yellow and reddish brown maculate ..... 1. *K. bulbosa*

4b. Middle spike oblong-cylindric to oblong, 6–14 mm; lateral spikes oblong, ca. 6 mm; spikelets ovoid-ellipsoid to ovoid, 1- or 2-flowered; glumes greenish yellow to yellowish white and not reddish brown maculate ..... 2. *K. cylindrica*

3b. Rhizomes long and creeping; culms scattered, single at each node of rhizome; spike 1(–)3; glume abaxial keel spinulose.

5a. Rhizomes thin; culms 5–30 cm tall, slender, compressed 3-angled; leaves bladeless on basal 2 sheaths, with a 5–15(or more) cm blade on apical 2 or 3 leaf sheaths; nutlet brown at maturity, obovoid ..... 5. *K. brevifolia*

5b. Rhizomes thick; culms 30–120 cm tall, stout, very compressed 3-angled or nearly compressed; leaves bladeless or with a shorter than 15 cm blade on apical 1 or 2 sheaths; nutlet black at maturity, oblong to obovoid-oblong.

6a. Involucral bracts 3; leaf sheaths purplish ..... 3. *K. melanosperma*

6b. Involucral bracts 5–8; leaf sheaths brown ..... 4. *K. polyphylla*

**1. *Kyllinga bulbosa*** P. Beauvois, Fl. Oware 1: 11. 1804.

三头水蜈蚣 san tou shui wu gong

*Kyllinga nana* Nees.

Perennials. Rhizomes short. Culms tufted, 5–30 cm tall, compressed 3-angled, smooth, base swollen, bulbous, and clothed with persistent brown leaf sheath remains splitting into fibers. Leaves shorter than culm; leaf blade 2–3 mm wide, flaccid, folded or flat, apical margin sparsely denticulate. Involucral bracts 2 or 3, leaflike, longer than inflorescence, ± horizontal, downward reflexed after anthesis. Spikes usually 3, with numerous spikelets congested into a capitate shape; middle spike broadly ovoid, 5–6 mm; lateral spikes globose, 3–4 mm. Spikelets radially arranged, oblong, 2–2.5 mm, 1-flowered. Glumes greenish yellow and reddish brown maculate, ovate to ovate-ellipsoid, 2–2.5 mm, concave, keel abaxially green, veins 2 or 3 on each side of keel, apex mucronate. Stamens 1–3. Style short; stigmas 2, longer than style. Nutlet yellowish brown, oblong, 2/3–3/4 as long as subtending glume, compressed plano-convex, with punctate processes. Fl. and fr. Jul–Oct.  $2n = 14$ .

Wet places at field margins. Guangdong, Hainan [Bangladesh, India, Malaysia (Peninsular), Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; tropical Africa].

*Kyllinga bulbosa* is naturalized in E Australia and Malaysia.

The name *Kyllinga triceps* Rottbøll (Descr. Icon. Rar. Pl. 14. 1773) has been misapplied to this species (e.g., in FRPS 11: 185. 1961). That name was nomenclaturally superfluous when published and is therefore illegitimate because, in the protologue, Rottbøll cited the older name *Scirpus glomeratus* Linnaeus (Sp. Pl. 1: 52. 1753) as a synonym.

**2. *Kyllinga cylindrica*** Nees in Wight, Contr. Bot. India, 91. 1834.

圆筒穗水蜈蚣 yuan tong sui shui wu gong

*Cyperus sesquiflorus* (Torrey) Mattfeld & Kükenthal var.

*cylindricus* (Nees) Kükenthal; *Kyllinga odorata* Vahl subsp. *cylindrica* (Nees) T. Koyama; *K. sesquiflora* Torrey subsp. *cylindrica* (Nees) T. Koyama.

Perennials. Rhizomes short. Culms tufted, 8–32 cm tall, slightly slender, 3-angled, smooth, base few leaved. Leaves shorter than culm; sheath short; leaf blade 2.5–4 mm wide, flat, margin denticulate. Involucral bracts 3(or 4), ± horizontal, sometimes reflexed. Spikes (1–)3, congestate, with numerous densely arranged spikelets; middle spike oblong-cylindric to oblong, 6–14 × 4–6 mm; lateral spikes oblong, ca. 6 mm. Spikelets ovoid-ellipsoid to ovoid, ca. 2.2 mm, slightly turgid, 1- or 2-flowered. Glumes greenish yellow to yellowish white, broadly ovate, ca. 2 mm, concave, veins several, keel not spinulose, apex mucronate. Stamens 2; anthers broadly linear. Style of medium length; stigmas 2. Nutlet at first yellow but dark brown when mature, ellipsoid to obovoid-ellipsoid, compressed biconvex, with punctate processes. Fl. and fr. May–Jul.

Wet places along trails, river margins, ditch margins; near sea level to 2000 m. Fujian, Guangdong, NE Guizhou, SE Jiangxi, Taiwan, S Yunnan [Bhutan, India, Indonesia, Japan (Ryukyu Islands), Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Madagascar].

**3. *Kyllinga melanosperma*** Nees in Wight, Contr. Bot. India, 91. 1834.

黑籽水蜈蚣 hei zi shui wu gong

*Cyperus melanospermus* (Nees) J. V. Suringar.

Perennials. Rhizomes thick, long creeping, internodes short, clothed with brown scales, with 1 culm at each node. Culms distant, 30–120 cm tall, very compressed 3-angled to nearly compressed, smooth, base bulbous, clothed with long leaf sheaths. Leaf sheath brown, cylindrical, margin scarious, mouth obliquely truncate, apex mucronate, apical 1 or 2 with a blade; leaf blade ca. 5 cm × 3–5 mm or shorter, flat, apical mar-

gin denticulate. Involucral bracts 3, leaflike, spreading to downward reflexed. Spike 1, ovoid, oblong-ovoid, or subglobose, 6–12 × 6–8 mm, with numerous densely arranged spikelets. Spikelets narrowly ellipsoid-ovoid, ca. 3 mm, 1- or 2-flowered. Glumes straw-colored with rusty brown striae, ovate-lanceolate, ca. 3 mm, 5–7-veined, keel ± spinulose, apex mucronate. Stamens 3; anthers shortly linear; connective prominent beyond anthers. Style long; stigmas 2, shorter than style. Nutlet yellowish white at first but black when mature, oblong to obovoid-oblong, ca. 1/2 as long as subtending glume, plano-convex, with dense punctate processes, apex mucronate. Fl. and fr. Apr–Sep.

Wet places along trails, water margins, sandy areas; below 100–1000 m. Guangdong, S Guangxi, Hainan, Yunnan [India, Indonesia, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, NE Australia, Madagascar].

#### 4. *Kyllinga polyphylla* Kunth, Enum. Pl. 2: 134. 1837.

水蜈蚣 shui wu gong

*Cyperus aromaticus* (Ridley) Mattfeld & Kükenthal; *Kyllinga aromatica* Ridley; *K. erecta* Schumacher var. *polyphylla* (Kunth) Hooper.

Perennials. Rhizomes thick, horizontally long creeping, internodes short, clothed with brown to purple or blackish scales, with 1 culm at each node. Culms scattered, 25–90 cm tall, 3-angled, smooth, base bulbous, clothed with long leaf sheaths. Leaf sheath purplish, cylindrical, margin scarios, mouth obliquely truncate, apex subacute, apical 1 or 2 with a blade; leaf blade 3–5(–15) cm × 2–6 mm or shorter, flat, apical margin denticulate. Involucral bracts 5–8, leaflike, longest to 15 cm, ± horizontal to slightly reflexed. Spikes 1–3, hemispheric to subglobose, 6–12 × 6–8 mm; lateral spikes much smaller, with numerous densely arranged spikelets. Spikelets narrowly ellipsoid-ovoid, ca. 3 mm, 1- or 2-flowered. Glumes straw-colored with rusty brown striae, ovate-lanceolate, 3–4 mm, 5–7-veined, midvein ± spinulose, apex mucronate. Stamens 3; anthers shortly linear; connective prominent beyond anthers. Style long; stigmas 2, shorter than style. Nutlet yellowish white at first but black when mature, oblong to obovoid-oblong, ca. 1/2 as long as subtending glume, plano-convex, densely punctulate, apex apiculate. Fl. and fr. Jul–Oct.

Naturalized in moist or brackish sandy areas; below 300 m. Hong Kong, Taiwan [native to tropical Africa, Indian Ocean islands, and Madagascar].

*Kyllinga polyphylla* is also naturalized in tropical America, Asia, Australia, and Pacific islands.

#### 5. *Kyllinga brevifolia* Rottbøll, Descr. Icon. Rar. Pl. 13. 1773.

短叶水蜈蚣 duan ye shui wu gong

Perennials. Rhizomes slender, long creeping, clothed with brown, membranous scales, internodes 1–2.5 cm, with 1 culm at each node. Culms serially arranged, sometimes also laxly tufted, 2–30 cm tall, compressed 3-angled, smooth, base not swollen, with 4 or 5 leaf sheaths. Leaves shorter to slightly longer than culm; sheaths brown, mouth obliquely truncate, apex acuminate, basal 2 bladeless, apical 2 or 3 with a blade; leaf blade 5–15 cm × 2–4 mm, flaccid, flat, midvein and apical

margin spinulose. Involucral bracts 3, leaflike, longest erect to oblique or horizontal. Spike 1(–3), globose to ovoid-globose, 5–11 × 4–10 mm, with numerous densely arranged spikelets. Spikelets narrowly oblong-ovoid to narrowly ovoid, ca. 3 × 1 mm, compressed, 1- or 2-flowered. Glumes white and rusty brown maculate or rarely straw-colored, ovate, 2.8–3 mm, keel spinulose or not, veins 2 or 3 on each side of keel, apex with a strict or recurved mucro or not mucronate. Stamens 1–3; anthers linear, ca. 0.7 mm. Style long; stigmas 2, less than 1/2 as long as style. Nutlet obovoid-oblong, 1–1.5 mm, biconvex, densely punctate. Fl. and fr. May–Oct.

Under shrubs or forests, grasslands, swamps, meadows, mountain slopes, valleys, wet places along trails, ditch margins, shallow water, river margins, wet places at seashores, paddy field margins; near sea level to 2800 m. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xisha Qundao, S and SE Xizang, Yunnan, Zhejiang [Afghanistan, Bangladesh, Bhutan, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Russia (Far East), Sri Lanka, Thailand, Vietnam; tropical Africa, Atlantic Ocean islands, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific islands].

*Kyllinga brevifolia* var. *yunnanensis* E. G. Camus (Notul. Syst. (Paris) 1: 239. 1910) could not be treated here because no material was seen by the present authors.

- 1a. Culms 2–6 cm tall; spike 4–6 mm wide, with several to 20 or more spikelets; spikelets 1- or 2-flowered ..... 5c. var. *stellulata*
- 1b. Culms 5–30 cm tall; spike 4.5–10 mm wide, with numerous spikelets; spikelets 1-flowered.
  - 2a. Keel of glumes spinulose, apex recurved mucronate; longest involucral bract erect to oblique .... 5a. var. *brevifolia*
  - 2b. Keel of glumes not spinulose, apex without a mucro or sometimes with a strict mucro; longest involucral bract oblique to horizontal ..... 5b. var. *leiolepis*

#### 5a. *Kyllinga brevifolia* var. *brevifolia*

短叶水蜈蚣(原变种) duan ye shui wu gong (yuan bian zhong)

*Cyperus brevifolius* (Rottbøll) Endlicher ex Hasskarl.

Culms 5–30 cm tall. Longest involucral bract erect to oblique. Spike 5–11 × 4.5–10 mm, with numerous spikelets. Spikelets 1-flowered. Glumes with a spinulose keel, apex recurved mucronate. Fl. and fr. May–Oct.  $2n = 18$ .

Under shrubs or forests, grasslands, swamps, meadows, mountain slopes, valleys, wet places along trails, ditch margins, shallow water, river margins, paddy field margins; 100–2800 m. Anhui, Chongqing, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Sichuan, Taiwan, Xisha Qundao, S and SE Xizang, Yunnan, Zhejiang [Afghanistan, Bangladesh, Bhutan, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Atlantic Ocean islands, Australia, Central, North, and South America, Indian Ocean islands, Madagascar, Pacific islands].

**5b. *Kyllinga brevifolia* var. *leiolepis*** (Franchet & Savatier) H. Hara, J. Jap. Bot. 14: 339. 1938.

无刺鳞水蜈蚣 wu ci lin shui wu gong

*Kyllinga monocephala* Rottbøll var. *leiolepis* Franchet & Savatier, Enum. Pl. Jap. 2: 108. 1877; *Cyperus brevifolius* var. *gracillimus* (Miquel) Kükenthal; *K. brevifolia* var. *leiocarpa* Kitagawa; *K. gracillima* Miquel; *K. monocephala* var. *leiocarpa* Kitagawa.

Longest involucre bract oblique to horizontal. Spikelets slightly broad and turgid. Glumes not spinulose on keel, apex without a mucro or sometimes with a strict mucro. Fl. and fr. May–Oct.

Along trails, grassland slopes, river margins, shallow water, wet places at seashores, paddy field margins; near sea level to 1200 m. Anhui, Fujian, Gansu, Hebei, Henan, Hubei, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, NW Yunnan, Zhejiang [Japan, Korea, Nepal, Russia (Far East)].

Naturalized in E North America, this variety has a more northerly distribution than the others and has been treated as a species, *Kyllinga gracillima*, in some floras (e.g., Fl. N. Amer. 23: 193–194. 2002).

**5c. *Kyllinga brevifolia* var. *stellulata*** (J. V. Suringar) Ohwi, Bot. Mag. (Tokyo) 56: 199. 1942.

小星穗水蜈蚣 xiao xing sui shui wu gong

*Cyperus brevifolius* var. *stellulatus* J. V. Suringar, Cyperus, 48. 1898; *Kyllinga intermedia* R. Brown.

Culms 2–6 cm tall. Spike globose, 4–6 mm wide, with several to 20 or more spikelets. Spikelets laxly arranged, radially spreading, usually 1- or 2-flowered. Glumes not spinulose on keel. Fl. and fr. Jun–Jul.

Valleys; 1900–2700 m. NW Yunnan [S India, Indonesia, Papua New Guinea, Philippines].

*Kyllinga brevifolia* f. *pumila* (J. V. Suringar) Tang & F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 188. 1961; *Cyperus brevifolius* f. *pumila* J. V. Suringar, Geslacht Cyperus Mal. Archipel. 48. 1898) is similar to *K. brevifolia* var. *stellulata*, but the two taxa have not been provisionally combined here because the type of f. *pumila* has not been seen.

**6. *Kyllinga nemoralis*** (J. R. Forster & G. Forster) Dandy ex Hutchinson & Dalziel, Fl. W. Trop. Afr. 2: 487. 1936.

单穗水蜈蚣 dan sui shui wu gong

*Thryocephalon nemorale* J. R. Forster & G. Forster, Char. Gen. Pl. 65. 1775.

Perennials. Rhizomes long creeping. Culms distant or laxly tufted, 10–40 cm tall, slender, compressed triquetrous, base not swollen. Leaves usually shorter than culm; sheath brown or purplish brown maculate, short, basalmost bladeless; leaf blade

2.5–4.5 mm wide, flat, flaccid, margin laxly dentate. Involucre bracts 3 or 4, leaflike, much longer than inflorescence. Spike 1(–3), ovoid to globose, 5–9 × 5–7 mm, with numerous spikelets. Spikelets subobovoid to narrowly ovoid-oblong, 2.5–3.5 × ca. 1.5 mm, compressed, 1-flowered. Glumes pale to straw-colored and rusty brown maculate, boat-shaped, 2.5–3.5 mm, keel wings narrow at basal part and ± broad from middle to apex, veins 3 or 4 on each side of keel, margin spinulose, apex slightly recurved mucronate. Stamens 3. Style long; stigmas 2. Nutlet brown, oblong to obovoid-oblong, ca. 1/2 as long as subtending glume, compressed plano-convex, densely punctulate, apex shortly mucronate. Fl. and fr. May–Aug.  $2n = 18$ .

Under shrubs or forests, meadows, swamps in valleys, mountain slopes, wet places along trails, field margins, river margins, ditch margins; 100–1400 m. Guangdong, Guangxi, Hainan, Hunan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, NE Australia, Indian Ocean islands, Madagascar, Pacific islands].

*Kyllinga nemoralis* is naturalized in tropical America.

**7. *Kyllinga squamulata*** Vahl, Enum. Pl. 2: 381. 1805.

冠鳞水蜈蚣 guan lin shui wu gong

*Cyperus metzii* (Hochstetter ex Steudel) Mattfeld & Kükenthal; *Kyllinga metzii* Hochstetter ex Steudel; *K. squamulosa* Kunth.

Annuals. Roots fibrous. Culms densely tufted, 2–20 cm tall, slender, compressed triquetrous, smooth, base not swollen. Leaves equaling or slightly shorter than culm; sheath brownish purple, basal 1 or 2 bladeless; leaf blade 2–3 mm wide, flaccid. Involucre bracts 3 or 4, leaflike, much longer than inflorescence, spreading to downward reflexed, base usually broadening. Spike 1(–3), subglobose, 6–9 mm in diam., with many spikelets. Spikelets densely congested, broadly ovoid, 2.5–3 × 1.5–2 mm, compressed, 1-flowered. Glumes pale to straw-colored and sometimes rusty brown maculate, boat-shaped, 2.5–3 mm, keel green, winged, with 6–10 slightly broad teeth shaped like a cockscomb on apical ca. 2/3 of margin, and 1–3 spinelike trichomes at apex of teeth, apex with a strict mucro. Stamens 1 or 2; anthers oblong. Style of medium length; stigmas 2. Nutlet at first yellow but dark brown when mature, ellipsoid, ca. 2/3 as long as subtending glume, compressed, with dense punctate processes. Fl. and fr. Aug–Oct.  $2n = 14$ .

Wet grasslands, forests in valleys; 2300–3000 m. SW Sichuan, Yunnan [Bhutan, India, Nepal, Pakistan, Vietnam; tropical Africa, NE Australia, Madagascar].

*Kyllinga squamulata* is naturalized in SE North America and the Caribbean.

## 20. LIPOCARPHA R. Brown in Tuckey, Narr. Exped. Zaire, 459. 1818, nom. cons.

湖瓜草属 hu gua cao shu

Dai Lunkai (戴伦凯); Gordon C. Tucker

Herbs, annual or perennial. Leaves basal; leaf blade flat. Involucre bracts leaflike. Spikes 2–7, fascicled into a capitulum or rarely single, with many bractlets and spikelets; bractlets spirally arranged, each with a spikelet. Spikelet with 2 glumes (sometimes

absent) and a bisexual flower; rachilla very short, articulate at base, deciduous at article when mature; glumes alternate, membranous, several veined; basal glume without a flower; apical glume with a bisexual flower. Perianth bristles absent. Stamens 2. Stigmas 2. Nutlet 3-sided, biconvex, or plano-convex, included by subtending glume.

About 35 species: warm temperate and subtropical regions; four species in China.

- 1a. Leaf blade 2–4 mm wide; spikes (3 or)4–7-fascicled at culm apex; bractlet apex subtruncate, acuminate; nutlet biconvex ..... 1. *L. chinensis*  
 1b. Leaf blade 1–2 mm wide; spikes 2- or 3(or 4)-fascicled at culm apex; bractlet apex abruptly contracted and forming a recurved mucro; nutlet 3-sided to plano-convex.  
 2a. Bractlets blackish purple but mucro green; spikes 4–7 mm; nutlet blackish purple, narrowly ovoid ..... 4. *L. tenera*  
 2b. Bractlets greenish with reddish brown striae; spikes 2–5 mm; nutlet straw-colored, narrowly oblong.  
 3a. Culms 5–40 cm; nutlet 0.9–1 mm, subtended by 2 glumes ..... 2. *L. microcephala*  
 3b. Culms 5–30 cm; nutlet 0.5–0.6 mm, subtended only by a squarrose bract ..... 3. *L. squarrosa*

**1. *Lipocarpa chinensis*** (Osbeck) J. Kern, Blumea, Suppl. 4: 167. 1958.

华湖瓜草 hua hu gua cao

*Scirpus chinensis* Osbeck, Dagb. Ostind. Resa, 220. 1757; *Hypaelyptum argenteum* Vahl, nom. illeg. superfl.; *Lipocarpa argentea* R. Brown, nom. illeg. superfl.; *L. bawangensis* R. H. Miao; *L. senegalensis* (Lamarck) T. Durand & H. Durand; *S. senegalensis* Lamarck.

Perennials. Culms tufted, 10–60 cm tall, 1–1.5 mm thick, flat or compressed triquetrous, longitudinally sulcate, very laxly puberulent. Leaves basal; sheath tubular, 1.8–2.5 cm, glabrous, basal ones without a blade, apical ones with a blade; leaf blade linear, ca. 1/2 as long as culm, 2–4 mm wide, papery, margin revolute, apex acuminate. Involucral bracts 2 or 3, leaflike, 2–7 cm, not sheathing. Spikes (3 or)4–7-fascicled, ovoid to broadly ovoid, 5–10 × ca. 5.5 mm, with numerous bractlets and spikelets; bractlets pale and purple striate, oblanceolate, ca. 2 mm, keeled, submembranous, apex subtruncate to acuminate. Spikelets with 2 glumes and 1 bisexual flower; basal glume elliptic, ca. 1.5 mm, membranous, 5-veined, margin involute, apex obtuse; apical glume ovate-lanceolate, ca. 1.5 mm, with a bisexual flower, apex acute. Stamens 2; anthers narrowly oblong. Style of medium length; stigmas 3, nearly as long as style, puberulent. Nutlet brown when mature, oblong-obovoid, ca. 1 mm, biconvex, with punctate processes on surface, apex rounded and shortly apiculate. Fl. and fr. May–Oct.  $2n = 26$ .

Wet places at roadsides, ditch margins, river margins, mountain slopes, field margins; 100–2100 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Shandong, Taiwan, SE Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan (Ryukyu Islands), Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Indian Ocean islands, Madagascar].

**2. *Lipocarpa microcephala*** (R. Brown) Kunth, Enum. Pl. 2: 268. 1837.

湖瓜草 hu gua cao

*Hypaelyptum microcephalum* R. Brown, Prodr. 220. 1810.

Annuals, without a rhizome. Culms 5–40 cm tall, ca. 0.7 mm thick, flat, longitudinally sulcate, puberulent. Leaves basal; sheath tubular, 1.5–2.5 cm, membranous, glabrous, basal ones

without a blade, apical ones with a blade; leaf blade linear, 1/4–1/2 as long as culm, 0.7–1.5 mm wide, papery, both surfaces glabrous, midvein obsolete, margin involute. Involucral bracts 2 or 3, leaflike, slightly broad at base, not sheathing. Spikes 2- or 3(or 4)-fascicled, ovoid, 3–5 × ca. 3 mm, with numerous bractlets and spikelets; bractlets oblanceolate to spatulate, ca. 2 mm, membranous, apex abruptly contracted and formed into recurved mucro. Spikelets with 2 glumes and 1 bisexual flower; basal glume white, elliptic, ca. 1 mm, hyaline, 5-veined, apex obtuse; apical glume oblong, ca. 1 mm, membranous, several veined, with a bisexual flower, apex acute. Stamens 2; anthers linear-oblong, ca. 0.3 mm. Style slender, exerted from subtending glume; stigmas 3, pubescent. Nutlet straw-colored, narrowly oblong, 0.9–1 mm, slightly curved, 3-sided, densely punctulate, shiny, apex mucronate. Fl. and fr. Jun–Oct.  $2n = 46$ .

Water margins, wet places, swamps; 400–2100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Sichuan, Taiwan, S Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; Australia, Pacific islands].

**3. *Lipocarpa squarrosa*** (Linnaeus) Goetghebeur, Wagenin-gen Agr. Univ. Pap. 89(1): 71. 1989.

毛毯细莞 mao tan xi guan

*Scirpus squarrosus* Linnaeus, Mant. Pl. Alt. 181. 1771; *Isolepis squarrosa* (Linnaeus) Roemer & Schultes; *Schoenoplectus squarrosus* (Linnaeus) S. Yun Liang; *Scirpus neochinensis* Tang & F. T. Wang.

Annuals, without a rhizome. Culms 5–30 cm tall, ca. 0.7 mm thick, subterete, smooth. Leaves basal; sheath tubular, 1.5–2.5 cm, membranous, glabrous, basal ones without a blade, apical ones with a blade; leaf blade linear, 1–7 cm × 0.6–1 mm, papery, both surfaces glabrous, midvein obsolete, margin involute. Involucral bract 1, leaflike, dilated at base. Spikes 1 or 2, ovoid, 3–5 × ca. 3 mm; bractlets oblanceolate to spatulate, ca. 2 mm, membranous, apex abruptly contracted and formed into recurved mucro (i.e., squarrose). Spikelets without glumes, with 1 bisexual flower. Stamens 1 or 2; anthers ellipsoid, 0.2–0.3 mm. Style slender, exerted from subtending bract; stigmas 3. Nutlet pale yellowish brown, narrowly obovoid, 0.5–0.6 mm, 3-sided, densely punctulate, shiny, apex mucronate.

Wastelands, shady sandy areas. Guangdong (Guangzhou), Hainan (Dongfang), Zhejiang [Cambodia, India, Indonesia (Java), Kashmir, Malaysia (Peninsular), Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam].

**4. *Lipocarpha tenera*** Boeckeler, Beitr. Cyper. 1: 21. 1888.

细秆湖瓜草 xi gan hu gua cao

*Lipocarpha atropurpurea* Boeckeler.

Annuals, without a rhizome. Culms tufted, 10–18 cm tall, ca. 1 mm thick, compressed, longitudinally sulcate, glabrous. Leaves basal, ca. 1/3 as long as culm; sheath tubular, 1–1.5 cm; leaf blade ca. 1 mm wide, obsolete midveined, glabrous, margin involute. Involucral bracts 2 or 3, leaflike, slender, not

sheathing. Spikes 2- or 3-fascicled at culm apex, rarely single, ovoid, 4–7 × ca. 2.6 mm, with many bractlets and spikelets; bractlets blackish purple, oblanceolate, keeled, glabrous, apex green, caudate-acuminate, and slightly recurved. Spikelets with 2 glumes and a bisexual flower; glumes oblong, ca. 1 mm, membranous, with several slightly thick veins, margin hyaline, apex acute to obtuse. Stamens 2; anthers oblong, as long as filament. Style short, as long as stigma; stigmas 3. Nutlet blackish purple when mature, narrowly ovoid, ca. 1 mm, plano-convex to nearly 3-sided, densely blackish punctulate, apex rounded and mucronate. Fl. and fr. Oct–Dec.

Wet places at water margins; 1800–1900 m. Guangxi, Hainan, Yunnan [Vietnam; Africa].

**21. BLYSMUS** Panzer ex Schultes, Mant. 2: 41. 1824, nom. cons.

扁穗草属 bian sui cao shu

Liang Songyun (梁松筠 Liang Song-jun); Gordon C. Tucker

*Blismopsis* Oteng-Yeboah; *Nomochloa* P. Beauvois ex T. Lestiboudois.

Herbs, perennial. Rhizomes creeping. Culms nodose or not, 3-angled or terete, smooth or scabrous. Leaves basal or cauline, ligulate. Basalmost involucral bract leaflike, suberect; bractlets glumelike. Inflorescences spicate with few to many pseudodistichous spikelets, rarely with a lateral branch. Spikelets dark brown, with few bisexual flowers. Glumes imbricate, subdistichous. Perianth bristles 3–6, rarely absent, usually retrorsely scabrous. Stamens 3; connective apex evident beyond anthers. Style deciduous, base not thickened; stigmas 2. Nutlet stipitate, oblong, plano-convex, smooth, apex beaked.

About four species: temperate regions in N Africa, Asia, Europe, and North America; three species in China.

- 1a. Culms subterete; nutlet 3.5–4 mm; perianth bristles shorter than nutlet or usually absent ..... 1. *B. rufus*  
 1b. Culms 3-angled; nutlet ca. 2 mm; perianth bristles 1–3 × as long as nutlet.  
 2a. Perianth bristles erect or slightly flexuose, ± as long as nutlet; anthers ca. 2 mm ..... 2. *B. compressus*  
 2b. Perianth bristles contorted, slender, 2–3 × as long as nutlet; anthers 2–2.5 mm ..... 3. *B. sinocompressus*

**1. *Blismus rufus*** (Hudson) Link, Hort. Berol. 1: 278. 1827.

内蒙古扁穗草 nei meng gu bian sui cao

*Schoenus rufus* Hudson, Fl. Angl., ed. 2, 1: 15. 1778; *Blismopsis rufa* (Hudson) Oteng-Yeboah; *Blymus exilis* (Printz) Ivan; *B. rufus* subsp. *exilis* Printz; *Scirpus rufus* (Hudson) Schrader.

Rhizomes slender. Culms 3–20 cm tall, subterete, clothed at base with brown bladeless leaf sheaths. Cauline leaves as long as or shorter than culm; leaf blade brown, narrowly linear, thickly crescentic in cross section, apex ± obtuse. Involucral bract dark reddish brown, leaflike or glumelike, many veined, apex acute. Inflorescences consisting of 4–7 spikelets arranged in a distichous spike, 0.7–1.7 cm. Spikelets oblong-ovoid, 5–6 mm, 2- or 3-flowered, apex ± obtuse. Glumes elliptic-ovate, ca. 5 mm, 2- or 3-veined, apex obtuse. Perianth bristles usually absent. Stamens 3; anthers 3–4 mm; connective apex ca. 2 mm. Stigmas 2. Nutlet yellowish, shortly stipitate, oblong-ovoid, ca. 3.5 × 1.5 mm, plano-convex, base subrounded. Fl. and fr. Jun–Sep.  $2n = 40$ .

Wet saline meadows, wet sandy places; 500–5200 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; Europe, North America].

**2. *Blismus compressus*** (Linnaeus) Panzer ex Link, Hort. Berol. 1: 278. 1827.

扁穗草 bian sui cao

*Schoenus compressus* Linnaeus, Sp. Pl. 1: 43. 1753; *Blismopsis compressus* (Linnaeus) Oteng-Yeboah; *Nomochloa compressa* (Linnaeus) Beetle; *Scirpus compressus* (Linnaeus) Persoon.

Rhizomes 1–1.5 cm × 1.5–2 mm. Culms 9–30 cm tall, 3-angled, clothed at base with black bladeless leaf sheaths. Cauline leaves usually shorter than culm; sheath brown to rust-colored, mouth obliquely truncate, apex acuminate; ligule very short; leaf blade linear, flat, 1–3.5 mm wide, membranous. Involucral bract leaflike, slightly shorter or longer than inflorescence. Inflorescences consisting of 3–12 spikelets arranged in a simple distichous spike, oblong to obovoid, 1–2.2 × 0.4–0.9 cm. Spikelets ovoid to narrowly ovoid, 5–7 mm, 5–8-flowered. Glumes subdistichous, oblong-ovate, ca. 5 mm, membranous, 7-veined, apex obtuse. Perianth bristles 6, as long as nutlet, slightly flexuose at base, retrorsely scabrous. Stamens 3; anthers oblong, ca. 2 mm. Stigmas 2, as long as nutlet. Nutlet brown, obovoid, ca. 2 mm, plano-convex. Fl. and fr. Jul–Sep.  $2n = 44, 79$ .

Swampy meadows, valleys, wet places; 500–5000 m. Qinghai,

Shanxi (Lüliang Shan), Xinjiang, Xizang [Afghanistan, Bhutan, N India, Kashmir, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

**3. *Blysmus sinocompressus*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 224. 1961.

华扁穗草 hua bian sui cao

Rhizomes yellow, 2–7 cm × 2.5–3.5 mm, shiny, with black scales. Culms scattered, 5–60 cm tall, 0.7–4 mm thick, compressed 3-angled, clothed at base with brown to purplish brown leaf sheaths. Cauline leaves shorter than culm; ligule pale, very short; leaf blade flat, 0.5–4 mm wide, membranous, involute, margin scabrous, apex acuminate. Involucral bract leaflike, usually surpassing inflorescence; bractlets glumelike, membranous. Inflorescences consisting of 3–10 or more spikelets, densely arranged in a distichous or subdistichous spike; basal 1 or several spikelets usually remote, 1.5–3 × 0.6–1.1 cm. Spikelets narrowly ovoid, ovoid, or long ellipsoid, 5–7 mm, 2–9-flowered. Glumes rust-colored brown, subdistichous, long ovate, 3.5–4.5 mm, 3–5-veined, keel green, apex acute. Perianth bristles 3–6, flexuose or contorted, 2–3 × as long as nutlet, retrorsely scabrous. Stamens 3; anthers narrowly oblong, 2–2.5 mm; connective apex ca. 0.3 mm. Stigmas 2, ± as long as style. Nutlet dark brown, broadly obovoid, ca. 2 mm, plano-convex. Fl. and fr. Jun–Sep.

Wet places, stream and river margins, riverbeds, grasslands, valleys, swampy meadows, slopes; 500–4800 m. Gansu, Hebei, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, NW Yunnan [Mongolia].

1a. Culms 0.7–1 mm thick; leaf blade 0.5–0.8 mm wide ..... 3c. var. *tenuifolius*

1b. Culms 1–4 mm thick; leaf blade 1.5–4 mm wide.  
2a. Culms 5–20 cm tall, 1–1.2 mm thick; leaf blade 1.5–2.5 mm wide ..... 3a. var. *sinocompressus*  
2b. Culms 26–60 cm tall, 3–4 mm thick; leaf blade 3–4 mm wide ..... 3b. var. *nodosus*

**3a. *Blysmus sinocompressus* var. *sinocompressus***

华扁穗草(原变种) hua bian sui cao (yuan bian zhong)

Culms 5–20 cm tall, 1–1.2 mm thick. Leaf blade 1.5–2.5 mm wide. Fl. and fr. Jun–Sep.

Stream margins, riverbeds, grasslands; 500–4800 m. Gansu, Hebei, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, NW Yunnan [Mongolia].

**3b. *Blysmus sinocompressus* var. *nodosus*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 224. 1961.

节秆扁穗草 jie gan bian sui cao

Culms 26–60 cm tall, 3–4 mm thick. Leaf blade 3–4 mm wide. Fl. and fr. Jul–Sep.

• Wet places, stream margins, river margins, swampy meadows; ca. 2700 m. Hebei, Nei Mongol, Shaanxi, Shanxi.

**3c. *Blysmus sinocompressus* var. *tenuifolius*** Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 224. 1961.

细叶扁穗草 xi ye bian sui cao

Culms slender, 0.7–1 mm thick. Leaf blade finely linear, 0.5–0.8 mm wide. Fl. and fr. Aug.

• Slopes; ca. 2200 m. S Gansu (Minxian), Shanxi, W Sichuan.

## 22. *ACTINOSCHOENUS* Bentham, Hooker's Icon. Pl. 14: 33. 1881.

星穗莎属 xing sui suo shu

Zhang Shuren (张树仁), Liang Songyun (梁松筠 Liang Song-jun); Tetsuo Koyama, David A. Simpson

Perennials, shortly rhizomatous or stoloniferous. Culms scapose, tufted. Leaves ligulate; leaf blade very short or absent. Involucral bracts small. Inflorescences capitate with 2 to many spikelets. Spikelets with 4–7 distichous deciduous glumes of increasing length, 1(or 2)-flowered. Flowers bisexual, subtended by penultimate large glume enclosed by wings of next glume; rachilla internodes short, ± elongated between flowers. Perianth bristles absent. Stamens 3. Style deeply 3-cleft, deciduous, basally distinctly thickened. Nutlet obovoid, 3-sided, ± 3-ribbed, smooth to slightly tuberculate.

Four species: Africa, S and SE Asia, Australia, Indian Ocean islands, Madagascar, Pacific islands (New Caledonia); two species in China.

1a. Spikelets 3–7(–12), ovoid to narrowly ovoid; glumes reddish brown, thickly papery, apical half hairy; leaves with a blade ..... 1. *A. yunnanensis*  
1b. Spikelets 1 or 2(–6), narrowly ovoid; glumes brown, membranous, glabrous; leaves reduced to a bladeless sheath ..... 2. *A. thourarii*

**1. *Actinoschoenus yunnanensis*** (C. B. Clarke) Y. C. Tang, Abstr. Pap. 30th Anniv. Bot. Soc. China, 130. 1963.

云南星穗莎 yun nan xing sui suo

*Fimbristylis yunnanensis* C. B. Clarke, J. Linn. Soc., Bot. 36: 247. 1903.

Rhizomes creeping. Culms 12–50 cm tall, slender. Leaves

1/3–1/2 as long as culm; leaf blade 1–1.5 mm wide, sparsely hairy, apex acute. Involucral bracts 2 or 3, leaflike to nearly setaceous, 0.5–2.7 cm, longer than inflorescence, hairy. Inflorescences capitate, 0.8–1.2 cm in diam., with 3–7(–12) spikelets. Spikelets ovoid to narrowly ovoid, 5–7 mm, with 7 or 8 glumes distichous basally and with 4 or 5 basal ones empty. Glumes reddish brown, ovate-lanceolate and boat-shaped, thickly papery, apically hairy. Stamens 3. Style 3-sided, not cili-

ate, basally inflated; stigmas 3. Nutlet white, obovoid, 1/3–1/2 as long as subtending glume, obtusely 3-sided, reticulation not prominent. Fl. and fr. Jun.

Mountain slopes; 1200–1300 m. Yunnan [N India, Thailand, Vietnam].

D. A. Simpson and T. Koyama (Fl. Thailand 6(4): 342. 1998) treated this as *Fimbristylis yunnanensis* but noted that its placement was uncertain.

**2. Actinoschoenus thouarsii** (Kunth) Benth., Hooker's Icon. Pl. 14: 33. 1881.

星穗莎 xing sui suo

*Arthrostylis thouarsii* Kunth, Enum. Pl. 2: 284. 1837; *A. chinensis* Benth.; *Actinoschoenus chinensis* (Benth.) Benth.; *Fimbristylis chinensis* (Benth.) Tang & F. T. Wang.

Culms tufted, 15–40 cm tall, slender, 3-angled, with 2

sheaths at base. Leaves bladeless; sheath brown, with prominent ribs, margin membranous and darker, apically attenuate to a caudate apex but basal ones not caudate, mouth obliquely truncate. Involucral bracts subulate, usually shorter than inflorescence, base continuing into culm. Spikelets 1 or 2(–6), narrowly ovoid, 6–8 × 0.5–2 mm, with fewer flowers, with 5–7 glumes distichous basally and 3 basal ones empty, few-flowered and apicalmost glume with a sterile flower. Glumes brown, semicircular to broadly ovate basally on spikelet and oblong-ovate apically on spikelet, 0.2–2 mm, membranous, glabrous, 3-veined, apex mucronate. Stamens 3; stigmas 3. Nutlet cream-colored to light brownish, obovoid, 1–1.2 mm, 3-sided, smooth to verruculose and indistinctly reticulate. Fl. Sep–Oct, fr. Apr–May.

On rocks in woods; 200–300 m. Guangdong, Hainan [Cambodia, India, Indonesia, Malaysia (Peninsular), Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia, Indian Ocean islands, Madagascar].

## 23. RHYNCHOSPORA Vahl, Enum. Pl. 2: 229. 1805 [*“Rynchospora”*], nom. cons.

刺子莞属 ci zi guan shu

Liang Songyun (梁松筠 Liang Song-jun); David A. Simpson

Herbs, perennial or more rarely annual. Culms tufted, erect, 3-angled or terete. Leaves basal or cauline; sheath closed, with or without a ligule; leaf blade linear, flat or canaliculate. Involucral bracts leaflike, sheathing. Inflorescences paniculate, usually consisting of terminal and lateral anthelae, sometimes spicate or capitate. Spikelets sessile or pedunculate, narrowly ovoid, ovoid, or ellipsoid, slightly bilaterally compressed or terete. Glumes few to many, spirally imbricate or rarely distichous, 1-veined; basal 3 or 4 glumes shorter than apical ones and empty. Flowers bisexual or basal flower bisexual and apical one male or sterile. Perianth bristles 0–6(–13), antrorsely or retrorsely scabrous, rarely smooth. Stamens 2 or 3. Style slender; stigmas 2. Nutlet usually obovoid to ovoid, biconvex, with various ornamentations or more rarely smooth; persistent style base thickened, mostly conic or rarely lunate, spongy, base truncate or ± lobed.

About 350 species: cosmopolitan but particularly in tropics and subtropics of the New World; nine species in China.

- 1a. Inflorescences with 1 to several globose heads.
- 2a. Inflorescence with 2–7 spicate heads ..... 7. *R. malasica*
- 2b. Inflorescence with 1 terminal head.
- 3a. Nutlet obovoid; perianth bristles 1/3–1/2 as long as nutlet ..... 8. *R. rubra*
- 3b. Nutlet linear-oblong; perianth bristles longer than nutlet and persistent style base ..... 9. *R. submarginata*
- 1b. Inflorescences paniculate, consisting of terminal and lateral open panicles.
- 4a. Perianth bristles absent; persistent style base saddle-shaped, much depressed and much broader than high; nutlet 1.3–1.5 mm, coarsely transversely wrinkled; leaf blade setaceous ..... 6. *R. gracillima*
- 4b. Perianth bristles present; persistent style base compressed conic to almost subulate; nutlet 2–4 mm; leaf blade flat or canaliculate, not setaceous.
- 5a. Leaf blade 9–17 mm wide; nutlet 3–4 mm, deeply channeled; style hardly divided ..... 1. *R. corymbosa*
- 5b. Leaf blade 0.5–4 mm wide; nutlet ca. 2 mm, not channeled; style 2-cleft.
- 6a. Perianth bristles 9–13, retrorsely scabrous ..... 2. *R. alba*
- 6b. Perianth bristles less than 6, antrorsely or retrorsely scabrous.
- 7a. Leaf blade 0.5–1 mm wide; perianth bristles retrorsely scabrous ..... 3. *R. faberi*
- 7b. Leaf blade 1.5–3 mm wide; perianth bristles antrorsely scabrous.
- 8a. Spikelets 3–4.5 mm; perianth bristles shorter than nutlet and persistent style base ..... 4. *R. rugosa*
- 8b. Spikelets 7–9 mm; perianth bristles longer than nutlet and persistent style base ..... 5. *R. chinensis*

**1. Rhynchospora corymbosa** (Linnaeus) Britton, Trans. New York Acad. Sci. 11: 84. 1892.

伞房刺子莞 san fang ci zi guan

*Scirpus corymbosus* Linnaeus, Cent. Pl. 2: 7. 1756; *Rhynchospora aurea* Vahl.

Perennials. Rhizomes short. Culms erect, 60–140 cm tall, stout, 3-angled, with several nodes, smooth or scaberulose on angles. Leaves basal and cauline; sheath semirounded, 2–6 cm, membranous, ligulate at mouth; leaf blade broadly linear, 30–60 × 0.9–1.7 cm, flat, herbaceous to thinly leathery, margin and abaxial midvein scabrous, apex long acuminate. Involucral

bracts 3–5, leaflike, shorter than inflorescence, base sheathing. Inflorescence a large compound panicle consisting of 2–5 distant corymbiform anthelae, 20–50 cm; anthelae compound, to 15 cm in diam., ± dense, diffuse, many branched; bractlets setaceous. Spikelets many, in clusters of 2–5, erect or obliquely patent, narrowly ovoid to fusiform, 7–10 mm; basal flower bisexual; apical 1 or 2 flowers male. Glumes 7 or 8, ovate to ovate-lanceolate, basal 4 and apicalmost empty. Perianth bristles 6, as long as nutlet, antrorsely scabrous. Stamens 3; filaments shorter than nutlet and style base; anthers linear; connective subulate. Style ca. 1.7 cm, base dilated; stigmas 2. Nutlet brown, oblong-obovoid to obovoid, 3–4 mm, compressed, finely transversely wrinkled in middle part, coarsely undulate rugose toward margin; persistent style base long conic, ca. 5.5 mm, ± as broad as nutlet, compressed, conspicuously grooved on both sides, smooth or asperous. Fl. and fr. Mar–Dec.  $2n = 18$ .

Moist stream margins along valleys; 100–900 m. Guangdong, Guangxi, Hainan, Hunan, Taiwan, Yunnan [Bangladesh, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Central and South America, Indian Ocean islands, Madagascar, Pacific islands].

**2. *Rhynchospora alba*** (Linnaeus) Vahl, Enum. Pl. 2: 236. 1805.

白鳞刺子莞 bai lin ci zi guan

*Schoenus albus* Linnaeus, Sp. Pl. 1: 44. 1753.

Perennials. Rhizomes short, slender. Culms tufted, erect, 15–42(–50) cm tall, 0.5–0.8 mm thick, apically slightly scabrous. Leaves shorter than culm; sheath straw-colored brown, basal ones with a blade or bladeless; leaf blade filiform, 0.7–2 mm wide, papery, margin involute. Involucral bracts leaflike, basal ones with a sheath, apical ones sheathless. Inflorescences paniculate, consisting of terminal and lateral subcapitate anthelae. Spikelets fascicled in a group of 2–7, sessile or shortly pedunculate, narrowly ovoid, 5–6 mm, 2-flowered. Glumes 5 or 6, at first white turning pale brown, ovate to ovate-lanceolate, membranous, keeled, apex mucronate. Perianth bristles 9–13, longer than nutlet, retrorsely scabrous, base sparsely hispid. Stamens 2; filaments as long as nutlet and style base; anthers linear. Style filiform, base dilated; stigmas 2, almost as long as style. Nutlet yellowish green to greenish brown, obovoid to oblong-obovoid, 1.5–2.5 mm, biconvex, ± smooth to obscurely wrinkled; persistent style base conic-subulate, 1/2–2/3 as long as nutlet. Fl. and fr. Aug.  $2n = 26$ .

Swamps, wet places; ca. 900 m. Jilin, Taiwan [Japan, Kazakhstan, Korea, Russia; SW Asia, Caribbean (Puerto Rico), Europe, North America].

**3. *Rhynchospora faberi*** C. B. Clarke, J. Linn. Soc., Bot. 36: 259. 1903.

细叶刺子莞 xi ye ci zi guan

Perennials. Rhizomes very short, with dense and slender fibrous roots. Culms tufted, erect, 20–40(–60) cm tall, 0.5–1 mm thick, 3-angled, basally clothed with pale yellowish bladeless sheaths, apically sometimes slightly scabrous. Leaves basal and a few cauline, shorter than culm; leaf blade filiform, 0.5–1 mm wide, 3-angled, sometimes slightly scabrous, apex finely

acuminate. Involucral bracts leaflike or setaceous, sheathing. Inflorescences paniculate, consisting of a terminal and 3 or 4 lateral corymbiform anthelae; anthelae small, very distant, with 2–5 spikelets. Spikelets erect, dark brown, narrowly ovoid, ca. 3.5 mm, base subtruncate, apex acuminate. Glumes 5 or 6, ovate to elliptic-ovate, 1- or 2-flowered; basal 3 or 4 glumes narrowly ovate, empty. Perianth bristles 6, slightly longer than nutlet, retrorsely scabrous. Stamen 1; filament as long as nutlet and style base. Style slender; stigmas 2. Nutlet brown to pale reddish brown, broadly obovoid to obovoid-globose, 1.5–2 mm, biconvex, finely transversely wrinkled with longitudinally oblong epidermal cells; persistent style base narrowly conic, 1/3–2/3 as long as nutlet. Fl. and fr. Aug–Oct.

Swamps, stream margins; ca. 400 m. Fujian, Guangdong, Guangxi, Hunan, Jiangsu, Jiangxi, Shandong, Zhejiang [Japan, Korea, Russia (Far East)].

**4. *Rhynchospora rugosa*** (Vahl) Gale subsp. ***brownii*** (Roemer & Schultes) T. Koyama in H. Hara, Stearn & L. H. J. Williams, Enum. Fl. Pl. Nepal 1: 118. 1978.

白喙刺子莞 bai hui ci zi guan

*Rhynchospora brownii* Roemer & Schultes, Syst. Veg. 2: 86. 1817; *R. glauca* Vahl var. *condensata* Kükenthal; *R. rugosa* var. *condensata* (Kükenthal) T. Koyama.

Perennials. Rhizomes very short. Culms tufted, erect, 30–55(–90) cm tall, slender, 3-angled, smooth but apically usually scabrous. Leaves basal and a few cauline and distant, shorter than culm; sheath brown, closed, 2.6–6 cm, glabrous, with very short ligule at mouth; leaf blade narrowly linear, 1.5–3 mm wide, flat or canaliculate, margin and abaxial midvein scabrous, apex long acuminate. Involucral bracts leaflike, basal ones sheathing, apicalmost sheathless. Inflorescences paniculate, narrow, consisting of 3 or 4 dense to ± lax corymbiform anthelae; lateral peduncles solitary or 2 together, compressed, often long exerted from sheaths; rays very unequal, erect; raylets setaceous. Spikelets dark brown, ellipsoid to subovoid, 3–4.5 mm, 3- or 4-flowered, base ± obtuse, apex acute. Glumes 7 or 8, elliptic-ovate, ovate, or broadly ovate; basal 3 or 4 glumes empty. Perianth bristles 6, slightly shorter than nutlet, unequal, antrorsely scabrous. Stamens (1–)3; filaments longer than nutlet and style base. Ovary obovoid; style filiform; stigmas 2, as long as style. Nutlet pale rust-colored, broadly ellipsoid-obovoid, ca. 1.7 mm, biconvex, finely transversely wrinkled with longitudinal epidermal cell; persistent style base broadly conic, shorter than nutlet. Fl. and fr. Jun–Oct.  $2n = 36$ .

Swamps, moist river margins; 1000–2400 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Europe, Indian Ocean islands, Madagascar, Pacific islands].

*Rhynchospora rugosa* subsp. *rugosa* occurs in tropical America and South America.

**5. *Rhynchospora chinensis*** Nees & Meyen ex Nees, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1): 108. 1843.

华刺子莞 hua ci zi guan

*Rhynchospora glauca* Vahl var. *chinensis* (Nees & Meyen ex Nees) C. B. Clarke; *R. japonica* Makino; *R. longisetigera* Hayata.

Perennials. Rhizomes very short. Culms tufted, erect, 25–60(–125) cm tall, slender, 3-angled, rigid, basally clothed with 1 or 2 bladeless sheaths, apically scabrous. Leaves basal and cauline, shorter than inflorescence; sheath 5–9 cm; ligule rust-colored brown, short, membranous; leaf blade narrowly linear, 1.5–2.5 mm wide, margin scabrous, apex acuminate. Involucral bracts leaflike, longer than inflorescence, basal ones sheathing, apicalmost one shortly sheathing or sheathless. Inflorescences paniculate, consisting of 3–5 corymbiform anthelae, mostly binate, suberect; peduncle exerted, subclaxly bearing 2–9 clusters of spikelets. Spikelets brown, narrowly ovoid, 7–8 mm, 2–5-flowered, base ± obtuse, apex acute. Glumes 5–8, brown to yellowish brown, elliptic-ovate to lanceolate-elliptic; basal 2 or 3 glumes empty; apical glumes broadly ovate to lanceolate-elliptic, membranous, 1-costate, apex mucronate to acuminate. Perianth bristles 6, antrorsely scabrous. Stamens 3; filaments slightly longer than nutlet and style base; anthers linear. Ovary obovoid; style filiform, base dilated; stigmas 2, shorter than style. Nutlet dark reddish brown, broadly ellipsoid-obovoid, 2–3.7 mm, biconvex, finely transversely wrinkled with longitudinally oblong epidermal cell; persistent style base narrowly conic, slightly shorter than or equaling nutlet. Fl. and fr. May–Oct.

Swamps, moist places, wet grasslands; 100–1400 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hubei, Jiangsu, Jiangxi, Shandong [Japan, Myanmar, Sri Lanka, Thailand, Vietnam; Indian Ocean islands, Madagascar].

**6. *Rhynchospora gracillima*** Thwaites, Enum. Pl. Zeyl. 435. 1864.

柔弱刺子莞 rou ruo ci zi guan

*Rhynchospora kamphoeveneri* Boeckeler.

Annuals or short-lived perennials. Culms densely tufted, 20–60 cm tall, filiform, 3-angled, smooth. Leaves shorter than culm; leaf blade setaceous, 0.5–1 mm wide, canaliculate, apex scabrous. Involucral bracts setaceous, sheathing. Inflorescences laxly paniculate, consisting of 1–3 corymbiform anthelae to 4 cm; terminal anthela longer than lateral ones, simple or subcompound; lateral anthelae simple, with peduncles exerted from sheaths; rays capillary, 2–4 cm, often upcurved, smooth, subtended by setaceous bractlets. Spikelets solitary, narrowly ovoid, 3- or 4-flowered, apex acute; peduncle long. Glumes 7 or 8, pale rust-colored with purplish lines, spirally imbricate, broadly ovate, membranous, mucous. Perianth bristles absent. Stamens 2; anthers 1.5–2.3 mm. Style ca. 2.3 mm, base much depressed, saddle-shaped, 2-lobed, and almost as broad as nutlet, apex 2-cleft to middle. Nutlet grayish white, shortly stipitate, broadly obovoid, 1.3–1.5 × 1.3–1.5 mm, biconvex, deeply transversely wavy ridged, with longitudinally linear epidermal cells, apex truncate. Fl. and fr. Sep–Oct.

Moist places, grassy slopes, forests; 900–1000 m. Fujian, Hong Kong [India, Indonesia, Papua New Guinea, Sri Lanka, Thailand; tropical Africa, NE Australia, Indian Ocean islands, Madagascar].

No specimens of *Rhynchospora gracillima* from China have been

seen by the present authors. The plants from China would be *R. gracillima* subsp. *gracillima*; another subspecies occurs in tropical Africa and Madagascar.

**7. *Rhynchospora malasica*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 670. 1893.

日本刺子莞 ri ben ci zi guan

*Rhynchospora nipponica* Makino.

Perennials. Rhizomes short, creeping. Culms erect, simple, 60–100 cm tall, rigid, with several nodes, smooth, basally obtusely 3-angled and clothed with dusky brown bladeless sheaths, apically acutely 3-angled. Leaves longer than culm; sheath elongated, tightly surrounding culm; ligule rust-colored brown, short, membranous; leaf blade broadly linear, 5–9 mm wide, flattish, apex long acuminate to acute. Involucral bracts spreading, 7–20 cm, much longer than inflorescence, sheathless. Inflorescences spicate, 3–20 cm, with 2–7 heads, basally interrupted, apically subcontiguous; heads sessile, globose, 1–1.5 cm in diam. Spikelets narrowly ovoid, 6–7 mm, weakly laterally compressed, 1-flowered, base contracted, apex acuminate. Glumes 5 or 6; basal 3 or 4 grayish brown, ovate, much smaller than others, membranous, 1-veined, apex acute; apical 2 glumes lanceolate-ovate. Perianth bristles 6, filiform, 3.5–4.5 mm, ca. 2 × as long as nutlet, flexuose, smooth. Stamens 3; anthers ca. 2 mm. Style slender; stigmas 2. Nutlet dark brown, obovoid to broadly obovoid, 2–2.3 mm, biconvex, indistinctly transversely wrinkled, shiny, base attenuate; persistent style base narrowly conic-subulate, 4–5 mm, glabrous. Fl. and fr. Sep–Oct.

Swamps, rarely in shallow water. Guangdong, Taiwan [Indonesia, Japan, Korea, Malaysia].

**8. *Rhynchospora rubra*** (Loureiro) Makino, Bot. Mag. (Tokyo) 17: 180. 1903.

刺子莞 ci zi guan

*Schoenus ruber* Loureiro, Fl. Cochinch. 1: 41. 1790; *Morisia wallichii* Nees; *Rhynchospora wallichii* (Nees) Kunth.

Annuals or short-lived perennials. Rhizome short. Culms tufted, 30–65 cm tall, 0.8–2 mm thick, terete, smooth. Leaves shorter than culm; sheath brownish straw-colored, 1–7 cm; leaf blade narrowly linear, 1.5–3.5 mm wide, papery, slightly scabrous, apex acuminate. Involucral bracts 4–10, stiffly spreading, leaflike, 1–5(–8.5) cm, longer than inflorescence, unequal, densely ciliate at dilated base, sheathless. Inflorescence a single terminal head, brown to orangish brown, globose, 1–1.8 cm in diam., with many spikelets. Spikelets narrowly ovoid, 6–8 mm, shiny, 2–4-flowered. Glumes 7 or 8, brown, ovate-lanceolate to elliptic-ovate, thinly papery, keeled, vein 1, apex obtuse to acute; basal glumes each with a female flower; apical 1 or 2 glumes each with a male flower. Perianth bristles 4–6, unequal, 1/3–1/2 as long as nutlet, antrorsely scabrous. Stamens 2 or 3; filaments shorter to longer than subtending glume; anthers linear; connective evident. Style filiform; stigmas 2 or sometimes undivided, very short. Nutlet brown when mature, obovoid, 1.5–1.8 mm, biconvex, edges subacute with apical half hispid-serrulate, sides sparsely hispid-scabrous mainly on apical half, obscurely spotted with minute isodia-

metric epidermal cells; persistent style base conic, 1/5–1/4 as long as nutlet, base abruptly widened. Fl. and fr. May–Nov.

Road margins, grassy slopes, wet places; 100–1400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, S Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Indian Ocean islands, Madagascar, Pacific islands].

Plants from China would be *Rhynchospora rubra* subsp. *rubra*; other subspecies occur in Africa and Madagascar.

**9. *Rhynchospora submarginata*** Kükenthal, Bot. Jahrb. Syst. 74: 498. 1949.

类缘刺子莞 lei yuan ci zi guan

*Rhynchospora marginata* C. B. Clarke (1908), not (Liebmann) Steudel (1855).

Annuals. Roots fibrous. Culms tufted, erect, 10–60 cm

tall, slender, 3-angled, smooth. Leaves basal and 1 or 2 cauline in lower 1/3 of culm, 1/4–3/4 as long as culm; leaf blade linear, 2–2.5 mm wide, glabrous or pubescent, margin slightly involute, apex acuminate. Involucral bracts 3–6, leaflike, to 15 cm, base dilated and densely ciliate, apically slightly involute, sheathless, apex acuminate. Inflorescence a single terminal head, 1.2–2 cm in diam. Spikelets narrowly ovoid, 5–6 mm, shiny, 2-flowered. Glumes 6 or 7, rust-colored, ovate-lanceolate to elliptic-lanceolate; basal 3 or 4 empty, ± smaller; middle glumes ca. 4 mm, each with 1 female flower; apical 2 or 3 glumes each with a male flower. Perianth bristles 6, longer than nutlet and style base, antrorsely scabrous. Stamens 2 or 3; anthers linear, ca. 2 mm; connective slightly evident, reddish, pubescent. Nutlet blackish, linear-oblong, ca. 3.5 mm, sub-biconvex, whitish setulose to almost glabrous; persistent style base pale brown, ca. 1/2 as long as nutlet. Fl. and fr. Jun–Oct.

Sandy grasslands, paddy fields. Hainan [India, Indonesia, Malaysia, Papua New Guinea, Thailand, Vietnam; N Australia].

## 24. *SCHOENUS* Linnaeus, Sp. Pl. 1: 42. 1753.

赤箭莎属 chi jian suo shu

Liang Songyun (梁松筠 Liang Song-jun); Jeremy J. Bruhl, Karen L. Wilson

Herbs, perennial or rarely annual. Rhizomes short. Culms terete. Leaves basal or cauline; sheath reddish brown; leaf blade flat, 3-angled, or semiterete. Involucral bracts leaflike, sheathing. Inflorescences paniculate, racemose, or rarely headlike. Spikelets usually narrowly ovoid or oblong-ovoid, usually 1–4-flowered, basal 1 or 2 flowers usually bisexual, apical 1 or 2 flowers male. Glumes dark colored with whitish margin, distichous, usually papery, deciduous, 1-veined, keeled, basal 2 or 3 empty. Perianth bristles 6 or absent. Stamens 3. Style slender; stigmas 3. Nutlet ellipsoid or obovoid, usually terete, 3-sided, or rarely biconvex, smooth or with reticulate ornamentation.

More than 120 species: mostly in Australia, a few in E and SE Asia, Pacific islands (New Caledonia, New Zealand), Europe, and America; four species (one endemic) in China.

- 1a. Inflorescences lax; spikelets ca. 2 cm; peduncle 10–15 cm ..... 1. *S. calostachyus*  
 1b. Inflorescences dense; spikelets less than 1 cm; peduncle much shorter or inflorescences sessile.  
 2a. Culms densely tufted; perianth bristles absent ..... 4. *S. nudifructus*  
 2b. Culms laxly tufted; perianth bristles 1–6.  
 3a. Culms 60–100 cm tall; leaf blade 1–5 mm wide; spikelets 7–14 × ca. 2.5 mm ..... 2. *S. falcatus*  
 3b. Culms 20–40 cm tall; leaf blade ca. 0.5 mm wide; spikelets 4–6 × ca. 1 mm ..... 3. *S. apogon*

**1. *Schoenus calostachyus*** (R. Brown) Poiret, Encycl., Suppl. 2: 251. 1811.

长穗赤箭莎 chang sui chi jian suo

*Chaetospora calostachya* R. Brown, Prodr. 233. 1810.

Perennials. Rhizomes short. Culms tufted, erect, (30–)70–90 cm tall, obtusely 3-angled to subterete, sulcate, smooth. Leaves basal and cauline; sheath blackish purple; leaf blade linear, 30–75 cm × 1–2 mm, rigid, 3-veined on abaxial surface, margin scaberulose, apex acute. Involucral bracts leaflike; sheaths black purplish red to reddish black, 1.5–2.5 cm, terete; mouth pale, oblique, membranous. Inflorescences racemose, to 50 cm, very lax, with 2 or 3 very distant fascicles of branches; peduncle 10–15 cm, glabrous; branches solitary or 2(or 3) together, erect, ca. 12.5 cm, unequal, compressed, scaberulose on angles, each bearing 1(–3) spikelets. Spikelets chestnut-brown, oblong to narrowly ovoid, 3–5-flowered, apex acute to acuminate. Glumes distichous, narrowly lanceolate, basal 5 and apical

1 or 2 empty; fertile glumes to 1.5 cm; sterile glumes ca. 0.4 cm, leathery, densely ciliate especially toward apex, keel green. Perianth bristles 4–7, white, ca. 1/2 as long as nutlet, antrorsely scabrous on apical part, easily caducous. Stamens 3; anthers linear, caducous. Style slender, apical half ciliate; stigmas 3, papillate. Nutlet grayish brown, obovoid, 3-sided, reticulately wrinkled, glabrous, base attenuate, apex obscurely beaked. Fl. and fr. Jul–Sep.

Slopes, hilltops; ca. 600 m. Guangdong, S Guangxi, Hainan (Wenchang) [Indonesia, Japan (Ryukyu Islands), Malaysia, Papua New Guinea, Thailand, Vietnam; Australia, Pacific islands].

**2. *Schoenus falcatus*** R. Brown, Prodr. 232. 1810.

赤箭莎 chi jian suo

*Schoenus sinensis* Handel-Mazzetti.

Perennials. Rhizomes short. Culms tufted, 60–100 cm tall, 2–5 mm thick, subterete, smooth. Leaves basal and cauline.

Basal leaves with sheath dark purple to dark reddish purple, 3–4 cm; leaf blade linear, 1–5 mm wide, margin scabrous. Cauline leaves 1–3, remote, rather short; sheath reddish brown, mouth oblique. Involucral bracts leaflike; sheaths brown to reddish brown; basalmost bract with a blade subequalling inflorescence. Inflorescence a narrow lax panicle; branches 2–4-nate, occasionally single. Spikelets brown, narrowly ovoid, 7–14 × ca. 2.5 mm, erect, slightly flattened, shortly pedunculate, 3–8-flowered. Glumes brown with a pale margin, distichous, ovate-lanceolate to ovate, 5–7 mm, papery, glabrous except for scabrous keel, keel yellowish green, apex acute; basal 2 or 3 glumes sterile and smaller. Perianth bristles (0 or) 1–3, ferruginous, antrorsely scabrous. Stamens 3; filaments slender; anthers linear, ca. 3 mm, caducous; connective apex appendage white, to 0.5 mm. Style 3–4 mm; stigmas 3, much shorter than style. Nutlet rusty brown, obovoid, 1–1.5 mm, 3-sided, reticulate, apex hirsute with white appressed hairs. Fl. and fr. May–Jul.

Swamps, wet places; ca. 400 m. Guangdong, Guangxi, Guizhou, Taiwan [Indonesia, Japan (Ryukyu Islands), Malaysia, Papua New Guinea, Thailand, Vietnam; N Australia, Pacific islands].

**3. *Schoenus apogon*** Roemer & Schultes, Syst. Veg. 2: 77. 1817.

矮赤箭莎 ai chi jian suo

Annuals or short-lived perennials, slender. Roots fibrous. Culms tufted, 20–40 cm tall, 0.5–1 mm thick, mostly 2-nodose, smooth. Leaves basal and cauline. Cauline leaves 2, shorter than culm; sheath reddish purple, 1–2 cm; leaf blade capillary, ca. 0.5 mm wide. Involucral bracts surpassing inflorescence; sheath reddish purple, 0.5–1 cm. Inflorescences consisting of 2–5 distant corymbiform partial panicles, each bearing several sessile and shortly pedunculate spikelets; partial panicles 0.8–1.5 cm and as broad. Spikelets reddish brown, narrowly ovoid, 4–6 mm, flattened, 1- or 2(or 3)-flowered. Glumes sanguineous

with pale margin, lanceolate to ovate-lanceolate, 3–4 mm, papery, apex obtuse; basal 2 or 3 glumes empty, rather short. Perianth bristles 6, ca. 2 mm, antrorsely scabrous. Stamens 3. Style ca. 1.5 mm, base glabrous; stigmas 3, as long as style. Nutlet whitish, globose-obovoid, ca. 1 mm, obtusely 3-sided, sides convex, shiny, and minutely reticulate. Fl. and fr. May.

Moist coastal grasslands; near sea level. W Taiwan (Taizhong) [Japan, Vietnam; Australia].

This is a very rare species in Taiwan with only one collection at the TAI herbarium, collected in May 1906 and obtained from the MAK herbarium.

**4. *Schoenus nudifructus*** C. Chen in Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 230. 1961.

无刚毛赤箭莎 wu gang mao chi jian suo

?Perennials, tightly clumped. Roots slender fibrous. Culms tufted, erect, 55–100 cm tall, 0.8–1.1 mm thick, terete, smooth. Leaves basal, rarely also cauline. Basal leaf sheaths 1.5–2.5 cm, reddish black at base; leaf blade linear, 1–2 mm wide, papery, veins 7 and abaxially prominent. Cauline leaf sheaths brown, cylindric, 1.7–3 cm, glabrous, ligule absent. Involucral bracts leaflike; sheath brown; blade gradually shorter apically. Inflorescences paniculate, lax, branches 6 or 7 or more. Spikelets erect, narrowly ovoid, 7–9 mm, compressed, usually 2 or 3 or more clustered, ± pedunculate, 3- or 4-flowered. Glumes brownish red, lanceolate to ovate, keel abaxially yellowish green, margin pale, apex mucronate in basal glume and obtuse in apical glumes; basal 2 or 3 glumes empty, apical ones with 3 or 4 bisexual flowers. Perianth bristles absent. Stamens 3; anthers linear, deciduous. Style slender; stigmas 3, pubescent. Nutlet brownish, broadly ovoid to ovoid-oblong, 1–1.3 mm, 3-sided, reticulate, apex sparsely pubescent or glabrous. Fl. and fr. Jul.

• 1800–1900 m. C Yunnan (Kunming).

## 25. *GAHNIA* J. R. Forster & G. Forster, Char. Gen. Pl. 26. 1775.

黑莎草属 hei suo cao shu

Liang Songyun (梁松筠 Liang Song-jun); Jeremy J. Bruhl, Karen L. Wilson

Herbs, perennial, forming slender to massive tussocks. Roots stout. Rhizomes woody. Culms erect, usually tall and robust, terete, several noded. Leaves linear, deeply many channeled, narrowly crescent-shaped, twisted lengthwise through 180°, involute on drying; ligule present, usually truncate, papery. Inflorescences plumose-paniculate, usually decompound, consisting of several fascicles per node. Spikelets brown or black, numerous, solitary or 2–4 together. Flowers 1 or 2, apical one bisexual, usually with a second more basal one male. Glumes black or dark brown, spirally arranged, papery; basal 3–8 glumes empty, lanceolate, keeled, abaxial surface and margin scabrous, apex acute; apical 2 or 3 glumes smaller than remaining ones, thin at anthesis but becoming thick in fruit, apex obtuse; apicalmost glume bearing a bisexual flower. Perianth bristles absent. Stamens (2 or) 3[or 6]; filaments elongating markedly after anthesis, persistent on nutlet and entangled in glumes thereby suspending fruit. Stigmas 3[or 4]. Nutlet ovoid, ellipsoid, obovoid-fusiform, or globose, terete or 3-sided; endocarp blackish, thick, bony.

About 30 species: S and SE Asia; three species in China.

- 1a. Inflorescences spikelike, dense; spikelets 7–10 mm ..... 1. *G. tristis*  
 1b. Inflorescences paniculate, lax; spikelets 4–5 mm.  
   2a. Spikelets usually 1-flowered; filaments strongly elongate after anthesis, tips enrolled by apex of glumes ..... 2. *G. javanica*  
   2b. Spikelets usually 2-flowered; filaments scarcely elongate after anthesis, sticky tips in bisexual flower  
       cohering with tips of basal male flower ..... 3. *G. baniensis*

**1. *Gahnia tristis*** Nees in Hooker & Arnott, Bot. Beechey Voy. 228. 1837.

黑莎草 *hei suo cao*

Roots stout, rigid. Rhizomes short, woody. Culms 0.5–1.5 m tall, robust, hollow, noded. Leaves basal and cauline; sheath brown to reddish brown, 10–20 cm; leaf blade 0.4–1.8 m × 0.7–1.2 cm, papery to leathery, margin scabrous, apex acuminate. Inflorescence a contracted panicle, spikelike, 14–40 × 2–3 cm, bearing 7–20 fascicles of partial panicles; partial panicles ovoid to ellipsoid, 2–5 cm; peduncles short, rigid, enclosed by inflorescence bract sheath. Spikelets numerous, densely congested, fusiform, 8–10 mm, 1-flowered. Glumes 8–10, initially yellowish brown but maturing to dark brown; basal 4–6 glumes ovate-lanceolate, papery, rigid, 1-veined, apex acuminate; apical 2 or 3 glumes broadly ovate, much shorter, margin apically ciliolate, apex emarginate to rounded; apicalmost glume bearing a bisexual flower. Perianth bristles absent. Stamens 3. Stigmas 3. Nutlet pale brown when young but maturing black, obovoid-oblong, 4–4.5 × 1.7–2 mm, 3-sided, smooth, shiny. Fl. and fr. Mar–Dec.

Dry grassy slopes, thickets, forests; 100–3000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Thailand, Vietnam].

**2. *Gahnia javanica*** Zollinger & Moritz in Moritz, Syst. Verz. 98. 1846.

爪哇黑莎草 *zhua wa hei suo cao*

*Gahnia castanea* Ridley; *G. javanica* f. *sinensis* Benl.

Culms 75–120 cm tall, robust, terete, solid, nodose. Leaf sheath 10–15 cm; leaf blade usually longer than inflorescence, ca. 8 mm wide, papery to subleathery, gradually narrow apically, margin scabrous. Inflorescence a panicle, spreading and lax, consisting of a terminal and several lateral partial panicles; lateral panicles usually 2, shortly exerted from sheath; peduncles 6–10 cm. Spikelets narrowly ellipsoid, 5.5–6 mm, 1-flow-

ered. Glumes 7 or 8; basal 3 or 4 glumes ovate-lanceolate; apical 2 glumes chestnut-brown to black, broadly oblong, shorter, 2.8–4 mm, apex ± distinctly awned and distally ciliolate; apicalmost glume with a bisexual flower. Perianth bristles absent. Stamens 3; filaments strongly elongate after anthesis; filament tips enrolled by apex of glumes. Stigmas 3. Nutlet yellowish brown with a black apex, narrowly elliptic, ca. 3.8 mm, 3-sided, smooth, shiny. Fl. and fr. Apr–Oct.

Mossy forests, thickets in dry alpine grasslands. Yunnan [Indonesia, Malaysia, Papua New Guinea, Philippines, Vietnam; Pacific islands].

**3. *Gahnia baniensis*** Benl, Repert. Spec. Nov. Regni Veg. 44: 197. 1938.

散穗黑莎草 *san sui hei suo cao*

*Gahnia javanica* Zollinger & Moritz var. *penangensis* C. B. Clarke; *G. penangensis* (C. B. Clarke) Kükenthal.

Culms ca. 90 cm tall, robust, terete, rigid, noded. Leaf sheath blackish brown, 8–15 cm; leaf blade equaling or slightly longer than inflorescence, 8–12 mm wide, papery to leathery, margin scabrous, apex acuminate. Involucral bracts usually shorter than inflorescence. Inflorescences black, 40–70 × 6–15 cm, spreading and lax, consisting of a terminal and several lateral panicles. Spikelets blackish, in clusters of 2 or 3 or solitary, oblong, 4–5 mm, 2-flowered. Glumes 7 or 8, blackish brown, rigid; basal 5 or 6 glumes ovate to ovate-elliptic, 2–3 mm, keeled, empty, apex mucronate; apical 2 glumes broader, bearing a bisexual flower and next a functionally male flower, margin ciliolate, apex obtuse. Perianth bristles absent. Stamens (2 or)3; filaments scarcely elongate after anthesis, sticky tips of filaments of bisexual flower cohering with tips of basal male flower. Stigmas 3. Nutlet reddish brown, ellipsoid, ca. 3 mm, 3-sided, smooth, shiny. Fl. and fr. Aug–Sep.

Moist hills and slopes; 800–1500 m. Fujian, Guangdong, Guangxi, Hainan [Indonesia, Japan, Malaysia (Peninsular), Vietnam; Australia].

## 26. CLADIUM P. Browne, Civ. Nat. Hist. Jamaica, 114. 1756.

克拉莎属 *ke la suo shu*

Liang Songyun (梁松筠 Liang Song-jun); Jeremy J. Bruhl, Karen L. Wilson

Herbs, perennial. Rhizomes short, creeping. Culms terete. Leaves cauline; leaf blade V-shaped in cross section, margin scabrous. Involucral bracts leaflike, sheathing. Inflorescence an elongated compound anthela. Spikelets ovoid. Glumes ± spirally arranged, basal 4–6 empty, apical 2 fertile, apicalmost flower bearing a nutlet. Perianth bristles absent. Stamens 2. Stigmas 3; style base not distinct, thickened, persistent. Nutlet ovoid, subterete.

About four species: tropical and warm temperate regions of Asia, Australia, Europe, North and South America, and Pacific islands; one species in China.

**1. *Cladium jamaicense*** Crantz subsp. ***chinense*** (Nees) T. Koyama in H. Hara, Stearn & L. H. J. Williams, Enum. Fl. Pl. Nepal 1: 105. 1978.

克拉莎 *ke la suo*

*Cladium chinense* Nees in Hooker & Arnott, Bot. Beechey Voy. 228. 1837; *C. mariscus* (Linnaeus) Pohl subsp. *chinense* (Nees) Govaerts.

Herbs, clump-forming. Rhizomes short, creeping. Culms solitary, 1–2.5 m tall, terete at base, many noded. Leaves cauline; ligule absent; leaf blade broadly linear, 60–80 cm × 8–10 mm, V-shaped in cross section, thickly leathery, gradually tapering apically to a 3-angled caudate apex, margin and abaxial midvein strongly antrorsely scabrous. Involucral bracts leaflike, decreasing in length distally, margin and abaxial midvein strongly antrorsely scabrous. Inflorescences with 5–8 terminal

and lateral antherae; peduncles compressed; bractlets glumelike, narrowly ovate to lanceolate, papery, veins brown, apex caudate to acuminate. Spikelets in 4–12 rusty brown globose heads, ovoid to broadly so, ca. 3 × 4–7 mm. Glumes 6–8, ovate to broadly ovate, apex obtuse to acute; basal 4 glumes empty, apical 2 fertile. Distal flower bisexual, basal flower functionally male. Anthers ca. 2 mm. Style slender; stigmas 3, as long as

style, pubescent. Nutlet brown, oblong-ovoid, ca. 2.5 mm, base rounded, apex obscurely beaked. Fl. and fr. May.

Wet places, swamps; ca. 2200 m. Guangdong, Guangxi, Hainan, Taiwan, E Xizang, Yunnan [India, Japan, Korea, Nepal, Vietnam; Pacific islands].

*Cladium jamaicense* subsp. *jamaicense* occurs in tropical America.

## 27. MACHAERINA Vahl, Enum. Pl. 2: 238. 1805.

剑叶莎属 *jian ye suo shu*

Liang Songyun (梁松筠 Liang Song-jun); Jeremy J. Bruhl, Karen L. Wilson

*Baumea* Gaudichaud.

Herbs, perennial, often with long scaly rhizomes. Culms tufted, erect, flattened, angular, or terete, usually smooth, rarely rough. Leaves distichous; basal sheaths brown to purplish; ligule absent; leaf blade unifacial, compressed or terete, sometimes reduced to a sheath. Involucral bracts sheathing and with a short blade. Inflorescences paniculate, consisting of few to several partial panicles, main axis often sinuous. Spikelets often clustered, rarely solitary, ovoid to narrowly ovoid, compressed. Glumes distichous, basal 1 or 2 flowers bisexual, apical flower(s) male. Perianth bristles absent. Stamens 3. Style base distinctly thickened, conic or pyramidal, persistent; stigmas 3. Nutlet stipitate or sessile, ovoid, oblong, or oblong-ellipsoid, ± terete or 3-sided, smooth or rugulose, apex beaked.

About 50 species: mostly tropical and temperate regions, especially Australia; three species (two endemic) in China.

- 1a. Culms terete ..... 3. *M. rubiginosa*  
 1b. Culms flattened.  
     2a. Leaf blade ca. 1.5 m, margin smooth; spikelets ca. 5 mm ..... 1. *M. myriantha*  
     2b. Leaf blade ca. 0.5 m, margin scabrous; spikelets 10–12 mm ..... 2. *M. ensigera*

**1. *Machaerina myriantha*** (Chun & F. C. How) Y. C. Tang, Fl. Hainan. 4: 537. 1977.

多花剑叶莎 *duo hua jian ye suo*

*Cladium myrianthum* Chun & F. C. How, Acta Phytotax. Sin. 7: 83. 1958.

Rhizomes short, stout. Culms to 2 m tall, 6–8 mm thick, flattened, several nodose. Leaves basal; leaf blade ensiform, ca. 1.5 m × 1.8–2.2 cm, smooth, margin entire, apically gradually narrowed. Inflorescences paniculate, consisting of a terminal and several lateral branches, 20–60 cm. Spikelets 2–4 clustered, oblong-ovoid, 4–5 mm, 2–4-flowered; basal 1 or 2 spikelets bearing nutlet. Glumes 5 or 6, brown, ovate to oblong, basal-most ca. 4 mm, pubescent, margins hyaline and ciliate, apex obtuse. Perianth bristles 4–6, brown, shorter than style. Stamens 3; anthers oblong, 3.5–4 mm; connective apex apiculate. Style ca. 4 mm, persistent, with white hairs, base thickened; stigmas 3. Nutlet brown, obovoid, ca. 1 mm, acutely 3-sided, glabrous, apex beaked. Fl. and fr. Aug–Sep.

• Riversides, forests, ditch sides; 900–2800 m. Hainan.

**2. *Machaerina ensigera*** (Hance) T. Koyama, Bot. Mag. (Tokyo) 69: 63. 1956.

剑叶莎 *jian ye suo*

*Cladium ensigerum* Hance, J. Bot. 23: 80. 1885.

Rhizomes horizontal, 4.5–6.8 mm thick. Culms flattened. Leaves basal; leaf blade ensiform, 3.8–50 × 0.7–2.5 cm, rigid, many veined, margin purple, finely scabrous, and denticulate. Inflorescences paniculate, narrow, usually 3-branched. Spikelets purple, ca. 11.3 × 3.5 mm, 2- or 3-flowered. Glumes ovate-lan-

ceolate, apex acuminate. Nutlet subdrupaceous, ellipsoid, 3-furrowed; persistent style base thickened. Fl. and fr. Apr–Aug.

• Swamps, lake margins. Hong Kong.

No specimen has been seen by the present authors.

**3. *Machaerina rubiginosa*** (Solander ex G. Forster) T. Koyama, Bot. Mag. (Tokyo) 69: 65. 1956.

圆叶剑叶莎 *yuan ye jian ye suo*

*Schoenus rubiginosus* Solander ex G. Forster, Fl. Ins. Austr. 89. 1786; *Fuirena rubiginosa* (Solander ex G. Forster) Sprengel.

Rhizomes long, horizontal, scaly. Culms tufted, (0.3–)1–1.8 m tall, 2–6 mm thick, compressed biconvex to subterete, smooth. Basal leaves shorter than to equaling culm; leaf blade erect, (2–)4–7 mm wide, biconvex with obtuse edges to subterete, smooth; pith spongy. Cauline leaves long sheathing with short blades. Inflorescences paniculate, erect, narrow, dense or interrupted, (10–)20–50 cm, 3–7-noded. Spikelets in oblong to globose clusters, 4–7 × 2–2.5 mm, narrowly ovoid maturing to ovoid, 2- or 3-flowered, bearing 1 or 2 nutlets. Glumes 5, ovate to lanceolate, 4.5–6.5 mm, margins long ciliate, apex acuminate. Perianth bristles absent. Stamens 3; anthers 1.5–2 mm; connective apex prominently apiculate. Nutlet orange to reddish brown, sessile, ellipsoid to oblong-ellipsoid, 3–5 × 1.5–2 mm, 3-sided, smooth, shiny; persistent style base depressed to shortly pyramidal, densely hairy. Fl. and fr. Apr–Aug.

Swamps, lake margins, *Sphagnum* bogs; below 1800 m. Hong Kong, Yunnan (Tengchong) [Bangladesh, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Papua New Guinea, Philippines, Sri Lanka, Vietnam; Australia, Pacific islands (New Zealand)].

**28. LEPIDOSPERMA** Labillardière, Nov. Holl. Pl. 1: 14. 1805.鳞籽莎属 *lin zi suo shu*

Liang Songyun (梁松筠 Liang Song-jun); Jeremy J. Bruhl, Karen L. Wilson

Herbs, perennial. Rhizomes short, woody. Culms tufted, erect, terete or flattened. Leaves basal, distichous, usually equitant; leaf blade terete or flattened, similar to culm, sheathing. Inflorescences paniculate. Spikelets narrowly ovoid-oblong. Flowers usually (1 or)2 or 3(-5), proximal one usually functionally male, distal one bisexual. Glumes 3-8, seemingly spirally arranged, mostly distally scaberulose, basal ones empty. Perianth scales [3 or]6, shorter than nutlet, fleshy. Stamens 3; connective apex apiculate. Style slender, base persistent. Nutlet oblong or oblong-ellipsoid, ± terete, usually smooth and shiny.

About 100 or more species: mostly Australia including many undescribed species, SE Asia, Pacific islands (New Zealand); one species in China.

**1. *Lepidosperma chinense*** Nees & Meyen ex Kunth, Enum. Pl. 2: 320. 1837.

鳞籽莎 *lin zi suo*

Rhizomes creeping. Culms tufted, erect, 45-90 cm tall, terete to obscurely angular, stiff. Leaves basal; sheath purplish black to blood-red, 3-8 cm, margins membranous; ligule present; leaf blade shorter than culm, 2-3 mm thick, terete, stiff, smooth, glabrous. Involucral bracts spathe-like, sheathing, glabrous. Inflorescences paniculate, 3-10 cm. Spikelets densely

clustered, fusiform-oblong, 6-8 mm, 1- or 2-flowered. Glumes lanceolate, 4-6.5 mm, scabrous, apex obtuse and mucronate; basal 2 glumes empty, apical 2 with bisexual flowers. Perianth scales 6, whitish, very short, connate at base. Stamens 3; connective apex apiculate. Stigmas 3. Nutlet brownish yellow, ovoid to ellipsoid, 2.5-4 mm, terete, smooth, shiny. Fl. and fr. Jul-Dec.

Hillsides, wet places, riversides, sparse forests along valleys; 800-1500 m. Fujian, Guangdong, E Guangxi, Hainan, S Hunan, S Zhejiang [Indonesia, Malaysia, Papua New Guinea, Vietnam].

**29. TRICOSTULARIA** Nees ex Lehmann, Nov. Stirp. Pug. 8: 50. 1844.三肋果莎属 *san lei guo suo shu*

Liang Songyun (梁松筠 Liang Song-jun); Jeremy J. Bruhl, Karen L. Wilson

Herbs, perennial. Rhizomes short. Culms tufted, erect, terete or 3-angled. Leaves basal, rarely 1 or 2 cauline, often reduced to sheaths; ligule absent. Inflorescences paniculate, usually much branched. Spikelets solitary or clustered, compressed, narrowly ovoid-oblong, 1- or 2(or 3)-flowered, basalmost flower usually male, apical flower(s) bisexual. Glumes 4-6, pale brown, distichous, membranous, glabrous, 1-veined, keeled, basal 2-4 empty. Perianth scales (3-6), whitish, lanceolate to linear, short, flat, hyaline. Stamens 3; connective apex apiculate. Stigmas 3. Nutlet brown, sessile, obovoid or pyriform, small, 3-sided, with 3 pale ribs, hispid at apex.

Six species: all in Australia, one extending to Asia; one species in China.

**1. *Tricostularia undulata*** (Thwaites) J. Kern, Acta Bot. Neerl. 8: 267. 1959.

三肋果莎 *san lei guo suo**Cladium undulatum* Thwaites, Enum. Pl. Zeyl. 353. 1864.

Herbs, tussock-forming. Roots thick. Culms 30-90 cm tall, 1-2 mm thick, rigid, obtusely 3-angled, sulcate-striate, smooth. Leaves basal, shorter than to as long as culm; leaf blade 1-3 mm wide, rigid, margin involute and scabrous. Inflorescences paniculate, branched, diffuse to dense, consisting of 4 or 5 fascicles; branches 2 or 3 together, unequal, ± exserted from

sheath, compressed, rigid, flexuose, scabrous. Spikelets almost sessile, in clusters of 2-8, 1-flowered. Glumes 4, oblong-lanceolate, apex acute; basal 2 glumes ca. 2 mm, apical ones 4-5 mm. Perianth scales 6, lanceolate to linear-lanceolate, densely covered with white antrorse short hairs. Stamens 3; anthers ca. 2 mm; connective apex 3-sided, oblong. Nutlet chestnut-brown to blackish, obtusely 3-sided, slightly reticulate-rugulose, with 3 whitish ribs, apex hispidulous.

Watersides near seacoast; near sea level. Hainan (Wenchang) [India, Indonesia, Malaysia, Papua New Guinea, Sri Lanka, Thailand, Vietnam; N Australia].

**30. SCLERIA** P. J. Bergius, Kongl. Vetensk. Acad. Handl. 26: 142. 1765.珍珠茅属 *zhen zhu mao shu*

Zhang Shuren (张树仁); Gordon C. Tucker, David A. Simpson

Herbs, perennial or annual, rhizomatous or not; stolons sometimes present. Culms erect, 3-angled or rarely terete. Leaves cauline or both basal and cauline; sheaths at middle part of culm, winged or not, apex sometimes with contraligule opposite blade; leaf blade linear, scabrid, sheathing, usually prominently 3-veined. Involucral bracts leaflike and sheathing, setaceous, or glumelike; bractlets usually setaceous, rarely glumelike. Inflorescences terminal, paniculate, usually stout and elongated, sometimes reduced into a discontinuous spike. Unisexual spikelets usually dominant on inflorescence, rarely bisexual ones dominant; basal 2-4 glumes

of spikelets empty. Male spikelets with several flowers. Female spikelets with a single flower. Bisexual spikelets with a basal female flower and several male flowers. Flowers unisexual. Male flowers: stamens 1–3; anthers linear or linear-oblong; connective apex often protruding and subulate. Female flowers: style base not inflated; stigmas 3. Nutlet brick red, white, or yellowish purple, spherical or ovoid, often obtusely 3-sided, smooth or variously sculptured, mostly shiny, glabrous or hairy (hairs simple or stellate), usually borne on a gynophore apically dilated into a ± 3-lobed disk.

About 200 species: pantropical and extending into temperate regions in S Africa, E Asia, and North and South America; 24 species (three endemic) in China.

Note: nutlets and underground parts are essential for accurate identification.

- 1a. Bisexual spikelets dominant on inflorescences; disk subtending nutlet either stipelike or indistinct.
  - 2a. Annuals, without a rhizome; inflorescences spicate; glumes ovate; nutlet surface transversely rugose ..... 1. *S. pergracilis*
  - 2b. Perennials, with a woody creeping rhizome; inflorescences paniculate; glumes lanceolate or ovate-lanceolate; nutlet surface smooth, subsmooth, or slightly rugose.
    - 3a. Spikelets 4–10 mm, pilose; disk stalklike.
      - 4a. Nutlet 1.5–1.8 mm, covered with tufts of stellate hairs; contraligule absent ..... 2. *S. neesii*
      - 4b. Nutlet 2.5–2.7 mm, glabrous; contraligule narrow ..... 3. *S. tonkinensis*
    - 3b. Spikelets 3–4.5 mm, glabrous; disk appressed to nutlet.
      - 5a. Culms 30–60 cm tall, 1.4–2 mm thick; leaf blade 1.5–2 mm wide; lateral branches of inflorescence often spicate, single; nutlet ca. 2.5 mm ..... 4. *S. lithosperma*
      - 5b. Culms 60–200 cm tall, 3–7 mm thick; leaf blade 15–20 mm wide; lateral branches of inflorescence cymose, often binate; nutlet ca. 3.5 mm ..... 5. *S. corymbosa*
- 1b. Bisexual spikelets few or absent on inflorescences; disk subtending nutlet lobed or cup-shaped (but not well developed in *S. novae-hollandiae*).
  - 6a. Small annuals (or short-lived perennials); rhizomes absent or not well developed.
    - 7a. Involucral bracts linear-lanceolate; nutlet ca. 1.5 mm in diam.; disk lobes obtuse ..... 7. *S. rugosa*
    - 7b. Involucral bracts setaceous; nutlet ca. 2 mm in diam.; disk lobes acute or acuminate.
      - 8a. Leaf sheath glabrous; disk ca. 1/2 height of nutlet, lobes brown, membranous, apex acuminate; nutlet surface smooth.
        - 9a. Nutlet ± spherical, apex with purple tip ..... 8. *S. biflora*
        - 9b. Nutlet trisulcate, apex with yellowish white tip ..... 9. *S. laxa*
      - 8b. Leaf sheath villous; disk 1/4–1/3 height of nutlet, lobes yellowish white, thick, apex acute; nutlet surface pitted with regular longitudinally elongate pattern.
        - 10a. Nutlet 2–2.5 mm, subovoid-spherical; perianth lobes rounded at apex ..... 6. *S. novae-hollandiae*
        - 10b. Nutlet 2.8–3 mm, spheroid to obovoid-spherical; perianth lobes acute at apex ..... 10. *S. parvula*
  - 6b. Perennials; rhizomes well developed and prominent.
    - 11a. Culms terete or slightly 3-angled; leaf sheath not winged.
      - 12a. Nutlet surface smooth, only apically slightly hispid; disk not cup-shaped, scarcely 1/5 height of nutlet, appressed to base of nutlet, lobes triangular, margins reflexed; leaves alternate, well spaced, not whorled ..... 23. *S. harlandii*
      - 12b. Nutlet surface hexagonally reticulate, pilose; disk cup-shaped, 1/2–4/5 height of nutlet and enclosing it, lobe apex dentate, margins not reflexed; leaves ± 3-whorled ..... 24. *S. sumatrensis*
    - 11b. Culms 3-angled or triquetrous; leaf sheath winged at middle part of culm (not obviously in *S. hookeriana*).
      - 13a. Nutlet smooth.
        - 14a. Inflorescences subspicate, branches short or without secondary branches; spikelets with 3–5 awns; nutlet 4–4.5 mm; disk obscurely 3-lobed ..... 19. *S. psilorrhiza*
        - 14b. Inflorescences paniculate; spikelets without or with fewer fine awns; nutlet 3–3.5 mm; disk obviously 3-lobed.
          - 15a. Bractlets glumelike, shorter than spikelet; leaf blade thickly leathery, contraligule scarcely developed; stamen 1; nutlet ca. 2.5 mm in diam.; disk lobes triangular ..... 20. *S. poiformis*
          - 15b. Bractlets setaceous, longer than spikelet; leaf blade papery, contraligule conspicuous and triangular; stamens 3; nutlet ca. 2 mm in diam.; disk lobes subrounded at apex.
            - 16a. Inflorescences with 4 or 5 lateral branches; disk lobes semicircular ..... 21. *S. radula*
            - 16b. Inflorescences with 1–3 lateral branches; disk lobes ovate ..... 22. *S. oblata*
  - 13b. Nutlet ± reticulate and stellate-hairy.
    - 17a. Glumes blackish purple; leaf sheath obscurely winged; inflorescences without or rarely with a distant branch ..... 11. *S. hookeriana*
    - 17b. Glumes brown or reddish brown; leaf sheath obviously winged; inflorescences with 1–3 distant branches.

- 18a. Contraligule oblong to oblong-lanceolate, 4–12 mm, glabrous ..... 12. *S. ciliaris*  
 18b. Contraligule depressed rounded, semicircular or nearly semicircular, at most 4 mm, ciliate or glabrescent.  
 19a. Disk slightly 3-lobed or barely lobed; lobes flatly semicircular, apex rounded.  
 20a. Nutlet with white reticulation ..... 13. *S. terrestris*  
 20b. Nutlet with purplish brown reticulation ..... 14. *S. dulungensis*  
 19b. Disk deeply 3-lobed; lobes lanceolate-triangular or ovate-triangular, apex acute to subtruncate.  
 21a. Nutlet ca. 2 mm in diam., rugose ..... 15. *S. levis*  
 21b. Nutlet 2.5–2.8 mm in diam., reticulate-pitted or scrobiculate.  
 22a. Leaves alternate, not whorled; disk yellowish white ..... 16. *S. jiangchengensis*  
 22b. Leaves in whorls of 2–5; disk brownish purple.  
 23a. Nutlet whitish when mature, 2.2–2.7 mm wide, scrobiculate to smooth ..... 17. *S. scrobiculata*  
 23b. Nutlet at first whitish but brownish purple when mature, 1.7–2 mm wide, cancellate ..... 18. *S. purpurascens*

**1. *Scleria pergracilis*** (Nees) Kunth, Enum. Pl. 2: 354. 1837.

纤秆珍珠茅 xian gan zhen zhu mao

*Hypoporum pergracile* Nees, Edinburgh New Philos. J. 17: 267. 1834.

Annuals. Rhizomes absent. Culms tufted, erect, 11–30 cm tall, ca. 0.5 mm wide, 3-angled, sulcate, glabrous. Leaves basal and cauline, sheathing; contraligule rounded to obtuse; leaf blade capillary, ca. 1 mm wide. Involucral bracts setaceous, basal one to 0.6 cm and shorter than spikelet cluster; bractlets glumelike. Inflorescences spicate, 2.5–8.5 cm, formed by clusters of 2 or 3 spikelets each separated by 2–17 mm. Spikelets mostly bisexual, ovoid, 3–4 mm, rarely basal one unisexual with a single male flower. Glumes ovate, keeled, both sides of midvein membranous with reddish brown lines, apex mucronate; basal 2 glumes empty; middle glume with a female flower; apical 1 or 2 glumes with a male flower. Male flowers: stamens 3; connective apex protruding, forming a thin tip. Female flowers: stigmas 3. Disk obscure. Nutlet white, subspherical, ca. 1 mm in diam., slightly 3-sided, transversely rugose, base with a brown stalk, apex tipped. Fl. and fr. Aug–Oct.  $2n = 10$ .

Alpine grasslands, valley pastures; 1200–4000 m. Guangdong, Guangxi, Jiangsu, E Xizang, Yunnan [Bangladesh, Cambodia, India, Indonesia, Kashmir, Korea, Laos, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, NE Australia].

**2. *Scleria neesii*** Kunth, Enum. Pl. 2: 358. 1837.

柄果珍珠茅 bing guo zhen zhu mao

Perennials. Rhizomes short, thick, woody, oblique, not creeping. Culms 16–70 cm tall, slender, triquetrous, glabrous or pilose. Leaves basal and cauline. Basal leaves only with closed sheath, without leaf blade; sheath pale brown, 3-angled, edges villous, surfaces pubescent, not winged, apex with 3 triangular teeth. Cauline leaves with a sheath like that of basal leaves; contraligule absent; leaf blade linear, 1.5–3 mm wide but apically narrowing, both surfaces villous, margins scabrous, apex obtuse. Involucral bracts leaflike, basalmost to 5 cm, sheathing; bractlets setaceous, both surfaces densely pilose. Inflorescences subcapitate, laxly globose, 1–3 cm, with 5–20 spikelets. Spikelets narrowly ovoid, 4–8 mm, villous especially distally, unisexual,

with 14–16 glumes. Glumes yellowish brown, awned, basal 1 or 2 empty, 1 above empty ones with a female flower, others with male flowers. Male flowers: stamens 3. Female flower: style slender; stigmas 3, longer than style, slightly puberulent. Disk brown, stalklike, not lobed. Nutlet white or light brown, subspherical, 1.5–2 mm, obscurely if at all 3-sided, tuberculate, shiny, with tufts of stellate hairs, apex rounded and with a fine tip. Fl. and fr. Apr–Jul.

Moist sandy open or shaded habitats; low elevations. Hainan [India, Laos, Malaysia (Peninsular), Sri Lanka, Thailand, Vietnam; Indian Ocean islands].

**3. *Scleria tonkinensis*** C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 57. 1908.

越南珍珠茅 yue nan zhen zhu mao

*Scleria kwangtungensis* Chun & F. C. How; *S. levis* Retz. var. *scaberrima* Benth.

Perennials. Rhizomes short, thick, woody, creeping, densely covered with scales; scale brown, tubular, with several parallel veins. Culms 16–70 cm tall, thinner, sharply 3-angled, villous at apical part. Leaves basal and cauline. Basal leaves only with closed sheath, without leaf blade; sheath pale brown, 3-angled, edges villous, surfaces pubescent, not winged, apex with 3 triangular teeth. Cauline leaves with a sheath like that of basal leaves; contraligule dark reddish brown, narrowly triangular, membranous; leaf blade linear, 0.5–1.5 cm wide but apically attenuate, both surfaces villous, margins scabrous, apex obtuse. Involucral bracts leaflike, basalmost to 5 cm, sheathing; bractlets setaceous, both surfaces villous. Inflorescences paniculate, 2.5–6 cm. Spikelets narrowly ovoid, 8–10 mm, villous, both bisexual and unisexual spikelets numerous, with 14–16 glumes. Glumes pale brown to yellowish green, basal 1 or 2 empty, 1 above empty ones with a female flower, others with male flowers. Male flowers: stamens 3. Female flower: style slender; stigmas 3, longer than style, slightly puberulent. Disk brown, stalklike, not lobed. Nutlet white, broadly obovate to subspherical, 3–3.5 mm, obscurely 3-sided, obscurely rugose to subsmooth, shiny, apex rounded with a fine tip. Fl. and fr. Apr–Jul.

Moist grasslands, thickets; below 100 m. Guangdong, Guangxi, Hainan [Cambodia, Thailand, Vietnam].

*Scleria tonkinensis* was misidentified as *S. radula* by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 206. 1961).

**4. *Scleria lithosperma* (Linnaeus) Swartz, Prodr. 18. 1788.**

石果珍珠茅 shi guo zhen zhu mao

Perennials. Rhizomes short, thick, woody, creeping. Culms tufted, 30–50 cm tall, 1.4–2 mm wide, 3-angled, glabrous. Leaves basal and cauline. Basal leaves sheathlike, bladeless. Cauline leaves with sheath 3-angled, closed, pilose; contraligule depressed rounded or depressed deltoid, ciliate; leaf blade narrowly linear, 1.5–2 mm wide, margins finely serrate, apex attenuate into a caudate tip. Involucral bracts leaflike, basal one to 10 cm, sheathing. Inflorescences paniculate, well-developed ones more than 30 cm, with 1–3 lateral branches or without branch at basal part; basal part often reduced to spikelike, 3.5–7 cm. Spikelets 1–3 in a cluster, 3–4.5 mm, with 4 or 5 glumes, with 1 or 2 male flowers and 1 female flower below male ones. Glumes ovate-lanceolate, keeled, both sides of midvein membranous with short brown lines, apex mucronate. Disk not well developed. Nutlet white, broadly obovoid to subellipsoid, ca. 2.5 mm, 3-sided or not, smooth or transversely rugose or irregularly ± reticulate with wavy ridges, shiny, base narrow and triangular. Fl. and fr. Jun–Oct.

Thickets in forests, woods; 100–1000 m. Guangdong, Hainan, Taiwan, SE Yunnan [India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, America, and Australia, Indian Ocean islands, North and South America, Pacific islands].

- 1a. Nutlet smooth ..... 4a. subsp. *lithosperma*  
 1b. Nutlet transversely rugose or  
 irregularly somewhat reticulate  
 with wavy ridges ..... 4b. subsp. *linearis*

**4a. *Scleria lithosperma* subsp. *lithosperma***

石果珍珠茅(原亚种) shi guo zhen zhu mao (yuan ya zhong)

*Scirpus lithospermus* Linnaeus, Sp. Pl. 1: 51. 1753.

Nutlet smooth.

Thickets in forests; 100–1000 m. Guangdong, Hainan, Taiwan, SE Yunnan [India, Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa, America, and Australia, Indian Ocean islands, North and South America, Pacific islands].

**4b. *Scleria lithosperma* subsp. *linearis* (Benth) T. Koyama in Dessanayake & Fosberg, Revis. Handb. Fl. Ceylon 5: 353. 1985.**

线叶珍珠茅 xian ye zhen zhu mao

*Scleria lithosperma* var. *linearis* Benth, Fl. Austral. 7: 430. 1878; *S. lithosperma* var. *roxburghii* C. B. Clarke; *S. roxburghii* (C. B. Clarke) Domin.

Nutlet transversely rugose or irregularly somewhat reticulate with wavy ridges.

Woods. Hainan [India, Indonesia, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands (Fiji)].

**5. *Scleria corymbosa* Roxburgh, Fl. Ind., ed. 1832, 3: 574. 1832.**

伞房珍珠茅 san fang zhen zhu mao

*Scleria ridleyi* C. B. Clarke.

Perennials. Rhizomes thick, subwoody, covered with brown scales. Culms 0.6–2 m tall, 3–7 mm wide, sharply 3-angled. Leaves on apical part of culms nearly whorled; sheath laxly embracing culm; contraligule semicircular, margin ca. 1 mm wide and membranous; leaf blade linear, 50–80 × 1.4–2 cm, midvein and margins apically scabrid, apex acute. Involucral bracts leaflike, basalmost to 47 cm, sheathing, glabrous; bractlets setaceous, 1–1.5 cm, base dilated, margin ciliate. Inflorescences compound paniculate, ca. 40 cm; lateral inflorescence branches 5–7, cymose, often binate, ovoid, ca. 4 cm; inflorescence axes robust, 3-angled, slightly hairy. Spikelets 3–4 mm, 1–3 in a cluster, mostly bisexual, fewer male. Glumes broadly ovate to ovate-lanceolate, leathery, keel green, laterally brown with rust-colored short lines, apex mucronate. Male flowers: stamens 3; anthers linear, ca. 2 mm; connective apex protruding beyond anthers. Disk reduced, appressed to nutlet. Nutlet white or grayish white, obovoid to ellipsoid, ca. 3.5 × 2.5 mm, slightly 3-sided, smooth, glabrous, base attenuate, apex apiculate. Fl. and fr. summer and autumn.

Water margins, valleys, woods; elevation probably below 100 m. Guangdong, Hainan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand].

**6. *Scleria novae-hollandiae* Boeckeler, Flora 58: 120. 1875.**

角架珍珠茅 jiao jia zhen zhu mao

*Scleria fujianensis* G. P. Li; *S. nankingensis* Tang & F. T. Wang.

Annuals. Rhizomes short, subwoody. Culms 30–60 cm tall, slender, 3-angled, glabrous. Leaves cauline; sheath 3-angled, not winged, glabrous; contraligule semicircular; leaf blade narrowly linear, 2.5–3.5(–5.5) mm wide, papery, slightly shiny, glabrous, margin scabrous, apex acute. Involucral bracts leaflike, sheathing; bractlets small, narrow, sheathless. Inflorescences paniculate; branches single or binate, (0.5–)1–2 cm, distant. Spikelets mostly unisexual, narrowly ovoid, ca. 5 mm, lax, with ca. 9 flowers, with 11 or 12 glumes. Bisexual spikelets with 1 or 2 empty basal glumes, middle glumes with a female flower, apicalmost glume empty or with a reduced flower. Glumes pale brown, ovate to ovate-lanceolate but apical ones lanceolate, membranous, keel abaxially green, apex acute. Perianth lobes rounded at apex. Male flowers: stamens 2 or 3. Female flowers: style slender; stigmas 2, almost as long as style. Disk not well developed. Nutlet white, subovoid-spherical, 2–2.5 mm (excluding stalk), obscurely reticulate, glabrous, base truncate, apex subrounded and without a tip. Fl. and fr. Jul–Oct.

Slopes, swamps; near sea level. Fujian (Zhao'an), Guangdong, Jiangsu (Lianyungang, Nanjing) [Indonesia, Papua New Guinea, Philippines, Vietnam; Australia, Pacific islands (Micronesia)].

**7. *Scleria rugosa* R. Brown, Prodr. 240. 1810.**

垂序珍珠茅 chui xu zhen zhu mao

*Scleria fenestrata* Franchet & Savatier var. *pubigera* (Makino) Ohwi; *S. onoei* Franchet & Savatier; *S. onoei* var. *pubigera* (Makino) Ohwi; *S. pubigera* Makino.

Annuals. Roots fibrous. Rhizomes absent. Culms tufted, erect, 10–25 cm tall, 3-angled, glabrous or villous. Leaves cauline; sheath barely winged, pubescent to villous; contraligule semicircular, margin ciliate; leaf blade linear, 2–4 mm wide but apically attenuate, papery, both surfaces hairy, margins scabrous, apex obtuse. Involucral bracts leaflike, to 14 cm, sheathing, opening of sheath with dense brown pubescence; bractlets small, sheathless. Inflorescences paniculate, with 3–5 branches; branches 0.7–1.5 cm, distant, with few spikelets; branch peduncles 0.4–4 cm, usually winged. Spikelets 1 or 2 in a cluster, narrowly ovoid, 2–4 mm, mostly unisexual; female spikelets with 3–5 glumes and 1 female flower. Female flowers: ovary obovoid, smooth, glabrous. Disk 1/4–1/3 height of nutlet, 3-lobed; lobes semicircular, margin reflexed, apex rounded. Nutlet white or grayish white, spherical to subspherical, ca. 1.5 mm in diam., smooth, shiny, apex subrounded and slightly tipped.

Wet grassy places; 600–700 m. SW Fujian, Guangdong, Hainan, Jiangsu, Taiwan, S Yunnan [India, Indonesia, Japan, S Korea, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Indian Ocean islands, Pacific islands].

**8. *Scleria biflora*** Roxburgh, Fl. Ind., ed. 1832, 3: 573. 1832.

二花珍珠茅 er hua zhen zhu mao

*Scleria biflora* var. *ferruginea* J. Kern; *S. ferruginea* Ohwi (1938), not Peter (1937).

Annuals. Roots fibrous. Rhizomes absent. Culms nearly tufted, 30–40 cm tall, slender, 3-angled, glabrous. Leaves cauline; sheath tubular, 3-angled, barely winged, glabrous, apex of basal ones with triangular teeth; contraligule semicircular, pubescent; leaf blade linear, 2.5–5.5 mm wide but apically attenuate, papery, smooth, glabrous, margins scabrous, apex slightly obtuse. Involucral bracts leaflike, basal one to 15 cm, sheathing, opening of sheath with brown pubescence; bractlets setaceous, sheathless, much longer than spikelet. Inflorescences paniculate, with 2 or 3 branches; branches 1.5–2.5 cm, with many spikelets; lateral branches distant. Spikelets 1 or 2 in a cluster, narrowly ovoid, 3.5–4 mm, mostly unisexual; female spikelets with 4 or 5 glumes and 1 female flower; male spikelets with 7–9 or more glumes. Glumes ovate to lanceolate, apically attenuate, keel green to same color as glume, apex acute and apiculate. Male flowers: stamens 2 or 3. Female flowers: ovary obovoid, finely reticulate, densely pubescent. Disk ca. 1/2 height of nutlet, 3-lobed; lobes ovoid-triangular, slightly shiny. Nutlet white or yellowish, subspherical, ca. 2 mm in diam., reticulate, apex with a purple tip. Fl. and fr. Aug–Sep.

Grasslands, wastelands, field margins; 600–1800 m. Fujian, Guangdong, Guangxi, Hainan, N Jiangsu, Taiwan, Yunnan [India, Indonesia, Japan (Ryukyu Islands), Kashmir, Malaysia (Peninsular), Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

*Scleria biflora* was misidentified as *S. tessellata* C. B. Clarke by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 208. 1961).

**9. *Scleria laxa*** R. Brown, Prodr. 240. 1810.

疏松珍珠茅 shu song zhen zhu mao

*Scleria trisulcata* G. P. Li.

Annuals. Roots fibrous. Rhizomes short or not well developed, thick. Culms tufted, 20–40 cm tall, slender, 3-angled, smooth, glabrous, apically often nodding. Leaves cauline; sheaths at culm base glabrous, barely winged, bladeless or with a short blade; sheaths at middle and apical part of culm narrowly winged, villous and more densely so near contraligules; contraligule semicircular, apex obtuse; leaf blade linear, 3.5–5.5 mm wide but apically attenuate, papery, both surfaces hairy or only on 2 lateral veins of abaxial surface, margins scabrous, apex slightly obtuse to acute. Involucral bracts leaflike, sheathing, opening of sheath with dense brown pubescence; bractlets setaceous, as long as or slightly longer than spikelet. Inflorescences paniculate, with 2–4 branches; branches 1.2–3 cm, distant, with few spikelets. Spikelets narrowly ovoid, 4–5 mm, mostly unisexual; female spikelets with 4 or 5 glumes and 1 female flower; male spikelets with 7–9 or more glumes. Glumes deeply straw-colored to brownish purplish, ovate to lanceolate, keeled, apex acute and apiculate. Male flowers: stamens 2 or 3. Female flowers: ovary subspherical, glabrous. Disk yellowish white, 1/4–1/3 height of nutlet, slightly 3-lobed; lobes ovoid-triangular to subglobose, margin reflexed, apex truncate. Nutlet subspherical to obovoid-spherical, 2.8–3 × 1.8–2 mm, trisulcate, pitted with irregular longitudinally elongate lacunae (i.e., trabeculate), glabrous, apex with a yellowish white tip. Fl. and fr. Aug–Oct.

Grassy swamps; near sea level. Fujian (Zhao'an), Guangdong, Hainan [Papua New Guinea, Philippines; N Australia].

**10. *Scleria parvula*** Steudel, Syn. Pl. Glumac. 2: 174. 1855.

小型珍珠茅 xiao xing zhen zhu mao

*Scleria fenestrata* Franchet & Savatier; *S. tessellata* C. B. Clarke (1903), not Willdenow (1805).

Annuals. Roots fibrous. Rhizomes short or not well developed, thick. Culms tufted, 40–60 cm tall, slender, 3-angled, smooth, glabrous. Leaves cauline; sheaths at culm base glabrous, barely winged, bladeless or with a short blade; sheaths at middle and apical part of culm narrowly winged, villous and more densely so near contraligules; contraligule semicircular, apex obtuse; leaf blade linear, 3.5–5.5 mm wide but apically attenuate, papery, both surfaces hairy or only on 2 lateral veins of abaxial surface, margins scabrous, apex slightly obtuse to acute. Involucral bracts leaflike, basalmost to 20 cm, sheathing, opening of sheath with dense brown pubescence; bractlets setaceous, as long as or slightly longer than spikelet. Inflorescences paniculate, with 2–4 branches; branches 1.2–3 cm, distant, with few spikelets. Spikelets narrowly ovoid, 4–5 mm, mostly unisexual; female spikelets with 4 or 5 glumes and 1 female flower; male spikelets with 7–9 or more glumes. Glumes deeply straw-colored to brownish purplish, ovate to lanceolate, keeled, apex acute and apiculate. Perianth lobes acute at apex. Male flowers: stamens 2 or 3. Female flowers: ovary subspherical, glabrous. Disk yellowish white, 1/4–1/3 height of nutlet,

slightly 3-lobed; lobes ovoid-triangular to subglobose, margin reflexed, apex acute. Nutlet subspherical to obovoid-spherical, 2.8–3 × 1.8–2 mm, pitted with regular longitudinally elongate lacunae, glabrous, apex with a yellowish white tip. Fl. and fr. Jul–Oct.

Slopes, valleys, wastelands, paddy fields; 700–2700 m. Fujian, Guangdong, Guizhou, Hunan, NE Jiangsu, Jiangxi, Shandong, Sichuan, SE Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, India, Japan, Korea, Laos, Nepal, Papua New Guinea, Philippines, Sri Lanka, N Thailand, Vietnam; tropical Africa].

*Scleria parvula* was misidentified as *S. biflora* by Tang and F. T. Wang (Fl. Reipubl. Popularis Sin. 11: 208. 1961).

**11. *Scleria hookeriana*** Boeckeler, *Linnaea* 38: 498. 1874.

黑鳞珍珠茅 hei lin zhen zhu mao

Perennials, stoloniferous. Rhizomes short, woody, densely covered with purplish red oblong-ovate scales. Culms erect, 60–100 cm tall, 2–4 mm wide, 3-angled, slightly scabrous, sometimes pubescent. Leaf sheath 1–10 cm, sometimes pubescent; sheaths basal on culm purplish red to pale brown, obtusely 3-angled, with 3 triangular teeth of various sizes at opening; sheaths at middle part of culm green, sharply 3-angled, rarely narrowly winged; contraligule semicircular, with purple barbs; leaf blade linear, 4–35 cm × 4–8 mm, papery, slightly scabrous, glabrous or slightly pubescent. Involutral bracts leaflike, basalmost to 30 cm, sheathing; bractlets setaceous, base auriculate with barbate auricles. Inflorescences paniculate, 4–7 × 2–4 cm. Spikelets (1 or) 2–4 in a close cluster, ca. 3 mm, mostly unisexual, rarely bisexual. Male spikelets oblong-ovoid; glumes ovate-lanceolate to oblong-lanceolate. Female spikelets usually at basal part of inflorescence branch, narrowly ovoid, with few glumes; glumes broadly ovate, triangular, or ovate-lanceolate. Male flowers: stamens 3. Female flowers: ovary villous; stigmas 3. Disk yellowish, ± 3-lobed; lobes semicircular, margin reflexed, apex rounded. Nutlet white, ovoid, ca. 2 mm in diam., reticulate, slightly rust-colored hispid, apex obtusely 3-sided. Fl. and fr. May–Jul.

Sunny slopes, valleys, scrub, roadsides, grasslands; 1400–2200 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, W Hubei, Hunan, Jiangxi, Sichuan, Yunnan, S Zhejiang [India, Vietnam].

**12. *Scleria ciliaris*** Nees in Wight, *Contr. Bot. India*, 117. 1834.

华珍珠茅 hua zhen zhu mao

*Scleria chinensis* Kunth.

Perennials. Rhizomes woody, covered with purple to purplish brown scales. Culms tufted, 70–120 cm tall, ca. 5 mm wide, 3-angled, slightly scabrous, glabrous. Leaf sheath 1–10 cm, papery, glabrous; sheaths at culm base brown to purplish brown, not winged, with 3 narrowly ovoid teeth of various sizes at opening; sheaths at middle part of culm green, wing 1–3 mm wide; contraligule brown to reddish brown, lanceolate to oblong-lanceolate, 4–12 mm (fragile tip sometimes broken off), glabrous, margin sometimes apically purple; leaf blade linear, 15–35 cm × 6–9 mm, papery, slightly scabrous, glabrous. Invol-

ucral bracts leaflike, basalmost to 20 cm, sheathing; bractlets setaceous, base auriculate and hispid. Inflorescences paniculate, with 1–3 slightly distant lateral branches; branches 6–10 × 2–6 cm, slightly condensed. Spikelets brown to purple, (1 or) 2–4 in a cluster, ca. 4 mm, mostly unisexual. Male spikelets oblong-ovoid; glumes 3–4 mm, membranous, margin sometimes ciliate; basal glumes keeled, apex aristate to apiculate. Female spikelets usually growing at base of branch, narrowly ovoid; glumes broadly ovate to ovate-lanceolate, keeled, apex aristate to apiculate. Male flowers: stamens 3. Female flowers: ovary pubescent; stigmas 3. Disk yellow, 1.6–2 mm in diam., with dense rust-colored lines, 3-lobed; lobes nearly semicircular, margin reflexed, apex rounded. Nutlet white, subspherical, ca. 2.5 mm in diam., slightly 3-sided, slightly reticulately pitted, slightly stellate pubescent. Fl. and fr. Dec–Apr.

Valleys, forests, grasslands; (below 100–)300–900 m. Guangdong, Hainan [Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; tropical Australia, Pacific islands].

**13. *Scleria terrestris*** (Linnaeus) Fassett, *Rhodora* 26: 159. 1924.

高秆珍珠茅 gao gan zhen zhu mao

*Zizania terrestris* Linnaeus, *Sp. Pl.* 2: 991. 1753; *Scleria doederleiniana* Boeckeler; *S. elata* Thwaites; *S. elata* var. *latior* C. B. Clarke.

Perennials, stoloniferous. Rhizomes woody, with dark purple scales. Culms sparse, 0.6–3 m tall, 4–7 mm wide, 3-angled, often scabrous, glabrous. Leaf sheaths 1–8 cm, papery; basal 2 or 3 sheaths on culm purplish red, not winged; sheaths at middle part of culm with wings 1–3 mm wide; contraligule semicircular, short, usually barbate, barbs purple; leaf blade linear, 30–40 cm × 6–10 mm, papery, slightly scabrous, glabrous. Involutral bracts leaflike, basalmost to 40 cm, sheathing; bractlets setaceous, basally auriculate, auricles slightly hispid. Inflorescences paniculate, with 1–3 distant branches; branches 3–8 × 1.5–6 cm. Spikelet 1(or) 2 in a cluster, entirely unisexual, oblong-ovoid to narrowly ovoid, apex truncate to acuminate. Glumes of male spikelets 2–3 mm, thickly membranous, basal ones keeled and with rust-colored short lines, apical ones pale colored and scarious. Female spikelets usually growing at base of branch; glumes broadly ovate to ovate-lanceolate, 2–4 mm wide, sometimes with rust-colored short lines, keeled, apex apiculate. Male spikelets 3-flowered. Male flowers: anthers linear. Female flowers: stigmas 3. Disk yellow, ca. 1.8 mm in diam., slightly 3-lobed to barely lobed; lobes semicircular, flat, margin reflexed. Nutlet white or pale brown, spherical to ovoid, ca. 2.5 mm in diam., sometimes ± 3-sided, reticulate, slightly hispid, apex tipped. Fl. and fr. May–Oct.

Slopes, dry or moist places, valleys, stream margins, under shrubs, open woods, beside farms or roads; near sea level to 2000 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Hunan, Jiangsu, Jiangxi, SE Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, S Japan, Kashmir, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia].

**14. *Scleria dulungensis*** P. C. Li, Acta Bot. Yunnan. 12: 12. 1990.

独龙珍珠茅 du long zhen zhu mao

Rhizomes not seen. Culms to 100 cm tall, 5–8 mm wide, 3-angled, scabrous on ridges. Leaf sheath pale green, 3-angled, glabrous, not winged; contraligule oblong, barbate; leaf blade 15–20 cm, glabrous, veins and margin scabrous. Involucral bracts leaflike, sheaths pale green; bractlets glumelike, long awned. Inflorescences paniculate, to 50 cm, with 9–11 lateral branches; branches 10–15 × 10–12 cm, spreading and distant, with many spikelets. Spikelets single, unisexual, blackish purple; basal spikelets female, apex obovate; apical spikelets male, oblong, apex truncate; female glumes ovate-oblong, 3–3.5 mm, midrib green, apex acuminate. Disk ca. 3 mm in diam., 3-lobed; lobes golden yellow with purple lines, semicircular, margins reflexed. Nutlet white, spherical, ca. 3 mm, puberulent, reticulation purplish brown, apex tipped. Fl. and fr. Aug.

• Grasslands bordering evergreen broad-leaved forests on slopes; 1300–1400 m. Yunnan (Gongshan).

**15. *Scleria levis*** Retzius, Observ. Bot. 4: 13. 1786.

毛果珍珠茅 mao guo zhen zhu mao

*Scleria hebecarpa* Nees; *S. hebecarpa* var. *pubescens* (Steudel) C. B. Clarke; *S. levis* var. *pubescens* (Steudel) C. Z. Zheng; *S. pubescens* Steudel.

Perennials, stoloniferous. Rhizomes woody, covered with purple scales. Culms laxly tufted or scattered, 70–90 cm tall, 3–5 mm wide, 3-angled, scabrous, pubescent. Leaf sheath 1–8 cm, papery; sheath of leaves at culm base brown, not winged; sheaths on apical half of culm green, wing 1–3 mm wide; contraligule nearly semicircular, short, barbate; leaf blade linear, ca. 30 cm × 7–10 mm. Involucral bracts leaflike, basalmost to 13 cm; bractlets setaceous, auriculate at base, auricles barbate. Inflorescences paniculate, with 1 or 2 lateral branches; branches 3–8 × 1.5–3 cm. Spikelets 1 or 2 in a cluster, brown, unisexual, sessile, ca. 3 mm. Male spikelets narrowly ovoid to oblong-ovoid; glumes 1.5–3 mm, keeled, thickly membranous. Female spikelets usually at basal part of branch, narrowly ovoid; glumes oblong-ovate, broadly ovate, or ovate-lanceolate, keeled, with rust-colored short lines. Male flowers: stamens 3; anthers linear, ca. 1.3 mm. Female flowers: stigmas 3. Disk pale yellow, slightly narrower than nutlet, deeply 3-lobed; lobes lanceolate-triangular, margin reflexed. Nutlet white, spherical to ovoid, ca. 2 mm in diam., bluntly 3-sided, ± smooth to rugulose, apex tipped. Fl. and fr. Jun–Sep.

Dry places, grasslands on slopes, thickets in forests, scrub; near sea level to 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bangladesh, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; NE Australia, Pacific islands].

**16. *Scleria jiangchengensis*** Y. Y. Qian, Bull. Bot. Res., Harbin 19: 241. 1999.

江城珍珠茅 jiang cheng zhen zhu mao

Perennials, stoloniferous. Rhizomes woody, covered with

brown scales. Culms laxly tufted to scattered, 70–110 cm tall, 3–4 mm wide, 3-angled, slightly puberulent. Sheath brown to greenish brown at middle part of culm, 1–6 cm, papery, puberulent, wings 1–3 mm wide; contraligules nearly semicircular, puberulent, barbate; leaf blade linear, to 35 cm × 3–8 mm, both surfaces pubescent. Involucral bracts leaflike, sheathing; bractlets setaceous, puberulent, base auriculate. Inflorescences paniculate, with 2–4 lateral branches; branches 2–7 × 1.5–5 cm, slightly distant. Spikelets 1 or 2 in a cluster, greenish purple to dark purple, 3.5–4.5 mm, unisexual. Male spikelets narrowly ovoid; basal glumes 1.5–3.3 mm, thickly membranous; apical glumes thinner and paler. Female spikelets usually at basal part of branch, narrowly ovoid; glumes 5; basal 2 glumes ovate, not keeled; apical 3 glumes ovate to ovate-lanceolate, keeled, apex awned. Male flowers: stamens 3. Female flowers: stigmas 3. Disk yellowish white, slightly narrower than nutlet, deeply 3-lobed, margins partly reflexed. Nutlet white, spherical, 2.5–2.8 mm in diam., 3-sided, reticulate, puberulent, apex tipped. Fl. and fr. Jul–Sep.

• Forests; 1000–1100 m. Yunnan (Jiangcheng).

No specimen of this species has been seen by the present authors. The description was adapted from the original protologue of the species.

**17. *Scleria scrobiculata*** Nees & Meyen in Wight, Contr. Bot. India, 117. 1834.

轮叶珍珠茅 lun ye zhen zhu mao

Perennials. Rhizomes hardened. Culms 1–2.5 m, 4–10 mm thick, triquetrous, scabrous on apical angles. Leaves ± in whorls of 2–5 at mid-culm (otherwise scattered); sheaths 4–6 cm, papery, glabrous, winged or not; contraligule depressed rounded, margin ciliate; leaf blade linear, ca. 40 × 1–1.3 cm, thickly papery, slightly scabrous, apically attenuate. Involucral bracts leaflike, basalmost to 15 cm, sheathing; bractlets setaceous. Inflorescences paniculate, with several branches; lateral branches spreading, often 2 or 3 in a cluster, 6–7 × ca. 10 cm, axes angled. Spikelets 2 or 3 in a cluster, brown, 3–4 mm, unisexual. Male spikelets oblong-ovoid, pedicellate, apex truncate; glumes rust-colored to brown, 3–4 mm, membranous, basal ones keeled and with a cuspidate apex. Female spikelets narrowly ovoid, apex acuminate; glumes broadly ovate to ovate, keeled. Male flowers: stamens 3; anthers linear, ca. 1 mm; connective apex protruding, ca. 1/4 as long as anther. Female flowers: stigmas 3. Disk brown to purple, 3-lobed; lobes smooth, narrow, apex acute. Nutlet whitish, globose, 2.5–3 × 2.2–2.7 mm, slightly 3-sided, with hexagonal reticulation, scrobiculate (marked with many shallow depressions, grooves, or pits), glabrous but sparsely pubescent on ridges, apex cuspidate. Fl. and fr. Apr–Aug.

Evergreen broad-leaved forests; below 100–300 m. Guangdong (Lianzhou), Taiwan (Taidong) [Indonesia, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam; N Australia, Indian Ocean islands, Pacific islands].

**18. *Scleria purpurascens*** Steudel, Syn. Pl. Glumac. 2: 169. 1855.

紫花珍珠茅 zi hua zhen zhu mao

Perennials. Rhizomes hardened. Culms 1–2 m tall, 3–7

mm thick, triquetrous, scabrous or smooth on apical angles, glabrous or pubescent. Leaves  $\pm$  in whorls of 2–5 at mid-culm (otherwise scattered); sheath 3–6 cm, papery, glabrous, wingless; contraligule depressed rounded, margin hirsute-ciliate; leaf blade linear, 30–60  $\times$  0.3–1.5 cm, thickly papery, slightly scabrous, apically long acuminate. Involucral bracts leaflike, basalmost to 15 cm, sheathing; bractlets setaceous. Inflorescences paniculate, 20–50 cm, with 1–4 branches; lateral branches often 2 or 3 clustered, spreading, 4–10  $\times$  ca. 10 cm, axes angled. Spikelets 2 or 3 in a cluster, brown, 3–4 mm, unisexual (rarely bisexual). Male spikelets oblong-ovoid, pedicellate, apex truncate; glumes rust-colored to brown, 3–4 mm, membranous, basal ones keeled and with a cuspidate apex. Female spikelets obovoid, apex acuminate; glumes broadly ovate to ovate, keeled. Male flowers: stamens 3; anthers linear, ca. 1 mm; connective apex protruding, ca. 1/4 as long as anther. Female flowers: stigmas 3. Disk brown to purple, 3-lobed; lobes smooth, narrow, apex acute. Nutlet white but purplish brown when mature, ovoid, ellipsoid, or obovoid, 2–2.5  $\times$  1.7–2 mm, slightly 3-sided, with hexagonal reticulation, conspicuously cancellate, sparsely pubescent on ridges and apex, apex cuspidate. Fl. and fr. summer.

Slopes, valleys, open woods; below 1000 m. Guangdong, Hainan [India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Indian Ocean islands].

**19. *Scleria psilorrhiza*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 691. 1894.

细根茎珍珠茅 xi gen jing zhen zhu mao

Perennials. Stolons ca. 3 mm in diam., covered with brown [or purplish] scales. Culms 60–100[–150] cm tall, 2–4 mm wide, sharply 3-angled, smooth to scabrous, glabrous. Leaf sheath 1–15 cm; several sheaths brown at base of culm, membranous to papery, not winged; other sheaths yellowish green, papery, wing 2–5 mm wide; ligule yellowish brown, glabrous or pilose; contraligule ovate-deltoid; leaf blade linear, ca. 30  $\times$  0.5–1.5 cm, papery, glabrous. Involucral bracts leaflike, basalmost to 23 cm, sheathing; bractlets setaceous, base dilated. Inflorescences paniculate, with 1 distant lateral branch; branch spicate. Spikelets usually 2 or 3 in a cluster, rust-colored brown, sessile, ca. 3.5 mm, unisexual [or bisexual]. Male spikelets ellipsoid to oblong; glumes 2–3 mm, thickly membranous. Female spikelets usually at base of branch, ellipsoid to narrowly ovoid; glumes broadly ovate-lanceolate to broadly ovate, keeled, apex aristate. Male flowers: stamens 3; anthers linear, ca. 1.5 mm. Female flowers: stigmas 3. Disk pale brown, bluntly triangular, ca. 2.5 mm in diam., shallowly 3-lobed; lobes nearly semicircular, short, margin reflexed. Nutlet white or pale brown, ovoid, ca. 3 mm in diam., smooth, shiny, glabrous. Fl. and fr. Jul.

Sunny slopes; ca. 200 m. Yunnan [Cambodia, India, Indonesia, Papua New Guinea, Philippines, Thailand; N Australia].

**20. *Scleria poiformis*** Retzius, Observ. Bot. 4: 13. 1786.

稻形珍珠茅 dao xing zhen zhu mao

*Scleria oryzoides* J. Presl & C. Presl.

Perennials. Culms to 1 m tall, robust, 3-angled, scabrous,

glabrous. Leaf sheath 7–25 cm, to 2 mm thick, leathery to  $\pm$  fleshy, glabrous, sometimes 3-winged, basal ones purplish red; contraligule not prominent; leaf blade linear, ca. 1 m  $\times$  1–2.5 cm, glabrous, margins sometimes scabrous, apex acute. Involucral bracts setaceous, basalmost to 1.5 cm; bractlets glumelike, shorter than spikelets. Inflorescences compound paniculate, ca. 15  $\times$  7–8 cm, with many branches; branch axes long, angled, scabrous, with many spikelets. Spikelets 1 or 2 in a cluster, dark brown, unisexual. Male spikelets many, more than female ones, oblong-ovoid, ca. 4 mm, apex truncate; glumes 2–3 mm, membranous, with rust-colored lines. Female spikelets usually at base of branch, narrowly ovoid, slightly longer than male ones, apex acuminate; glumes triangular-ovate, ovate-lanceolate, or broadly ovate, slightly longer than male glumes. Male flowers: stamen 1; anther linear, ca. 1.7 mm; connective apex protruding, 1/5–1/4 as long as anthers. Female flowers: stigmas 3. Disk brown, triangular-cordate, ca. 1.5 mm in diam., 3-lobed; lobes triangular, short, margin reflexed, apex acute. Nutlet white or gray, ovoid, ca. 3  $\times$  2.5 mm, bluntly triangular, smooth, shiny, glabrous. Fl. and fr. Apr.

Water margins. Hainan [Cambodia, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa and Australia, Madagascar].

**21. *Scleria radula*** Hance, Ann. Sci. Nat., Bot., sér. 4, 18: 232. 1862.

光果珍珠茅 guang guo zhen zhu mao

*Scleria laeviformis* Tang & F. T. Wang.

Perennials. Culms ca. 1 m tall, ca. 1 cm wide, 3-angled. Leaf sheath laxly embracing culm, to 15 cm, sometimes pubescent, winged on middle part of culm, wing 1–4 mm wide; contraligule purple, triangular; leaf blade linear, 15–50  $\times$  1.5–2.5 cm, papery, slightly scabrous, glabrous. Involucral bracts leaflike, basalmost to 25 cm, sheathing; bractlets setaceous, pubescent. Inflorescences paniculate; lateral branches 4 or 5, 6–5  $\times$  5–10 cm, compact, with many spikelets, ca. 2/3 of spikelets male. Male spikelets brown, oblong-ovoid; glumes membranous. Female spikelets usually basal, narrowly ovoid to ovoid; glumes brown, thickly membranous, hispid, apex apiculate. Male flowers: stamens 3. Female flowers: stigmas 3. Disk yellow, ca. 1.5 mm in diam., 3-lobed; lobes semicircular, margins thick and reflexed. Nutlet white, ovoid, ca. 2.5  $\times$  2 mm, bluntly 3-sided, smooth, glabrous, apex tipped. Fl. and fr. Apr–Aug.

• Valleys, streamsides, dense forests, wet places among hills; 100–800 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan.

**22. *Scleria oblata*** S. T. Blake, Blumea 11: 219. 1961.

扁果珍珠茅 bian guo zhen zhu mao

Perennials. Rhizomes woody, covered with purple to purplish brown scales. Culms tufted, 60–120 cm tall, 2–3 mm wide, triquetrous, smooth, glabrous. Leaves cauline; sheath 2–7 cm, papery, glabrous; sheath at culm base brown to purplish brown, not winged, with 3 ovoid-lanceolate teeth of various sizes at opening; sheath at middle part of culm green, wing 1–3 mm wide; contraligule brown to reddish brown, shortly deltate, 1–3 mm, glabrous or ciliate; leaf blade linear, 15–60 cm  $\times$  6–9

mm, papery, slightly scabrous, glabrous. Involucral bracts leaf-like, basalmost to 25 cm, sheathing; bractlets setaceous, base auriculate and hispid. Inflorescences paniculate, 10–20 cm, with 1–3 slightly distant lateral branches; branches 6–10 × 2–6 cm, slightly condensed. Spikelets 2 or 3 in a cluster, brown to purple, ca. 4 mm, unisexual. Male spikelets oblong-ovoid to narrowly ovoid-oblong; glumes 3–4 mm, membranous, margin sometimes ciliate; basal glumes keeled, apex aristate to apiculate. Female spikelets usually at base of branch, ovoid; glumes ovate-orbicular, keeled, apex acuminate. Male flowers: stamens 3. Female flowers: ovary pubescent; stigmas 3. Disk yellow, 1.6–2 mm in diam., deeply 3-lobed; lobes ovate, margin reflexed, apex obtuse to rounded. Nutlet white, ± spherical, ca. 2.5 mm in diam., smooth, glabrous.

Open wet grasslands; below 700 m. Guangdong [Bangladesh, India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Indian Ocean islands].

**23. *Scleria harlandii*** Hance, Ann. Sci. Nat., Bot., sér. 5, 5: 248. 1866.

圆秆珍珠茅 *yuan gan zhen zhu mao*

*Scleria purpurascens* Benth (1861), not Steudel (1855).

Perennials. Culms to more than 1 m tall, ca. 6 mm wide, subcylindric to sometimes slightly 3-angled, shiny, glabrous. Leaf sheath yellow with purple lines, tightly embracing culm, 4–6 cm, thinly leathery, not winged, sometimes pilose, apical ones often overlapped; contraligule purple, semicircular, margin ciliate, cilia ca. 1 mm; leaf blade linear, ca. 30 × 0.6–0.8 cm, thinly leathery, slightly scabrous, glabrous, apex attenuate. Involucral bracts leaflike, basalmost to 35 cm, sheathing; bractlets setaceous, subequaling spikelets, hairy, base auriculate. Inflorescences compound paniculate, to 40 cm, with 8 or 9 branches; branches ca. 5 cm, triangular, axes often pubescent. Spikelets 1 or 2 in a cluster, light rust-colored to purple, 3–4 mm, mostly unisexual. Male spikelets oblong-ovoid to narrowly ovoid, apex truncate to acute; glumes 1.4–3 mm, membranous, with rust-colored lines. Female spikelets usually at base of branch, narrowly ovoid, apex acuminate; glumes broadly ovate to ovate-lanceolate, ± keeled, margin apically ciliate, apex cuspidate.

Male flowers: stamens 3; anthers linear, ca. 1 mm; connective apex ca. 0.3 mm. Female flowers: stigmas 3. Disk yellow with light rust-colored lines, ca. 2 mm in diam., 3-lobed; lobes triangular, margins reflexed, apex acute to acuminate or 2- or 3-lobed. Nutlet white, subspherical, ca. 2.5 mm in diam., bluntly 3-sided, smooth, shiny, only apical part sparsely hairy, apex tipped. Fl. and fr. Mar–Sep.

Slopes, valleys, woodlands; below 400 m. Fujian, Guangdong, Guangxi, Hainan, SE Yunnan [Vietnam].

**24. *Scleria sumatrensis*** Retzius, Observ. Bot. 5: 19. 1788.

印尼珍珠茅 *yin ni zhen zhu mao*

Perennials. Culms 2–4 m tall, 6–7 mm wide, 3-angled, glabrous. Leaves ± in whorls of 3; sheaths ca. 4 cm, papery, glabrous, basal ones winged; contraligule nearly semicircular, very short, margin ciliate; leaf blade linear, ca. 40 × 1–1.3 cm, thickly papery, slightly scabrous, apically attenuate. Involucral bracts leaflike, basalmost to 25 cm, sheathing; bractlets setaceous, laterally hairy, base dilated. Inflorescences compound paniculate, with several branches; lateral branches often 2 or 3 in a cluster, 6–7 × ca. 10 cm, spreading, axes angled. Spikelets 1 or 2 in a cluster, brown, ca. 5 mm, unisexual, basal glumes distichous. Male spikelets oblong-ovoid, apex truncate; glumes rust-colored to brown, 2–3.5 mm, membranous, basal ones keeled and with a cuspidate apex. Female spikelets narrowly ovoid, apex acuminate; glumes broadly ovate-lanceolate, ovate, or oblong-ovate, keeled. Male flowers: stamens 3; anthers linear, ca. 1.2 mm; connective apex protruding, ca. 1/4 as long as anther. Female flowers: stigmas 3. Disk brown, purple, yellowish, or bright shiny red, cup-shaped, 1/2–4/5 height of nutlet and enclosing it, 3-lobed; lobes smooth, shiny, apex dentate. Nutlet flattened globose, ca. 1.5 × 2–2.5 mm, with hexagonal reticulation, sparsely pubescent, apex cuspidate. Fl. and fr. Apr.

Stream margins; 200–300 m or less. Hainan, Taiwan (Pingdong) [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Indian Ocean islands, Pacific islands].

### 31. *DIPLACRUM* R. Brown, Prodr. 240. 1810.

裂颖茅属 *lie ying mao shu*

Zhang Shuren (张树仁); Gordon C. Tucker, Jeremy J. Bruhl

Herbs, annual or occasionally perennial, tenuous, with thin fibers. Leaves cauline, sheathing, without a ligule, regularly spaced along stem; leaf blade linear, short. Inflorescence a capitate cyme, condensed, exerted from leaf sheath. Spikelets unisexual. Male spikelets basal on inflorescence; glumes usually 3, usually thin and narrow, each with 1 or 2 male flowers. Female spikelets apical on inflorescence; glumes 2, opposite, equal in size, veined, each with 1 female flower, apex 3-lobed or not. Male flowers: anthers 1–3. Female flowers: stigmas 3. Disk present. Nutlet small, globose, with vertical ribs or reticulate, sometimes apically hairy, tightly enclosed in 2 subtending glumes and shed with them.

About six species: tropics into warm temperate regions of both hemispheres; two species in China.

- 1a. Glume subtending female flower prominently several veined, apex 3-lobed; nutlets globose, with 3 longitudinal ribs and rectangular reticulation ..... 1. *D. caricinum*  
 1b. Glume subtending female flower with only a prominent midvein, apex not lobed; nutlets depressed globose, with 3 longitudinal ribs and square reticulation between ribs ..... 2. *D. reticulatum*

**1. *Diplacrum caricinum*** R. Brown, Prodr. 241. 1810.

裂颖茅 lie ying mao

*Scleria caricina* (R. Brown) Benth.

Annuals. Culms 10–40 cm, slightly erect or sprawling, 3-angled, glabrous. Veins of leaf blades and bracts purple, fine. Leaf sheath with narrow wings but apically broader; ligule absent; leaf blade linear, 1–4 cm × 1.5–3 mm, apex acute to acuminate. Involucral bracts and bractlets leaflike or glumelike; leaflike bracts green, 3–10 mm, papery. Inflorescence a capitate cyme, 1 or 2 at each node. Male spikelets with 3 glumes and 1 or 2 flowers; glumes scarious. Female spikelets oblong to ovoid, with 2 opposite glumes and 1 flower; glumes greenish yellow, suboblong, ca. 1.8 mm, membranous, prominently several veined, 3-lobed, middle lobe larger, longer, and apically mucronate. Male flowers: anthers 1 or 2. Female flowers: stigmas 3, pubescent. Disk adnate to base of nutlet, obscurely 3-sided. Nutlet included in 2 glumes, globose, 0.8–1 mm in diam., with 3 longitudinal ribs and rectangular reticulation, apex hispid. Fl. and fr. Sep–Oct.

Water margins, shaded slopes, field margins; below 100–800 m. Fujian, Guangdong, S Guangxi, Hainan, S Jiangsu, Taiwan, S Zhejiang [Bangladesh, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar,

Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Indian Ocean islands, Pacific islands].

**2. *Diplacrum reticulatum*** Holttum, Gard. Bull. Singapore 11: 295. 1947.

网果裂颖茅 wang guo lie ying mao

*Scleria reticulata* (Holttum) J. Kern.

Annuals. Culms 10–40 cm, slightly erect or sprawling, 3-angled, glabrous. Veins of leaf blades and bracts purple, fine. Leaf sheath with narrow wings but apically broader; ligule absent; leaf blade linear, 1–4 cm × 1.5–3 mm, apex acute to acuminate. Involucral bracts and bractlets leaflike or glumelike; leaflike bracts green, 3–10 mm, papery. Inflorescence a capitate cyme, 1 or 2 at each node. Male spikelets with 3 glumes and 1 or 2 flowers; glumes scarious. Female spikelets turbinate, 1.2–1.5 × ca. 1.2 mm; glumes greenish yellow and often with pale red spots, ovate to oblong, ca. 1.2 mm, membranous, midvein prominent, lateral veins faint, apex entire (not 3-lobed) and mucronate. Disk adnate to base of nutlet, obscurely 3-sided. Nutlet depressed globose, ca. 1 mm in diam., with 3 longitudinal ribs and square reticulation between ribs, apex hispid. Fl. and fr. autumn and winter.

Wet grasslands. Hainan [Bangladesh, Malaysia (Peninsular), Myanmar, Thailand].

**32. KOBRESIA** Willdenow, Sp. Pl. 4: 205. 1805.

嵩草属 song cao shu

Zhang Shuren (张树仁); Henry J. Noltie

Herbs, perennial. Rhizomes usually very short, sometimes obliquely and shortly creeping, rarely stoloniferous and spreading. Stems usually tufted, rarely scattered. Leaves basal or sub-basal; basal leaf sheaths persistent and usually prominent; blade with midrib not distinct abaxially (margin involute, sometimes filiform), or with midrib distinct abaxially (flat, sometimes folded). Inflorescence terminal, paniculate to spicate, sometimes unisexual; lowest involucral bract leafy or glumelike, sheathless; branches of inflorescence sessile. Spikelets subtended by glumes, unisexual or bisexual; bisexual spikelets with 1 female flower at base and 1 to several male flowers at distal parts enclosed by prophylls; unisexual spikelets with a solitary female flower within prophylls. Sterile rachilla in female spikelet usually present. Flowers unisexual. Female flowers reduced to naked pistils; ovary 2- or 3-carpellate; style elongated; stigmas 2 or 3. Male flowers subtended by male glumes; stamens 1–3; filaments free, longer than glumes, slender; male glumes usually distinct in shape from glumes of female spikelets. Nutlets trigonous or flattened, usually included in prophylls, beaked or not, stipitate or not.

About 54 species: mainly in temperate regions of the N Hemisphere; 44 species (16 endemic, one unconfirmed) in China.

- 1a. Prophylls leathery in texture, utriculiform, inflated, much larger than nutlet at maturity.
  - 2a. Leaves flat with midrib conspicuous abaxially; culms over 6 cm; prophylls over 5 mm; plants of meadows and slopes up to 4600 m ..... 16. *K. inflata*
  - 2b. Leaves filiform, U-shaped in cross section, midrib not conspicuous abaxially; culms under 4 mm; prophylls to 5 mm; dwarf mat-forming plants of stony plateaus over 4800 m ..... 17. *K. yadongensis*
- 1b. Prophylls thinly textured, open or utriculiform, if utriculiform then closely enveloping nutlet at maturity.
  - 3a. Nutlets mostly with 2 stigmas, compressed (biconvex) with 2 sharp edges.
    - 4a. Spikes linear, more than 5 × as long as broad; sometimes some nutlets with 3 stigmas ..... 28. *K. myosuroides*
    - 4b. Spikes short, ca. 3 × as long as broad; nutlets all with 2 stigmas.
      - 5a. Glumes pale brown to brown, margin hyaline or not; nutlets obovoid, very shortly stipitate; lower spikelets with 1 female and 2–5 male flowers (E China) ..... 43. *K. pusilla*
      - 5b. Glumes dark brown, occasionally brown, margin narrowly hyaline or not; nutlets oblong, distinctly stipitate; lower spikelets with 1 female and 1–3 male flowers (W China) ..... 44. *K. karakoromensis*
  - 3b. Nutlets all or mostly with 3 stigmas (in *K. capillifolia*, *K. filifolia*, and *K. myosuroides* sometimes with 2), trigonous, although one of angles sometimes extremely weak (so nutlet appearing compressed).
    - 6a. Rhizomes elongate, stoloniferous.

- 7a. Stigmas 3; nutlets not stipitate; prophylls usually over 7 mm; plants robust ..... 1. *K. gammiei*
- 7b. Stigmas 2; nutlets long stipitate at maturity (stipes to 1 mm); prophylls to 6.5 mm; plants slender.
- 8a. Leaf blade flat, midrib distinct abaxially; prophylls to 3.6 mm; spikelets usually unisexual; glumes fawn brown ..... 14. *K. macrantha*
- 8b. Leaf blade filiform, U-shaped, midrib not distinct abaxially; prophylls over 4 mm; lower spikelets of lateral spikes usually bisexual; glumes dark reddish brown ..... 15. *K. hohxilensis*
- 6b. Rhizomes extremely short, so plants densely tufted.
- 9a. Inflorescence paniculate.
- 10a. Prophylls utriculiform (open only near apex); most spikelets unisexual (some near base of inflorescence branches sometimes bisexual).
- 11a. Prophylls to 3.5 mm; glumes of female spikelets to 3 mm ..... 6. *K. fragilis*
- 11b. Prophylls over 3.5 mm; glumes of female spikelets over 4 mm.
- 12a. Leaves usually over 5 mm wide; prophylls over 8 mm, rachilla much shorter than nutlet; inflorescence branches linear, elongate ..... 3. *K. curticeps*
- 12b. Leaves never over 5 mm wide; prophylls under 7 mm (if more than inflorescence dense, clublike and lowest involucre bract glumelike), rachilla subequaling or exceeding nutlet.
- 13a. Nutlet elliptic, ca. 2 × as long as wide (Yunnan only) ..... 5. *K. loliacea*
- 13b. Nutlet narrowly elliptic to linear, ca. 3 × as long as wide (more widespread).
- 14a. Surface of prophyll glabrous; branches ± equal in length throughout inflorescence, curving outward ..... 2. *K. laxa*
- 14b. Surface of prophyll minutely hispid near apex; lower inflorescence branches longer than upper, appressed or obliquely ascending.
- 15a. Rachilla shorter than nutlet; margins of glumes hyaline; culms slender ..... 4. *K. sikkimensis*
- 15b. Rachilla almost or exceeding prophyll; margins of glumes not hyaline; culms stout ..... 7. *K. uncinoides*
- 10b. Prophylls open almost to base; spikelets bisexual or unisexual.
- 16a. Spikelets bisexual.
- 17a. Leaves filiform; some nutlets with 2 stigmas ..... 11. *K. filifolia*
- 17b. Leaves flat; all nutlets with 3 stigmas.
- 18a. Culms very stout, acutely triquetrous; inflorescence very dense, club-shaped ..... 12. *K. kansuensis*
- 18b. Culms slender, not obviously triquetrous; inflorescence branches slightly spreading ..... 13. *K. royleana*
- 16b. Spikelets unisexual.
- 19a. Rhizome stout, oblique, very shortly creeping, bearing short, bladeless sheaths ..... 8. *K. kuekenthaliana*
- 19b. Rhizome not developed, culms densely tufted, not bearing bladeless sheaths.
- 20a. Leaves filiform ..... 9. *K. condensata*
- 20b. Leaves flat, midrib distinct abaxially.
- 21a. Prophylls over 5 mm, keels hispid ..... 10. *K. tunicata*
- 21b. Prophylls to 4 mm, keels not hispid ..... 13. *K. royleana*
- 9b. Inflorescence spicate.
- 22a. Prophylls over 6 mm ..... 21. *K. robusta*
- 22b. Prophylls under 6 mm.
- 23a. Lower spikelets bisexual, with at least 1 male flower enclosed within prophyll.
- 24a. Leaves flat, midrib distinct abaxially.
- 25a. Prophylls with basal female and 2–7 male flowers ..... 18. *K. humilis*
- 25b. Prophylls with basal female and 1 or 2 male flowers.
- 26a. Prophylls utriculiform, open only above middle; glumes not or minutely aristate; leaves short, stiff ..... 19. *K. duthiei*
- 26b. Prophylls open almost to base; glumes long aristate; leaves longer, flaccid ..... 20. *K. filicina*
- 24b. Leaves filiform, midrib not distinct abaxially.
- 27a. Prophylls open in upper half (SW Xizang) ..... 22. *K. burangensis*
- 27b. Prophylls open almost to base.
- 28a. Plants and spikes robust, basal sheaths conspicuous, papery, commonly orange-brown, shiny; male flowers up to 7 per prophyll.

- 29a. Glumes aristate, with conspicuous greenish midrib; inflorescence elongate; nutlets 3–4.5 mm ..... 23. *K. cuneata*
- 29b. Glumes usually not aristate, midrib not conspicuous; inflorescence shorter and broader; nutlets 1.7–3.5 mm ..... 24. *K. schoenoides*
- 28b. Plants and spikes more slender, basal sheaths often dark brown; male flowers 1–5 per prophyll.
- 30a. Culm stout (to 1.5 mm in diam.), erect, exceeding leaves; spike very short in relation to culm ..... 27. *K. tibetica*
- 30b. Culm more slender (to 1.3 mm in diam.), not or slightly exceeding leaves; spike more elongate.
- 31a. Sheaths usually dark chocolate brown, sometimes shiny; glumes wide, blunt, with broad hyaline margin ..... 26. *K. capillifolia*
- 31b. Sheaths paler, dull; glumes narrower, more acute, not or narrowly hyaline margined.
- 32a. Spike club-shaped; glumes orange-brown; male flowers usually 3–5 per spikelet; nutlets all with 3 stigmas ..... 25. *K. setschwanensis*
- 32b. Spike linear; glumes dark brown; male flowers usually 1 per spikelet; some nutlets sometimes with 2 stigmas ..... 28. *K. myosuroides*
- 23b. All spikelets unisexual, prophylls enclosing a nutlet and sterile rachilla, male and female spikelets sometimes in separate inflorescences or on separate plants.
- 33a. Spikes clearly bisexual (androgynous), with female spikelets below and male spikelets at apex.
- 34a. Prophylls utriculiform, open only in upper half; glumes orange-brown ..... 29. *K. nepalensis*
- 34b. Prophylls open to base; glumes dark brown ..... 30. *K. cercostachys*
- 33b. Spikes unisexual (occasionally with a few reduced male spikelets at apex).
- 35a. Leaves flat.
- 36a. Prophylls narrowly elliptic or oblong, not embracing nutlets, keels obscure ..... 32. *K. fissiglumis*
- 36b. Prophylls linear or linear-oblong, embracing nutlets, keels obvious and scabrid.
- 37a. Prophylls 2–3.5 mm, utriculiform when young; female inflorescence linear, 1.7–6.5 cm ..... 31. *K. esenbeckii*
- 37b. Prophylls 5–5.5 mm, open to base even when young; female inflorescence oblong, 1.5–2 cm ..... 33. *K. falcata*
- 35b. Leaves filiform.
- 38a. Prophylls utriculiform, open only in upper half.
- 39a. Midvein of glume conspicuous, ca. 1/3 width of glume, green ..... 34. *K. vidua*
- 39b. Midvein of glume less than 1/3 width of glume, not conspicuously green.
- 40a. Plants slender; glumes reddish brown to brown; prophylls elliptic (Sichuan) ..... 35. *K. yangii*
- 40b. Plants rigid; glumes pale brown; prophylls narrowly oblong or lanceolate (more widespread, especially Xizang).
- 41a. Plants robust (culms 1–2 mm in diam.); inflorescences large, female ones 15–40 × 2–3 mm, male ones 17–30 × 4–5 mm; prophylls 3.5–5 mm ..... 36. *K. littledalei*
- 41b. Plants slender (culms less than 1 mm in diam.); inflorescences small, female ones 10–20 × 2–3 mm, male ones 6–13 × 2–5 mm; prophylls 2.5–3 mm ..... 37. *K. prainii*
- 38b. Prophylls open almost to base.
- 42a. Spikes club-shaped (ca. 2 × as long as wide).
- 43a. Dwarf, turf-forming plants; culms commonly under 5 cm; prophylls ca. 2.5 mm (widespread) ..... 38. *K. pygmaea*
- 43b. Erect, tufted plants; culms usually over 7 cm; prophylls over 3 mm (Gansu, Qinghai) ..... 39. *K. squamiformis*
- 42b. Spikes linear (more than 5 × as long as wide).
- 44a. Plants slender, culms ca. 0.5 mm in diam.; spikes slender, linear ..... 40. *K. vaginosa*

- 44b. Plants stout, culms ca. 1 mm or more in diam.; spikes oblong.
- 45a. Basal sheaths fibrillose, dull; female glumes  $5-6 \times 1.5-2$  mm, apex acute to obtuse, not hyaline; prophylls  $5-6$  mm ..... 41. *K. graminifolia*
- 45b. Basal sheaths not fibrillose, slightly shiny; female glumes  $6.2-8 \times 2.5-4$  mm, apex broad, very blunt, hyaline; prophylls  $7-9$  mm ..... 42. *K. woodii*

**1. *Kobresia gammiei*** C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 68. 1908.

根茎嵩草 gen jing song cao

*Kobresia williamsii* T. Koyama.

Rhizomes elongated, stoloniferous. Basal sheaths few, pale reddish brown, dull, retaining dried leaf blades. Culms loosely tufted, trigonous to subterete, 7–58 cm tall, slender, 1–1.5 mm in diam. Leaves basal or sub-basal, shorter than culms; blade flat, 1.5–4.5(–5) mm wide, midrib distinct abaxially. Inflorescence loosely or densely paniculate, reddish brown with green, club-shaped,  $2.6-8 \times 0.5-1.2$  cm; lowest involucral bract leafy or glumelike with long arista, shorter than or exceeding inflorescence. Lowest spikelets of inflorescence branches bisexual with 1 basal female flower and 1 distal male flower, middle ones unisexual with only 1 female flower, apical ones male; glumes reddish brown, with green midvein, elliptic to oblong,  $(3.5-5.5-8.5 \times 3.2-4)$  mm, midvein broad, margin broadly hyaline, apex subacute to rounded-truncate. Prophylls pale green, partly brown, utriculiform, lanceolate,  $(5.6-7-10.3 \times 1-2)$  mm, membranous, 2-keeled, keels smooth, apex attenuate into a beak. Nutlets yellowish green, obovoid, trigonous,  $3.3-4 \times 1.5-2$  mm, not beaked. Rachilla in unisexual spikelets, shorter than or subequaling nutlet, flat, prominent, sometimes with a sterile male glume at apex. Stigmas 3, base of style disklike. Fl. and fr. May–Aug.

Grassy slopes, damp slopes in *Abies* forests, streamsides, cliffs; 3700–4400 m. Xizang [Bhutan, India (Sikkim), Nepal].

**2. *Kobresia laxa*** Nees in Wight, Contr. Bot. India, 119. 1834 [*“Cobresia”*].

疏穗嵩草 shu sui song cao

*Elyna laxa* (Nees) Kunth; *Hemicarex laxa* (Nees) Benth.; *Kobresia pseudolaxa* C. B. Clarke; *Schoenoxiphium laxum* (Nees) K. V. Ivanova.

Rhizomes shortly elongated. Basal sheaths few, pale to dark brown, dull, retaining dried leaf blades or not. Culms loosely tufted, obscurely trigonous, (4–)13–35 cm tall, slender, ca. 1 mm in diam. Leaves sub-basal, shorter than culms; blade flat, 1.4–4 mm wide, midrib distinct abaxially. Inflorescence a loose or sometimes slightly compact panicle, reddish brown, linear or oblong,  $3.5-8 \times 1-1.5$  cm; inflorescence branches all similar in length, curving outward, lower branches again branched; lowest involucral bract leaflike, sometimes surpassing inflorescence. Inflorescence branches usually androgynous in upper part of inflorescence, those in lower part usually female, sometimes whole inflorescence composed of primarily

male or primarily female spikelets; spikelets unisexual; glumes reddish brown, with green midvein, narrowly ovate or oblong,  $3.5-5 \times 1-1.4$  mm, midvein narrow, margin broadly hyaline, apex aristate, acute, or rounded. Prophylls pale green, utriculiform, linear or linear-lanceolate, sometimes slightly curved,  $(3.5-4.5-6.6 \times 0.5-0.8)$  mm, membranous, 2-keeled, keels slightly scabrid, margins fused to apex or free in upper half. Nutlets pale yellow or brown, narrowly oblong or elliptic-oblong, trigonous,  $2.5-3 \times 0.4-0.6$  mm, slightly beaked. Rachilla in female spikelets longer than nutlet, exerted from or included in prophyll, green, flat, margins scabrid. Stigmas 3. Fl. and fr. May–Jul.

Moist meadows, on wet rocks; 2200–3700 m. Xizang [Afghanistan, India (Himachal Pradesh, Sikkim), Kashmir, Nepal, Pakistan, Tajikistan].

**3. *Kobresia curticeps*** (C. B. Clarke) Kükenthal in Engler, Pflanzenr. 38(IV. 20): 47. 1909.

短梗嵩草 duan geng song cao

*Carex curticeps* C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 729. 1894.

Rhizomes short. Basal sheaths stout, pale brown, dull, retaining dried leaf blades, sometimes decaying to fibers. Culms tufted, erect, rigid, trigonous, 22–95 cm tall, 1.1–2.2 mm in diam. Leaves borne on lower half and subequaling culm; blade flat,  $(3.7-5-7.5)$  mm wide, midrib distinct abaxially. Inflorescence densely paniculate, brown, narrow,  $6.5-9.5 \times 0.8-2.3$  cm; lowest involucral bract erect, leaflike, sometimes exceeding inflorescence; branches usually androgynous in upper part of inflorescence, those in lower part usually female, sometimes whole inflorescence composed of primarily female spikelets; spikelets unisexual. Lower inflorescence branches linear, stiffly appressed (lowest to 6 cm), androgynous or female, sometimes again branched, bearing spikelets to base. Female glumes cream or brown, with green midvein, narrowly ovate or oblong, encircling branch,  $5.5-10 \times 2-3$  mm, midvein broad, 3–5-ribbed, apex aristate. Prophylls utriculiform, linear-lanceolate,  $(6-8-11.3 \times 1-1.6)$  mm, 2-keeled, keels minutely scabrid, herbaceous and strongly ca. 4-veined between keels, usually minutely hispid near margins above, margins fused from base to just below apex. Nutlets cream or pale brown, very narrowly ellipsoid, trigonous,  $5.5-6.5 \times 1.3-1.7$  mm, shortly stipitate. Rachilla in female spikelets less than 1/2 length of nutlet. Stigmas 3. Fl. and fr. Jun–Oct.

Open stony or sandy slopes in damp conifer (including *Abies*) forests [in Bhutan]; 2700–4100 m. S Xizang (Yadong) [Bhutan, India (Sikkim, West Bengal), Nepal].

**4. *Kobresia sikkimensis*** Kükenthal in Engler, Pflanzenr. 38(IV. 20): 47. 1909.

锡金嵩草 xi jin song cao

*Carex prainii* Kükenthal, Bull. Herb. Boissier, sér. 2, 4: 51. 1903, not C. B. Clarke (1904), nor *Kobresia prainii* Kükenthal (1904).

Rhizomes short. Basal sheaths cream, dull, slender, retaining dried leaf blades. Culms tufted, rigid, erect, trigonous, 16–38 cm tall, ca. 1 mm in diam. Leaves borne on lower half, 1/2 as long as to equaling culm; blade flat, 2.4–3 mm wide, midrib conspicuous abaxially. Inflorescence densely paniculate, brown, narrowly pyramidal, 4–7 × 1–2 cm; lowest involucrel bract erect, leaflike, exceeding inflorescence; branches androgynous; spikelets unisexual. Lower inflorescence branches narrowly oblong, not stiffly appressed (lowest to 4 cm), androgynous, not bearing spikelets in lower 1/3. Female glumes brown, with green midvein, narrowly ovate or oblong, ca. 5.5 × 2 mm, midvein narrow, 3-ribbed, margin hyaline, apex aristate. Prophylls utriculiform, linear-lanceolate, 4.1–5.8 × 1–1.7 mm, 2-keeled, keels minutely scabrid, herbaceous and weakly ca. 4-veined between keels, usually minutely hispid above, margins fused from base to just below apex. Nutlets cream or pale brown, very narrowly ellipsoid, trigonous, 3–3.3 × 0.8–1.5 mm, shortly stipitate. Rachilla in female spikelets more than 1/2 length of nutlet. Stigmas 3. Fl. and fr. Jul–Aug.

?S Xizang [Bhutan, India (Sikkim), Nepal].

Although not yet recorded in China, this species is almost certain to occur in S Xizang, as it occurs very close to the border in NW Bhutan and also in India (Sikkim) and NE Nepal (where it occurs at forest margins and on scree in *Juniperus* forests at elevations of 3000–4200 m).

**5. *Kobresia loliacea*** F. T. Wang & Tang ex P. C. Li, Acta Bot. Yunnan. 12: 13. 1990.

黑麦嵩草 hei mai song cao

Rhizomes short. Basal sheaths few, pale brown, dull, retaining dried leaf blades. Culms tufted, 15–45 cm tall, slender, 1–1.5 mm in diam. Leaves basal or sub-basal, shorter than culms; blade flat, 1.5–2 mm wide, midrib distinct abaxially. Inflorescence loosely paniculate, yellowish green, linear, 2.5–6 × 0.4–0.5 cm; lowest involucrel bract leafy, longer than inflorescence. Spikelets bisexual with 1 basal female flower and 1–4 distal male flowers, sometimes unisexual with only 1 female flower; glumes yellowish green, oblong, 4.5–5.5 × 2–2.5 mm, apex mucronate. Prophylls yellowish green, utriculiform, oblong or elliptic, 5–6.6 × ca. 2 mm, papery, 2-keeled, keels smooth, many veined between keels, apex attenuate into beak. Nutlets pale to dark brown, obovoid-oblong, obscurely trigonous, 2.8–3.8 × 1–2 mm, not beaked. Rachilla in unisexual spikelets prominent, flat, ca. 2/3 as long as nutlet, with a sterile male glume at apex. Stigmas 3. Fl. and fr. Jul–Sep.

• Slopes, roadsides, grasslands; 3200–3400 m. Sichuan, Xizang, Yunnan.

**6. *Kobresia fragilis*** C. B. Clarke, J. Linn. Soc., Bot. 36: 267. 1903.

囊状嵩草 nang zhuang song cao

*Carex curvata* Boott, Ill. Gen. Carex 1: 2. 1858, not Knaf (1847); *Kobresia bonatiana* Kükenthal; *K. clarkeana* (Kükenthal) Kükenthal; *K. curticeps* (C. B. Clarke) Kükenthal var. *gyirongensis* Y. C. Yang; *K. curvata* C. B. Clarke; *K. hispida* Kükenthal; *K. yuennanensis* Handel-Mazzetti; *Schoenoxiphium clarkeanum* Kükenthal; *S. fragile* (C. B. Clarke) C. B. Clarke.

Rhizomes short. Basal sheaths few, pale brown, dull, not retaining dried leaf blades. Culms tufted, erect, trigonous or subterete, (1.5–)6–45 cm tall, slender, 0.5–1.1 mm in diam. Leaves basal or sub-basal, shorter than or equaling culms, sometimes curved; blade V-shaped in transverse section, inrolled, 1–2 mm wide, midrib not distinct abaxially. Inflorescence a loose or sometimes slightly compact panicle, yellowish brown, or green and partly brown, linear or narrowly cylindrical, sometimes curved, 1–8 × 0.2–0.7 cm; branches mainly androgynous, subequal in length, appressed or slightly spreading; lower inflorescence branches compound or simple, linear-oblong to ovate; lowest involucrel bract leaflike, usually surpassing inflorescence. Spikelets usually unisexual (occasionally bisexual); glumes pale yellow to brown, sometimes marked with brown spots and lines, ovate or oblong, 2–3.5 × 1–1.7 mm, midvein green, broad, margin hyaline, apex aristate, acute, or rounded. Prophylls pale yellow or pale green, sometimes with reddish brown spots and lines, utriculiform, oblong, narrowly elliptic, or narrowly ovate to lanceolate, 2.4–3.5 × 0.8–1.5 mm, membranous, 2-keeled, keels slightly scabrid or smooth, margins fused to apex. Nutlets pale yellow or brown, narrowly oblong or elliptic-obovoid, trigonous, 1.5–2.5 × 0.5–1 mm, shortly beaked. Rachilla in female spikelets longer than nutlet, included in prophyll, green, flat, margins scabrid. Stigmas 3. Fl. and fr. Jun–Sep.

Open grassy slopes, grasslands under *Quercus* woods, riversides; 2600–4300 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

This species represents a complex on which further work is required. There are two distinct forms differing in micromorphology of nutlet surface, but these cannot be correlated with the forms that differ (often dramatically) in gross morphology (e.g., in habit—erect vs. weak) or the forms that are predominantly male.

**7. *Kobresia uncinoides*** (Boott) C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 698. 1894 [“*uncinoides*”].

钩状嵩草 gou zhuang song cao

*Carex uncinoides* Boott, Ill. Gen. Carex 1: 8. 1858.

Rhizomes very stout, shortly oblique. Basal sheaths few, pale brown or cream, dull, retaining dried leaf blades, decaying to fibers. Culms tufted, rigid and erect, obtusely trigonous or subterete, (1.5–)6–50 cm tall, 1–2.5 mm in diam. Leaves basal or sub-basal, shorter than culms; blade flat, 2–4 mm wide, midrib distinct abaxially. Inflorescence densely paniculate (very rarely spicate), yellowish brown and partly green, narrowly club-shaped, (1–)2.5–7 × 0.8–1.7 cm; lowest involucrel bract glumelike, apex aristate, arista short or long (occasionally subequaling inflorescence); branches oblong or lanceolate, appressed, androgynous or female, lower branches sometimes

distant; spikelets unisexual with only 1 female flower; female glumes yellowish brown, with green midvein, oblong or ovate, 5–8 (excluding awn)  $\times$  2.4–3.6 mm, membranous, midvein extending into arista, margin not hyaline, apex aristate. Prophylls yellowish brown, utriculiform, narrowly lanceolate, 5.5–8.5(–10.5)  $\times$  1.4–1.5 mm, herbaceous, upper part often hairy, 2-keeled and many veined, keels scabrid, margins fused from base to just below apex. Nutlets chestnut-brown, narrowly oblong, trigonous, 3.1–4.5  $\times$  0.8–1.4 mm, not beaked (but style base sometimes persistent), shortly stipitate. Rachilla in female spikelets longer than nutlet, slightly exserted from prophyll, green, flat, margins ciliate. Stigma 3. Fl. and fr. Jun–Oct.

Alpine meadows, streamsides, lakesides, grassy slopes, forest margins, among shrubs; 2900–4900 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Myanmar, Nepal].

**8. *Kobresia kuekenthaliana*** Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 57: 290. 1920.

宁远嵩草 ning yuan song cao

*Schoenoxiphium kuekenthalianum* (Handel-Mazzetti) K. V. Ivanova.

Rhizomes shortly and obliquely elongate, bearing pale brown scales (bladeless sheaths). Basal sheaths persistent, brown, not retaining dried leaves. Culms densely tufted, erect, obtusely trigonous, 25–40 cm, slender, ca. 1 mm in diam. Leaves basal, longer than culms; sheaths with reddish brown, membranous margins; blade flat or folded, 1.5–2.5 mm wide, midrib distinct abaxially. Inflorescence densely paniculate, pale brown, linear-lanceolate, 2.6–4  $\times$  0.6–0.8 cm; branches  $\pm$  equal in length, slightly spreading; lowest involucre bract glumelike, apex aristate. Inflorescence branches androgynous, with 1 (perhaps sometimes more) basal female spikelet, and ca. 6 upper and terminal male flowers. Glumes pale brown or brown, with yellowish brown midvein, ovate or ovate-oblong, 4.5–5.5  $\times$  1.5–2 mm, membranous, midvein narrow, margin hyaline, apex acute or mucronate. Prophylls yellowish brown, oblong or oblong-elliptic, 4.3–5  $\times$  1–1.5 mm, membranous, 2-keeled, keels smooth, margins free from apex almost to base, apex rounded or slightly 2-toothed. Immature nutlets yellowish, oblong-obovoid, ca. 3  $\times$  1 mm. Rachilla sometimes present in female spikelets, very short. Stigmas 3. Fl. and fr. Apr.

- Sandy ground; ca. 2700 m. S Sichuan (Xichang).

This taxon is known only from the immature type specimen; further collections are required to assess its status, in particular its relationship with *Kobresia royleana* subsp. *minshanica*.

**9. *Kobresia condensata*** (Kükenthal) S. R. Zhang & Noltie, *comb. et stat. nov.*

密穗嵩草 mi sui song cao

Basionym: *Kobresia capillifolia* (Decaisne) C. B. Clarke var. *condensata* Kükenthal, Notes Roy. Bot. Gard. Edinburgh 7: 134. 1912.

Rhizomes short. Basal sheaths prominent and persistent, outer ones dark brown, inner ones orange-brown, margins and apices fibrillose, retaining dried leaf blades. Culms densely tufted, erect, stiff, obtusely trigonous, 14–44 cm, slender, 1–1.8

mm in diam. Leaves basal, shorter than culms; blade stiffly erect, filiform, V-shaped in cross section, 0.5–1 mm wide. Inflorescence a dense panicle, brown, oblong-lanceolate, to 2–4  $\times$  0.6–1 cm; branches short, obliquely appressed; lowest involucre bract glumelike, apex shortly aristate. Lateral branches androgynous with 1 or 2 basal female spikelets and up to 10 male flowers, or unisexual with up to 6 female spikelets. Glumes brown, with conspicuous green midvein, ovate-oblong, 5.5–6  $\times$  2.7–3 mm, papery, midvein broad, margin hyaline, apex acute or mucronate. Prophylls yellowish brown, oblong, 4–4.5  $\times$  1.5–1.8 mm, membranous, strongly 2-keeled, keels minutely scabrid, margins free nearly to base, apex hyaline, truncate. Nutlets cream, oblong, compressed trigonous, 3–3.5  $\times$  1.1–1.7 mm, not or very shortly beaked, very shortly stipitate. Stigmas 3. Fl. and fr. Jun–Jul.

- Streambeds, river terraces and wet meadows with shrubs, open areas in mixed conifer forests; 3200–4000 m. SW Sichuan (Daocheng, Xiangcheng), NW Yunnan (Lijiang).

**10. *Kobresia tunicata*** Handel-Mazzetti, Symb. Sin. 7: 1254. 1936.

玉龙嵩草 yu long song cao

Rhizomes short. Basal sheaths prominent and persistent, brown, not shiny, not retaining dried leaf blades. Culms densely tufted, erect and rigid, trigonous, 20–25 cm tall, ca. 1.5 mm in diam. Leaves basal, longer than culms; blade flat or folded, 1.5–3 mm wide, midrib distinct abaxially. Inflorescence loosely paniculate, brown, lanceolate, ca. 5 cm  $\times$  7 mm; lowest involucre bract glumelike, blunt; inflorescence branches linear, androgynous; spikelets unisexual, terminal spikelets male (up to 3), lower ones (up to 9) female. Female glumes brown, with green midvein, ovate-lanceolate or oblong-ovate, 5–5.5  $\times$  1.5–2 mm, midvein narrow, margin hyaline, apex subacute or obtuse. Prophylls pale brown, linear-lanceolate, 5.2–6  $\times$  ca. 1 mm, papery, apex hyaline, 2-keeled, keels scabrid, margins free to base, overlapping. Immature nutlets narrowly elliptic, obscurely trigonous, ca. 4 mm (including stipe)  $\times$  0.8 mm, stipitate, crowned with stout beaklike style base, beak ca. 1 mm. Stigmas 3. Sterile rachilla of female spikelets flat, ca. 2 mm, sometimes with vestigial glume at apex. Fl. and fr. May–Sep.

- Alpine grasslands, marshes at edges of pools; 3300–4300 m. Sichuan, Yunnan.

Both Kükenthal and Ivanova (in schedis, 1939, 1941) referred the type specimen of *Kobresia tunicata* (Handel-Mazzetti 3525, WU) to *K. kansuensis*, of which it may only be a less-robust form with unisexual spikelets. It is also possible that it is a form of *K. graminifolia* with a branched inflorescence, but further collections are required.

**11. *Kobresia filifolia*** (Turczaninow) C. B. Clarke, J. Linn. Soc., Bot. 20: 381. 1883.

丝叶嵩草 si ye song cao

*Elyna filifolia* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 28(1): 353. 1855; *Kobresia capillifolia* (Decaisne) C. B. Clarke var. *filifolia* (Turczaninow) Kükenthal; *K. filifolia* var. *macrophylla* Y. C. Yang; *K. gracilis* Meinshausen; *K. macrophylla* (Y. C. Yang) P. C. Li; *K. pratensis* Freyn.

Rhizomes short. Basal sheaths prominent and persistent, orange-brown, not retaining dried leaf blades, sometimes decaying to fibers. Culms densely tufted, obtusely trigonous, 15–50 cm, slender, 0.6–1 mm in diam. Leaves basal, shorter than or subequaling culms; blade filiform, weak, margin involute, 0.5–1.5 mm wide. Inflorescence a dense spike-like panicle (occasionally reduced to a spike), reddish brown or pale brown, cylindrical, 1–3 × 0.3–0.7 cm, branches short, appressed; lowest involucre bract glumelike, apex aristate. Lower inflorescence branches with terminal spikelets male, lower spikelets bisexual. Bisexual spikelets 2–7-flowered, basal one female, other 1–6 male. Glumes reddish brown or brown, with yellowish brown midvein, ovate or ovate-oblong, (3–)4–4.5(–6.2) (excluding arista) × 1.5–2.8 mm, membranous, margin broadly hyaline, apex acute or aristate. Prophylls brown or yellowish brown, ovate-oblong or oblong-elliptic, 3–4 × 1–1.8 mm, membranous, 1- or 2-keeled, keels slightly scabrid, margins free to base, apex rounded or slightly 2-toothed. Nutlets dark brown, obovoid or oblong-obovoid, trigonous or biconvex, 2.1–3.5 (excluding beak) × 1–1.2 mm, very shortly stipitate, shortly beaked, beak slightly conic. Stigmas usually 3, occasionally both 3 and 2 on same inflorescence. Fl. and fr. May–Oct.  $2n = ca. 60$ .

Wet grassy slopes, boggy meadows; 1700–2900 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi [Mongolia, Russia].

Forms with simple (spicate) inflorescences are similar to *Kobresia myosuroides* subsp. *bistaminata* and to *K. capillifolia* (both of which share the bistigmatic tendency). Such forms differ from both taxa in having weaker leaves; and they differ from the latter in having dull, orange-brown, shorter basal sheaths and usually more than 2 male flowers per spikelet.

**12. *Kobresia kansuensis*** Kükenthal, Acta Horti Gothob. 5: 38. 1930.

甘肃嵩草 gan su song cao

*Kobresia pseuduncinoides* Noltie.

Rhizomes short, thick, woody. Basal sheaths prominent, dark brown, shiny, leathery, not retaining dried leaf blades. Culms densely tufted, erect, sharply triquetrous, (14–)20–70 cm tall, stout, 2.2–4(–6) mm in diam. Leaves basal, shorter than or ± equaling culms; blade flat, sometimes folded at base, 4–9 mm wide, midrib distinct abaxially. Inflorescence densely paniculate (occasionally spicate), brown or dark brown, partly green, narrowly oblong to lanceolate, (2–)3–6.5 × 0.7–1.8 cm, with numerous short, appressed branches; inflorescence branches simple; lowest involucre bract glumelike, broad green midvein elongated into filiform arista not exceeding inflorescence. Terminal spikelets of inflorescence branches male, lower ones bisexual with 1 basal female flower and 2–4(–6) distal male flowers, sometimes with some unisexual female ones above (or throughout). Glumes brown, with yellowish green or green midvein, oblong, oblong-elliptic, or oblong-ovate, 5–10 × 2–3.5 mm, midvein narrow, margin narrowly hyaline near apex, apex acute to strongly aristate. Prophylls yellow or yellowish green in lower part, brown in upper part, narrowly oblong, 4.5–7.4 × 1–1.3 mm, papery, 2-keeled, keels minutely scabrid, sometimes 2–4-veined between keels, margins open to base. Nutlets brown or grayish brown, narrowly obovoid or narrowly oblong, trigo-

nous, 2.8–4(–5) × 0.8–1 mm, very shortly stipitate, shortly beaked, beak to 0.6 mm. Stigmas 3. Fl. and fr. May–Oct.

Shaded and wet places, open marshes, among shrubs, alpine meadows, grassy slopes, streamsides; 3000–4700 m. Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, Nepal].

Specimens from Bhutan, Nepal, and SE Xizang (described as *Kobresia pseuduncinoides*) tend to be extremely robust, with large prophylls and strongly aristate glumes, but variation in these characters is found to be continuous. Forms with simple spikes can be distinguished from robust forms of *K. cuneata* by their flat leaves.

**13. *Kobresia royleana*** (Nees) Boeckeler, Linnaea 39: 8. 1875.

喜马拉雅嵩草 xi ma la ya song cao

Rhizomes short, thick, woody. Basal sheaths prominent, brown or reddish brown, dull, not fibrillose, retaining dried leaf blades. Culms densely tufted, rigid, acutely trigonous, or subterete in lower part, (2–)6–75 cm tall, 1–2.5 mm in diam. Leaves basal, shorter than culms; blade flat, 2–4 mm wide, midrib distinct abaxially. Inflorescence a dense or slightly loose panicle, brown, 1–3.5 × 0.6–1.2 cm; inflorescence branches simple, obliquely ascending, decreasing in length toward apex; lowest involucre bract glumelike, apex aristate. Terminal spikelets of inflorescence branches male, lower ones bisexual or unisexual. Bisexual spikelets with 1 basal female flower and 2 or 3(–6) distal male flowers. Glumes brown, with green midvein, ovate-oblong, 2.6–5.1 × 1.7–3.5 mm, margin hyaline or not, apex acute or aristate. Prophylls pale brown, oblong or oblong-lanceolate, 2.7–5 mm, membranous, 2-keeled, keels scabrid, margins open to base. Nutlets narrowly oblong, trigonous, 1.7–4 mm, beak to 1 mm, very shortly stipitate. Sterile rachilla sometimes present in female spikelets, to 1/3 as long as nutlet. Stigmas 3. Fl. and fr. May–Sep.

Moist habitats, among scrub; 700–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, India (Himachal Pradesh, Uttarakhand), Kashmir, Kyrgyzstan, Nepal, Pakistan, Tajikistan].

- 1a. Spikelets bisexual; culms rigid, acutely trigonous, or subterete in lower part, 5–35 cm tall, 1.5–2.5 mm in diam.; leaf blade 2–4 mm wide ..... 13a. subsp. *royleana*
- 1b. Spikelets unisexual; culms trigonous, or subterete in lower part, 30–75 cm tall, slender, 1–1.5(–1.8) mm in diam.; leaf blade 1.5–2(–2.5) mm wide ... 13b. subsp. *minshanica*

**13a. *Kobresia royleana* subsp. *royleana***

喜马拉雅嵩草(原亚种) xi ma la ya song cao (yuan ya zhong)

*Trilepis royleana* Nees, Edinburgh New Philos. J. 17: 267. 1834; *Elyna kokanica* Regel; *E. stenocarpa* Karelin & Kirilov; *Kobresia paniculata* Meinshausen; *K. royleana* var. *kokanica* (Regel) Kükenthal; *K. royleana* var. *paniculata* (Meinshausen) Kükenthal; *K. stenocarpa* (Karelin & Kirilov) Steudel; *K. stenocarpa* var. *royleana* (Nees) C. B. Clarke; *K. stenocarpa* var. *simplex* Y. C. Yang.

Culms rigid, acutely trigonous, or subterete in lower part, 5–35 cm tall, 1.5–2.5 mm in diam. Leaves basal, blade flat, 2–4 mm wide. Inflorescence a dense panicle, lower branches some-

times slightly distant, 1–3.5 × 0.6–1.2 cm. Terminal spikelets of inflorescence branches male, lateral ones bisexual or unisexual. Lower spikelets of branches usually bisexual with 1 basal female flower and 2 or 3(–6) distal male flowers. Glumes ovate-oblong, 2.6–4.5 × 3.2–3.5 mm. Prophylls 3–5 mm. Nutlets 2.4–4 mm, beak to 1 mm.

Moist habitats; 700–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, India (Himachal Pradesh, Uttarakhand), Kashmir, Kyrgyzstan, Nepal, Pakistan, Tajikistan].

Records of *Kobresia caricina* Willdenow (FRPS 12: 22–23. 2000) and *K. persica* Kükenthal & Bornmüller (loc. cit.: 35–36) are based on misidentifications of *K. royleana* subsp. *royleana*.

**13b. *Kobresia royleana* subsp. *minshanica*** (F. T. Wang & Tang ex Y. C. Yang) S. R. Zhang, Novon 9: 453. 1999.

岷山嵩草 *min shan song cao*

*Kobresia minshanica* F. T. Wang & Tang ex Y. C. Yang, Acta Biol. Plateau Sin. 2: 1. 1984; *K. menyuanica* Y. C. Yang.

Culms trigonous, or subterete in lower part, 30–75 cm tall, slender, 1–1.5(–1.8) mm in diam. Leaf blade flat, 1.5–2(–2.5) mm wide. Inflorescence narrowly paniculate, compact or slightly loose in lower part, 1.2–3.5 × 0.7–0.9 cm. Lower spikelets of inflorescence branches usually unisexual with 1 female flower only (occasionally bisexual with 1 basal female flower and 2–5 distal male flowers). Glumes ovate-oblong, 3.3–5.1 × 1.7–2.1 mm. Prophylls 2.7–4.4 mm. Nutlets 1.7–3 mm, beak ca. 0.4 mm. Sterile rachilla in female spikelets much shorter than nutlet.

• Moist places, hillsides, among scrub; 2900–3800 m. Gansu, Qinghai, Sichuan, Yunnan.

**14. *Kobresia macrantha*** Boeckeler, Beitr. Cyper. 1: 39. 1888.

大花嵩草 *da hua song cao*

*Blysmocarex macrantha* (Boeckeler) K. V. Ivanova; *B. macrantha* subsp. *nudicarpa* (Y. C. Yang) D. S. Deng; *B. nudicarpa* Y. C. Yang; *Kobresia macrantha* var. *nudicarpa* (Y. C. Yang) P. C. Li; *K. nudicarpa* (Y. C. Yang) S. R. Zhang.

Rhizomes elongate, slender, stoloniferous. Basal sheaths pale brown, retaining dried leaf blades. Culms scattered, erect, trigonous, 3–17 cm tall, 1–1.5 mm in diam. Leaves basal, shorter than culms; blade flat, 1–3 mm wide, midrib distinct abaxially. Inflorescence paniculate, cylindrical to ovoid, 1–2 × 0.6–1 cm; inflorescence branches androgynous or unisexual (whole inflorescence sometimes ± unisexual), lowest branch sometimes slightly distant; lowest involucre bract leaflike or glumelike, apex long aristate. Spikelets usually unisexual; glumes chestnut-brown with green midvein, ovate to ovate-lanceolate, 4–6.3 × 2–2.3 mm, margin broadly hyaline, apex acute or obtuse. Prophylls yellowish brown, ovate-lanceolate, 3–3.6 × 1.2–2 mm, thinly membranous, 2-keeled, keels smooth, margins free or connate at base. Nutlets elliptic-ovoid or subcircular, flattened, 1.4–2 × 0.8–1 mm, not beaked, conspicuously stipitate, stipe 0.6–1 mm. Sterile rachilla of female spikelets terete, minute, subequaling stipe of nutlet. Stigmas 2, very long. Fl. and fr. Jun–Aug.

Open ground, sandy soils, meadows in river valleys; 2500–4800 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Nepal].

**15. *Kobresia hohxilensis*** R. F. Huang, Biol. & Human Physiol. Hoh Xil Region, 101. 1996.

匍茎嵩草 *pu jing song cao*

*Blysmocarex macrantha* (Boeckeler) K. V. Ivanova subsp. *stolonifera* (Y. C. Tang ex P. C. Li) D. S. Deng; *Kobresia stolonifera* Y. C. Tang ex P. C. Li.

Rhizomes elongate, slender, stoloniferous. Basal sheaths yellowish brown or brown, 2–5 cm, retaining dried leaf blades or not. Culms scattered, erect or curved, subterete, slender, 3–20 cm tall, 0.6–1 mm in diam. Leaves basal, shorter than culms; blade filiform, margin involute, 0.4–0.8 mm wide. Inflorescence narrowly paniculate, sometimes spicate, reddish brown, cylindrical to narrowly ovoid, 1.5–2 × ca. 0.8 cm; lower inflorescence branches androgynous, or with mixed female and male spikelets, upper part of inflorescence spicate consisting of bisexual and terminal male spikelets; lowest involucre bract glumelike, apex long aristate. Spikelets unisexual and bisexual; glumes reddish brown, with yellowish brown midvein, narrowly ovate, 5.6–6.5 × 2–3 mm, margin hyaline, apex rounded or acute. Prophylls yellow to yellowish brown, narrowly ovate, 4.3–6.5 × 1.6–2.7 mm, papery to leathery, margins free or connate at base and overlapping. Nutlets broadly oblong, flattened, 2–3 × 1.5–1.8 mm, not beaked, stipe 0.6–1 mm. Sterile rachilla of female spikelets terete, minute. Stigmas 2, very long, slender. Fl. and fr. Jun–Sep.

• Sandy or rocky and sandy ground, open grassy plains; 3100–4900 m. Gansu, Qinghai, Xizang.

**16. *Kobresia inflata*** P. C. Li in S. Y. Jin & Y. L. Chen, Cat. Type Spec. Herb. China (Suppl.), 73. 1999.

膨囊嵩草 *peng nang song cao*

Rhizomes obliquely and shortly elongate. Basal sheaths yellowish brown, dull, retaining dried leaf blades. Culms tufted, obscurely trigonous, 4–12 cm tall, usually slender, 0.6(–1.4) mm in diam. Leaves basal, shorter than culms, curved; blade flat, 2–3 mm wide, midrib distinct abaxially. Inflorescence spicate or sometimes paniculate, 2–2.5 × 0.7–2 cm, predominantly unisexual; branches if present short, appressed; lowest involucre bract glumelike, apex aristate to varying degrees. Spikelets unisexual (sometimes bisexual), shortly stipitate; glumes brown to yellowish brown, ovate, 4–7.2 × 3–3.5 mm. Prophylls brown or yellowish green marked with brown, utriculiform, inflated (not tightly appressed to nutlet at maturity), ovoid, beaked, 5.5–8 × 2.3–3 mm, thickly papery or leathery, 2-keeled, keels smooth, apex weakly notched. Nutlets obovoid, triquetrous, 2.5–4 × 1.8–2.5 mm, not beaked, style base disklike. Sterile rachilla of female spikelets flat, subequaling or exceeding nutlet, sometimes with 1 or 2 male flowers distally. Stigmas 3. Fl. and fr. Jul–Sep.

Alpine meadows, grasslands on slopes, dry banks by streams, scree; 3600–4600 m. Xizang, Yunnan [Bhutan].

This species is similar to *Kobresia nitens* C. B. Clarke of the W Himalayas, which differs in having bisexual spikelets.

**17. *Kobresia yadongensis*** Y. C. Yang in C. Y. Wu, Fl. Xizang. 5: 387. 1987.

亚东嵩草 ya dong song cao

Plants forming dense, round patches; rhizomes very short. Basal sheaths prominent and persistent, brown, dull, not retaining dried leaf blades. Culms erect, subterete, dwarf, ca. 0.5–(4) cm tall, scarcely emerging from sheaths. Leaves basal, usually longer than culms (to 1.5 cm); blade stiffly erect, filiform, ca. 0.8 mm wide, margin involute. Inflorescence spicate, unisexual; all spikelets 1-flowered. Male spikes not seen. Female spike pale brown, subspherical, ca. 1 cm, spikelets ca. 5; lowest involucral bract glumelike with long green arista. Female glumes ovate, ca. 5 (excluding arista)  $\times$  3.5 mm, brown laterally, with yellowish green midrib, midrib broad, 3-veined, margin broadly hyaline, apex acute or aristate. Prophylls flushed brown, utriculiform, triangular-ovoid, inflated (not tightly appressed to nutlet at maturity), 4–5  $\times$  2.5–4 mm, thickly papery or leathery, keels obscure, minutely hispid, margins fused to above middle, apex acute, notched. Nutlets triangular-ovoid, 3-lobed, 2.5–3  $\times$  ca. 2.3 mm, attenuate to apex. Stigmas 3. Sterile rachillas flat, minute, ca. 1/3 as long as nutlet. Fl. and fr. Sep.

• Alpine meadows, gravelly river terraces; 4800–5100 m. S Xizang (upper Targo Tsangpo basin, Yadong).

**18. *Kobresia humilis*** (C. A. Meyer ex Trautvetter) Sergievskaja in Komarov, Fl. URSS 3: 111. 1935.

矮生嵩草 ai sheng song cao

*Elyna humilis* C. A. Meyer ex Trautvetter, Trudy Imp. S.-Peterburgsk. Bot. Sada 1: 21. 1871; *Kobresia royleana* (Nees) Boeckeler var. *humilis* (C. A. Meyer ex Trautvetter) Kükenthal.

Rhizomes short. Basal sheaths prominent, pale brown to brown, dull, retaining dried leaf blades. Culms densely tufted, erect, obtusely trigonous, 2–15 cm tall, 0.8–1.5 mm in diam. Leaves basal, shorter than culms, sometimes recurved; blade flat, midrib distinct abaxially, folded at base, 1–2.2 mm wide. Inflorescence spicate, brown, densely cylindric, 0.8–1.7  $\times$  0.4–0.6 cm, with up to 10 spikelets; lowest involucral bract glumelike, aristate. Terminal spikelets of inflorescence male, lower ones bisexual with 1 basal female flower and 2–7 distal male flowers. Glumes brown, with a yellowish green or green midvein, oblong, ovate-elliptic, or ovate, 3–5  $\times$  1.5–2.5 mm, margin broadly hyaline, apex obtuse or rounded, sometimes aristate. Prophylls pale brown, oblong or elliptic, 3–5  $\times$  1.5–2 mm, membranous, glabrous, 2-keeled, keels scabrid, margins open to base. Nutlets brown or grayish brown, narrowly obovoid or elliptic, trigonous, 2.5–3  $\times$  1–1.5 mm, very shortly stipitate, shortly beaked. Stigmas usually 3. Fl. and fr. Jun–Sep.

Sunny slopes, alpine meadows; 2500–4400 m. ?Ningxia, ?Qinghai, Xinjiang, Xizang [Afghanistan, India (Sikkim), Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Tajikistan, Uzbekistan; SW Asia].

This species sometimes has two stigmas, and may then resemble *Kobresia pusilla*.

**19. *Kobresia duthiei*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 697. 1894.

线形嵩草 xian xing song cao

Rhizomes short. Basal sheaths persistent, brown, reddish brown, or yellowish brown, dull, not fibrillose, retaining dead leaf blades or not. Culms densely tufted, stiffly erect, subterete, (0.5–)4–20(–40) cm tall, 0.6–1.2 mm in diam. Leaves basal, shorter than culms; blade flat, 1.4–2.3 mm wide, midrib distinct abaxially. Inflorescence spicate, greenish or pale brown, linear or linear-oblong, 1–5  $\times$  0.2–0.4 cm, dense; all spikelets bisexual, occasionally male flowers reduced; lowest involucral bract glumelike, apex acute or aristate. Spikelets usually 2-flowered, basal one female, distal one male. Glumes pale brown laterally, with green midvein, ovate, 2–4.5  $\times$  1.5–2.6 mm, midvein broad, 3-ribbed, margin hyaline, apex acute or obtuse, sometimes with very short scabrid arista; male glume 2.3–3.6 mm, stamen 1. Prophylls pale green or yellowish brown with ferruginous spots and lines, oblong or linear-oblong, (2.2–)3–5  $\times$  0.7–1 mm, membranous, 2-keeled, keels scabrid, margins united to above middle, apex obtuse or 2-toothed. Nutlets pale brown, narrowly oblong, trigonous, 1.9–2.8 (excluding beak)  $\times$  0.6–0.9 mm, beak 0.5–1.5 mm, exerted from prophyll when mature, shortly stipitate. Stigmas 3. Fl. and fr. May–Sep.

Bare mossy peat, wet and open marshes, exposed and dry rocky ridges, grassy slopes; 3600–4600 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim, Uttarakhand), Nepal].

**20. *Kobresia filicina*** (C. B. Clarke) C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 696. 1894.

蕨状嵩草 jue zhuang song cao

*Hemicarex filicina* C. B. Clarke, J. Linn. Soc., Bot. 20: 384. 1883; *Kobresia filicina* var. *subfilicinoides* P. C. Li.

Rhizomes short. Basal sheaths persistent, brown, reddish brown, or yellowish brown, dull, not fibrillose, retaining a few dried leaf blades. Culms tufted, flaccid or slightly stiff, obtusely trigonous, 8–35 cm tall, slender, 0.4–0.8 mm in diam. Leaves basal, slightly shorter than to exceeding culms; blade flat or partly folded, 0.6–2(–3) mm wide, usually flaccid, midrib distinct abaxially. Inflorescence spicate, yellowish green or partly brown, linear or linear-oblong, 1–4(–5)  $\times$  0.1–0.3 cm, dense above, basal spikelets usually slightly distant; a few terminal spikelets male, lower ones bisexual; lowest involucral bract glumelike, apex aristate, arista to 8 mm. Bisexual spikelets usually 2-flowered, basal one female, distal one male, male flower with 1 or 2(or 3) stamens. Glumes yellowish brown laterally, with green midvein, ovate-oblong, 2–3 (excluding arista)  $\times$  0.5–1 mm, midvein broad, 3-ribbed, margin hyaline, apex aristate or acute, arista to 2 mm. Prophylls yellowish green or yellowish brown with ferruginous spots and lines, oblong or linear-oblong, 2–2.6  $\times$  0.5–0.7 mm, membranous, 2-keeled (sometimes obscurely), keels scabrid, margins open to middle part or below, apex rounded. Nutlets narrowly oblong, trigonous, 1.9–2.4 (excluding beak)  $\times$  ca. 0.6 mm, beak ca. 0.5 mm, exerted from prophylls when mature, shortly stipitate, stipe ca. 0.2 mm. Stigmas 3, short. Fl. and fr. Jul–Oct.

Forest understories, dry riverbeds, on rocks; 2000–4000 m. Sichuan, Xizang, Yunnan [Bhutan, India (Himachal Pradesh, Sikkim, Uttarakhand), Nepal].

A specimen with wide leaves and long spikes from Yunnan was described as *Kobresia filicina* var. *subfilicinooides*, but similar forms have been seen from Nepal and are not worth taxonomic recognition.

**21. *Kobresia robusta*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 29: 218. 1883.

粗壮嵩草 cu zhuang song cao

*Kobresia robusta* var. *sargentiana* (Hemsley) Kükenthal; *K. sargentiana* Hemsley.

Rhizomes short or obliquely elongated and rarely stoloniferous, thick, woody. Basal sheaths prominent and persistent, yellow to yellowish brown, slightly shiny, to 5 cm, not retaining dried leaf blades. Culms tufted, erect or curved, rigid, obtusely trigonous or subterete, 5–60 cm tall, stout, 1.2–3 mm in diam. Leaves basal, longer or shorter than culms; blade rigid, erect or curved, filiform, 0.7–1.7(–2) mm wide, margin involute. Inflorescence densely spicate, with ca. 10 spikelets, lower spikelets sometimes distant, very pale orange-brown, cylindrical, 2–5 × 0.4–0.8 cm; terminal spikelets male, lower spikelets bisexual; lowest involucre bract glumelike, apex rounded. Bisexual spikelets with 1 basal female flower and 1–3 distal male flowers. Glumes yellowish brown laterally, with pale yellow to yellow midvein, broadly ovate, (7.2–)7.8–10 × 5.5–6.5 mm, midvein broad, 3–9-veined, margin very broadly hyaline, apex obtuse. Prophylls yellowish brown, utricle-like, broadly elliptic or ovate-elliptic, abruptly narrowed above, 6.5–10 × 2.5–3.5 mm, membranous, obscurely 2-keeled, keels smooth, margins free in upper 1/3 or almost to base. Nutlets grayish brown, oblong or broadly elliptic, trigonous, concave, 4–5 × 2–2.4 mm, very shortly beaked, stipitate, stipe ca. 1 mm. Stigmas 3. Fl. and fr. May–Sep.

• Sandy soils, herb-rich meadows; 2900–5200 m. Gansu, Qinghai, Xinjiang, Xizang [?Mongolia].

**22. *Kobresia burangensis*** Y. C. Yang, Fl. Xizang. 5: 374. 1987.

普兰嵩草 pu lan song cao

Rhizomes short. Basal sheaths prominent, yellowish brown to pale brown, shiny, not retaining dried leaf blades. Culms densely tufted, rigid and erect, subterete, 8–12 cm tall, 1–1.2 mm in diam. Leaves basal, erect, longer than or ± equaling culms; blade filiform, 0.5–0.8 mm wide, margin involute. Inflorescence densely spicate, yellowish brown, narrowly elliptic to lanceolate, 1.8–2(–2.5) × 0.2–0.3 cm; terminal spikelets male, lower ones bisexual; lowest involucre bract glumelike, apex obtuse or rounded. Bisexual spikelets with 1 basal female flower and 2 or 3 distal male flowers. Glumes yellowish brown, with pale green or yellowish green midvein, ovate-oblong or oblong, 5–7 × 2.5–3 mm, obtuse and rounded, midvein broad, margin broadly hyaline. Prophylls lower part pale yellow, upper part brown, obovate-oblong, 3.5–4 × ca. 1.2 mm, membranous, apex truncate and hyaline, 2-keeled, keels slightly scabrid, margins united from base to halfway. Immature nutlets elliptic, obscurely trigonous. Stigmas 3. Fl. Jul.

• Grassy slopes; ca. 5000 m. SW Xizang (Burang).

This species is known only from the immature type specimen.

**23. *Kobresia cuneata*** Kükenthal, Acta Horti Gothob. 5: 39. 1930.

截形嵩草 jie xing song cao

*Kobresia lepidochlamys* F. T. Wang & Tang ex P. C. Li.

Rhizomes short, thick, woody. Basal sheaths prominent, brown or dark brown, margins fibrillose, retaining dried leaf blades. Culms densely tufted, erect and stout, obtusely trigonous, (10–)15–45 cm tall, 1.5–2.5 mm in diam. Leaves basal, shorter than or ± equaling culms; blade filiform, 1–3(–5) mm wide, V- or U-shaped in cross section, midrib not distinct abaxially. Inflorescence a dense spike, sometimes interrupted at base, brown or dark brown, oblong to narrowly oblong, 2–6 × 0.5–1.2 cm; lowest involucre bract glumelike, apex aristate. Spikelets (except a few terminal ones that may be male only) bisexual with a basal female flower and (1–)3–7 distal male flowers; glumes brown or chestnut-brown, with yellowish green or green midvein, oblong, oblong-elliptic, or oblong-ovate, 5–6 × 2–3 mm, margin hyaline or not, apex obtuse or rounded and aristate; arista sinuate, 1–5 mm, margin hispid. Prophylls yellow or whitish yellow in lower part, brown above, oblong, 5–8 × 1.8–3 mm, papery, 2-keeled, keels smooth or very minutely scabrid, with up to 8 veins between keels, margins open to base, apex truncate. Nutlets yellow or yellowish brown, oblong, trigonous, 3–4.5 × 2–3 mm, very shortly stipitate, not or shortly beaked. Stigmas 3. Fl. and fr. May–Sep.

• Alpine meadows among shrubs, alpine swampy meadows, wet grassy slopes, grassy areas under woods; 3000–4800 m. Gansu, ?Qinghai, Sichuan, Xizang, Yunnan.

This is like a robust form of *Kobresia schoenoides*, from which it is distinguished by its fibrillose sheaths; longer spikes; midribs of glumes broader, green, developed into an arista; and nutlets larger, narrower. In the description of *K. lepidochlamys*, the male flowers were misinterpreted as perianth scales. A specimen from Yunnan (*Rock 9600*) is intermediate between *K. cuneata* and *K. kansuensis*: it has the spicate inflorescence and fibrillose leaf sheaths of the former, but the very robust habit and flat leaves (midribs distinct abaxially) of the latter.

**24. *Kobresia schoenoides*** (C. A. Meyer) Steudel, Syn. Pl. Glumac. 2: 246. 1855.

赤箭嵩草 chi jian song cao

*Elyna schoenoides* C. A. Meyer in Ledebour, Fl. Altaic. 4: 235. 1833; *Kobresia deasyi* C. B. Clarke; *K. glaucifolia* F. T. Wang & Tang ex P. C. Li; *K. lacustris* P. C. Li; *K. maquensis* Y. C. Yang; *K. pamiroalaica* K. V. Ivanova; *K. septatonodosa* T. Koyama.

Rhizomes short. Basal sheaths prominent, commonly yellowish- to reddish brown (occasionally dark brown), shiny, leathery, not retaining dried leaf blades. Culms densely tufted, erect, subterete or upper part trigonous, 3–60(–70) cm tall, stout, 1–2.5 mm in diam. Leaves basal, erect or sometimes curved, longer or shorter than culms; blade filiform, 1–2 mm wide, midrib not distinct abaxially, margin involute. Inflorescence densely spicate, dark to yellowish brown, oblong to clavate, occasionally ovate or narrowly ovate, 1–4 × 0.2–1 cm. Spikelets (except a few terminal ones that may be male only) bisexual; lowest involucre bract glumelike, apex aristate or not.

Bisexual spikelets with 1 basal female flower and (1–)4–7 distal male flowers; glumes brown, with yellowish green midvein, oblong to narrowly ovate or sometimes broadly ovate, 3–6 × 1.2–3.6 mm, midvein broad, margin broadly to narrowly hyaline, apex obtuse or mucronate. Prophylls yellowish brown to brown, oblong, narrowly elliptic, or lanceolate, (3–)3.5–7.3 × (0.9–)1.4–2.5 mm, papery to membranous, 2-keeled (sometimes obscurely so), keels smooth, sometimes many veined between keels, margins free to base. Nutlets pale yellow to grayish brown, obovoid or oblong-obovoid, trigonous, 1.7–3.5 × 1–2.1 mm, 1/2–2/3 as long as prophyll, shortly stipitate, shortly beaked, beak 0.5–0.7 mm. Stigmas 3. Fl. and fr. May–Sep.

Boggy places among shrubs, sedge moors, streamsides, shaded places; 2500–5800 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India (Himachal Pradesh, Sikkim), Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia (Iran)].

**25. *Kobresia setschwanensis*** Handel-Mazzetti, Symb. Sin. 7: 1254. 1936.

四川嵩草 *si chuan song cao*

*Kobresia handel-mazzettii* K. V. Ivanova; *K. longearistita* P. C. Li; *K. pinetorum* F. T. Wang & Tang ex P. C. Li.

Rhizomes short. Basal sheaths prominent and persistent, pale brown, dull or slightly shiny, not fibrillose, not retaining dried leaf blades. Culms densely tufted, stiffly erect, obtusely trigonous, 5–20(–40) cm, slender, 0.7–1.3 mm in diam. Leaves basal, shorter than culms; blade folded or margin involute, stiff, 1–2 mm wide, midrib not distinct abaxially. Inflorescence usually a dense spike (occasionally with 1 or 2 branches at base), greenish brown, cylindrical, 1–3.5 × 0.3–0.6 cm; lowest involucre bract glumelike, apex long or shortly aristate; terminal few spikelets male, lower ones bisexual with 1 female and 2–5 male flowers. Glumes brown, with yellowish green to green midvein, oblong-ovate to oblong-lanceolate, 3–4.5 × 1.5–2.5 mm, papery, midvein broad, margin usually narrowly hyaline, apex usually subacute, sometimes shortly aristate. Prophylls yellowish brown, oblong, 2–4.5 × 1–1.6 mm, membranous, 2-keeled, keels smooth or slightly scabrid, sometimes veined between keels, margins free nearly to base, apex rounded or acute. Nutlets yellowish, narrowly obovoid, compressed trigonous, 2.1–3 × 1–1.3 mm, not beaked, subsessile. Stigmas 3. Fl. and fr. May–Sep.

• Grassy slopes, alpine meadows, swampy meadows and marshes by lakes, dry limestone slopes, forest (including *Pinus*) understories, *Quercus* scrub; 2300–4300 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

This is a slender version of *Kobresia schoenoides* with narrower spikes—linking that species with *K. capillifolia* and *K. tibetica*, together forming a complex that requires further work.

Plants with slender culms, filiform leaves, and small spikes from *Pinus* forests (i.e., dry habitats) in NW Yunnan were described as *Kobresia pinetorum*; but specimens with equally small spikes have been seen from wet habitats, and forms from *Pinus* forests with robust culms and larger spikes are also known: all of these seem best referred to a variable *K. setschwanensis*.

**26. *Kobresia capillifolia*** (Decaisne) C. B. Clarke, J. Linn. Soc., Bot. 20: 378. 1883.

线叶嵩草 *xian ye song cao*

*Elyna capillifolia* Decaisne in Jacquemont, Voy. Inde 4(Bot.): 173. 1844; *Kobresia brunnescens* Boeckeler; *K. capilliformis* N. A. Ivanova; *K. elata* Boeckeler; *K. kashgarica* Dickoré; *K. macrolepis* Meinshausen; *K. ovczinnikovii* T. V. Egorova; *K. yushuensis* Y. C. Yang.

Rhizomes short. Basal sheaths prominent and persistent, brown to dark brown, often shiny, apices and margins sometimes fibrillose, not retaining dried leaf blades. Culms densely tufted, erect, slightly stiff, obtusely trigonous, (5–)10–45 cm tall, slender, 0.6–1 mm in diam. Leaves basal, shorter than to equaling culms; blade stiffly erect, filiform (tubular in section), margin involute, 0.7–1 mm wide. Inflorescence a dense spike, lowest spikelets sometimes slightly distant, brown, narrowly cylindrical, 2–4.5 × 0.2–0.4 cm; lowest involucre bract glumelike, apex aristate or not; terminal few spikelets male, lower ones bisexual. Bisexual spikelets with 1 basal female floret and (1 or)2–4 distal male florets. Glumes pale brown to dark brown, with yellowish green to green midvein, usually broadly oblong-lanceolate to ovate, 4–6 × 2.5–2.8 mm, papery, midvein narrow or wide, margin broadly hyaline, apex usually rounded. Prophylls brown, oblong, lanceolate, or elliptic, 2.5–5.3 × 0.8–1.8 mm, membranous, 1- or 2-keeled, keels smooth or slightly scabrid, margins free nearly to base, apex rounded or truncate. Nutlets brown to dark brown, elliptic to obovoid, trigonous, (2–)2.5–3.5 × 0.8–1.6 mm, shortly beaked, subsessile. Stigmas (2 or)3. Fl. and fr. May–Sep.

Dry and open grassy and rocky slopes, slopes in *Juniperus* scrub, disturbed slopes in *Picea* forests, grassy areas within *Abies* forests; 2000–4800 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Afghanistan, Bhutan, India (Himachal Pradesh, Sikkim), Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Tajikistan].

*Kobresia kashgarica*, described from high elevations in Xinjiang, appears to be an extremely reduced form of *K. capillifolia* but is also similar to *K. myosuroides* subsp. *bistaminata*. Reduced forms of many species can be found; they appear to represent phenotypic responses to extreme habitats and (while often difficult to identify) do not merit specific treatment.

**27. *Kobresia tibetica*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 29: 219. 1883.

西藏嵩草 *xi zang song cao*

*Kobresia capillifolia* (Decaisne) C. B. Clarke var. *tibetica* (Maximowicz) Kükenthal.

Rhizomes short. Basal sheaths prominent, brown to dark brown, dull, not retaining dried leaf blades. Culms densely tufted, rigid and erect, subterete or upper part trigonous, 10–40 cm tall, 1–1.5 mm in diam. Leaves basal, erect, shorter than culms; blade filiform (tubular in section), 0.5–1 mm wide. Inflorescence spicate, brown or dark brown, broadly and densely cylindrical, 1–2.5 × 0.3–0.4 cm; terminal spikelets male, lower ones bisexual; lowest involucre bract glumelike, apex aristate or not. Bisexual spikelets with a basal female flower and 2–4 distal male flowers. Glumes brown or dark brown, with pale

midvein, oblong to ovate-oblong, 3.5–4.5 × 1.5–2.5 mm, obtuse, midvein narrow, margin narrowly hyaline or not. Prophylls pale colored to yellowish brown or occasionally brown, oblong-ovate, 2.1–3 × 1–1.4 mm, hyaline to very thinly membranous, usually without keels and veins, rarely obscurely keeled, margins free to base. Nutlets brown or dark brown, oblong or narrowly ovoid-oblong, flattened-trigonus, slightly shorter than prophylls, 1.5–2.5(–3) × 1–1.4 mm, very shortly stipitate, shortly beaked. Stigmas 3. Fl. and fr. May–Aug.

• Alpine swampy meadows, weedy plains, marshes, riversides; 2500–4600 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang.

This species is distinguished from *Kobresia capillifolia* with difficulty: the culm is wider, and longer in relation to the leaves, and the spike is shorter in proportion to breadth, and much shorter in proportion to the length of the culm (resembling an *Eleocharis*).

**28. *Kobresia myosuroides*** (Villars) Fiori in Fiori et al., Fl. Italia 1: 125. 1896.

嵩草 song cao

Rhizomes short. Basal sheaths prominent and persistent, reddish brown to dark brown, dull or slightly shiny, margins and apices sometimes fibrillose, not retaining dried leaf blades. Culms densely tufted, erect, slightly stiff, obtusely trigonus or subterete, 3–30(–40) cm tall, 0.5–1 mm in diam. Leaves basal, shorter than or ca. as long as culms; blades stiffly erect, filiform (tubular in cross section), 0.25–0.7 mm wide. Inflorescence a dense spike, reddish brown to brown, narrowly cylindrical, 1–3 × 0.2–0.3 cm, lowest spikelets sometimes slightly distant; lowest involucre bract glumelike, apex aristate or not; a few terminal spikelets male, others bisexual (lower ones occasionally female only). Bisexual spikelets with basal female flower and 1(or 2) male flowers. Glumes yellowish- or reddish brown to dark brown, with pale midvein, ovate or oblong-ovate, 2–4 × 1.2–2.7 mm, submembranous, midvein very narrow, margin broadly to not or narrowly hyaline, apex acute or rounded. Prophylls pale below, brown above, oblong or oblong-ovate, 2.2–3.5 × 1–1.4 mm, membranous, 2-keeled, keels slightly scabrid, margins free to lower 1/3 or nearly to base, upper margin hyaline, apex rounded or acute. Nutlets brown to dark brown, slightly shiny, oblong-obovoid, trigonus or flattened-trigonus, 1.8–3 (including beak) × 0.8–1 mm, shortly beaked, subsessile. Stigmas 2 or 3 (sometimes both on same plant). Fl. and fr. May–Sep.  $2n = 56$ .

Moist or dry open places in calcareous soils, alpine meadows, on rocks, dry ridges, grassy slopes, among shrubs; 1500–4500 m. Gansu, Hebei, Jilin, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang [Japan, Kazakhstan, Korea, Mongolia, Russia; Europe, North America].

- 1a. Stigmas 3; glumes 2.5–4 mm, usually pale brown; nutlets ca. 2.5 mm ..... 28a. subsp. *myosuroides*  
 1b. Stigmas usually 2, but sometimes 3, or a mixture of both on same plant; glumes 2–3 mm, dark brown; nutlets 1.8–2.3 mm ..... 28b. subsp. *bistaminata*

**28a. *Kobresia myosuroides*** subsp. *myosuroides*

嵩草(原亚种) song cao (yuan ya zhong)

*Carex myosuroides* Villars, Prosp. Hist. Pl. Dauphiné, 17. 1779; *C. affinis* R. Brown; *C. bellardii* Allioni; *Elyna myosuroides* (Villars) Fritsch ex Janchen; *E. spicata* Schrader; *Kobresia bellardii* (Allioni) Degland ex Loiseleur-Deslongchamps; *K. filiformis* Dewey; *K. scirpina* Willdenow.

Basal sheaths reddish brown. Inflorescences 1–3 × 0.2–0.3 cm. Glumes yellowish brown or reddish brown to brown, 2.5–4 × 1.2–2 mm. Prophylls oblong, 2.5–3.5 × 1–1.3 mm. Nutlets 2.5–3 (including beak) × 0.8–1 mm. Stigmas 3. Fl. and fr. May–Sep.  $2n = 56$ .

Moist or dry open places in calcareous soils, alpine meadows, on rocks, dry ridges, grassy slopes, among shrubs; 1500–3500 m. Gansu, Hebei, Jilin, Nei Mongol, Shanxi, Xinjiang [Japan, Kazakhstan, Korea, Mongolia, Russia; Europe, North America].

**28b. *Kobresia myosuroides*** subsp. *bistaminata* (W. Z. Di & M. J. Zhong) S. R. Zhang, Novon 9: 453. 1999.

二蕊嵩草 er rui song cao

*Kobresia bistaminata* W. Z. Di & M. J. Zhong, Acta Bot. Boreal.-Occid. Sin. 6: 275. 1986.

Basal sheaths brown to dark brown. Inflorescence 1–2.5 × ca. 0.2 cm. Glumes pale brown to dark brown, 2–3 mm. Prophylls oblong or oblong-ovate, 2.2–2.8 mm. Nutlets 1.8–2.3 mm (including beak). Stigmas usually 2 (sometimes 3, or both 2 and 3 on same plant). Fl. and fr. Jun–Sep.

• Alpine meadows, grassy slopes, among shrubs; 2100–4500 m. Gansu, Nei Mongol, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang.

The frequent bistigmatic tendency found in Chinese plants has not been noted elsewhere in the range of the widespread circumboreal *Kobresia myosuroides*. A similar tendency (though to a lesser degree) is also found in Chinese *K. capillifolia*. Further work may confirm that specific rank for the bistigmatic “Greater Tibetan” taxon is more appropriate.

**29. *Kobresia nepalensis*** (Nees) Kükenthal in Engler, Pflanzener. 38(IV. 20): 40. 1909.

尼泊尔嵩草 ni bo er song cao

*Uncinia nepalensis* Nees in Wight, Contr. Bot. India, 129. 1834; *Carex linearis* Boott (1858), not Clairville (1811); *C. linearis* var. *elachista* C. B. Clarke; *Kobresia nepalensis* var. *elachista* (C. B. Clarke) Kükenthal.

Rhizomes short. Basal sheaths prominent and persistent, pale brown or brown, dull, fibrillose, not retaining dried leaf blades. Culms densely tufted, erect and rigid, occasionally filiform, obtusely trigonus, (2–)10–44 cm tall, 0.7–1.5 mm in diam. Leaves basal, ± equaling culms; blade filiform, margin involute, 0.3–1.1 mm wide. Inflorescence spicate, androgynous, linear, 1.5–8 × 0.2–0.5 cm, dense above, looser below; lowest involucre bract glumelike, apex long aristate. Spikelets all unisexual, 1-flowered. Male glumes yellowish brown laterally, with green midvein, narrowly oblong, ca. 7.5 × 1.5 mm, sides papery, margin not hyaline, apex obtuse. Female glumes brown laterally, with green midvein, ovate to lanceolate, 3.3–5 × 2–2.4 mm, midvein broad, margin hyaline or not, apex mucronate, acute, or obtuse. Prophylls lower part pale green, apex brown,

utriculiform, linear-oblong, 4–7.5 × 0.8–1.7 mm, membranous, 2-keeled, keels scabrid, margins open only near apex. Nutlets narrowly oblong or oblanceolate, trigonous, stipitate and beaked, 3.5–6.5 (including beak and stipe) × 0.7–1 mm, beak 1.5–2.2 mm, stipe ca. 0.5 mm. Stigmas 3. Sterile rachilla of female spikelets green, linear, 1/4–2/3 as long as nutlet, margin ciliate. Fl. and fr. Jun–Oct.

Scree slopes, dry grassy slopes, on rocks, alpine shrubby meadows, damp rocky cliffs; 3600–4600 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim, Uttarakhand), Kashmir, Nepal, Pakistan].

**30. *Kobresia cercostachys*** (Franchet) C. B. Clarke, J. Linn. Soc., Bot. 36: 267. 1903.

尾穗嵩草 wei sui song cao

*Carex cercostachys* Franchet, Bull. Soc. Philom. Paris, sér. 8, 7: 27. 1895; *Kobresia nepalensis* (Nees) Kükenthal var. *stiebritziana* (Handel-Mazzetti) R. C. Srivastava; *K. stiebritziana* Handel-Mazzetti.

Rhizomes short. Basal sheaths prominent and persistent, brown or pale brown, dull, margins strongly fibrillose, not retaining dried leaf blades. Culms densely tufted, erect or sometimes curved, rigid, obtusely trigonous, 5–35 cm tall, 0.7–1.5 mm in diam. Leaves basal, shorter than or equaling culms; blade filiform, folded or involute, 1–2 mm wide, midrib not distinct abaxially. Inflorescence densely spicate, androgynous, brown, linear, 1.7–7 × 0.3–0.7 cm; lowest involucre bract glumelike, apex obtuse, acute, or shortly aristate; upper spikelets male, lower spikelets female (rarely androgynous in lowest part of inflorescence). Male glumes brown, oblong-lanceolate, 4–6 mm, membranous, margin hyaline near apex. Female glumes brown to dark brown, with pale brown or pale green midvein, oblong-lanceolate or lanceolate, 4–6.5(–7.5) × 1.5–2.3 mm, midvein narrow or broad, margin hyaline, apex acute or obtuse, occasionally aristate. Prophylls: lower part pale green, apex brown, narrowly oblong or lanceolate, 4.5–7 × 0.8–1 mm, papery, 2-keeled, keels scabrid, margins free to base, overlapping, apex truncate or notched, hyaline. Nutlets narrowly oblong or oblanceolate, trigonous, shortly stipitate and beaked, 2.7–4 (excluding beak) × 0.6–1.2 mm, beak 0.5–1 mm. Stigmas 3. Sterile rachilla of female spikelets to 1/2 as long as nutlet, sometimes with vestigial glume(s) at apex. Fl. and fr. Jul–Oct.

Scree slopes, grassy slopes among shrubs, on rocks, alpine meadows; 3600–5000 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

**31. *Kobresia esenbeckii*** (Kunth) Noltie, Edinburgh J. Bot. 50: 43. 1993.

三脉嵩草 san mai song cao

*Carex esenbeckii* Kunth, Enum. Pl. 2: 522. 1837, based on *C. trinervis* Nees in Wight, Contr. Bot. India, 120. 1834, not Degland (1807); *C. mutans* Boott ex C. B. Clarke; *Hemicarex hookeri* (Boeckeler) Benth; *H. trinervis* (Boeckeler) Benth & J. D. Hooker ex C. B. Clarke; *Kobresia angusta* C. B. Clarke; *K. foliosa* C. B. Clarke; *K. hookeri* Boeckeler; *K. hookeri* var. *dioica* C. B. Clarke; *K. seticulmis* Boeckeler; *K. trinervis* Boeckeler.

Rhizomes short. Basal sheaths prominent and persistent, brown or dark brown, shiny, sometimes decaying to fibers, not retaining dried leaf blades. Culms densely tufted, erect, trigonous (sometimes obtusely), 3–32 cm tall, slender, 0.5–1 mm in diam. Leaves basal, ± equaling culms; blade flat, 1.5–5 mm wide, midrib distinct abaxially. Inflorescence spicate, unisexual or androgynous, male and female spikes sometimes borne on same plant; all spikelets 1-flowered (occasionally a few at base bisexual with a single male flower). Male spikes compact, 3.5–5 × ca. 0.4 cm; male glumes yellowish brown, narrowly oblong, 7–8.5 × 1.5–2 mm, 1-veined, margin broadly hyaline, apex obtuse. Female and androgynous spikes linear, 1.7–6.5 × 0.15–0.4 cm, spikelets usually loosely arranged; lowest involucre bract glumelike, apex aristate. Female glumes brown laterally, with green midvein, oblong or ovate, 2.2–4 × 1–2 mm, midvein narrow, margin narrowly hyaline, apex mucronate, acute, or obtuse. Prophylls utriculiform when young, splitting to base when mature, pale brown, linear-oblong, 2–3.7 × 0.4–0.7 mm, membranous, 2-keeled, keels ciliate, apex truncate and rounded. Nutlets narrowly oblong or elliptic, curved or not, very shortly stipitate and beaked, 2.5–3.7 (excluding beak) × 0.7–1 mm, stipe ca. 0.5 mm, beak 0.8–2 mm. Stigmas 3, twisted, white in field, thick. Sterile rachilla of female spikelets linear, minute, to 1/4 as long as nutlet. Fl. and fr. May–Oct.

Wet rocks, crevices of cliffs, grassy slopes, lakeshores, on trees; 2800–4300(–4900) m. Sichuan, Xizang, Yunnan [Bhutan, India (Himachal Pradesh, Sikkim, Uttarakhand), Myanmar, Nepal].

**32. *Kobresia fissiglumis*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 696. 1894.

柄果嵩草 bing guo song cao

*Kobresia esenbeckii* (Kunth) Noltie var. *fissiglumis* (C. B. Clarke) Noltie.

Rhizomes short. Basal sheaths prominent and persistent, brown, dull, not retaining dried leaf blades. Culms densely tufted, erect, triquetrous or obtusely trigonous, 3–14 cm tall, slender, ca. 0.5 mm in diam. Leaves basal, shorter than to exceeding culms; blade flat, 1.5–2 mm wide, midrib distinct abaxially. Inflorescences spicate, unisexual, dense above, looser below, male and female inflorescences borne on same plant; all spikelets unisexual, 1-flowered; lowest involucre bract of female spikes glumelike, apex obtuse. Male spikes linear, ca. 1.5 × 0.3 cm; male glumes reddish brown, oblong, 6–7 × ca. 2 mm, 1-veined, margin hyaline, apex obtuse. Female spikes linear, 2.2–4 × 0.2–0.3 cm; female glumes brown or reddish brown laterally, with green midvein, oblong or narrowly ovate, 3.5–5 × 1–1.5 mm, midvein narrow, margin of upper parts hyaline, apex rounded or obtuse. Prophylls pale brown or brown, oblong or elliptic-oblong, 2–3 × 0.5–0.9 mm, membranous, not keeled, margins open to base even in juvenile stage, apex rounded. Nutlets narrowly oblong, trigonous, stipitate and beaked, 2–3.5 (excluding beak) × 0.5–0.9 mm in diam., stipe 0.6–0.7 mm, beak 1–1.5 mm. Stigmas 3, curved, slender. Sterile rachilla of female spikelets linear, minute. Fl. and fr. Jun–Aug.

Grassy slopes, on rocks and cliff ledges; 3200–4300 m. Xizang, Yunnan [Bhutan, India (Himachal Pradesh, Sikkim), Nepal].

**33. *Kobresia falcata*** F. T. Wang & Tang ex P. C. Li, Acta Bot. Yunnan. 12: 18. 1990.

镰叶嵩草 lian ye song cao

Rhizomes short. Basal sheaths prominent and persistent, dark brown, dull, not retaining dried leaf blades. Culms densely tufted, erect, trigonous, 12–15 cm tall, slender, ca. 1 mm in diam. Leaves basal, slightly shorter than or  $\pm$  equaling culms; blade flat, slightly curved and falcate, 2–3.7 mm wide. Inflorescence moderately densely spicate, androgynous, oblong, 1.5–2  $\times$  0.3–0.4 cm; all spikelets 1-flowered, terminal 3 or 4 male, others female; lowest involucral bract glumelike, apex aristate, arista to 9 mm. Male glumes brown, lanceolate, 5–6 mm, membranous. Female glumes brown laterally, with yellowish brown midvein, narrowly oblong, 6–6.5 (excluding arista)  $\times$  ca. 2 mm, papery, margin of upper parts very narrowly hyaline, apex rounded and aristate, arista 1–1.5 mm. Prophylls yellow in lower part, upper parts and margin brown, linear-oblong, 5–5.5  $\times$  0.5–0.7 mm, membranous, 2-keeled, keels scabrid, margins open to base even in juvenile stage, apex rounded. Nutlets narrowly oblong, trigonous, 4.8–5.2 mm (including beak), beak ca. 2 mm, included in prophylls when mature. Stigmas 3. Sterile rachilla of female spikelets linear, minute, ca. 1/5 as long as nutlet. Fl. and fr. Jul–Aug.

- In rock crevices; 2800–4000 m. Gansu, Sichuan.

**34. *Kobresia vidua*** (Boott ex C. B. Clarke) Kükenthal in Engler, Pflanzenr. 38(IV. 20): 40. 1909.

短轴嵩草 duan zhou song cao

*Carex vidua* Boott ex C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 713. 1894; *Kobresia harrismithii* Kükenthal; *K. prattii* C. B. Clarke.

Rhizomes short. Basal sheaths prominent and persistent, brown to dark brown, slightly shiny, not fibrillose, not retaining dried leaf blades. Culms densely tufted, stiffly erect, subterete, (1.5–)3–20 cm tall, slender, 0.8–1(–2) mm in diam. Leaves basal, shorter to longer than culms; blade erect, filiform, 0.5–1.1 mm wide, margin involute. Inflorescence spicate, unisexual; all spikelets 1-flowered. Male spikes pale brown, narrowly ellipsoid, (0.7–)1–2.5  $\times$  0.2–0.5 cm; male glumes pale brown laterally, with yellow midvein, linear-oblong, 4.5–7  $\times$  1–3 mm, apex obtuse. Female spikes compact or slightly lax, brown and partly green, linear or cylindrical, 1.3–3.5  $\times$  0.2–0.4 cm; lowest involucral bract glumelike; female glumes brown or chestnut-brown laterally, with green midvein, oblong-ovate, 1.9–5  $\times$  1.3–2.4 mm, papery, midvein very broad (ca. 1/3 width of glume), margin narrowly hyaline, apex rounded or mucronate. Prophylls: lower parts pale green, upper parts brown or chestnut-brown, utriculiform, elliptic or oblong, 2.2–4  $\times$  0.6–1.7 mm, papery, 2-keeled, keels ciliate or smooth, margins fused to apex. Nutlets pale brown, oblong or elliptic, trigonous, 1.6–3.5  $\times$  0.9–1.3 mm, very shortly stipitate, shortly beaked, beak 0.4–1 mm. Stigmas 3. Sterile rachilla of female spikelets less than 1/2 as long as nutlet. Fl. and fr. May–Sep.

Grassy slopes, alpine meadows, on rocks, among shrubs; 3000–5100 m. Gansu, Qinghai, ?Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

**35. *Kobresia yangii*** S. R. Zhang, Acta Phytotax. Sin. 33: 160. 1995.

纤细嵩草 xian xi song cao

*Kobresia gracilis* Y. C. Yang, Acta Biol. Plateau Sin. 2: 10. 1984, not Meinshausen (1901).

Rhizomes very short. Basal sheaths prominent and persistent, brown, dull, fibrillose, not retaining dried leaf blades. Culms densely tufted, erect, subtriquetrous, 8–23 cm tall, slender, less than 0.5 mm in diam. Leaves basal, shorter than to subequaling culms; blade filiform, thinner than culms, margin involute. Inflorescence spicate, unisexual; all spikelets 1-flowered. Male spikes pale brown, linear, occasionally with 1 or 2 female spikelets at base; male glumes pale brown, oblong, ca. 4 mm, membranous, apex acute or rounded. Female spike compact, brown or pale brown, linear or cylindrical, (0.5–)1–2  $\times$  0.1–0.2 cm; lowest involucral bract glumelike, apex rounded; female glumes brown or chestnut-brown laterally, with green midvein, oblong-ovate, 3–3.5 mm, membranous, midvein broad, margin narrowly hyaline, apex rounded. Prophylls yellowish green, with brown apex, utriculiform, narrowly elliptic, 2–3  $\times$  0.7–1 mm, membranous, 2-keeled, keels smooth, margins fused to apex. Nutlets pale brown, oblong, trigonous or compressed trigonous, very shortly stipitate, shortly beaked, 1.5–2.5 mm, beak ca. 0.8 mm. Stigmas 3. Sterile rachilla of female spikelets narrowly lanceolate, ca. 1/2 as long as nutlet. Fl. and fr. Aug.

- Grassy slopes, grasslands among *Quercus*; 3600–4400 m. Sichuan.

**36. *Kobresia littledalei*** C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 67. 1908.

康藏嵩草 kang zang song cao

*Kobresia tibetica* Maximowicz subsp. *littledalei* (C. B. Clarke) P. C. Li.

Rhizomes short. Basal sheaths prominent and persistent, very pale brown, dull, not fibrillose, not retaining dried leaf blades. Culms densely tufted, erect, rigid, subterete, 10–25 cm tall, 1–2 mm in diam. Leaves basal, shorter than or  $\pm$  equaling culms; blade stiffly erect, filiform, ca. 1 mm wide, margin involute. Inflorescence spicate, usually unisexual; all spikelets 1-flowered. Male spikes linear or linear-oblong, 1.7–3  $\times$  0.4–0.5 cm, occasionally with a few female spikelets at base; male glumes yellowish brown to brown, with pale green midvein, lanceolate, margin broadly hyaline, apex obtuse. Female spikes slightly lax, pale brown, linear, 1.5–4  $\times$  0.2–0.3 cm; lowest involucral bract glumelike, apex aristate or not; female glumes brown or yellowish brown laterally, with pale green midvein, ovate to lanceolate, 4–6  $\times$  1.5–2 mm, margin narrowly hyaline, apex acute. Prophylls pale brown or brown, utriculiform, oblong or lanceolate, 3.5–5  $\times$  1.2–1.3 mm, membranous, 2-keeled, keels ciliate, margins fused to middle part or to apex, apex rounded. Nutlets oblong, trigonous, 2–2.7  $\times$  ca. 1 mm, not stipitate, not beaked. Stigmas 3. Sterile rachilla of female spikelets linear, flat, ca. 1/2 as long as nutlet or slightly longer. Fl. and fr. May–Sep.

- Grassy slopes, alpine meadows, alpine shrubby meadows, rocky and sandy grassy slopes; 4300–5300 m. ?Qinghai, Sichuan, Xizang.

**37. *Kobresia prainii*** Kükenthal, Bull. Herb. Boissier, sér. 2, 4: 50. 1903.

不丹嵩草 bu dan song cao

*Kobresia prainii* var. *elliptica* Y. C. Yang; *K. utriculata* C. B. Clarke.

Rhizomes short. Basal sheaths prominent and persistent, pale brown, dull, not retaining dried leaf blades. Culms densely tufted, erect, rigid, subterete, 3–10(–25) cm tall, slender, 0.5–1 mm in diam. Leaves basal, shorter to longer than culms; blade erect or recurved, filiform, less than 0.5 mm wide, margin involute. Inflorescence spicate, unisexual; all spikelets 1-flowered. Male spikes cream to pale brown, narrowly elliptic, often curved, 6–13 × 2–5 mm; male glumes whitish or pale brown, linear-lanceolate, 5.5–7.5 × 0.8–1 mm, membranous, apex obtuse. Female spike slightly lax, pale brown, linear-elliptic or narrowly oblong, 1–2 × 0.2–0.3 cm; lowest involucre bract glumelike, blunt; female glumes brown or yellowish brown laterally, with paler midvein, ovate to lanceolate, 3.5–6 × 1–1.5 mm, midvein narrow, margin narrowly hyaline, apex acute or obtuse. Prophylls lower parts yellowish green, upper parts brown, utriculiform, oblong, 2.5–3 × 0.8–1 mm, membranous, 2-keeled, keels ciliate, margins fused to apex, apex rounded. Nutlets brown, oblong or elliptic, trigonous, 1.8–2.4 × 0.7–1 mm, not stipitate, not beaked. Stigmas 3. Sterile rachilla of female spikelets linear, less than 1/2 as long as to subequaling nutlet. Fl. and fr. May–Sep.

Grassy slopes, alpine meadows, rocky and grassy slopes; 3300–5600 m. Xizang [Bhutan, India (Sikkim), Nepal].

**38. *Kobresia pygmaea*** (C. B. Clarke) C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 696. 1894.

高山嵩草 gao shan song cao

*Hemicarex pygmaea* C. B. Clarke, J. Linn. Soc., Bot. 20: 383. 1883; *Kobresia microstachya* K. V. Ivanova; *K. pygmaea* var. *filiculmis* Kükenthal.

Plants usually extremely densely tufted, forming turf or cushions. Basal sheaths persistent, brown or pale brown, dull, not retaining dried leaf blades. Culms stiffly erect, obtusely trigonous, very short, (0.4–)1–10 cm tall, ca. 0.5 mm in diam. Leaves basal, ca. as long as culms; blades erect, filiform, 0.3–0.5 mm wide, margin involute. Inflorescence a dense ovoid spike, brown, 0.3–10 × 0.1–0.3 cm, androgynous; lowest involucre bract glumelike, apex sometimes shortly aristate; all spikelets unisexual, terminal spikelets male, lower ones female (occasionally with a sterile glume within prophyll). Male glumes brown, oblong-lanceolate, ca. 4 × 1.8 mm, membranous. Female glumes brown, with yellowish green to green midvein, ovate or oblong-ovate, 2–3.5 × 2–2.5 mm, papery, midvein broad, margin narrowly hyaline, apex acute or obtuse. Prophylls brown, oblong or elliptic, 2–2.5 × 1–1.2 mm, membranous, 1- or 2-keeled, keels smooth or slightly scabrid, margins free to base, sometimes overlapping, apex truncate. Nutlets brown to dark brown, shiny, obovoid, trigonous, 1.5–2 × ca. 1 mm, very shortly beaked and stipitate. Stigmas 3. Fl. and fr. May–Sep.

Dry and open grassy places, wet alpine meadows, turf in wet habitats, rocky slopes, on sand and gravel beside rivers; 3100–5600 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India (Himachal Pradesh, Sikkim, Uttarakhand), Kashmir, Myanmar, Nepal, Pakistan].

**39. *Kobresia squamiformis*** Y. C. Yang, Acta Biol. Plateau Sin. 2: 9. 1984 [*“squamaeformis”*].

夏河嵩草 xia he song cao

*Kobresia setschwanensis* Handel-Mazzetti subsp. *squamiformis* (Y. C. Yang) S. R. Zhang.

Rhizomes short, plants densely tufted. Basal sheaths persistent, brown, dull, not retaining dried leaf blades. Culms stiffly erect, obtusely trigonous, very short, 9–16 cm tall, ca. 0.8 mm in diam. Leaves basal, ca. as long as culms; blade erect, filiform, ca. 0.5 mm wide, margin involute. Inflorescence a dense spike, brown, cylindric, 1–1.5 × 0.3–0.5 cm, androgynous; lowest involucre bract glumelike, apex shortly aristate; spikelets usually all unisexual, terminal few male, lower ones female (occasionally with a single reduced male flower within prophyll). Male glumes brown, with yellowish green midvein, lanceolate, ca. 3.5 × 1.5 mm, apex rounded. Female glumes brown, with yellowish green midvein, ovate or oblong-ovate, 3–3.5 × 1.8–2.5 mm, papery, midvein broad, margin very narrowly hyaline, apex rounded. Prophylls brown, oblong, 3–3.8 × 1.2–1.5 mm, membranous, 2-keeled, keels smooth, margins free to base. Nutlets brown to dark brown, shiny, oblong-elliptic, trigonous, 2.3–2.5 × 1.3–1.6 mm, not beaked, not stipitate. Stigmas 3. Sterile rachilla of female spikelets much shorter than to subequaling nutlet, sometimes bearing a vestigial male glume. Fl. and fr. Jul–Oct.

• Grassy slopes; 2900–3600 m. Gansu (Xiahe), E Qinghai (Zèkog).

This appears to form a link between *Kobresia pygmaea* and *K. setschwanensis*; it seems more logical to recognize it as a distinct species than as a slender subspecies of the latter, when it could equally well be made a robust subspecies of the former.

**40. *Kobresia vaginosa*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 6: 695. 1894.

发秆嵩草 fa gan song cao

*Kobresia cercostachys* (Franchet) C. B. Clarke var. *capillacea* P. C. Li; *K. nepalensis* (Nees) Kükenthal subsp. *vaginosa* (C. B. Clarke) T. Koyama; *K. nepalensis* var. *vaginosa* (C. B. Clarke) R. C. Srivastava.

Rhizomes short, or shortly and obliquely elongated, plants forming a turf. Basal sheaths prominent and persistent, reddish brown or pale brown, dull, fibrillose, not retaining dried leaf blades. Culms densely tufted, erect or curved, subterete, 3.5–10 cm tall, slender, ca. 0.5 mm in diam. Leaves basal, equaling or exceeding culms; blade filiform, flaccid, ca. 0.5 mm wide, margin involute. Inflorescence spicate, linear, rather lax, usually unisexual, occasionally gynaeandrous or androgynous, plants with male and female inflorescences on same individual, or sometimes dioecious; spikelets unisexual. Male spikes 1.5–3 × ca. 0.2 cm; male glumes oblong-lanceolate, 6–8 × 1.2–2 mm,

midvein green, margin and apex hyaline. Female spikes 2–3.5 × ca. 0.2 cm; lowest involucre bract glumelike, apex acute or shortly aristate; female glumes brown, with pale brown or pale green midvein, lanceolate, 5–6.2 × 1.7–2 mm, midvein narrow, margin broadly hyaline, apex subacute or obtuse. Prophylls lower part yellow, upper part and margin brown, linear, 4.7–5.7 × ca. 0.7 mm, 2-keeled, keels scabrid, margins free to base, apex truncate, hyaline. Nutlets narrowly oblong or oblanceolate, trigonous, shortly stipitate and beaked, 3.5–4 (excluding beak) × 0.6–1.2 mm, beak 0.5–1 mm. Stigmas 3. Sterile rachilla of female spikelets to 1/2 as long as nutlet. Fl. and fr. Jul–Sep.

Dry slopes, on rocks in alpine meadows; 4000–4800 m. Xizang, Yunnan [India (Sikkim), ?Nepal].

**41. *Kobresia graminifolia*** C. B. Clarke, J. Linn. Soc., Bot. 36: 268. 1903.

禾叶嵩草 he ye song cao

Rhizomes short. Basal sheaths prominent and persistent, pale brown or yellowish brown, dull or slightly shiny, margins and apices fibrillose, not or retaining a few dried leaf blades. Culms densely tufted, erect and rigid, obscurely trigonous, (7–)20–45 cm tall, 1–1.5 mm in diam. Leaves basal, shorter to longer than culms; blade semicircular or V-shaped in transverse section, 0.5–1.5 mm wide, midrib not usually distinct abaxially. Inflorescence ± densely spicate, usually unisexual (sometimes androgynous or gynaeandrous), male and female spikes borne on same plant. Male inflorescence narrowly cylindrical or narrowly ellipsoid, 1.5–3(–5) × 0.3–0.6 cm; male glumes narrowly oblong, 6–8(–10) × 1–2 mm, margin narrowly hyaline, apex rounded. Female inflorescence brown, narrowly cylindrical, 2.5–7.5 × 0.3–0.6 cm, lower spikelets distant; lowest involucre bract glumelike, apex acute or shortly aristate; female glumes brown, with paler midvein, oblong-ovate or narrowly triangular-ovate, 5–6 × 1.5–2 mm, midvein narrow, margin very narrowly hyaline, apex acute or obtuse. Prophylls lower part pale green, apex brown, narrowly oblong-elliptic, 4–6 × 0.8–1.8 mm, papery, 2-keeled, keels scabrid, margins free to base or fused in lower 1/4, not overlapping, apex truncate or notched. Nutlets narrowly elliptic or oblanceolate, trigonous, very shortly stipitate and shortly beaked, 3.5–5.5 (including stipe and beak) × 0.8–1.5 mm. Stigmas 3. Sterile rachilla of female spikelets 1.2–2 mm, less than 1/2 length of nutlet. Fl. and fr. Jun–Sep.

Grassy slopes, among shrubs, on mossy rocks, alpine meadows; 3100–4700 m. Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Nepal].

This is possibly a form of *Kobresia cercostachys*, which it resembles (especially in its fibrillose leaf sheaths and somewhat intermediate leaf morphology) but differs from in its (usually) contrasting female and male spikes.

**42. *Kobresia woodii*** Noltie, Edinburgh J. Bot. 50: 48. 1993.

阔鳞嵩草 kuo lin song cao

Rhizomes short. Basal sheaths prominent and persistent, inner ones straw-colored, outer ones chocolate brown with darker margins, slightly shiny, not fibrillose, retaining dried leaf blades. Culms densely tufted, erect and rigid, subterete, 24–28

cm tall, ca. 1 mm in diam. Leaves basal, slightly longer than culms; blade filiform, semicircular or V-shaped in transverse section, ca. 1.5 mm wide, midrib not distinct abaxially. Inflorescence spicate, narrowly cylindrical, unisexual, male and female spikes borne on same plant. Male inflorescence ca. 4 × 0.3 cm; male glumes oblong-oblanceolate, ca. 8 × 2.5 mm, margin narrowly hyaline, apex rounded. Female inflorescence dense, lower spikelets sometimes distant, brown, ca. 6 × 0.6 cm; lowest involucre bract glumelike, apex aristate, arista ca. 5 mm; female glumes brown laterally, with green midvein, oblong-ovate, 6.2–8 × 2.5–3.9 mm, midvein broad, margin very narrowly hyaline or not hyaline, apex obtuse. Prophylls lower part pale brown, apex brown, linear-oblong, 7–10 × 1–1.5 mm, papery, 2-keeled, keels minutely scabrid, margins free to base, overlapping. Nutlets linear, obscurely trigonous, body ca. 2.5 × 0.7 mm, with stipe ca. 1 mm, beaked with stout style base (ca. 1.5 mm). Stigmas 3. Fl. and fr. May–Sep.

Grasslands, alpine meadows; 3300–4800 m. S Xizang (Yadong) [Bhutan].

**43. *Kobresia pusilla*** N. A. Ivanova, Bot. Zhurn. S.S.S.R. 24: 496. 1939.

高原嵩草 gao yuan song cao

*Kobresia coninux* F. T. Wang & Tang; *K. daqingshanica* X. Y. Mao; *K. helanshanica* W. Z. Di & M. J. Zhong.

Rhizomes short. Basal sheaths pale brown to brown, dull, retaining dried leaf blades. Culms densely tufted, erect, obtusely trigonous, 2–15 cm tall, 0.7–1 mm in diam. (relatively stout for length). Leaves basal, shorter than or ± equaling culms, sometimes recurved; blade flat, folded at base (V-shaped in cross section), 1–1.5(–2) mm wide, midrib distinct abaxially or not. Inflorescence densely spicate (occasionally branched in lower part), brown, narrowly elliptic or narrowly ovate-oblong, 0.5–1.2 × 0.3–0.4 cm; lowest involucre bract glumelike, apex shortly aristate. Terminal spikelets of inflorescence male, lower ones bisexual with 1 basal female flower and (1 or)2–5 distal male flowers. Glumes brown or pale brown, with yellowish green or green midvein, oblong, ovate, or lanceolate, 3.2–5 × 1.5–2.5 mm, margin hyaline or not, apex obtuse or acute. Prophylls pale brown, oblong, ovate-oblong, or elliptic, 2.9–4 × 1–2 mm, membranous, abaxially sometimes hairy, 2-keeled, keels scabrid, margins open to base, apex truncate or 2-toothed. Nutlets brown and shiny, elliptic or oblong-ovate, flattened, body 1.6–2.5 × 0.8–1.5 mm, shortly stipitate, very shortly beaked. Stigmas 2. Fl. and fr. May–Oct.

• Exposed dry slopes, alpine meadows, shaded places, marshes; 3100–5300 m. Gansu, Hebei, Nei Mongol, Qinghai, Sichuan, Xizang.

This species is similar to *Kobresia humilis*, differing largely in its bistigmatic nutlets.

**44. *Kobresia karakorumensis*** Dickoré, Stapfia 39: 77. 1995.

喀拉昆仑嵩草 ka la kun lun song cao

Rhizomes short. Basal sheaths pale brown to brown, dull, retaining dried leaf blades. Culms densely tufted, dwarf, erect and rigid, subterete in lower part, trigonous above, (2–)3–15(–20) cm tall, 0.5–0.7 mm in diam. Leaves basal, usually

shorter than culms; blade V-shaped in section, recurved, 1–2.5 mm wide, midrib not distinct abaxially. Inflorescence spicate (rarely compound), brown or dark brown, densely and broadly cylindrical, 0.5–1.2 × 0.2–0.4 cm; lowest involucre bract glume-like. Terminal spikelets of inflorescence male, lower ones bisexual with 1 basal female flower and (1 or)2(or 3) distal male flowers. Glumes brown or dark brown, with pale midvein, ovate, 2.5–3 × ca. 2 mm, midvein narrow, margin very narrowly or not hyaline, apex obtuse. Prophylls pale brown at upper part, narrowly elliptic, ca. 3.3 × 0.9 mm, membranous, glabrous,

hyaline at base, obscurely 2-keeled, margins connate in lower 1/4(–1/2). Nutlets brown or pale brown, oblong-elliptic, flattened, body ca. 1.5 × 0.9 mm, stipe ca. 0.5 mm, very shortly beaked. Stigmas 2. Fl. and fr. Jul–Sep.

High alpine turf; (3100–)3800–5000 m. Xinjiang, Xizang [Afghanistan, India (Himachal Pradesh), Kashmir, ?Nepal, Pakistan, Tajikistan].

This is, perhaps, a western form of *Kobresia pusilla*, but it is also close to *K. myosuroides* subsp. *bistaminata*.

### 33. CAREX Linnaeus, Sp. Pl. 2: 972. 1753.

藁草属 tai cao shu

Dai Lunkai (戴伦凯), Liang Songyun (梁松筠 Liang Song-jun), Zhang Shuren (张树仁), Tang Yancheng (汤彦承 Tang Yen-cheng); Tetsuo Koyama, Gordon C. Tucker

Herbs, perennial; rhizome usually stoloniferous. Culms tufted or sparse, lateral or central, erect, trigonous, bladeless sheathed at base. Leaves basal or basal and cauline, flat, rarely involute or revolute on margins, linear or lorate, rarely lanceolate, sheathed at base. Involucre bracts leaflike, rarely scale-shaped or setaceous, sheathed or not. Flowers unisexual, 1 male flower or 1 female flower in a unisexual spikelet, female spikelet included by prophyll, prophyll wholly connate at margins into utricle, sometimes reduced spikelet axis present in utricle, with scalelike bractlet at base. Spikes 1 to numerous, usually numerous spikes arranged in spicate, racemose, or paniculate inflorescence, composed of many unisexual or bisexual spikes, bisexual spike androgynous or gynaeandrous, usually plants monoecious, rarely dioecious, pedunculate or sessile, with or without sheathlike or utriculiform cladoprophyll at base; male flower with (2 or)3 stamens, filaments distinct; female flower with 1 pistil, style slightly slender, persistent or deciduous, base usually not thickened; stigmas 2 or 3. Utricles trigonous, plano-convex or biconvex, with slightly long or short beak. Nutlets rather tightly or loosely enveloped in utricle, trigonous or plano-convex.

About 2,000 species: cosmopolitan; 527 species (260 endemic) in three subgenera and 69 sections (two endemic) in China.

- 1a. Spikes numerous, all bisexual, sessile, usually densely arranged in spicate inflorescence, cladoprophyll not present; stigmas usually 2, rarely 3 ..... 3. *C. subg. Vigna*
- 1b. Spikes few to numerous, unisexual or bisexual, pedunculate, rarely shortly pedunculate to subsessile, rarely single and terminal, usually loosely arranged in racemose or paniculate inflorescence, rarely in spicate inflorescence, cladoprophyll present; stigmas usually 3, rarely 2.
- 2a. Spikes bisexual and androgynous, very rarely unisexual, usually arranged in complex inflorescence, cladoprophyll utriculiform at spike base, with a female flower ..... 1. *C. subg. Vigneastr*
- 2b. Spikes unisexual, or unisexual and bisexual, rarely all bisexual, spikes 1 to several borne in an involucre bract sheath, rarely arranged in complex inflorescence, cladoprophyll sheathlike, without female flower ..... 2. *C. subg. Carex*

#### 1. *Carex* subg. *Vigneastr* (Tuckerman) Kükenthal, Bot. Jahrb. Syst. 27: 516. 1899.

复序藁草亚属 fu xu tai cao ya shu

Zhang Shuren (张树仁); Tetsuo Koyama, Gordon C. Tucker

*Carex* sect. *Vigneastr* Tuckerman, Enum. Meth. Caric. 10. 1843; *C. subg. Indocarex* Baillon ex Kükenthal, nom. illeg. superfl.

Inflorescence simple or compound. Spikes few to numerous, usually bisexual and androgynous, rarely unisexual; cladoprophyll utriculiform, with or without a developed female flower.

About 100 species: tropical and subtropical Asia; 36 species (16 endemic) in ten sections (one endemic) in China.

#### Key to sections

- 1a. Each cladoprophyll with a developed female flower inside; inflorescence spicate; spikes numerous and densely arranged ..... 1. *C. sect. Japonicae*
- 1b. Cladoprophylls without flowers or some with flowers; inflorescence paniculate or racemose, if inflorescence spicate then spikes fewer.
- 2a. Cladoprophyll below terminal spike with a developed female flower inside, others without flower; rachilla present at base of nutlet; inflorescence racemose.
- 3a. Terminal spike androgynous; utricle with smooth straight beak; nutlets with flat faces ..... 2. *C. sect. Mundae*
- 3b. Terminal spike male; utricle with scabrous geniculate beak; nutlets with concave faces ..... 3. *C. sect. Hangzhouenses*