

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. radians*
- 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. involucratus*
- 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 muticous 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. babakan*
- 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 muticous 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. Involucral 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. Involucral 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 cylindric spike; culms and anthela 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 cylindric, 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, cylindric, 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; anthela rays erect or suberect, less than 2 cm.
- 61a. Stolons short; culms laxly tufted; rays of anthelae 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 anthelae 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; anthela 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. Involucral bracts 14–24, leaflike, ca. 2 × as long as inflorescence, subequal in length, to 30 cm, 0.5–1.7 mm wide, margin scabridulous, basally ± horizontal, apically flexuose and ± 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 × 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 ± 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 × as long as inflorescence, subequal in length, 1–14 mm wide, ± 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 × 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 ± 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, ± stiff, ± 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 decomposed anthela; rays many (to 17), 2–8 cm, ± 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 × 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 decomposed 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) × 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 radians* Nees & Meyen ex Kunth, Enum. Pl. 2: 95. 1837.

辐射穗砖子苗 fu she sui zhuan zi miao

Cyperus radians var. *floribundus* (E. G. Camus) Kükenthal; *C. sinensis* Debeaux; *C. sinensis* var. *floribundus* E. G. Camus; *Mariscus radians* (Nees & Meyen ex Kunth) Tang & F. T. Wang; *M. radians* 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 raylets. 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. *pallescens* 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 subequalling 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), leaflike, 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 muticous. 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 qǐ pān suǒ cǎo

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 decompound 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^o: 204. 1816.

长尖莎草 cháng jiān suǒ cǎo

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 [Ban-

gladesh, 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 cháng bǎn lì suǒ cǎo

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 subobtuse 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 sì chuān suǒ cǎo

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 nán suǒ cǎo

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 subobtuse. 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 \pm narrowly ovoid, 4–10 \times 3–4 mm, slightly compressed, 3- or 4-flowered; rachilla wingless. Glumes yellowish brown tinged with dark brown, densely imbricate, ovate, 3–4 \times 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 \times 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, \pm horizontal to sometimes downward reflexed. Inflorescences capitate, with numerous spikelets. Spikelets densely aggregated, narrowly oblong-ovoid to suboblong, 4–5 \times 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 \times 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. *hilgendorfi-anus* (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, leaf-like, 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: Taibei, *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. *pingbienensis* 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 decomposed 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 decomposed 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 decomposed 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 decomposed anthela. Spikes narrowly cylindrical, 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 cylindrical, 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. Guangdong, 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 decompound 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, conspicuously 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, \pm thin. Spikes broadly ovoid, with 8–18 spikelets. Spikelets laxly distichous, linear, 0.8–4 cm \times 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 cylindrical, 2–5 cm \times 4–7 mm, with laxly arranged spikelets. Spikelets linear to narrowly linear-ovoid, 5–11 \times 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.

□ 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 \times 4–10 mm, with very many spikelets. Spikelets densely arranged in several rows, linear-oblong, 4–8 \times 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, \pm 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 \times 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 \times 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.

茳苳 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**

茳苳(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.

短叶茳苳 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, \pm 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 \times 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 \times 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 \times 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, \pm 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, slen-

der 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 \times 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 \pm 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* Kükenthal (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 \times 1–3 cm, with many spikelets. Spikelets slightly laxly arranged, linear to very narrowly linear-ovoid, 0.6–1.5 cm \times 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, \pm 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, mar-

gin 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. Inflores-

cence a simple anthela; rays 2–7, 0.8–5 cm, each with 1 spike. Spike broadly ovoid to in outline subflabelliform, 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. $2n = ca. 98, 112, 114, 128.$

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-flowered; 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 *zhuān zǐ miào*

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* Bentham, 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 cylindrical, 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 infra-specific 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 *suō zhuāng zhuān zǐ miào*

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 cylindrical, 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, Tai-

wan, 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), leaflike, 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, Pflanzenz. 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.-

Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 294. 1859.

沼生水莎草 zhao sheng shui suo cao

Juncellus limosus (Maximowicz) C. B. Clarke; *Pycreus 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, exserted. 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; *Torulinium 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].

