

CYPERACEAE

D.A. Simpson

Juss., Gen. Pl. (1789) 26; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 585; Ridley, Fl. Malay Penins. 5 (1925) 137; Kern, Fl. Males., ser. 1, 7(3) (1974) 435; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 113; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 141; Simpson & Koyama, Fl. Thailand 6(4) (1998) 247; Dai et al., Fl. China 23 (2010) 164. **Type:** *Cyperus* L.

Annual or perennial, rhizomatous to stoloniferous herbs. **Stems (culms)** simple, often 3-sided. **Leaves** basal and/or cauline, often 3-ranked, comprising blade and sheath, sometimes sheath only present; blade usually linear, grass-like, sometimes broader and constricted into a pseudopetiole below; sheath open or closed; ligule often present, sometimes on opposite side to blade. **Involucral bracts** 1–several, leaf-like or glume-like. **Inflorescence** unbranched to compoundly or decompoundly branched and umbel-like, or paniculate, comprising 1–many ultimate inflorescence units, these either indeterminate (= **spikelets**) or, in a few genera, determinate (= **spicoids**). **Spikelets** comprising 1–many glumes, the glumes membranous to coriaceous, spirally arranged or distichous, each subtending a single flower, the spikelet sometimes reduced to a single flower and aggregated into spikes. **Spicoids** (where present) comprising 2–12 membranous scale-like floral bracts on a much-reduced axis, the lowest 2 bracts opposite, keeled, the spicoid subtended and usually hidden by a glume-like spicoid bract, the bracts spirally arranged and aggregated into spikelet-like spikes. **Flowers** bisexual or unisexual, monoecious or rarely dioecious. **Perianth** absent or reduced to bristle-like or scale-like segments. **Stamens** 1–3; anthers basifixed. **Stigmas** 2–3, rarely style undivided, the base sometimes persistent and variously shaped in nutlet. **Ovary** 2–3-carpellate, unilocular, with a single ovule. **Nutlets** usually a hard, 2- or 3-sided nutlet, rarely with a succulent or corky exocarp, surface smooth or variously minutely patterned, sometimes partially or completely enclosed by an enlarged basal prophyll (**utricule**).

Distribution. Cyperaceae is the third largest family of Monocotyledons, comprising c. 5500 species in 89 genera (Govaerts et al., World Checklist of Cyperaceae, 2019). It has an almost cosmopolitan distribution, being absent only from Antarctica. In Singapore there are 18 genera and 102 species, compared to c. 40 genera and c. 390 species in the Malesian region (Kern, Fl. Males., ser. 1, 7(3) (1974) 435–753). The two largest genera in Singapore are *Cyperus* L. (39 species) and *Fimbristylis* Vahl (19 species). No genera or species are endemic to Singapore.

Ecology. Worldwide, Cyperaceae are found in a diverse range of habitats, including forests and forest margins, swamps, mangroves, in and along the margins of water bodies, grasslands, moorlands and bogs, deserts and areas of cultivation. Overall, they tend to favour damper or wetter habitats with a high water table for at least part of the year and occur on a wide range of substrates. Altitudinal distribution is similarly wide-ranging, from sea level up to 5200 m. Kern (Fl. Males., ser. 1, 7(3) (1974) 438–442) provides an excellent summary of the ecology of Malesian Cyperaceae.

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In Singapore Cyperaceae are found primarily in lowland forest, swamp forest, mangroves, margins of water bodies, beach margins, grasslands and cultivated ground (gardens and, particularly in the past when there was more agriculture in Singapore, amongst crops). A number of species which were once common have not been recorded in recent years and are now presumed extinct in Singapore, likely due to a decline in wetlands, agricultural land, wasteland and untended open areas in general.

Uses. Cyperaceae have widespread but often under-recorded uses. Simpson & Inglis (Kew Bull. 56 (2001) 257–360) recorded use in around 10% of the family worldwide. Such use ranges from human nutrition (e.g. *Eleocharis dulcis* (Burm.f.) Trin. ex Hensch.) to materials for basketry and matting (e.g. *Actinoscirpus grossus* (L.f.) Goetgh. & D.A.Simpson and *Lepironia articulata* (Retz.) Domin), medicine (e.g. *Cyperus rotundus* L.) and perfumery (e.g. *C. rotundus*). A number of species (e.g. *Cyperus rotundus*, *Fimbristylis dichotoma* (L.) Vahl, and *F. littoralis* Gaudich.) are serious weeds, while some are cultivated as ornamentals (e.g. *Cyperus papyrus* L.) Although there are no specific records for any taxa being used in Singapore, apart from those in cultivation, a number of taxa that occur in the country have use recorded elsewhere.

Taxonomy. The closest relatives to Cyperaceae are Juncaceae and Thurniaceae in the order Poales (Simpson in Rudall et al. (ed.), Monocot. Syst. Evol. 2 (1995) 497–509). Poaceae, which share some characteristics of Cyperaceae such as wind pollination and reduced floral structure, have often been placed near to Cyperaceae, but are now considered to be more distantly related (Simpson in Rudall et al. (ed.), Monocot. Syst. Evol. 2 (1995) 497–509).

Recent family treatments include those of Goetghebeur (in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 141–190) and Bruhl (Austral. Syst. Bot. 8(2) (1995) 125–305). The account by Kern (Fl. Males., ser. 1, 7(3) (1974) 435–753) differs from these, particularly in the amalgamation of several genera under *Cyperus* L. sensu lato and *Scirpus* L. sensu lato. Molecular phylogenetics (e.g. Muasya et al., Bot. Rev. (Lancaster) 75 (2009) 52–66; Semmouri et al., Bot. Rev. (Lancaster) 85 (2019) 1–39) give insights into the higher-level classification of Cyperaceae and support Kern's broader circumscription of *Cyperus* but a narrower circumscription of *Scirpus* with a number of segregate genera.

Subfamily, tribal and generic classification of the Singapore taxa is summarised below. Subfamilies follow Simpson et al. (Amer. J. Bot. 90 (2003) 1071–1087) and Muasya et al. (Bot. Rev. (Lancaster) 75 (2009) 52–66). Tribes follow Semmouri et al. (Bot. Rev. (Lancaster) 85 (2019) 1–39). Genera mostly follow Goetghebeur (in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 141–190), with modification to reflect a broadly circumscribed *Cyperus* (including *Kyllinga* Rottb., *Lipocarpa* R.Br., *Pycreus* P.Beauv. and *Remirea* Aubl.) and recognition of the recently described genus *Schoenoplectiella* Lye (Lye, Lidia 6 (2003) 20), a segregate from *Schoenoplectus* Palla (not in Singapore).

SUBFAMILY MAPANIOIDEAE

Tribe Chrysitricheae

Lepironia Rich.

Tribe Hypolytreae

Hypolytrum Pers.
Mapania Aubl.
Scirpodendron Zipp. ex Kurz

SUBFAMILY CYPEROIDEAE

Tribe Bisboeckelereae

Diplacrum R.Br.

Tribe Sclerieae

Scleria Berg.

Tribe Schoeneae

Gahnia J.R.Forst. & G.Forst.
Machaerina Vahl
Schoenus L.

Tribe Rhynchosporeae

Rhynchospora Vahl

Tribe Cariceae

Carex L.

Tribe Eleocharideae

Eleocharis R.Br.

Tribe Abildgaardieae

Bulbostylis Kunth
Fimbristylis Vahl

Tribe Fuireneae

Actinoscirpus (Ohwi) Haines & Lye
Fuirena Rottb.
Schoenoplectiella Lye

Tribe Cypereae

Cyperus L.

Inflorescence structure. The inflorescence is difficult to interpret in Cyperaceae due to its highly reduced nature. Consequently, the terminology used for describing parts of the inflorescence is confusing, with several terms often being applied to the same structure. In addition, several terms are also used in the Poaceae, but they do not always relate to the same structure in both families. A useful attempt to standardise terminology in Cyperaceae was made by Kukkonen (Ann. Bot. Fenn. 31 (1994) 37–43). In the current treatment, I have tried

to keep terminology as simple as possible and the glossary below includes definitions of the main features of the inflorescence.

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

The spikelet is indeterminate, i.e. having no terminal flower. However, in *Hypolytrum*, *Lepironia*, and *Mapania* and *Scirpodendron*, the basic inflorescence unit has an apparently terminal female flower. To distinguish this type of unit, the term spicoid is used here; some authors refer to it as a pseudospikelet. Its structure is rather different to that of the spikelet, comprising 2–12, scale-like floral bracts on a much-reduced axis (Fig. 1J). The two lowest bracts are opposite, keeled, and often enclose the upper bracts (when the latter are present). The lower bracts subtend a male flower comprising a single stamen, the upper bracts usually being empty. The terminal flower, which is not subtended by a floral bract, is female. There are no perianth segments and the whole structure is subtended and partially to fully hidden by a glume-like bract known as a spicoid bract. These are again aggregated into spikes, but there is further confusion in terminology with the spikes sometimes being referred to as spikelets. The above interpretation of the spicoid is widely accepted, although some workers have interpreted it as a single flower.

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

- Androgynous** – having male and female flowers in the same structure such as a *spike* in *Carex*.
- Beak** – short extension at the apex of an *utricle* or *nutlet*.
- Biconvex** – 2-sided, the sides convex.
- Cancellate** – having the appearance of a lattice.
- Capitate** – head-like inflorescence, without any apparent branching (Fig. 1B).
- Compound** – applied to an inflorescence or partial inflorescence where there are 2 orders of branching, i.e. primary and secondary.
- Conical** – cone-shaped, being wider at the base than the apex; here it is used as the 3-dimensional equivalent of lanceolate.
- Contraligule** – membranous, ligule-like structure at the apex of the leaf sheath on the side of the *culm* facing away from the leaf blade.
- Culm** – stem supporting the inflorescence.
- Decomound** – applied to an inflorescence or partial inflorescence where there are 3 or more orders of branching, i.e. primary, secondary and tertiary.

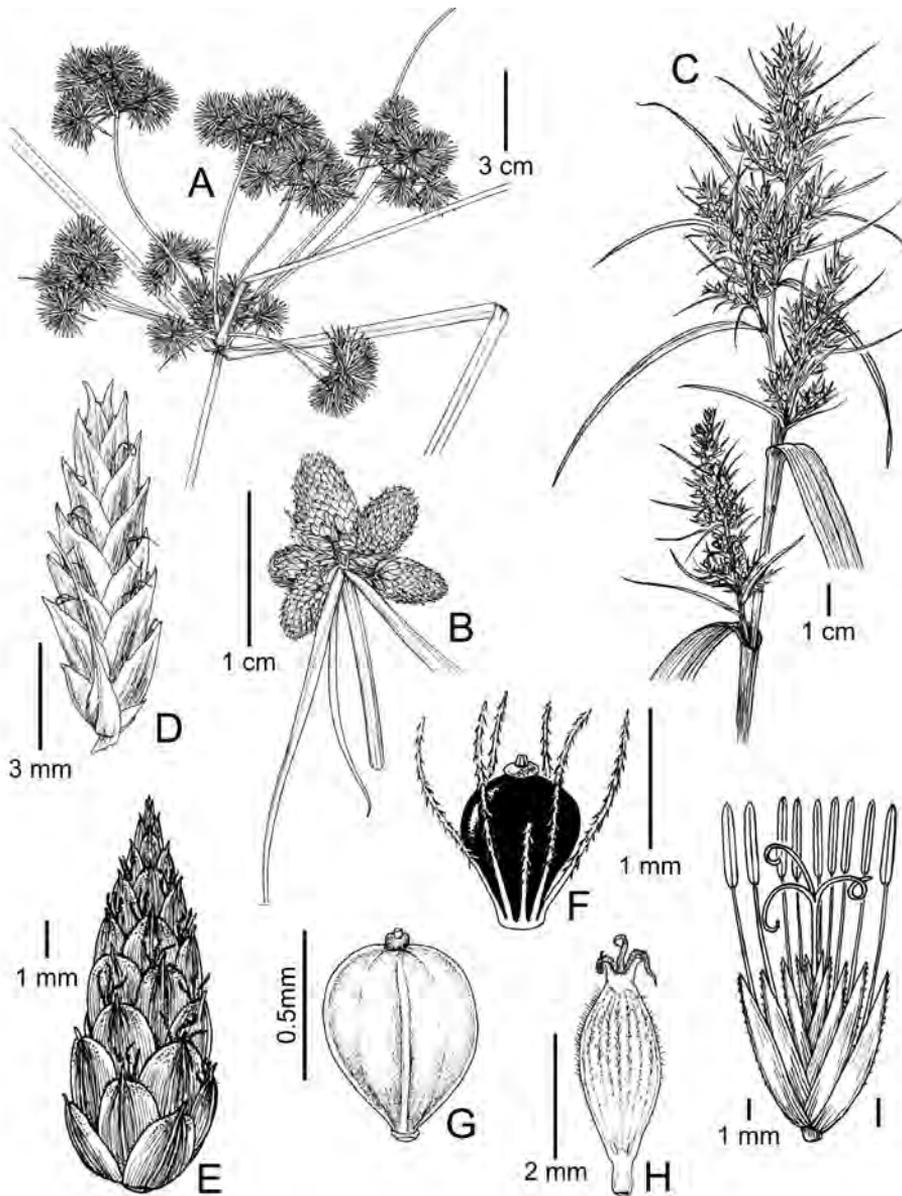


Figure 1. Examples of inflorescence structure in Cyperaceae. **A.** Umbel-like inflorescence, *Cyperus compactus* Retz. **B.** Capitulate inflorescence, *Cyperus albescens* (Steud.) Larridon & Govaerts. **C.** Paniculate inflorescence, *Scleria ciliaris* Nees. **D.** Spikelet with distichous glumes, *Cyperus compressus* L. **E.** Spikelet with spirally-arranged glumes, *Schoenoplectiella mucronata* (L.) J.Jung & H.K.Choi. **F.** Biconvex nutlet with perianth segments, *Eleocharis geniculata* (L.) Roem. & Schult. **G.** Trigonous nutlet without perianth segments, *Bulbostylis barbata* (Rottb.) C.B.Clarke. **H.** Utricle, *Carex cryptostachys* Brongn. **J.** Spicoid, *Scirpodendron ghaeri* (Gaertn.) Merr. (A, B, D, G, H drawn by J. Williamson; C, E, F, J drawn by M. Tebbs).

- Determinate** – applied to an inflorescence with terminal flowers and therefore not capable of indefinite growth.
- Disk** – 3-lobed structure occurring at the base of the *nutlet* in *Scleria* and *Diplacrum*. In some species it may be indistinct, whereas in *Scleria sumatrensis* it is developed into a cup-like structure \pm covering the *nutlet*.
- Distichous** (of *glumes* and *spikelets*) – arranged in 2 opposite rows down the *rachilla* or *rachis*. (Figure 1D).
- Floral bract** – membranous scale-like structure in a *spicoid* each of which subtends a male flower comprising a single stamen only. The lowest two floral bracts usually have a keel and are opposite.
- Glume** – membranous to leathery scale-like structure subtending individual flowers (Fig. 1 D, E).
- Indeterminate** – inflorescence which, in theory, is capable of indefinite growth.
- Involucral bract** – bract or bracts occurring at the point where the inflorescence arises from the *culm*. They vary from being leaf-like to glume-like or *setaceous*.
- Isodiametric** – of equal size both horizontally and vertically.
- Keel** – used here for the midrib of a *glume* or glume-like bract.
- Lageniform** – urn-shaped with a constriction in the middle.
- Ligule** – membranous tissue or fringe of hairs occurring at the apex of the leaf sheath on the inner side at the point where it joins the leaf blade.
- Nutlet** – hardened, usually minute, seed-like fruit, the surface of which may be smooth to variously sculptured and a diagnostic character for many species. Often referred to as an achene in literature on Cyperaceae (Fig. 1F, G).
- Paniculate** – inflorescence comprising partial inflorescences arising at intervals along the main inflorescence axis (Fig. 1C).
- Partial inflorescence** – primary branches of an inflorescence.
- Perianth segments** – small bristle-like or scale-like structures at the base of the *nutlet*. Presumed to be the remnants of a fully developed perianth. Also referred to as perianth bristles or scales in literature on Cyperaceae (Fig. 1F).
- Pilose** – covered with soft hairs.
- Prophyll** – 2-keeled structure at the base of a branch within an inflorescence. It may be glume-like, tubular or, in *Carex*, developed into a *utricle*.
- Rachis** – the axis of a *spike*.
- Rachilla** – the axis of a *spikelet*.
- Rhizome** – underground stem, which may be short, often giving the plant a tufted habit, or long creeping.
- Setaceous** – bristle-like.
- Septate** – partitioned. In some species, particularly in *Eleocharis* and *Lepironia*, the *culm* has a series of horizontal septa, which are best seen in dried material.
- Septate-nodulose** – as above but with small nodules on or between the septa.
- Simple** – applied to an inflorescence or partial inflorescence where there is only one order of branching, i.e. primary branching.
- Spicoid** – the ultimate inflorescence unit in *Hypolytrum*, *Lepironia*, *Mapania* and *Scirpodendron*. Has a much-reduced axis and appears flower-like (Fig. 1J). Comprises 2–15, scale-like bracts the lower ones subtending a male flower (comprising a single stamen only). The whole structure is terminated by a female flower, thus making it determinate. Sometimes referred to as a pseudospikelet in literature on Cyperaceae.
- Spicoid bract** – the glume-like bract subtending a *spicoid*.
- Spike** – an aggregation of *spikelets* or *spicoids*. Sometimes the whole structure is similar in appearance to a spikelet, as in *Carex*, the *Cyperus* spp. that were formerly in the genus *Lipocarpha*, *Hypolytrum*, *Lepironia* and *Mapania*.

Spikelet – the ultimate inflorescence unit in most genera of Cyperaceae. Has an elongated or reduced axis with 1 to many *glumes*, each *glume* subtending a bisexual or unisexual flower.

Stipe – short, narrowed extension to the base of the *nutlet*.

Stolon – in Cyperaceae this term is applied to a thin underground branch arising from the *rhizome* or base of the *culm*. Each stolon terminates in an aerial shoot.

Style base – a variously-shaped portion at the base of the style which is persistent on the mature *nutlet* in some genera.

Trabeculate – having the appearance of minute girders.

Trigonus – 3-sided, with the margins blunt and rounded. Applied here to the *culm* and *nutlet*.

Triquetrous – 3-sided with the margins acute. Applied here to the *culm* and *nutlet*.

Umbel-like – inflorescence in which the primary branches \pm arise from the same point, the inflorescence being subtended by 1 to several *involucral bracts*. Also referred to as anthelate or an anthela in literature on Cyperaceae.

Unifacial – applied to leaves which are bilaterally flattened, without a distinct dorsiventral appearance.

Utricle – a prophyll which has developed into a characteristic bottle-like structure and partially to completely surrounds the *nutlet* in *Carex*. Also referred to as a perigynium in literature on Cyperaceae.

Key to genera

For accurate identification of Cyperaceae, good fruiting material should be used wherever possible. Indeed, this is essential in certain genera such as *Fimbristylis* and *Scleria*. It is also very important to have underground parts as these may be diagnostic for some species, especially for distinguishing between annual and perennial taxa. Care is needed when counting the number of stigmas as these are easily broken off. Several flowers should be observed from the same specimen. Care is also needed when counting the stamens. Anthers break off easily leaving the filaments partially hidden within the glumes. Always check that filaments are present.

1. Inflorescence comprising spicoids with 2 opposite, keeled, floral bracts at base often enclosing a further 2–15 floral bracts, each unit subtended and usually hidden by a spicoid bract 2
 Inflorescence not as above 5
2. Leaves without blades; culms with transverse septa **11. Lepironia**
 Leaves with blades fully developed; culms without septa 3
3. At least some spicoids with more than 8 floral bracts; nutlets 6 mm or more wide, corky and with 6–10 deep longitudinal ridges **17. Scirpodendron**
 Spicoids with 2–6 floral bracts; nutlets up to 5 mm wide, not corky, sometimes with 2–5 shallow ridges or furrows 4
4. Spicoids with 5 or 6 floral bracts; stamens 3 per spicoid **13. Mapania**
 Spicoids with 2 floral bracts; stamens 2 per spicoid **10. Hypolytrum**

5.	All flowers unisexual	6
	At least some flowers bisexual	8
6.	Female flowers and nutlets hidden by a utricule	3. Carex
	Female flowers and nutlets not hidden by a utricule	7
7.	Inflorescence made up of capitate clusters of spikelets arising along whole length of culm; nutlets tightly enclosed by 2 subtending glumes and shed with them	5. Diplacrum
	Inflorescence paniculate or ± capitate, arising on upper part of culm; nutlets not tightly enclosed by 2 glumes	18. Scleria
8.	Spikelets much reduced, with 0–2 glumes subtended by a glume-like spikelet bract, spikelets densely clustered into spikes or in a capitate inflorescence	4. Cyperus
	Spikelets not as above, elongated, with spirally or distichously arranged glumes	9
9.	Spikelets usually with bisexual and male flowers	10
	Spikelets usually with bisexual flowers only	13
10.	Nutlets biconvex, with persistent style base; stigmas 2 or style undivided	14. Rhynchospora
	Nutlets trigonous or obtuse trigonous-cylindric, without persistent style base; stigmas 3 ..	11
11.	Glumes distichous	16. Schoenus
	Glumes spirally arranged	12
12.	Leaf blade unifacial; nutlets beaked	12. Machaerina
	Leaf blade dorsiventral; nutlets without a beak	9. Gahnia
13.	Style jointed with ovary and clearly demarcated from it	14
	Style continuous with ovary and not demarcated from it	16
14.	Leaf blades absent; perianth bristles present	6. Eleocharis
	Leaf blades usually present, if absent then style base not persistent on nutlet; perianth segments absent	15
15.	Leaf sheath without long silky hairs at apex; nutlets without persistent style base	7. Fimbristylis
	Leaf sheath with long silky hairs at apex; nutlets with persistent style base	2. Bulbostylis
16.	Glumes distichous; perianth segments absent	4. Cyperus
	Glumes spirally arranged; perianth segments present	17

17. Perianth segments 3, in 1 whorl only, obovate or oblong **8. Fuirena**
 Perianth segments more than 3, needle-like or bristle-like 18
18. Involucral bracts several, glume-like, spreading; inflorescence paniculate
 **1. Actinoscirpus**
 Involucral bract 1, culm-like, erect or patent, later deflexed; inflorescence capitate
 **15. Schoenoplectiella**

1. ACTINOSCIRPUS (Ohwi) Haines & Lye

(Greek, *actino-* = rayed, *-scirpus* = pertaining to *Scirpus* L.)

Bot. Not. 124 (1971) 481; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 165; Simpson & Koyama, Fl. Thailand 6(4) (1998) 274; Dai et al., Fl. China 23 (2010) 181. **Basionym:** *Scirpus* L. sect. *Actinoscirpus* Ohwi, Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B, Biol. 18 (1944) 98. **Type:** *Actinoscirpus grossus* (L.f.) Goetgh. & D.A.Simpson.

Hymenochaeta P.Beauv. ex T.Lestib., Essai Cypér. (1819) 43, nom. rej. **Type:** Not designated.

Robust perennials with slender stolons terminated by a small tuber. **Culms** 1(–3), broad, triquetrous, rather spongy, septate-nodulose, enlarged at base. **Leaves** basal, few per culm; blade linear; sheath open, rather spongy, septate-nodulose; ligule 0. **Involucral bracts** several, leaf-like, spreading, exceeding inflorescence. **Inflorescence** terminal, umbel-like. **Spikelets** small, often crowded. **Glumes** numerous, spirally imbricate, 1-nerved, all fertile. **Flowers** bisexual. **Perianth segments** (5–)6, needle-like. **Stamens** 3. **Stigmas** 3; style continuous with ovary. **Nutlets** broadly obovate to obdeltoid, subcompressed to triangular, sides flat.

Distribution. A genus of 1 species in tropical and subtropical Asia to northern Australia, including in Singapore.

Ecology. Swamps, ditches and, elsewhere in Southeast Asia, rice paddies, often growing in large stands.

Taxonomy. *Actinoscirpus* was previously placed in the closely related genera *Scirpus* and *Schoenoplectus* but differs from these in the structure of the inflorescence and embryo type. Its segregation from these is also supported by molecular phylogenetics (e.g. Semmouri et al., Bot. Rev. (Lancaster) 85 (2019) 1–39). Haines & Lye (Bot. Not. 124 (1971) 481) noted the morphological distinctions but did not formally transfer the species into *Actinoscirpus*. Other authors (e.g. Wilson, Telopea 2 (1981) 153–172) used *Hymenochaeta* as the generic name but this was subsequently rejected against *Hymenochaete* Leville, a genus of fungi.

Actinoscirpus grossus (L.f.) Goetgh. & D.A.Simpson

(Latin, *grossus* = thick, coarse; referring to the large size of the plant with thick culms)

Kew. Bull. 46 (1991) 171; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 519; Simpson & Koyama, Fl. Thailand 6(4) (1998) 274; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 10, 124, 225; Dai et al., Fl. China 23 (2010) 181. **Basionym:** *Scirpus grossus* L.f., Suppl. (1781) 104; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 659; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Fl. Malay Penins. 5 (1925) 162; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1981; Kern, Fl. Males., ser. 1, 7(3) (1974) 498; Turner, Gard. Bull. Singapore 45 (1993) 68; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 139. **Synonyms:** *Hymenochaeta grossa* (L.f.) Nees, Edinburgh New Phil. J. 17 (1834) 264. – *Schoenoplectus grossus* (L.f.) Palla, Allg. Bot. Z. Syst. 17 Beibl. (1911) 3. **Type:** *Collector unknown s.n.* (lectotype LINN [Herb. Linn. no. 71.32], designated by Goetghebeur & Simpson, Kew. Bull. 46 (1991) 171). **Fig. 2.**

Perennial. **Culms** 100–200 cm long, 10–12 mm wide, sides concave. **Leaves** basal; blade 50–170 cm long, 15–30 mm wide, apex gradually narrowed, 1-nerved, flattish-plicate; sheath up to 30 cm long. **Involucral bracts** 3–4, up to 50 cm long. **Inflorescence** simple to compound, 6–15 × 6–15 cm, primary branches up to 7 cm long scabrous above, secondary branches 1.5–4 cm long, scabrous. **Spikelets** solitary, pedicellate or sessile, ellipsoid to oblong-ellipsoid, 5–10 × 3.5–4 mm, rounded, light rusty brown to dark brown. **Glumes** elliptic to ovate-elliptic, 2.5–3 × 1.8–2 mm, apex obtuse, membranous, boat-shaped, ciliolate above and on upper margin, sides rusty brown to dark brown, keel green. **Perianth segments** slightly exceeding nutlet, retrorsely scabrous. **Anthers** 1.5 mm long. **Nutlets** 1–1.8 × 0.9–1 mm, reddish-brown.

Distribution. Tropical and subtropical Asia to northern Australia. Native in Singapore but no recent records. Previously recorded from Sembawang (*Sinclair SFN40626*, 20 May 1955, SING [SING0005230]), Singapore Botanic Gardens (*Furtado* 14 Mar 1956, SING [SING0239970]) and Swiss Club Road (*Ridley 5797*, 1892, SING [SING0005229]; *Hullett s.n.*, 31 Oct 1893, K [K000626695]).

Ecology. Common, emergent in swamps, ditches and rice paddies, often growing in large stands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Used for matting and weaving over much of its range but often considered to be of inferior quality compared to other species.

Vernacular name. *Greater clubrush* (English).

2. BULBOSTYLIS Kunth

(Latin, *bulbo-* = bulb, *-stylis* = style; alluding to the bulbous style-base on the nutlet)

Enum. Pl. 2 (1837) 205, nom. cons.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 651; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 77; Ridley, Fl. Malay Penins. 5 (1925) 160; Kern, Fl. Males., ser. 1, 7(3)

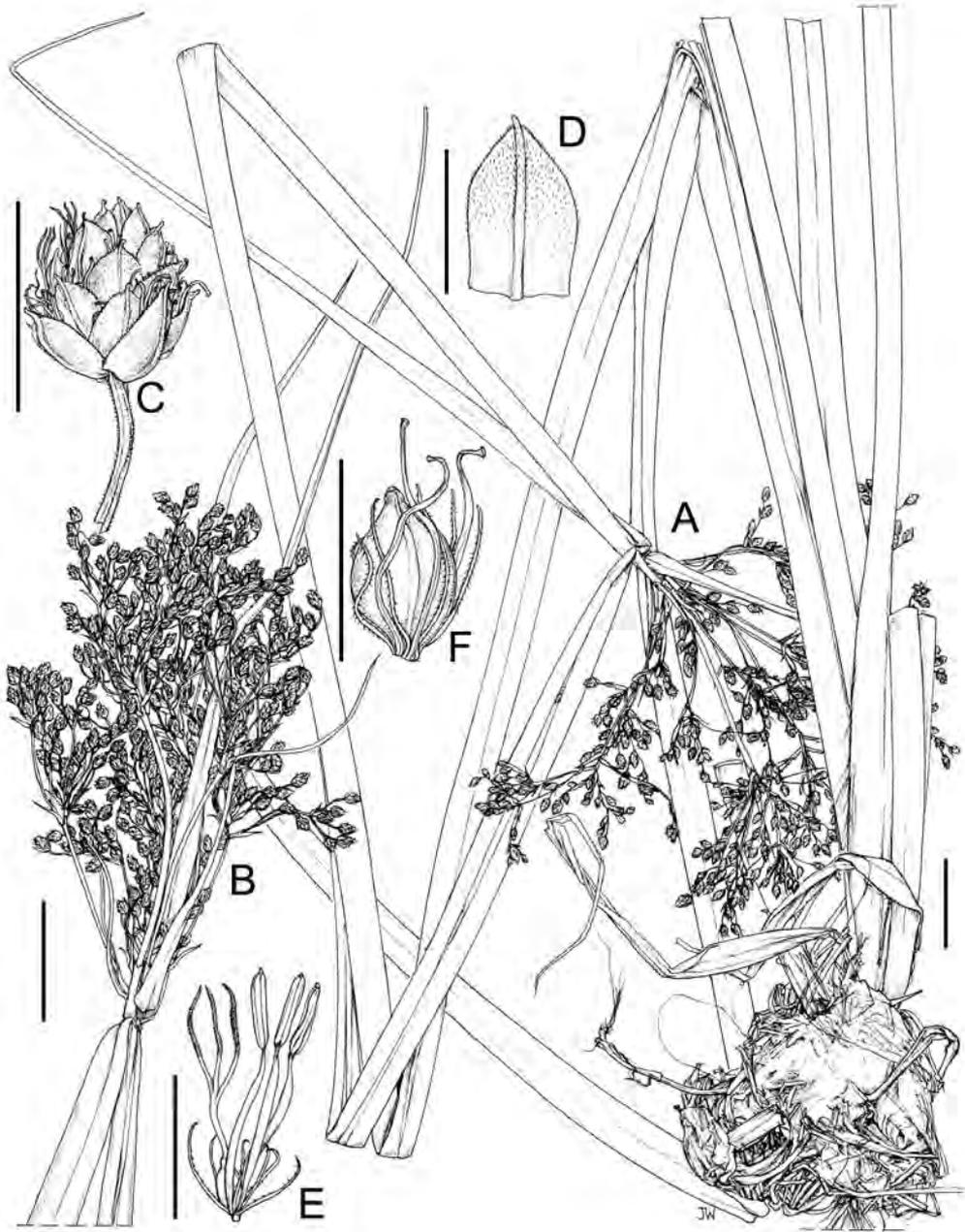


Figure 2. *Actinoscirpus grossus* (L.f.) Goetgh. & D.A.Simpson. A. Habit. B. Inflorescence. C. Spikelet. D. Glume. E. Flower. F. Nutlet. (From Peninsular Malaysia, *Simpson & Khamarudin* 89/46. Drawn by J. Williamson).

(1974) 537; Goetghebeur in Kubitzki et al. (ed.), *Fam. Gen. Vasc. Pl.* 4 (1998) 167; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 342; Liang & Tucker, *Fl. China* 23 (2010) 218. **Type:** *Scirpus capillaris* L. (= *Bulbostylis capillaris* (L.) Kunth ex C.B.Clarke).

Stenophyllus Raf., *Neogenyt.* (1825) 4. **Type:** *Stenophyllus caespitosus* Raf. (= *Bulbostylis stenophylla* (Elliott) C.B.Clarke).

Small to medium annuals or perennials. **Culms** ± filiform, terete. **Leaves** basal, bladed or rarely reduced to bladeless sheaths; blades narrowly linear or filiform; sheath with long silky hairs at apex. **Involucral bracts** leaf-like to glume-like. **Inflorescence** simple to decomposed umbel-like or capitate or reduced to a single terminal spikelet. **Spikelets** ovoid to ellipsoid, often angular. **Glumes** many, all fertile, spirally imbricate. **Flowers** bisexual. **Perianth segments** 0. **Stamens** 1–3. **Stigmas** 3; style-base thickened, persistent on nutlet. **Nutlets** obovoid to orbicular, trigonous to triquetrous, surface variously patterned.

Distribution. A genus of 219 species, tropics and subtropics to warm temperate regions. In Singapore 2 native species.

Ecology. Open, dry to semi-dry sandy places, often near the coast. Also found in inland savannah grasslands and on rock outcrops.

Taxonomy. *Bulbostylis* is morphologically close to *Fimbristylis* Vahl and there has been confusion between the two genera, particularly among African taxa. Molecular phylogenetics (e.g. Roalson et al., *Phytotaxa* 395(3) (2019) 199–208) confirm a sister group relationship between the genera. *Bulbostylis* can be distinguished by the presence of longish hairs at the leaf sheath apex and a persistent, bulbous style-base at the nutlet apex.

Key to *Bulbostylis* species

1. Glumes not hairy; stamen 1 **1. B. barbata**
Glumes hairy; stamens 2 **2. B. thouarsii**

1. *Bulbostylis barbata* (Rottb.) C.B.Clarke

(Latin, *barbatus* = bearded; referring to the tufts of long hairs in the leaf sheath apex and sometimes at the base of the spikelets)

in Hooker, *Fl. Brit. India* 6, fasc. 19 (1893) 651; Ridley, *J. Straits Branch Roy. Asiat. Soc.* 33 (1900) 182; Ridley, *Mat. Fl. Malay. Penins.* 3 (1907) 77; Ridley, *Fl. Malay Penins.* 5 (1925) 160; Henderson, *Malay. Wild Fls., Monocot.* (1954) 265; Kern, *Fl. Males., ser. 1*, 7(3) (1974) 539; Turner, *Gard. Bull. Singapore* 45 (1993) 61; Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 519; Keng et al., *Concise Fl. Singapore, vol. 2, Monocot.* (1998) 114; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 343; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 21, 124, 225; Liang & Tucker, *Fl. China* 23 (2010) 219. **Basionym:** *Scirpus barbatus* Rottb., *Descr. Icon. Rar. Pl.* (1773) 52. **Synonym:** *Stenophyllus barbatus* (Rottb.) T.Cooke, *Fl. Bombay* 2 (1908) 887. **Type:** *Collector unknown s.n.*, locality unknown (holotype C [C10009996]). **Fig. 3.**

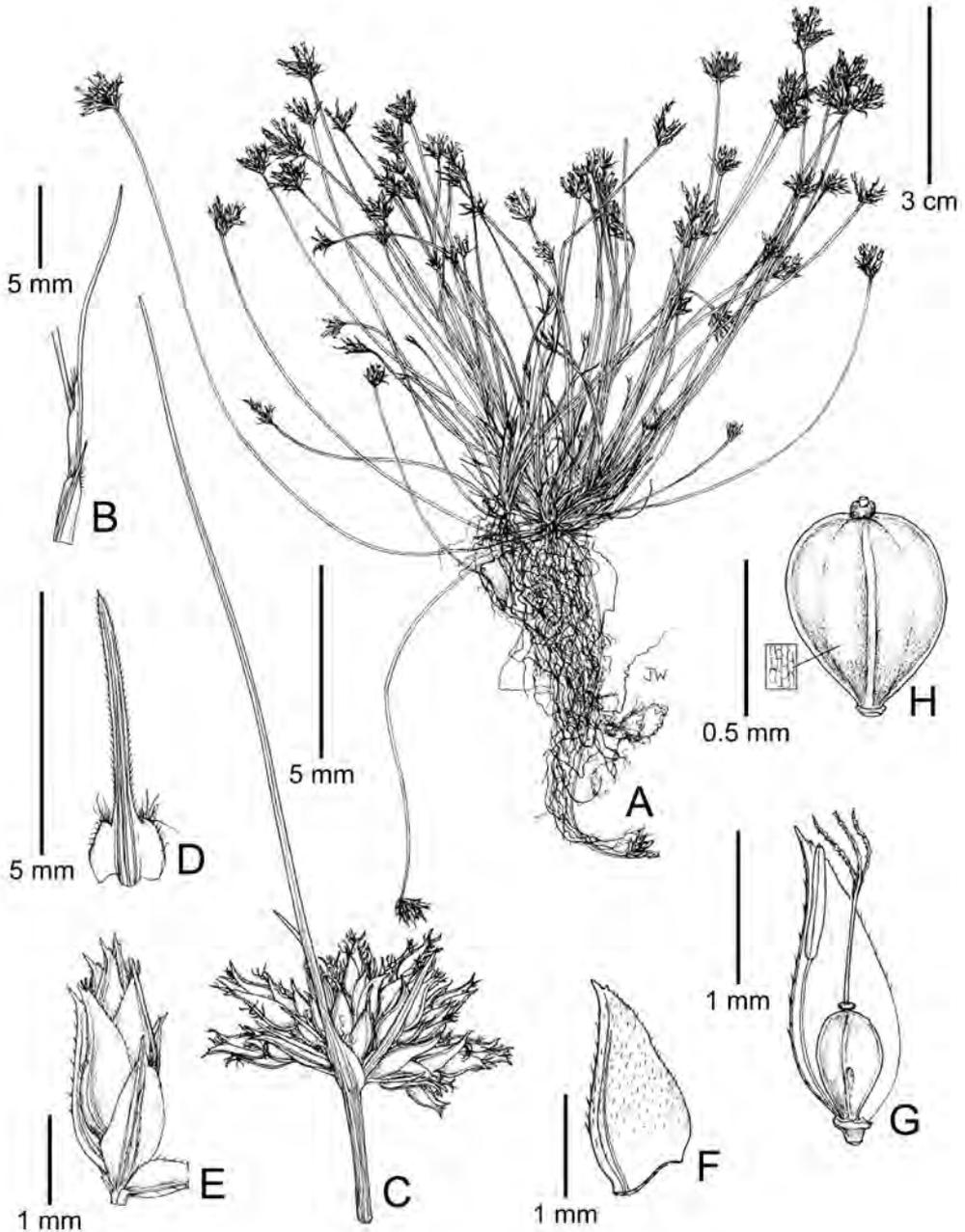


Figure 3. *Bulbostylis barbata* (Rottb.) C.B.Clarke. **A.** Habit. **B.** Leaf sheath apices. **C.** Inflorescence. **D.** Inflorescence bract. **E.** Spikelet. **F.** Glume. **G.** Flower. **H.** Nutlet. (A, B, H from Peninsular Malaysia, *Corner 25801*; C, D, E–G from Peninsular Malaysia, *Yao FRI53085*. Drawn by J. Williamson).

Annual. **Culms** densely tufted, 5–30 cm long, 0.2–0.4 mm diam., ± terete, smooth, glabrous. **Leaves** basal; blade filiform, 4–10 cm long, 0.2–0.5 mm wide, apex acute, glabrous to sparsely pilose above; sheaths 0.5–2 cm long, brownish. **Involucral bracts** 1–3, setaceous, the longest 0.3–2.5 cm long. **Inflorescence** capitate, 5–15 mm wide. **Spikelets** 2–20, lanceolate to ovoid-conical, angular, 3–8 × 1–1.8 mm. **Glumes** 7–15 per spikelet, ovate, 1.5–2.3 × 1–1.5 mm, apex acute, recurved-mucronate, sides membranous, yellowish-green to rusty or chestnut brown, ciliolate to puberulent, margins hyaline, keel acute. **Stamen** 1; anther 0.2–0.5 mm long. **Nutlets** obovoid-orbicular, trigonous, 0.6–0.8 × 0.4–0.6 mm, whitish, ± smooth to finely papillose.

Distribution. Old World tropics and subtropics, and in southeastern USA. Native in Singapore but no recent records and possibly extinct. Previously recorded from Changi (*Foxworthy s.n.*, 6 Apr 1889, SING [SING0055329]), Changi Beach (*Ridley s.n.*, 1891, SING [SING0055327]), Telok Paku (*Burkill HMB2125*, 6 Sep 1959, K [K000626996]) and Tongul (*Murton 132*, Jun 1878, SING [SING0055328]).

Ecology. Open semi-dry sandy places, elsewhere frequent on dunes and sandy ground near sea. Also across its range found in inland savannah grasslands and on rock outcrops.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Vernacular name. *Button sedge* (English).

2. *Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove

(Louis-Marie Aubert du Petit-Thouars, 1758–1831, French botanist)

Blumea 59(1) (2014) 10. **Basionym:** *Scirpus thouarsii* Roem. & Schult., Syst. Veg., ed. 15 bis, 2 (1817) 134. **Synonyms:** *Scirpus puberulus* Poir. in Lamarck, Encycl. 6, fasc. 2 (1805) 767, nom. illeg. non Michx. (1803). – *Isolepis thouarsii* (Roem. & Schult.) Nees, Linnaea 9 (1834) 291, nom. illeg. non A.Dietr. (1833). – *Isolepis puberula* Kunth, Enum. Pl. 2 (1837) 213, nom. illeg. superfl. – *Bulbostylis puberula* C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 652, nom. illeg. superfl.; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 78; Ridley, Fl. Malay Penins. 5 (1925) 160; Henderson, Malay. Wild Fls., Monocot. (1954) 265; Kern, Fl. Males., ser. 1, 7(3) (1974) 540; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 519; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 115, fig. 216; Simpson & Koyama, Fl. Thailand 6(4) (1998) 343; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 21, 124, 225; Liang & Tucker, Fl. China 23 (2010) 218. **Type:** *Petit-Thouars s.n.*, Madagascar (lectotype P [P00457046], designated by Veldkamp & Verlove, Blumea 59(1) (2014) 10; isolectotype P [P00457047]). **Fig. 4.**

Annual. **Culms** densely tufted, 7–40 cm long, 0.3–0.8 mm diam., scabrid, glabrous to puberulent. **Leaves** basal; blade filiform, 2–9 cm long, 0.3–0.6 mm wide, glabrous to puberulent; sheath 0.8–3 cm long, pubescent, pale brown. **Involucral bracts** 2–4, leaf-like, the longest up to 4 cm long. **Inflorescence** simple, often condensed and appearing ± capitate, 1–1.5 × 1.5 cm.



Figure 4. *Bulbostylis thoursii* (Roem. & Schult.) Lye ex Veldkamp & Verloove. (From Singapore, Bishan, Chen SING2017-701. Photos: L.M.J. Chen).

Spikelets (1–)5–20, solitary, ovoid to cylindric-ovoid, angular, $4\text{--}8 \times 1.4\text{--}1.6$ mm. **Glumes** 5–14 per spikelet, broadly ovate, $1.7\text{--}2.2 \times 1.5\text{--}2$ mm, apex acute, recurved-mucronate, sides membranous, pale greenish to light brown, densely pubescent, margins hyaline, keel acute. **Stamen** 1; anther 0.5–0.7 mm long. **Nutlets** broadly obovoid, triquetrous, $0.8\text{--}1 \times 0.5\text{--}0.8$ mm, whitish to pale yellowish, transversely wrinkled, obscurely reticulate with longitudinally oblong epidermal cells.

Distribution. Central Africa, through India to southeastern China and western Malesia. In Singapore recorded from Bishan, Changi Beach, Khatib Bongsu, Pulau Tekong (*Samsuri et al.* 55, 31 Oct 2001, SING [SING0039733]), Pulau Ubin (*Ali Ibrahim & Lai* SING2011-499, Nov 2011, SING [SING0182053]) and Singapore Botanic Gardens. Previously also recorded from Changi (*Ridley* 1727, SING [SING0004708]), Geylang (*Ridley s.n.*, Apr 1903, SING [SING0004709]), Tanjong Katong (*Deshmukh s.n.*, 27 Apr 1921 SING [SING0004710]) and Thomson Road.

Ecology. Open semi-dry, sandy ground, often near coast.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Uses. In the 1930s this plant was cultivated in the Thomson Road area and exported to China for use as a diuretic (Keng et al., *Concise Fl. Singapore*, vol. 2, Monocot. (1998) 115).

Notes. For discussion of the synonymy of this species, see Veldkamp & Verloove (*Blumea* 59(1) (2014) 10).

3. CAREX L.

(the classical Latin name for a sedge)

True sedges (English)

Sp. Pl. 2 (1753) 972; Clarke in Hooker, *Fl. Brit. India* 6, fasc. 20 (1894) 699; Ridley, *Mat. Fl. Malay. Penins.* 3 (1907) 115; Ridley, *Fl. Malay Penins.* 5 (1925) 180; Kükenthal in Engler, *Pflanzenr.*, IV, fam. 20 (Heft 38) (1909) 67; Burkill, *Dict. Econ. Prod. Malay Penins.* 1 (1935) 458; Kern & Nooteboom, *Fl. Males.*, ser. 1, 9(1) (1979) 107; Goetghebeur in Kubitzki et al. (ed.), *Fam. Gen. Vasc. Pl.* 4 (1998) 187; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 449; Dai et al., *Fl. China* 23 (2010) 285. **Type:** *Carex hirta* L., lectotype designated by Green, *Nom. Prop. Brit. Bot.* (1929) 187.

Perennials. **Culms** trigonous to triquetrous, rarely terete. **Leaves** 3-ranked, basal and/or cauline; blade linear to lanceolate; sheath closed; radical sheaths often brown-coloured, often disintegrating into fibres; ligule 0. **Involucral bracts** leaf-like to setaceous. **Inflorescence** paniculate, racemose or spicate, with 2 to many spikes, or reduced to a single, terminal spike. **Spikes** male only, androgynous or female, the male spikes usually terminal. **Glumes** spirally arranged, each subtending a single unisexual flower (= a reduced spikelet). **Male flowers** comprising 3 stamens. **Female flowers** comprising a bottle-shaped utricle, closed except at apex, the apex with or without a short beak, the beak truncate or 2-toothed. **Perianth segments** 0. **Stigmas** 2–3; style continuous with ovary. **Nutlets** 2–3-sided, surface usually papillose.

Distribution. A genus of 1992 species, cosmopolitan but with particular diversity in North America and eastern Asia. In Singapore 1 native species.

Ecology. *Carex* occurs in a diverse range of moist to wet habitats. In the tropics they usually occur at higher altitudes and are mostly absent from tropical lowlands, with the exception of a few species which occur on moist forest floors.

Taxonomy. *Carex* is the fifth largest genus of flowering plants and the largest in Cyperaceae. It is easily characterised by the presence of the bottle- or sac-like utricle surrounding the nutlet in female spikes. The relationship of *Carex* to the rest of the family was long uncertain but recent molecular phylogenetic studies show it to be sister group to genera in tribe Scirpeae.

Carex cryptostachys Brongn.

(Greek, *crypto-* = concealed, hidden, *-stachys* = relating to a spike;
alluding to the inflorescence often concealed or hidden by the leaves)

in Duperrey, Voy. Monde, Phan., fasc. 11 (1833) 152; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 714, as '*cryptostachys*'; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184, as '*cyrtostachys*'; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 38) (1909) 471; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 116; Ridley, Fl. Malay Penins. 5 (1925) 181; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 458; Henderson, Malay. Wild Fls., Monocot. (1954) 291; Kern & Nootboom, Fl. Males., ser. 1, 9(1) (1979) 148; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 520; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 115, fig. 217; Simpson & Koyama, Fl. Thailand 6(4) (1998) 470; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 23, 124, 202; Dai et al., Fl. China 23 (2010) 317. **Type:** *Dumont d'Urville s.n.*, [Indonesia, West Papua], Waigiou [Waigeo], Offack (holotype P [P00586684]). **Fig. 5.**

Rhizomatous perennial. **Rhizome** woody, creeping to ascending, covered with fibrous leaf sheath remains. **Culms** several, lateral, 10–50 cm long, 0.3–1 mm, trigonous, flexuous, smooth. **Leaves:** blade up to 70 cm long, 3–18 mm wide. **Involucral bracts** reduced to short-bladed sheaths 0.7–2 cm long. **Inflorescence** 6–27 cm long; nodes up to 6, each subtending 1 partial inflorescence or a single spike, the partial inflorescences 3–12 × 1 cm, with up to 8 spikes. **Spikes** erect, ± sessile to shortly pedunculate, cylindric, 1–3 cm long, androgynous, upper section male, lower female. **Female glumes** ovate, 2.2–2.8 mm long, apex acute to subacute, very shortly mucronate, sides membranous, indistinctly several-nerved, pale brown, keel indistinctly 3-nerved. **Utricles** erect, obovate to obovate-fusiform, trigonous, 3.5–5.5 × 1.5–2 mm, pale brown, finely many-nerved, sparsely puberulent above, rather abruptly narrowed into beak; beak 0.5–0.7 mm long, apex minutely 2-toothed. **Stigmas** 3. **Nutlets** ellipsoid, trigonous with sides concave above, 2 × 1 mm.

Distribution. Thailand to southeastern China and northern Australia. In Singapore recorded only from Bukit Timah (*Ridley 1720*, 1890, SING [SING0004810]; *Duistermaat & Leong HDS338*, 12 May 2005, K [K000626716], SING [SING0083501]; *Choo & Niissalo SING2018-1004*, 27 Dec 2018, SING [SING0266861]) and Singapore Botanic Gardens (*Jumali s.n.*, 15 Oct 1964, SINU).

Ecology. Wet, grassy forest floors.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Critically Endangered (CR/D) in Singapore.

Vernacular name. *Rumput ringgin* (Malay).

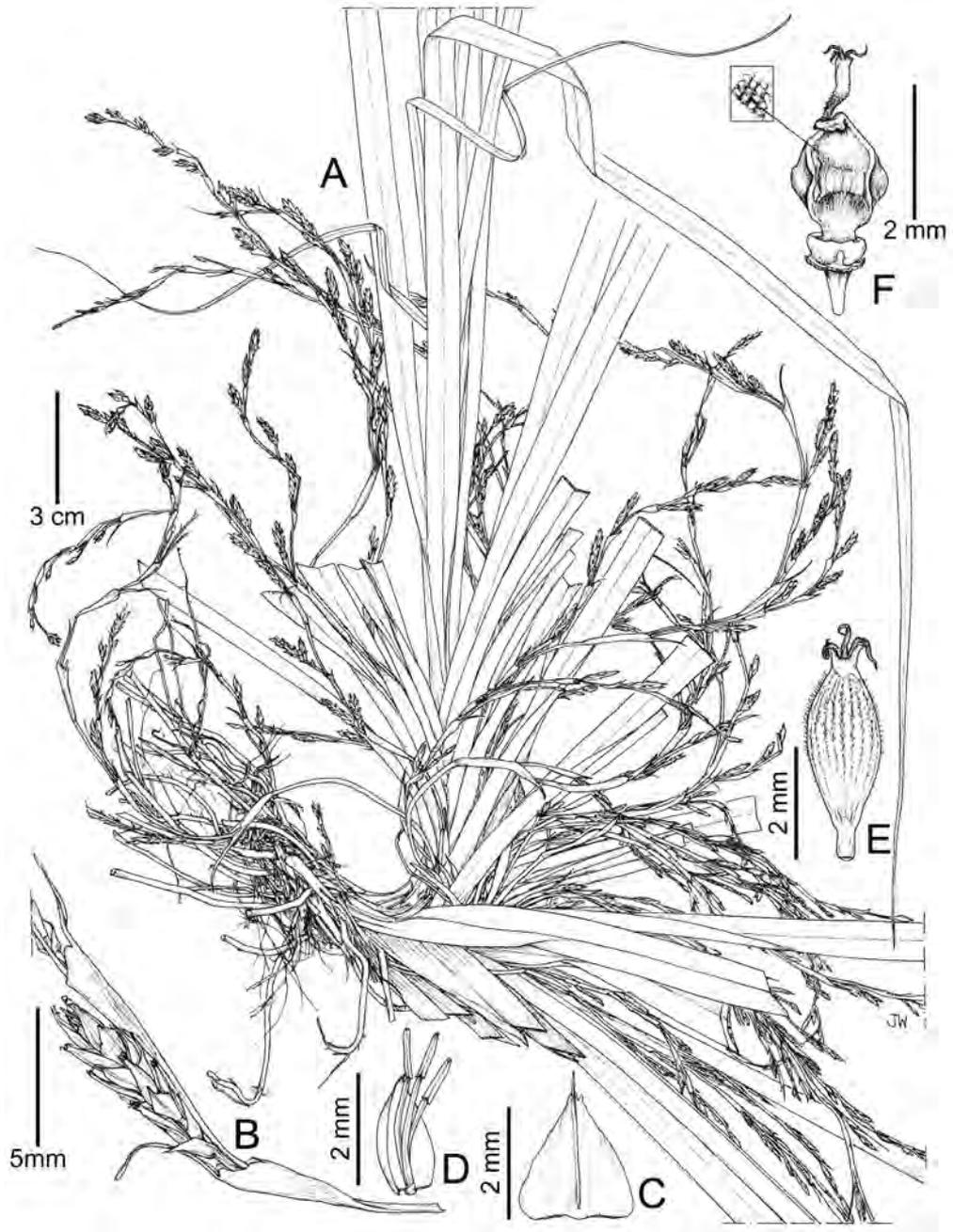


Figure 5. *Carex cryptostachys* Brongn. **A.** Habit. **B.** Spike. **C.** Glume. **D.** Male flower with glume. **E.** Utricle. **F.** Immature nutlet. (A–D from Peninsular Malaysia, *Burkill 2578*; E, F from Peninsular Malaysia, *King's Collector 8517*. Drawn by J. Williamson).

4. CYPERUS L.

(the classical Greek name for a sedge)

Umbrella sedge, flatsedge, nutgrass, nutsedge (English)

Sp. Pl. 1 (1753) 44; Linnaeus., Gen. Pl., ed. 5 (1754) 26; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 597; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 62; Ridley, Fl. Malay Penins. 5 (1925) 140; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 731; Kern, Fl. Males., ser. 1, 7(3) (1974) 592; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 170; Simpson & Koyama, Fl. Thailand 6(4) (1998) 345; Dai et al., Fl. China 23 (2010) 219. **Type:** *Cyperus esculentus* L., lectotype designated by Britton, Bull. Dept. Agric. Jamaica 5, Suppl. 1 (1907) 6.

Kyllinga Rottb., Descr. Icon. Rar. Pl. (1773) 12, nom. cons.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 587; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 58; Ridley, Fl. Malay Penins. 5 (1925) 138; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1288; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 172; Simpson & Koyama, Fl. Thailand 6(4) (1998) 396; Dai et al., Fl. China 23 (2010) 246. **Type:** *Kyllinga nemoralis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel. (= *Cyperus mindorensis* (Steud.) Huygh).

Remirea Aubl., Hist. Pl. Guiane 1 (1775) 44; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 677; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 99; Ridley, Fl. Malay Penins. 5 (1925) 169; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1888; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 170; Simpson & Koyama, Fl. Thailand 6(4) (1998) 402; Dai et al., Fl. China 23 (2010) 241. **Type:** *Remirea maritima* Aubl. (= *Cyperus pedunculatus* (R.Br.) J.Kern).

Mariscus Vahl, Enum. Pl. 2 (1805) 372, nom. cons.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 619; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 71; Ridley, Fl. Malay Penins. 5 (1925) 148; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1245. **Type:** *Mariscus capillaris* (Sw.) Vahl. (= *Cyperus nanus* Willd. var. *nanus*).

Pycneus P.Beauv., Fl. Oware 2, fasc. 15 (1816) 48; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 589; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 59; Ridley, Fl. Malay Penins. 5 (1925) 139; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1843; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 172; Simpson & Koyama, Fl. Thailand 6(4) (1998) 389; Dai et al., Fl. China 23 (2010) 242. **Type:** *Pycneus polystachyos* (Rottb.) P.Beauv. (= *Cyperus polytachyos* Rottb.).

Lipocarpha R.Br. in J.H.Tuckey, Narr. Exped. Zaire (1818) 459; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 667; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 81; Ridley, Fl. Malay Penins. 5 (1925) 163; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 172; Simpson & Koyama, Fl. Thailand 6(4) (1998) 405; Dai et al., Fl. China 23 (2010) 249. **Type:** *Lipocarpha argentea* (Kunth.) R.Br. (= *Cyperus albescens* (Steud.) Larridon & Govaerts).

Anosporum Nees in Wight, Contr. Bot. India (1834) 70. **Type:** *Anosporum monocephalum* (Roxb.) Boeckeler. (= *Cyperus cephalotes* Vahl).

Juncellus C.B.Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 594. **Type:** *Cyperus mucronatus* Rottb.

Annuals or perennials, rhizomatous or stoloniferous. **Culms** terete to trigonous. **Leaves** basal, 3-ranked; blade usually present, sometimes reduced or absent; ligule 0. **Involucral bracts** leaf-like. **Inflorescence** terminal or rarely pseudolateral, of four types: (1) umbel-like, simple to decompose, with ultimate branches terminating in 1 or more elongate spikes or finger-like

clusters of spikelets; (2) with spikes/spikelet clusters sessile; (3) capitate or (4) with 1–10, ovoid spikes each comprising numerous, densely imbricate, (0–)2-glumed spikelets subtended by a glume-like spikelet bract. **Spikelets** linear to oblong or elliptic, laterally flattened to subterete; axis straight or zigzag, persistent or falling entire. **Glumes** 1–many, distichous when more than 1, deciduous or persistent, sides membranous to chartaceous or coriaceous, nerves 0–several, keel obtuse or rounded or strongly acute and sometimes winged, smooth, spinulose or serrulate. **Flowers** bisexual. **Perianth segments** 0. **Stamens** 1–3. **Stigmas** (1–)2–3; style continuous with ovary. **Nutlets** 1–many per spikelet, trigonous, sometimes triquetrous, or dorsiventrally compressed, or laterally biconvex with one margin facing the spikelet axis.

Distribution. A genus of 957 species, ± cosmopolitan, but particularly abundant in the tropics. In Singapore 39 species, 35 of which are considered native.

Ecology. Generally found in a wide range of open, moist to wet habitats, from especially grasslands and areas of cultivation. A few species occur on coastal dunes, beaches and forest floors.

Taxonomy. The taxonomic history of *Cyperus* and allied genera is complex and mostly centres around whether the allied genera should be included or excluded from a broadly circumscribed *Cyperus*. Current thinking, based on molecular phylogenetics (e.g. Larridon et al., Bot. J. Linn. Soc. 172(1) (2013) 106–126), supports the broadly circumscribed approach. In Singapore (and adjacent countries) this includes the sinking of four previously recognised genera (*Kyllinga*, *Lipocarpha*, *Pycerus* and *Remirea*) into *Cyperus*. Sectional delimitation of *Cyperus* is complex and currently in a state of flux as new patterns of relationship are revealed by phylogenetics.

Cyperus exaltatus Retz. and *C. melanospermus* (Nees) Valck.Sur. are included in the key in italics below as they have been included in the literature for Singapore even though no specimens have been found (see Excluded species).

Key to *Cyperus* species

1. Spikelets much reduced, with 0–2 glumes subtended by a glume-like spikelet bract, the spikelets densely clustered into spikes or in a capitate inflorescence 2
Spikelets not as above, elongated, with spirally or distichously arranged glumes 5
2. Perennial with long-creeping rhizome; coastal only **25. *C. pedunculatus***
Annual or perennial, without long-creeping rhizome; coastal or inland 3
3. Spikes not squarrose, the spikelet bracts without a recurved apex **1. *C. albescens***
Spikes squarrose, the spikelet bracts with a recurved apex 4
4. Inflorescence terminal; glumes present; nutlets 0.9 mm or more long **20. *C. leptocarpus***
Inflorescence pseudolateral; glumes absent; nutlets less than 0.9 mm long
..... **23. *C. neochinensis***

- 5. Stigmas 3, rarely 2; nutlets trigonous, rarely biconvex with 1 side facing spikelet rachilla 2
 Stigmas 2; nutlets biconvex with 1 margin facing spikelet rachilla 34
- 6. Spikelets in elongated spikes (but sometimes the spike rachis short) 7
 Spikelets in finger-like or globose clusters or inflorescence capitate 26
- 7. Annuals, underground rhizomes or stolons absent 8
 Perennials, underground rhizomes or stolons present 10
- 8. Spikelets 2.5 mm or more wide; glumes 3 mm or more long **5. C. compressus**
 Spikelets less than 2.5 mm wide; glumes less than 3 mm long 9
- 9. Glume sides very pale brown often with dark reddish-brown patch on side; glume apex subobtuse to subacute **33. C. sphacelatus**
 Glume sides greenish to yellowish or mid-brown; glume apex rounded to shallowly emarginated **18. C. iria**
- 10. Longest spikelets usually with up to 9 glumes (if more than 9 then whole spikelet easily detaching from spike rachis) 11
 Longest spikelets with 9 or more glumes 15
- 11. Spike rachis hairy **26. C. pilosus**
 Spike rachis not hairy 12
- 12. Spikes globose-stellate; spike rachis less than 1 cm long **4. C. compactus**
 Spikes ovate to oblong or cylindrical; spike rachis 1 cm or more long 13
- 13. Spikelets lanceolate to elliptic-lanceolate, 1.8 mm or more wide; glumes usually over 2 mm wide **19. C. javanicus**
 Spikelets linear to narrowly lanceolate, less than 1.8 mm wide; glumes up to 2 mm wide ..
 14
- 14. Spikes with sides narrowed to base; spikelets 1 mm or more wide, at least the lowest ones somewhat erect **7. C. cyperinus**
 Spikes truly cylindrical; spikelets less than 1 mm wide, spreading to ± reflexed
 **8. C. cyperoides**
- 15. Spikelets easily breaking into 1-glumed sections (when gently rubbed between fingers); rachilla thick, ± corky, partially to ± totally obscuring nutlet **24. C. odoratus**
 Spikelets not easily breaking into 1-glumed sections; rachilla not thick and corky or obscuring nutlets 16

16. Spikelet rachilla distinctly winged along rachilla internode (best seen when glumes are removed) 17
 Spikelet rachilla internode not or hardly winged 24
17. Spikes cylindric; spikes densely crowded 18
 Spikes oblong to ovoid, rarely loosely cylindric; spikelets not densely crowded 21
18. Spikes mostly erect to suberect; anther connective tip prominent, setulose
 **14. C. elatus**
 Spikes mostly erect-patent to patent; anther connective tip minute 19
19. Spikelets with a pale central band and darker margin (seen particularly in dried material), weakly flattened to subterete; glumes apiculate **11. C. digitatus**
 Spikelets without a pale central band, strongly flattened; glumes mucronate 20
20. Spikes with 50 or more suberect spikelets; spike rachis usually obscured by spikelets
 **17. C. imbricatus**
 Spikes with less than 50 patent to spreading spikelets; spike rachis usually distinct
 *C. exaltatus*
21. Rhizome short; spikelet rachilla visible between glumes particularly in mature inflorescence 22
 Plants with horizontally creeping rhizome or stoloniferous; spikelet rachilla not visible unless glumes removed 23
22. Glumes less than 1.5 mm wide; nutlets less than 0.8 mm wide **12. C. distans**
 Glumes 1.5 mm or more wide; nutlets 0.8 mm or more wide **36. C. tenuiculmis**
23. Spikelets subterete; glumes broadly ovate, up to 2.7 mm long (coastal areas)
 **34. C. stolonifer**
 Spikelets flattened; glumes narrowly to elliptic ovate, usually over 2.7 mm long (widespread) **31. C. rotundus**
24. Rhizomatous; spike rachis smooth, glabrous; spikelets linear subterete
 **21. C. malaccensis**
 Stoloniferous; spike rachis scabrid to shortly pilose; spikelets linear lanceolate to oblong
 25
25. Spikelets 2.5 mm or more wide; spike rachis scabrid **28. C. procerus**
 Spikelets less than 2.5 mm wide; spike rachis densely shortly pilose **26. C. pilosus**
26. Inflorescence capitate (rarely with 1–4, simple branches) 27
 Inflorescence umbel-like 28
27. Annual; inflorescence usually capitate, rarely with 1–4 simple branches; glumes with strongly recurved apex; nutlets more than 2 per spikelet **6. C. cuspidatus**

- Perennial; inflorescence always capitate; glumes with acute, not recurved apex; nutlets
1–2 per spikelet **13. *C. dubius***
28. Glumes up to 1.5 mm long and less than 1 mm wide 29
Glumes usually over 1.5 mm long and 1 mm or more wide 32
29. Spikelets more than 20, in congested globose clusters 30
Spikelets less than 20, in finger-like clusters 31
30. Glumes \pm orbicular, 0.5–0.8 mm long, apex rounded or shallowly emarginated
..... **9. *C. difformis***
Glumes lanceolate, 1–1.5 mm, long, apex acute, often mucronulate
..... **35. *C. surinamensis***
31. Glumes usually more than 1 mm long; nutlets 0.4 mm or more wide **16. *C. haspan***
Glumes up to 1 mm long; nutlets less than 0.4 mm wide **38. *C. tenuispica***
32. Culms less than 11 cm long; glumes 3 mm or more long **30. *C. radians***
Culms 11 cm or more long; glumes less than 3 mm long 33
33. Culms not winged; spikelets in open, finger-like clusters **10. *C. diffusus***
Culms winged; spikelets in compact \pm globose clusters **39. *C. trialatus***
34. Spikelets with more than 2 glumes; spikelet rachilla and glumes persistent 35
Spikelets with 1–2 glumes; spikelet rachilla deciduous, spikelets falling whole 38
35. Lower part of culm with several nodes; glumes often furrowed on both sides of keel
..... **32. *C. sanguinolentus***
Lower part of culm without nodes; glumes not furrowed on both sides of keel 36
36. Glumes with \pm translucent sides; glume apices truncate to emarginate and excurved
mucronate to awned **29. *C. pumilus***
Glumes not as above 37
37. Spikelets spreading, glumes usually over 1 mm wide, apex narrowly obtuse
..... **15. *C. flavidus***
Spikelets erect or erect-patent; glumes up to 1 mm wide, apex mostly acute
..... **27. *C. polystachyos***
38. Glumes broadly winged, markedly white at first, becoming pale brown
..... **22. *C. mindorensis***
Glumes not winged, greenish to pale greenish, not markedly white 39
39. Rhizome short; culms tufted, the base swollen **37. *C. tenuifolius***
Rhizome horizontally creeping; culms crowded or distant in series along rhizome 40

40. Involucral bracts 4–7(–8); spikes 45, the lateral spikes subtended by involucral bracts **2. C. aromaticus**
 Involucral bracts 3; spike usually 1, lateral spikes if present not obviously subtended by
 involucral bracts 41
41. Culms crowded along rhizome; leaf-blades (when present) usually more than 3 mm wide;
 longest involucral bract usually more than 2.5 mm wide *C. melanospermus*
 Culms rather distant along rhizome; leaves mostly 1–3 mm wide; longest involucral bract
 up to 2.4 mm wide **3. C. brevifolius**

1. *Cyperus albescens* (Steud.) Larridon & Govaerts

(Latin, *albescens* = becoming white, whitish; referring to the colour of the inflorescence)

Kew Bull. 71(2)-30 (2016) 1. **Basionym:** *Kyllinga albescens* Steud., Syn. Pl. Glumac. 2, fasc. 7 (1854) 68. **Type:** *Cuming 1418*, Philippines, 1841 (holotype P [P00724154]; isotypes BM [BM000959104, BM000959105, BM000959106], CN, G, K [K000290942], L [L0042649, L0042650], LE, MO, P [P00724155], UPS). **Fig. 6.**

Scirpus chinensis Osbeck, Dagb. Ostind. Resa (1757) 220. **Synonym:** *Lipocarpha chinensis* (Osbeck) Kern, Blumea, Suppl. 4 (1958) 167; Kern, Fl. Males., ser. 1, 7(3) (1974) 521; Goetghebeur & Van den Borre, Wageningen Agric. Univ. Pap. 89(1) (1989) 27; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 134, fig. 243; Simpson & Koyama, Fl. Thailand 6(4) (1998) 406; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 56, 125, 228; Dai & Tucker, Fl. China 23 (2010) 250. **Type:** *Osbeck s.n.*, China (holotype S [S-G-6821]).

Scirpus senegalensis Lam., Tabl. Encycl. 1, fasc. 1 (1791) 140. **Synonyms:** *Hypaelyptum senegalense* (Lam.) K.Schum. in Engler, Pflanzenw. Ost-Afrikas, C (1895) 127. – *Lipocarpha senegalense* (Lam.) T.Durand & H.Durand, Syll. Fl. Congol. (1909) 619. – *Hypaelyptum argenteum* Vahl, Enum. Pl. 2 (1805) 283, nom. illeg. superfl. – *Hypolytrum argenteum* Kunth in Humboldt et al., Nov. Gen. Sp. 1 (1816) 218. – *Lipocarpha argentea* (Kunth) R.Br., Narr. Exped. Zaire (1818) 477, nom. illeg. superfl. **Type:** *Roussillon s.n.*, Senegal, 1789 (holotype P-LA; isotypes G [G00018513], P [P00668322], P [P02440021]).

Annual or perennial. **Culms** tufted, 15–70 cm long, 1–2 mm diam. **Leaves:** blade up to 40 cm long, 2–4 mm wide, apex acute, ± flat; sheaths 1–15 cm long, reddish-brown or reddish-purple. **Involucral bracts** 2–3(–5), the longest up to 20 cm long. **Inflorescence** terminal. **Spikes** (1–)3–10, oblong or ovoid-ellipsoid, 5–8 × 4–5 mm, densely spirally imbricate spikelets, each subtended and hidden by a single glume-like spikelet bract. **Spikelet bract** spatulate to obovate or oblong, 1.5–2.7 × 0.4–1.3 mm, apex obtuse, apical part 1–2 mm long, membranous, white to pale yellowish- or greenish-brown, mid-nerve green. **Spikelet** hidden by spikelet bract, comprising 2 glumes and 1 flower. **Glumes:** lower glume elliptic, c. 1.5 mm long, apex obtuse, sides membranous, margins involute; upper glume ovate-lanceolate, 1.2–1.5 mm long, apex acute, subtending the flower. **Stamens** 1(–2); anthers 1 mm long. **Stigmas** 3. **Nutlets** oblong or oblong-ovoid, trigonous, 1–1.2 × 0.3–0.5 mm, pale yellowish-brown.

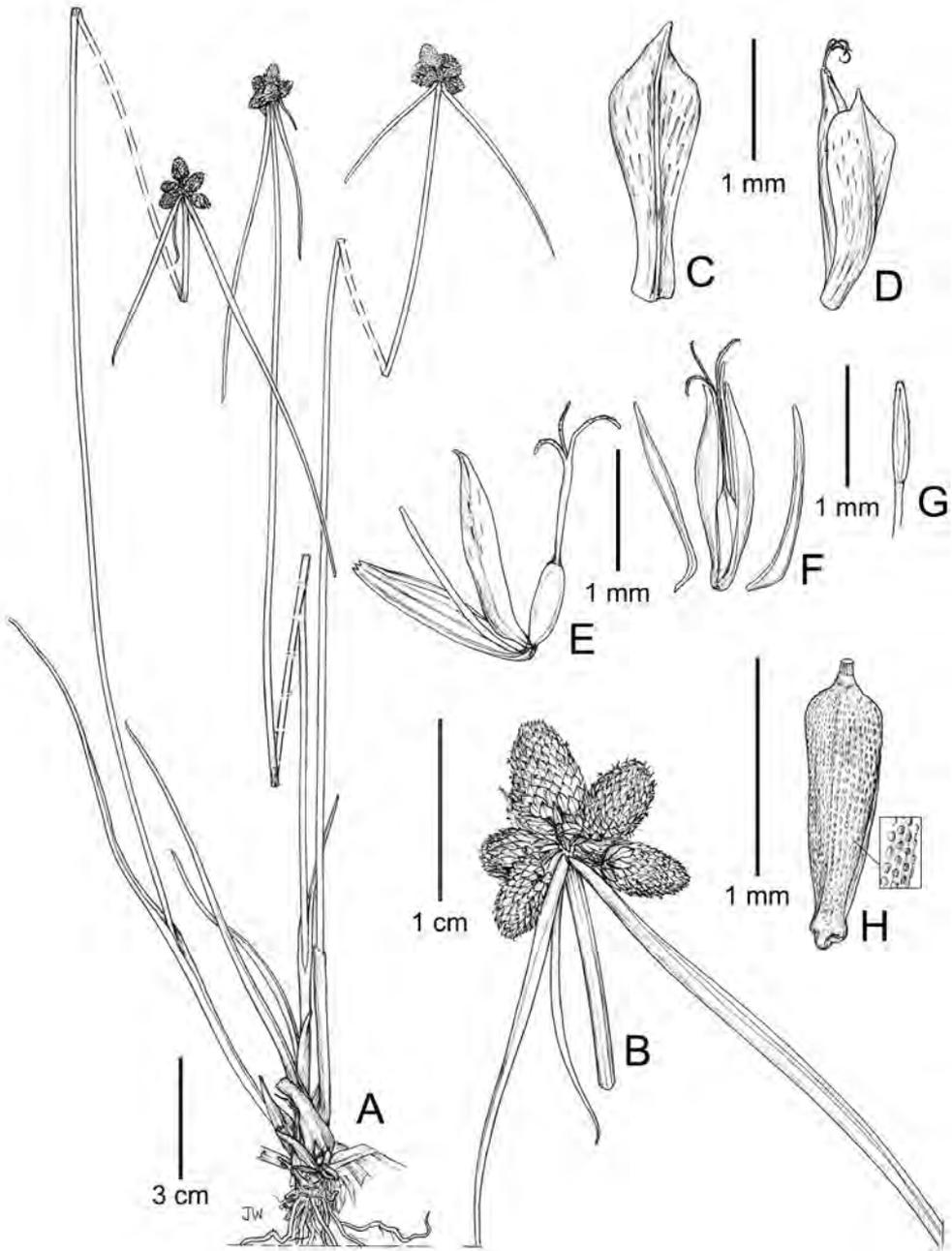


Figure 6. *Cyperus albescens* (Steud.) Larridon & Govaerts. **A.** Habit. **B.** Inflorescence. **C.** Spikelet bract. **D.** Spikelet with subtending spikelet bract. **E.** Spikelet. **F.** Spikelet with split upper glume. **G.** Anther. **H.** Nutlet. (A, B, H from Peninsular Malaysia, *Fitt 15*; C–G from Peninsular Malaysia, *Holtum 38206*. Drawn by J. Williamson, reproduced with the kind permission of the Director and the Board of Trustees, Royal Botanic Gardens, Kew).

Distribution. Old World tropics and subtropics. Native in Singapore but no recent records. Previously also recorded from Lower Peirce, MacRitchie (*Jumali s.n.*, 20 Jul 1961, SINU), Nee Soon, Pulau Ubin (*Sinclair s.n.*, 6 Aug 1949, SING [SING0005033]), Singapore Botanic Gardens (*Deshmukh s.n.*, 15 Sep 1921, SING [SING0240014]), Tampines Road (*Baker s.n.*, 15 Oct 1917, SING [SING0005035]) and Tanglin (*Ridley* 58, Jan 1889, SING [SING0005032]).

Ecology. Elsewhere in open marshy places, rice fields, and wet soil in forest clearings.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

2. *Cyperus aromaticus* (Ridl.) Matf. & Kük.

(Latin, *aromaticus* = aromatic, possibly referring to the aromatic rhizome)

in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 581; Kern, Fl. Males., ser. 1, 7(3) (1974) 656; Turner, Gard. Bull. Singapore 45 (1993) 67; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 116, fig. 218. **Basionym:** *Kyllinga aromatica* Ridl., Trans. Linn. Soc. London, Bot. 2 (1884) 146. **Type:** *Welwitsch 6801*, Angola, Pungo Andongo (holotype BM [BM000922550]; isotype LISU). **Fig. 7, 8.**

Kyllinga polyphylla Willd. ex Kunth, Enum. Pl. 2 (1837) 134; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Simpson & Koyama, Fl. Thailand 6(4) (1998) 396; Chong et al., Checkl. Vasc. Pl. Fl. Singapore Checkl. Vasc. Pl. Fl. Singapore (2009) 53, 125, 266; Dai et al., Fl. China 23 (2010) 248. **Type:** *Petit Thouars* [Herb. Willdenow 1441], Mauritius (holotype B-W).

Rhizomatous perennial; rhizome horizontally creeping. **Culms** crowded in series along rhizome, up to 75 cm long, 3 mm diam., triquetrous, smooth. **Leaves:** blade on uppermost 1–2 sheaths only, linear-lanceolate, 2–6.5 cm long, 4–5 mm wide, apex acute, flat; sheaths up to 15 cm long, greenish to purplish. **Involucral bracts** 4–7(–8), linear, the longest up to 14 cm long. **Inflorescence** capitate. **Spikes** 4–5; terminal spike ± globose, c. 0.7 × 0.7 cm, lateral spikes smaller, in axils of involucral bracts. **Spikelets** elliptic, 3–3.7 × 0.8–0.9 mm, 1–2-flowered. **Glumes** distichous, ovate-elliptic, 2.5–3 × 2 mm, apex obtuse, shortly mucronate, sides membranous, indistinctly 3–5-nerved, whitish to pale greenish, keel greenish, smooth to sparsely toothed. **Stamen** 1; anther 1–1.2 mm long. **Stigmas** 2. **Nutlets** oblong-obovate, laterally biconvex, c. 1 × 0.6 mm, greyish-brown.

Distribution. Tropical and southern Africa, and western Indian Ocean islands. Introduced elsewhere. In Singapore recorded from Pasir Panjang, Pasir Ris, Pulau Tekong (*Samsuri et al. PT28*, 31 Oct 2001, SING [SING0039705]), Pulau Semakau, Pulau Ubin (*Gwee et al. GAT150*, 7 Jan 2003, SING [SING0042878]), Tampines (*Ali Ibrahim SING2013-263*, 27 Oct 2013, SING [SING0201457]), Tampines Avenue 8 (*Duistermaat et al. HDS361*, 10 May 2005 SING [SING0080179]) and other localities. Previously also recorded from Changi Road (*Teruya 2169*, 13 Jan 1933, SING [SING0058274]), Clementi Road, Labrador, Pulau Hantu, Pulau Seletar, Serangoon, Singapore Botanic Gardens (*Purseglove P4024*, 7 Feb 1955, K [K000626697], SING [SING0240011]), St. John’s Island and other localities.

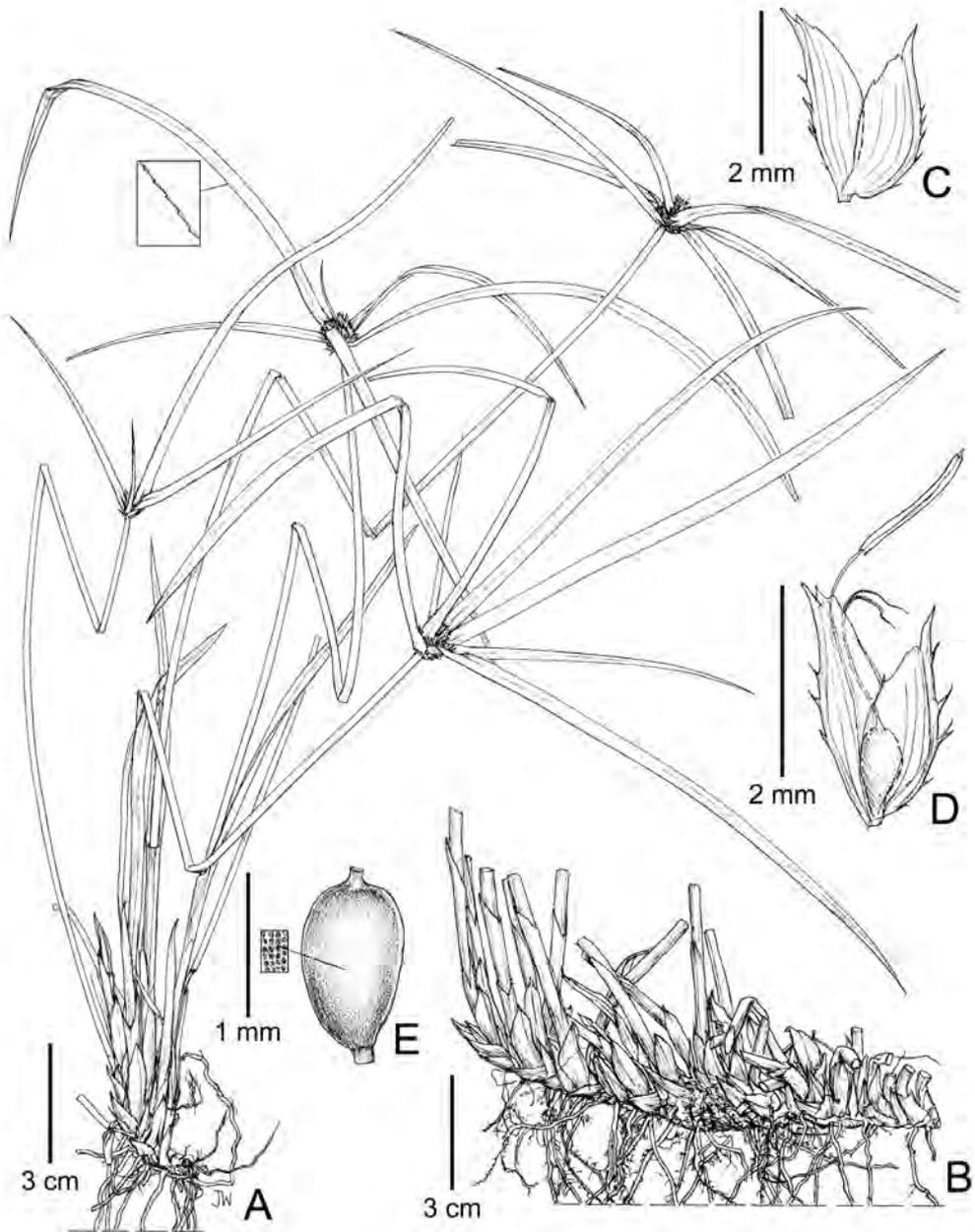


Figure 7. *Cyperus aromaticus* (Ridl.) Mattf. & Kük. **A.** Habit. **B.** Rhizome. **C.** Glumes. **D.** Spikelet with flower. **E.** Nutlet. (A, C–E from Peninsular Malaysia, *Simpson et al.* 89/17; B from Singapore, Sungei Buloh, *Duistermaat et al.* S67. Drawn by J. Williamson).



Figure 8. *Cyperus aromaticus* (Ridl.) Mattf. & Kük. **A.** Habit. **B.** Inflorescence. **C.** Rhizome. (From Singapore, MacRitchie, Leong-Škorničková & Leong SING2019-038. Photos: J. Leong-Škorničková).

Ecology. Open grassy places.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Vernacular names. *Greater kyllinga* (English), *sendayan* (Malay).

3. *Cyperus brevifolius* (Rottb.) Hassk.

(Latin, *brevi-* = short, *-folius* = leaved; with short leaves)

Cat. Hort. Bot. Bogor. (1884) 24; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 600; Henderson, Malay. Wild Fls., Monocot. (1954) 269; Kern, Fl. Males., ser. 1, 7(3) (1974) 656; Turner, Gard. Bull. Singapore 45 (1993) 62; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 116, fig. 219. **Basionym:** *Kyllinga brevifolia* Rottb., Descr. Icon. Rar. Pl. (1773) 13; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 588; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 58; Ridley, Fl. Malay Penins. 5 (1925) 138; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1289; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Simpson & Koyama, Fl. Thailand 6(4) (1998) 399; Chong et al., Checkl. Vasc. Pl. Fl. Singapore Checkl. Vasc. Pl. Fl. Singapore (2009) 53, 125, 271; Dai et al., Fl. China 23 (2010) 248. **Type:** *König s.n.*, India, Kerala, Malabar (holotype C [C10013371]; isotype C). **Fig. 9.**

Rhizomatous perennial; rhizome slender, long-creeping. **Culms** distant in series along rhizome, 7–30 cm long, 1–1.5 mm diam., triquetrous, smooth. **Leaves:** blade narrowly linear, 2–17 cm long, 1–3 mm wide, apex acute, flattish-plicate; sheath 1–20 cm long, brownish or purplish-brown. **Involutral bracts** 2–4, the longest 3–20 cm long, 1.7–2.4 mm wide, sometimes erect. **Inflorescence** capitate, globose. **Spikes** 1(–3), globose, 0.5–1 × 0.5–1 cm. **Spikelets** oblong-lanceolate to elliptic-lanceolate, 3–3.5 × 1 mm, 1(–2)-flowered. **Glumes** distichous, ovate-elliptic, 1–3.5 mm long, apex shortly cuspidate, sides membranous, 5–7-nerved, pale green to pale brown, keel sparsely spinulose, green. **Stamens** 1–2(–3); anthers 1 mm long. **Stigmas** 2. **Nutlets** 1–2 per spike, obovate or elliptic, laterally biconvex, 1–1.5 × 0.5–0.7 mm, brownish, minutely punctate.

Distribution. Tropics, subtropics and warm temperate regions. Native in Singapore and recorded from MacRitchie (*Leong-Škorničková & Leong SING2019-040*, 25 Jan 2019, SING [SING0260972], Punggol, Sembawang (*Boo SING2011-170*, 18 Mar 2011, SING [SING0170113]) and Serangoon. Previously also recorded from Changi Road (*Teruya 2170*, 13 Jan 1933, SING [SING0058274]), Nassim Road, National University of Singapore (Kent Ridge Campus) and Singapore Botanic Gardens (*Mhd Noor s.n.*, 20 Aug 1918, SING [SING0240007]; *Deshmukh s.n.*, 10 Sep 1921, SING [SING0240009]).

Ecology. Wet to dry grasslands, waysides, waste places, sandy areas near seashore. Elsewhere in margins of rice fields and forest plantations.



Figure 9. *Cyperus brevifolius* (Rottb.) Hassk. **A.** Habit. **B.** Rhizomes. **C.** Whole plant. (From Singapore, MacRitchie, Leong-Škorničková & Leong SING2019-040. Photos: J. Leong-Škorničková).

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Vernacular name. *Short-leaved kyllinga* (English).

4. *Cyperus compactus* Retz.

(Latin, *compactus* = compact; alluding to the compact, crowded nature of the globose-stellate spikes)

Observ. Bot. 5 (1788 [‘1789’]) 10; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 423; Henderson, Malay. Wild Fls., Monocot. (1954) 271; Kern, Fl. Males., ser. 1, 7(3) (1974) 638; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 520; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 117; Simpson & Koyama, Fl. Thailand 6(4) (1998) 379; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226; Dai et al., Fl. China 23 (2010) 237. **Synonym:** *Mariscus compactus* (Retz.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 1916 (1917) 634. **Type:** *Osbeck s.n.*, China (holotype LD [LD1291427]). **Fig. 10.**

Cyperus dilutus Vahl, Enum. Pl. 2 (1805) 357; Killip, J. Siam. Soc., Nat. Hist. Suppl. 7 (1927) 56. **Type:** *Röttler s.n.*, India (not traced).

Mariscus microcephalus J.Presl & C.Presl in C.Presl, Reliq. Haenk. 1, fasc. 3 (1828) 182; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 624; Ridley, J. Straits Branch Roy. Asiatic Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 74; Ridley, Fl. Malay Penins. 5 (1925) 149; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1425. **Type:** *Haenke s.n.*, Philippines, Luzon, Sorzogon (holotype PR n.v.; isotypes PRC [PRC450381], HAL [HAL0053193]).

Rhizomatous perennial. **Culms** 1–few, (30–)50–100 cm long, 3–6 mm diam., trigonous to subterete, ± septate-nodulose. **Leaves:** blade linear, up to 100 cm long, 5–9(–12) mm wide, apex acuminate, canaliculate, septate-nodulose; sheath 10–20 cm long, purplish-brown. **Involucral bracts** 3–5(–8), the longest 60–90 cm long. **Inflorescence** decomposed, 6–30 × 6–30 cm; primary branches 6–12, up to 18 cm long; secondary branches up to 3 cm long. **Spikes** ± globose-stellate, 8–20(–35) mm diam.; rachis 0.2–0.5 cm long. **Spikelets** numerous, falling entire, narrowly lanceolate to linear-subulate, subterete, 5–15 × 0.8–1.5 mm; rachilla zigzag. **Glumes** distichous, 3–7 or rarely more per spikelet, linear-lanceolate to linear-oblong, 3–4.5 × 1–1.5 mm, apex subobtuse to obtuse, sides membranous, nerves 0, pale brown to reddish-brown, slightly shiny, keel 5–7-nerved, greenish to brownish. **Stamens** 3; anthers 0.8–1 mm long. **Stigmas** 3. **Nutlets** narrowly cylindrical, trigonous, 1.5–2 × 0.4–0.5 mm, yellowish-brown, minutely punctate.

Distribution. Madagascar, tropical and subtropical Asia to northern Australia. In Singapore recorded from Pulau Serangoon (*Tan et al. C1114*, 25 Sep 1998, SINU), Sungei Buloh (*Duistermaat et al. S74*, 19 Mar 2002, SING [SING0059775]), Marina East (*Turner 93-27*, 22 Feb 1993, SINU) and Pulau Ubin (Seletar (*Loo et al. PS218*, 12 Sep 1998, SINU)). Previously also recorded from Bukit Timah Road and Geylang (*Ridley s.n.*, 1899, SING [SING0004811]).

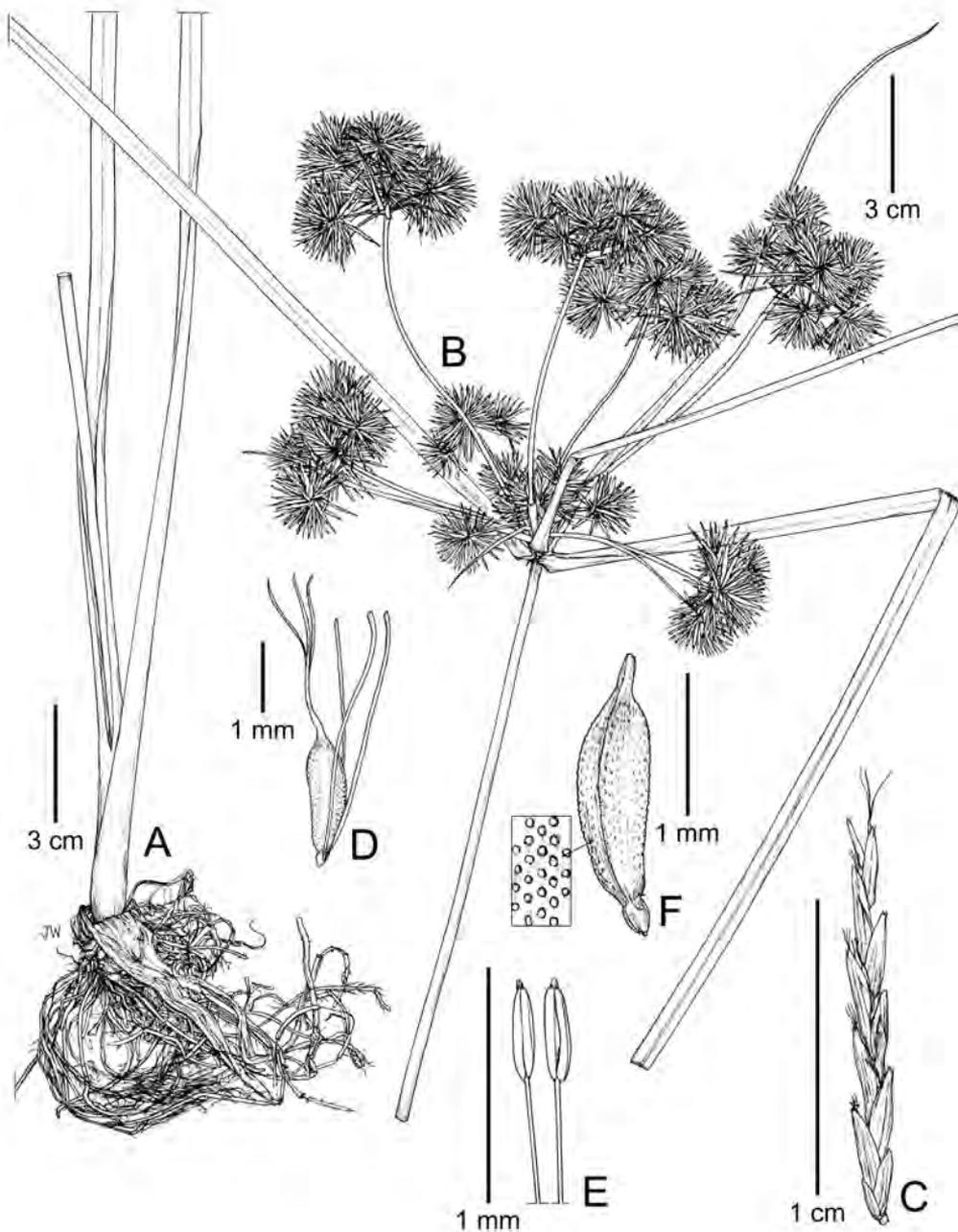


Figure 10. *Cyperus compactus* Retz. **A.** Base of plant. **B.** Inflorescence. **C.** Spikelet. **D.** Flower. **E.** Stamens. **F.** Nutlet. (A–C, E from Peninsular Malaysia, *Simpson et al.* 89/6; E from Peninsular Malaysia, *Griffith* 6245. Drawn by J. Williamson, reproduced with the kind permission of the Director and the Board of Trustees, Royal Botanic Gardens, Kew).

Ecology. Across its range found in swamps, rice fields, ditches, river banks, wet forest margins and coastal marshes.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore likely also Least Concern (LC) but as it is found mostly in vulnerable habitats an assessment should be done of the population size.

Vernacular name. *Swamp mariscus* (English).

5. *Cyperus compressus* L.

(Latin, *compressus* = compressed; referring to the lateral compression of the spikelets)

Sp. Pl. 1 (1753) 46; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 605; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 67; Ridley, Fl. Malay Penins. 5 (1925) 144; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 156; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 733; Henderson, Malay. Wild Fls., Monocot. (1954) 274; Kern, Fl. Males., ser. 1, 7(3) (1974) 617; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 520; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 117, fig. 220; Simpson & Koyama, Fl. Thailand 6(4) (1998) 363; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 237. **Type:** *Clayton* 598, ‘Habitat in Americae septentrionalis pratis arenosis’ (lectotype BM [BM000051698], designated by Tucker, Syst. Bot. Monogr. 43 (1994) 103). **Fig. 11.**

Annual. **Culms** tufted, 8–35(–50) cm long, 1–2 mm diam., trigonous, smooth. **Leaves:** blade linear, 3–20 cm long, 1–4 mm wide, apex acute, flat to channelled; sheath 1–7 cm long, pale brown to reddish-brown. **Involucral bract** 2–5, the longest up to 30 cm long. **Inflorescence** simple to ± capitate, open to congested, 1.5–10 × 2–10 cm; primary branches (when present) 2–5, 0.8–15 cm long; spikes solitary. **Spikes** ovate, 1.2–3 × 1.5–4 cm; rachis 0.1–0.5 cm long. **Spikelets** 3–10 per spike, patent to spreading, often appearing finger-like, linear to oblong-lanceolate, 10–25 × 2.5–4 mm, flattened; rachilla zigzag. **Glumes** distichous, ovate, 3–4 × 2–2.7 mm, apex acute, mucronate, sides herbaceous or chartaceous, 3-nerved, pale green to pale golden brown, keel sharply acute, green. **Stamens** 3; anthers 0.7–1 mm long. **Stigmas** 3. **Nutlets** broadly obovoid, trigonous, 1–1.5 × 0.7–1 mm, dark brown, shiny, minutely punctate.

Distribution. Pantropical. In Singapore recorded from Pasir Ris, Punggol (*Tan 814*, 26 Nov 2003, SINU) and Tampines (*Vermeulen & Ang*, 2213, 29 Dec 2001, SING [SING0043688]). Previously recorded from Changi (*Foxworthy s.n.*, 6 Apr 1889, SING [SING0057429]), Mandai Road, National University of Singapore (Bukit Timah Campus), Pulau Ubin, Singapore Botanic Gardens, Sungei Mandai, Tanah Merah (*Burkill SFN 4656*, 19 Jan 1919, K [K000626699], SING [SING0057423]), Tanjong Katong (*Deshmukh s.n.*, 27 Nov 1921, SING [SING0057428]) and other localities.

Ecology. Open grasslands, waste places, waysides and in cultivated ground.

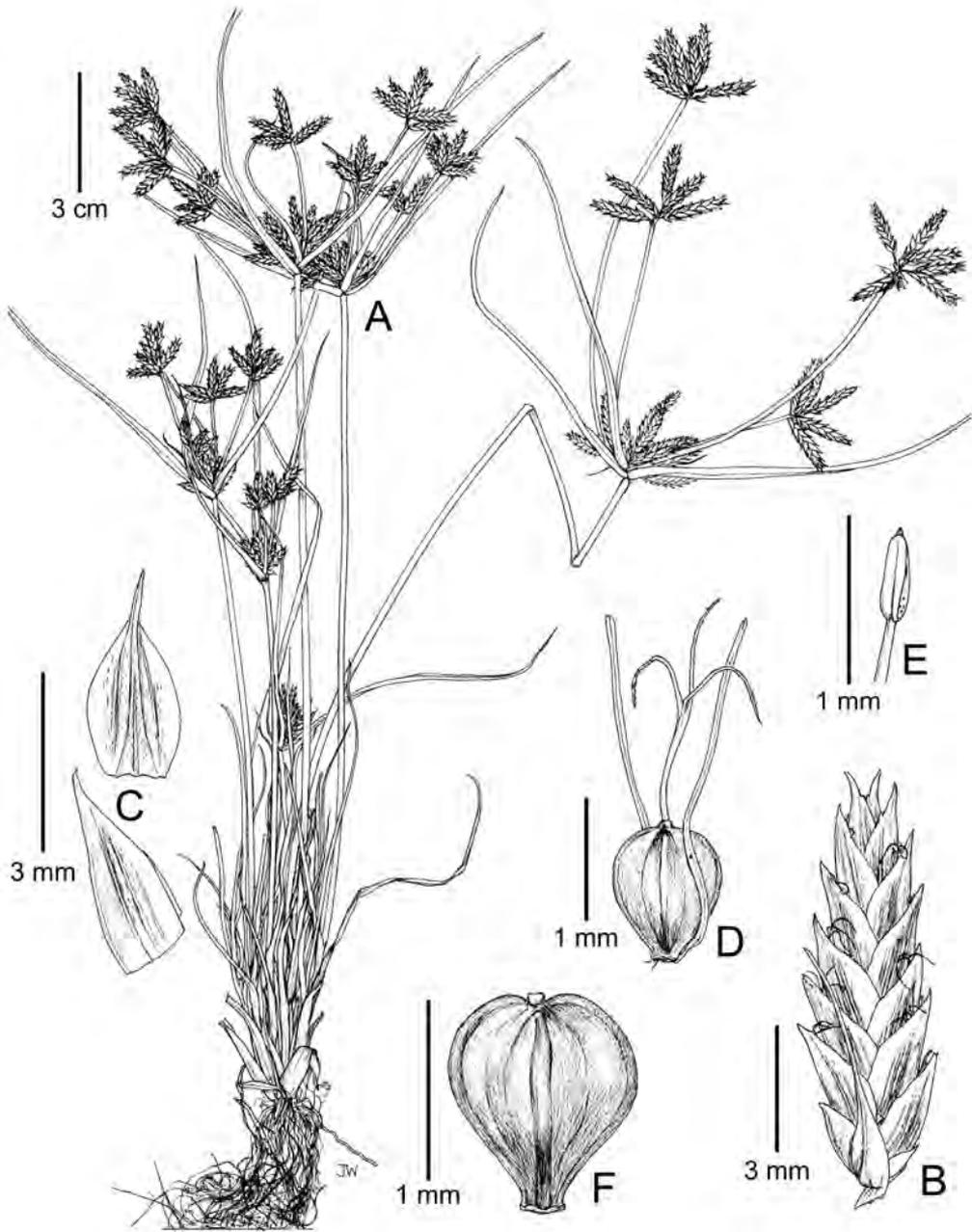


Figure 11. *Cyperus compressus* L. **A.** Habit. **B.** Spikelet. **C.** Glumes. **D.** Flower with maturing nutlet. **E.** Anther. **F.** Nutlet. (A, G from Peninsular Malaysia, *Burkill SFN 4656*; B–F from Peninsular Malaysia, *Hume 7412*. Drawn by J. Williamson).

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Vernacular names. *Hedgehog cyperus* (English), *rumput kuning* (Malay).

6. *Cyperus cuspidatus* Kunth

(Latin, *cuspidatus* = cuspidate; referring to the pointed glume apex)

in Humboldt et al., Nov. Gen. Sp. 1 (1816) 204; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 598; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 261; Kern, Fl. Males., ser. 1, 7(3) (1974) 629; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 117; Simpson & Koyama, Fl. Thailand 6(4) (1998) 374; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 227. **Type:** *Bonpland 5049*, Venezuela (holotype P [P00128946]).

Cyperus uncinatus auct. non Poir.: Ridley, Mat. Fl. Malay. Penins. 3 (1907) 64; Ridley, Fl. Malay Penins. 5 (1925) 141.

Slender annual. **Culms** tufted, 2–10 cm long, 0.3–0.9 mm diam., trigonous to triquetrous, smooth. **Leaves:** blade narrowly linear to ± setaceous, 1.3–8 cm long, 0.4–1 mm wide, apex acute, canaliculate; sheath 0.5–2 cm long, reddish to reddish-brown. **Involucral bracts** 2–5, unequal, the longest 2–8 cm long. **Inflorescence** simple to capitate, 1.5–4 × 2.5–6 cm; primary branches (when present) 1–4, up to 3 cm long. **Spikelets** linear, 5–15 × 2–3 mm, strongly flattened; rachis straight. **Glumes** distichous, narrowly elliptic, 1–1.5 (including mucro) × 0.6–1 mm, apex emarginate, strongly recurved-cuspidate, awn (0.5–)0.6–1 mm long, sides thinly chartaceous, nerves 0, rusty brown to chestnut brown, keel acute, strongly 3-nerved, greenish sometimes purplish-lineolate. **Stamens** 2–3; anthers 0.2–0.3 mm long. **Stigmas** 3. **Nutlets** obovoid to cylindric-obovoid, trigonous, 0.5–0.6 × 0.3–0.4 mm, brown, minutely punctate.

Distribution. Pantropical. Native in Singapore but no recent records. Previously recorded from Macpherson Road (*Ridley 8951*, 1897, SING [SING0004812]).

Ecology. In open sandy soil, sometimes in cultivated ground and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

7. *Cyperus cyperinus* (Retz.) Valck.Sur.

(Latin, *cyper-* = pertaining to *Cyperus* L., *-inus* = like, resembling; referring to the appearance of the plant)

Geslacht *Cyperus* Mal. Archipel. (1898) 154; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 518; Henderson, Malay. Wild Fls., Monocot. (1954) 271; Kern, Fl. Males., ser. 1, 7(3) (1974) 641;

Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 117, fig. 221; Simpson & Koyama, Fl. Thailand 6(4) (1998) 382; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 238. **Basionym:** *Kyllinga cyperina* Retz., Observ. Bot. 6 (1791) 21. **Synonym:** *Mariscus cyperinus* (Retz.) Vahl, Enum. Pl. 2 (1805) 377; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 621; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 73; Ridley, Fl. Malay Penins. 5 (1925) 149. **Type:** *König s.n.*, India (holotype LD [LD1299827]; isotype C [C10010148]).

Rhizomatous perennial. **Rhizome** short, woody. **Culms** 1–few, 10–50(–70) cm long, 1–3 mm diam., triquetrous, smooth, base thickened, somewhat fibrous. **Leaves:** blade narrowly linear, 12–48 cm long, 3–7 mm wide, apex acute, flattish-plicate; sheath 1–9 cm long, pale green to dark reddish-brown. **Involucral bracts** 4–10, the longest up to 40 cm long. **Inflorescence** simple, congested or capitate, 1.5–3 × 2–4 cm; primary branches (when present) 6–10, 0.1–1(–4) cm long; spikes solitary. **Spikes** oblong-obovate, narrowed towards base, rarely cylindric, 1–3 × 0.8–1.2 cm; rachis 1–1.3 cm long. **Spikelets** up to 80 per spike, falling entire, erect to erect-patent, linear-lanceolate to linear-oblong, subterete, 4–7 × 1–1.3 mm; rachilla ± straight. **Glumes** distichous, 4–7 on the longest spikelets, elliptic to oblong-elliptic, 3–3.8 × 1.8–2 mm, apex obtuse to abruptly acute, sides inrolled, membranous to thinly chartaceous, 3–4-nerved, glaucous to brownish, keel appressed, green. **Stamens** 3; anthers 1–1.5 mm long. **Stigmas** 3. **Nutlets** (1–)2–3 per spikelet, cylindric to narrowly ellipsoid, trigonous, 2–2.5 × 0.6–0.9 mm, brownish, minutely granulate.

Distribution. Arabian Peninsula, Seychelles, tropical and subtropical Asia to Pacific islands. Native in Singapore and found on Pulau Ubin (*Leong et al. 23*, 5 Nov 2002, SING [SING0042361]) and Pulau Tekong (*Tan et al. Tekong 84*, 26 Mar 1996, SINU). Previously also recorded from Geylang (*Ridley 8948*, 1897, SING [SING0057432]), Singapore Botanic Gardens (*Burkill s.n.*, 4 Apr 1924, SING [SING0057414]) and Tajong Katong (*Ridley s.n.*, 1900, SING [SING0057433]).

Ecology. Across its range in open wet to semi-dry areas including grasslands, waysides, floors of secondary forest or forest clearings and margins of rice fields.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Endangered (EN/D) in Singapore.

Vernacular name. *Compact mariscus* (English).

Notes. In *Cyperus cyperinus* the spikes may be sessile or solitary on short primary branches. The spikes also have their sides narrowed towards their base. The spikelets (at least the lower ones) are erect.

8. *Cyperus cyperoides* (L.) Kuntze

(Latin, *cyper-* = pertaining to *Cyperus* L., *-oides* = like, resembling;
referring to the appearance of the plant)

Revis. Gen. Pl. 3(3) (1898) 333, as '*cyperodes*'; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 514; Henderson, Malay. Wild Fls., Monocot. (1954) 271; Kern, Fl. Males., ser. 1, 7(3) (1974) 642; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 118; Simpson & Koyama, Fl. Thailand 6(4) (1998) 381; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 238. **Basionym:** *Scirpus cyperoides* L., Mant. Pl. Altera (1771) 181. **Synonym:** *Mariscus sieberianus* Nees ex C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 622, nom. illeg. non Nees ex Steud. (1855); Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 72; Ridley, Fl. Malay Penins. 5 (1925) 148; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1425. **Type:** König *s.n.*, India (lectotype LINN [Herb. Linn. no. 71.42], designated by Gordon-Gray, Strelitzia 2 (1995) 136).

Kyllinga sumatrensis Retz., Observ. Bot. 4 (1786–1787) 13. **Synonym:** *Mariscus sumatrensis* (Retz.) J. Raynal, Adansonia, sér. 2, 15 (1975) 110. **Type:** Wennerberg *s.n.*, [Indonesia], Sumatra (holotype LD [LD1297847]).

Rhizomatous perennial. **Culms** 1–several, (10–)30–80 cm long, 1–3 mm diam., triquetrous, smooth, base ± thickened and fibrous. **Leaves:** blade linear, 9–48 cm long, 3–6 mm wide, apex acuminate, flattish-plicate; sheath 2–11 cm long, pale to reddish-brown. **Involucral bracts** 3–10, the longest up to 30 cm long. **Inflorescence** simple, open, 3–10 × 3–15 cm; primary branches 3–15, patent, up to 8 cm long; spike solitary. **Spikes** cylindrical, (1–)2–5 × 0.6–1 cm; rachis 1.4–4.8 cm long. **Spikelets** numerous per spike, falling entire, spreading to ± reflexed, linear to linear-lanceolate, (3–)4–5 × 0.7–0.9 mm, subterete, rachilla straight. **Glumes** distichous, 4–5 on the longest spikelets, oblong-lanceolate to oblong-ovate, 3–3.5 × 1 mm, apex subacute, mucronulate, sides membranous, faintly 3–5-nerved, pale green, margins inrolled, keel obtuse, 3-nerved, green. **Stamens** 3; anthers 0.8–1 mm long. **Stigmas** 3. **Nutlets** (1–)2–3 per spikelet, linear-cylindrical, trigonous, 1.8–2.2 × 0.5 mm, trigonous, golden brown, minutely punctate.

Distribution. Tropical and subtropical Africa and Asia, extending north to central Japan. Also, Caribbean islands and north-eastern South America (possibly introduced). Native in Singapore but no recent records. Previously recorded from Ang Mo Kio (*Ridley s.n.*, Sep 1889, SING [SING0004815]), Bukit Kalang (*Ridley 10397*, 1899, SING [SING0004816]), Bukit Timah (*Hullett 481*, 12 Nov 1885, SING [SING0004821]), Seletar (*Ridley 69*, 29 Oct 1889, SING [SING0004817]), Singapore Botanic Gardens (*Mhd Noor s.n.*, 20 Aug 1918, SING [SING0239976]) and Tanglin.

Ecology. Open or slightly shaded forest margins and clearings, rice fields, waysides, cultivated ground and waste places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Vernacular name. *Common mariscus* (English).

9. *Cyperus difformis* L.

(Latin, *difformis* = irregularly, unevenly or differently formed; uncertain but possibly referring to the congested, globose spikelets with minute glumes)

Cent. Pl. 2 (1756) 6; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 599; Ridley, Fl. Malay Penins. 5 (1925) 142; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 237; Kern, Fl. Males., ser. 1, 7(3) (1974) 629; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 118; Simpson & Koyama, Fl. Thailand 6(4) (1998) 373; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 226. **Type:** *Collector unknown s.n.*, ‘India orientalis’ (lectotype LINN [Herb. Linn. no. 70.10], designated by Tucker, Syst. Bot. Monogr. 43 (1994) 50). **Fig. 12.**

Annual. **Culms** tufted, (10–)25–60 cm long, 2–5 mm diam., sharply triquetrous, sides concave. **Leaves:** blade linear, 2–22 cm long, 2–6 mm wide, apex acute, folded, sheath 2–10 mm long, pale or yellowish-brown to pinkish. **Involucral bracts** 2–3, unequal, the longest up to 25 cm long. **Inflorescence** simple, open, occasionally congested; primary branches 3–9, 1–4 cm long. **Spikelets** numerous, in congested, globose clusters, 2–6 × 2–6 mm, linear to linear-oblong, 2–8 × 1–1.3 mm, flattened; rachis straight. **Glumes** distichous, ± orbicular, 0.5–0.8 × 0.4–0.8 mm, apex rounded or shallowly emarginate, sides membranous, faintly 3-nerved, deep green tinged with brownish-purple, margins white hyaline, keel yellowish. **Stamens** 1–2; anthers 0.1 mm long. **Stigmas** 3. **Nutlets** ellipsoid-obovoid, trigonous, 0.5–0.7 × 0.3 mm, maturing yellowish.

Distribution. Old World tropics and subtropics but rare in Peninsular Malaysia. Introduced into the New World. Native in Singapore and recorded from Pasir Panjang (*Chen SING2017-747*, 6 Dec 2017, SING [SING0267375]), Punggol (*Boo SING2011-182*, 31 Mar 2011, SING [SING0170120]) and Serangoon (*Tan 1196*, 17 Dec 2003, SINU). Previously also recorded from Jurong Road (*Chan s.n.*, 31 Aug 1984, SINU).

Ecology. In wet or swampy places and open grassy fields. Elsewhere primarily a weed in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Notes. A common annual weedy species which has numerous small spikelets crowded into globose clusters. The minute glumes are orbicular with a rounded or shallowly emarginate apex.



Figure 12. *Cyperus difformis* L. (From Singapore, Pasir Panjang, *Chen SING2017-747*. Photos: L.M.J. Chen).

10. *Cyperus diffusus* Vahl

(Latin, *diffusus* = diffuse; referring to the typically open, diffuse nature of the inflorescence)

Enum. Pl. 2 (1805) 321; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 603; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 65; Ridley, Fl. Malay Penins. 5 (1925) 142; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 208; Henderson, Malay. Wild Fls., Monocot. (1954) 276; Kern, Fl. Males., ser. 1, 7(3) (1974) 619; Turner, Gard. Bull. Singapore 45 (1993) 62; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 118; Dai et al., Fl. China 23 (2010) 224. **Type:** *Collector unknown s.n.*, 'India orientalis' (holotype C [C10010239]).

Cyperus diffusus Vahl var. *macrostachyus* Boeckeler, Linnaea 35 (1868) 534; Kern, Fl. Males., ser. 1, 7(3) (1974) 619. **Synonyms:** *Cyperus laxus* Lam. var. *macrostachyus* (Boeckeler) Karthik., Fl. Ind. Enum., Monocot. (1989) 46; Simpson & Koyama, Fl. Thailand 6(4) (1998) 368. – *Cyperus pubisquama* Steud., Syn. Pl. Glumac. 2, fasc. 7 (1854) 20. **Type:** *Zollinger 533*, [Indonesia] (lectotype FI [FI012150], designated here).

Cyperus laxus auct. non Lam.: Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 522; Simpson & Koyama, Fl. Thailand 6(4) (1998) 368; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226.

Shortly rhizomatous perennial. **Culms** ± tufted, 30–80 cm long, 3–5 mm diam., trigonous to subtriquetrous, smooth. **Leaves:** blade linear, 8–48 cm long, 3–20 mm wide, apex abruptly acute, flattish; sheath 4–10 cm long, pale green to rusty or purplish-brown. **Involucral bracts** 4–12, unequal, the longest up to 50 cm. **Inflorescence** simple to decompose, open and diffuse to rather dense, 6–20 × 7–30 cm; primary branches 10–20 or more, 2.5–20 cm long; secondary and tertiary branches 0.5–4 cm long. **Spikelets** in open, finger-like clusters of (1–)2–9, oblong, subterete, 3–10 × 1.5–3 mm; rachilla straight. **Glumes** distichous, 6–20 per spikelet, ovate-orbicular, 1.5–2 × 1.5–2 mm, apex obtuse, recurved-mucronate, awn 0.2–0.5 mm long, sides thinly herbaceous, indistinctly to prominently 7–11-nerved, greenish to pale or reddish-brown, keel acute to subobtuse, greenish. **Stamens** 3; anthers 0.8–1 mm long. **Stigmas** 3. **Nutlets** elliptic, trigonous, 1.2–1.5 × 0.7–0.8 mm, blackish-brown, indistinctly minutely punctate.

Distribution. Tropical and subtropical Asia to northern Australia. Native in Singapore and recorded from Pulau Ubin (*Tan & Lai SING2011-500*, Nov 2011, SING [SING0170120]). Previously also recorded from Bukit Timah (*Ridley s.n.*, 20 Sep 1890, SING [SING0004822]).

Ecology. In scrub, on wet forest floors and around bamboo groves.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Critically Endangered (CR/D) in Singapore.

Vernacular name. *Broad-leaved cyperus* (English).

Taxonomy. As indicated above, this species was referred to as *Cyperus laxus* Lam. by several authors. However, Tucker (Syst. Bot. Monogr. 43 (1994) 42) had earlier observed differences between neotropical and paleotropical material, with the latter being recognised as *Cyperus diffusus*. This is accepted here.

11. *Cyperus digitatus* Roxb.

(Latin, *digitatus* = finger-like; referring to the spikes often aggregated into digitate clusters)

Fl. Ind. 1 (1820) 209; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 618; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 55; Kern, Fl. Males., ser. 1, 7(3) (1974) 601; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 118; Simpson & Koyama, Fl. Thailand 6(4) (1998) 351; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226; Dai et al., Fl. China 23 (2010) 229. **Type:** *Roxburgh s.n.*, India (lectotype K [K000592520], designated here).

Cyperus digitatus Roxb. var. *evolutior* auct. non C.B. Clarke: Ridley, Mat. Fl. Malay. Penins. 3 (1907) 73; Ridley, Fl. Malay Penins. 5 (1925) 149.

Shortly rhizomatous perennial. **Culms** tufted or solitary, 60–200 cm long, 3–7 mm diam., triquetrous to trigonous, smooth. **Leaves:** blade linear, up to 150 cm long, 5–15 mm wide, apex long-acute, flattish to plicate; sheath brownish-purple or dusky brown. **Involucral bracts** 3–8, the longest up to 60 cm long. **Inflorescence** simple to compound, 15–40 × 15–40 cm; primary branches 4–10, 3–30 cm long; secondary branches 1.2–6 cm long. **Spikes** often in digitate clusters, erect-patent to patent, cylindric, 3–6 × 1.5–3 cm; rachis 3–5 cm long. **Spikelets** numerous, rather lax, spreading, linear, 6–20 × 1–1.5 mm, subterete; rachilla straight, winged. **Glumes** distichous, 9 or more on the longest spikelets, narrowly elliptic to elliptic, 1.8–2.2 × 1 mm, apex acute, apiculate, sides membranous, obscurely 1–2-nerved below keel, pale yellowish-brown tinged with reddish-brown, below keel, keel greenish or brown. **Stamens** 3; anthers 0.5 mm long, connective minute. **Stigmas** 3. **Nutlets** cylindric-ellipsoid to cylindric-obovoid, trigonous, 0.9–1 × 0.4–0.5 mm, yellowish-brown, minutely punctate.

Distribution. Pantropical. In Singapore recorded from Upper Seletar (*Khng et al. NRS717*, 5 May 1992, SING [SING0058164]), Kranji Sanctuary (*Tan M317*, 14 Aug 2003, SINU), Pulau Serangoon (*Tan 1270*, 14 Jan 2004, SINU), Singapore Zoological Gardens and Sungei Sawa/Sungei Jelutong. Previously also recorded from Braddell Road (*Corner s.n.*, 30 Aug 1941, SING [SING0004823]) and Upper Thomson Road (*Sinclair SFN40031*, 23 Sep 1953, K [K000626700], SING [SING0004825]).

Ecology. Swamps, bogs, river banks and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore also Least Concern (LC).

Vernacular name. *Digitate cyperus* (English).

12. *Cyperus distans* L.f.

(Latin, *distans* = distant; referring to the rather distant spacing of the glumes along the spikelet rachilla)

Suppl. Pl. (1782 [‘1781’]) 103; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 607; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 69; Ridley, Fl. Malay Penins. 5 (1925) 145; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 137; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 733; Henderson, Malay. Wild Fls., Monocot. (1954) 277; Kern, Fl. Males., ser. 1, 7(3) (1974) 610; Turner, Gard. Bull. Singapore 45 (1993) 62; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 119, fig. 222; Simpson & Koyama, Fl. Thailand 6(4) (1998) 355; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 233. **Type:** *Collector unknown s.n.*, India (lectotype LINN [Herb. Linn. no. 70.42], designated by Adams, Fl. Mesoamer. 6 (1994) 428).

Rhizomatous perennial. **Culms** 1–few, 20–100 cm long, 2–5 mm diam., triquetrous, smooth, thickened at base. **Leaves:** blade linear, up to 100 cm long, 4–10 mm wide, apex acuminate, weakly folded; sheath 5–20 cm long, light brown to purple-brown. **Involucral bracts** 4–6, the longest 20–60 cm long. **Inflorescence** simple, rarely compound, open, 9–28 × 9–27 cm; primary branches 5–12, 3–17 cm long; secondary branches 0.5–3 cm long. **Spikes** broadly ovoid-pyramidal, 4–6 × 3–5 cm; rachis 0.2–0.3 cm long. **Spikelets** 8–20 per spike, mostly spreading, rather distant, linear, 8–40 × 0.8–1 mm, subterete; rachilla zigzag, winged, visible between glumes. **Glumes** distichous, 9 or more on the longest spikelets, rather distant, elliptic or oblong-ovate, 1.8–2 × 1–1.2 mm, apex obtuse to rounded-obtuse, sides membranous, 3–5-nerved below keel, light to dark reddish-brown, margins narrowly hyaline around apex, keel greenish. **Stamens** 3; anthers 0.5–0.7 mm long. **Stigmas** 3. **Nutlets** cylindrical to cylindrical-ellipsoid, trigonous, 1.5–1.8 × 0.3–0.5 mm, dark brown, minutely punctate.

Distribution. Old World tropics and subtropics. Introduced into the New World. In Singapore recorded from the British Broadcasting Corporation relay station at Kranji (*Thangavelu & Foo BBC36*, 21 Aug 2003, SINGU). Previously also recorded from Ang Mo Kio (*Goodenough s.n.*, 10 Apr 1890, SING [SING0057613]), Braddell Road (*Corner s.n.*, 30 Aug 1941, SING [SING0057611]), Bukit Mandai, Changi beach (*Burkill HMB1120*, 9 Jan 1957, SING [SING0057610]), Turut Track (Kranji), Newton (*Teruya 2027*, 21 Nov 1932, SING [SING0057610]), Singapore Botanic Gardens and Tanah Merah.

Ecology. Open, wet ground including forest clearings, waysides and elsewhere at the margins of rice fields. Also in swamps.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Critically Endangered (CR/D) in Singapore.

Vernacular name. *Slender cyperus* (English).

Notes. This species has narrow spikelets up to 1 mm wide and glumes which are rather distant along the culms so that the base of the glume and spikelet rachilla is visible.

13. *Cyperus dubius* Rottb.

(Latin, *dubius* = doubtful; application uncertain)

Descr. Icon. Rar. Pl. (1773) 20; Kükenthal in Engler, Pflanzenr. IV, 20(101) (1936) 563; Henderson, Malay. Wild Fls., Monocot. (1954) 271; Kern, Fl. Males., ser. 1, 7(3) (1974) 643; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 119; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 119; Simpson & Koyama, Fl. Thailand 6(4) (1998) 385; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226; Dai et al., Fl. China 23 (2010) 239. **Synonym:** *Mariscus dubius* (Rottb.) Kükenthal ex Fischer in Gamble, Fl. Madras 9 (1931) 1644. **Type:** *König s.n.*, India (lectotype C [C10010169], designated here).

Mariscus dregeanus auct. non Kunth: Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 620; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 72; Ridley, Fl. Malay Penins. 5 (1925) 148.

Rhizomatous perennial. **Culms** tufted, (5–)15–30 cm long, 1.5–3 mm diam., triquetrous, smooth, base bulbous, fibrous. **Leaves:** blade linear, 1.5–13 cm long, 2–5 mm wide, apex acuminate, flat or weakly incurved; sheaths 1–6 cm long, scarious, whitish. **Involucral bracts** 3–5, the longest 8–30 cm long. **Inflorescence** capitate, globose to ovoid-deltoid and ± lobed, 0.7–2 × 0.7–2 cm. **Spikes** 1–6, broadly ovoid; rachis up to 0.3 cm long. **Spikelets** 6–24 per spike, falling entire, ovate to oblong-lanceolate, 4–7 × 1.5–2.3 mm, ± flattened to subterete; rachilla straightish. **Glumes** distichous, somewhat spreading, broadly ovate to elliptic-lanceolate, 2.8–4 × 1.5–3 mm, apex acute, sides herbaceous to subcoriaceous, 7–9-nerved, greenish to whitish, ageing pale reddish, margins broad white-hyaline. **Stamens** 3; anthers 1.5–3 mm long. **Stigmas** 3. **Nutlets** 1–2 per spikelet, ellipsoid to obovoid-ellipsoid, trigonous, 1.6–1.9 × 0.6–0.8 mm, light brown.

Distribution. Tropical and South Africa to tropical Asia. Native in Singapore but no recent records. Previously recorded from Balestier (*Ridley s.n.*, 1894, SING [SING0004832]), Changi (*Ridley 1746*, Nov. 1890, SING [SING0004831]), Geylang (*Teruya 1967*, 17 Oct 1932, SING [SING0057618]) and Tanjong Katong (*Ridley s.n.*, Dec 1920, SING [SING0004830]).

Ecology. Sandy seashores and in rock crevices or shallow soil over rocks inland.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

14. *Cyperus elatus* L.

(Latin, *elatus* = tall; referring to the size of the plant)

Cent. Pl. 2 (1756) 301; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 618; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 71; Ridley, Fl. Malay Penins. 5 (1925) 148; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 59; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 733; Kern, Fl. Males., ser. 1, 7(3) (1974) 601; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 119; Simpson & Koyama, Fl.

Thailand 6(4) (1998) 349; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 230. **Type:** *Collector unknown s.n.*, India (lectotype LINN [Herb. Linn. no. 70.22]), designated by Simpson, Taxon 53 (2004) 178).

Cyperus digitatus auct. non Roxb.: Ridley, Mat. Fl. Malay. Penins. 3 (1907) 71; Ridley, Fl. Malay Penins. 5 (1925) 147.

Rhizomatous perennial. **Culms** tufted, 50–200 cm long, 4–10 mm diam., trigonous to triquetrous, smooth. **Leaves:** blade broadly linear, up to 200 cm long, 5–15 mm wide, apex acute, flattish to plicate; sheath dark purple or purplish-brown. **Involucral bracts** 4–8, the longest up to 70 cm long. **Inflorescence** simple to compound, 25–30 × 25–30 cm; primary branches 6–10, ± equal, 15–22 cm long; secondary branches 0.3–5 cm long or spikes in sessile clusters. **Spikes** mostly erect to suberect, narrowly cylindrical, 2–7 × 0.3–0.5 cm; rachis 2–4.5 cm long, obscured by spikelets. **Spikelets** crowded, suberect, linear, 3–7 × 1 mm, flattened; rachilla straight, winged. **Glumes** distichous, 9 or more on the longest spikelets, ovate, 1.2–1.8 × 0.5–0.7 mm, apex acute, mucronate, sides membranous, 3–5-nerved, golden yellow to copper-coloured or dark brown below keel, keel greyish-green. **Stamens** 3; anthers 0.5 mm long, anther connective tips prominent, setulose. **Stigmas** 3. **Nutlets** ellipsoid, trigonous, 0.8–1 × 0.3–0.4 mm, short-apiculate, greyish-brown or fulvous.

Distribution. India and China (Yunnan) to western Malesia. Native in Singapore but no recent records. Previously recorded from MacPherson Road (*Sinclair SFN40183*, 10 Jan 1954, K [K000626701], SING [SING0004826]) and Paya Lebar (*Corner s.n.*, 16 Oct 1941, SING [SING0004827, SING0004828]).

Ecology. Swamps, river-banks and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

15. *Cyperus flavidus* Retz.

(Latin, *flavidus* = yellowish, pale yellow; referring to the colour of the spikelets)

Observ. Bot. 5 (1788 [‘1789’]) 13. **Synonym:** *Pycneus flavidus* (Retz.) T.Koyama, J. Jap. Bot. 51 (1976) 316. **Type:** *König s.n.*, India (lectotype LD, designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 67).

Annual or perennial. **Culms** densely tufted, 8–60 cm by 1–1.5 mm, trigonous, smooth. **Leaves:** blade narrowly linear to setaceous, 2–24 cm by 1–2 mm, apex acuminate, flattish-plicate or canaliculate; sheath 1–10 cm long, reddish-brown. **Involucral bracts** 2–4, the longest up to 25 cm long. **Inflorescence** simple, open or congested; primary branches 1–6, 0.5–7 cm long. **Spikes** broadly ovoid to ± globose, 1–3 by 1.2–4 cm; axis 0.1–1 cm long. **Spikelets** 5–20 per spike, spreading, linear or linear-oblong, 6–30 by 1.5–3 mm, rachilla straight. **Glumes** distichous, oblong-ovate, 1.5–2.5 × 1–1.5 mm, apex narrowly obtuse, sides chartaceous, nerves 0, pale brown to dark reddish-brown, shiny, margins pale-hyaline, keel acute, 3-nerved,

greenish. **Stamens** 2; anthers 0.5 mm long. **Nutlets** narrowly obovate to oblong-elliptic, 0.8–1.2 by 0.4–0.6 mm, maturing dark brown, minutely punctate.

Distribution. Southern Europe to Japan and southern Africa to eastern Australia. Despite being only once and recently collected in Singapore, it is well distributed in the region and it is no surprise that it occurs in Singapore. It has been recorded from Sungei Tengah (*Ho et al. SING2018-430*, 27 Feb 2018, SING [SING0267374]).

Ecology. Open wet places, rice fields and margins of rivers, swamps and ponds.

Provisional Conservation Assessment. Globally Least Concern (LD). In Singapore it has only ever been collected once and is assessed here Critically Endangered (CR/D).

16. *Cyperus haspan* L.

(name of uncertain origin)

Sp. Pl. 1 (1753) 45; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 600; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 64; Ridley, Fl. Malay Penins. 5 (1925) 142; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 247; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 734; Henderson, Malay. Wild Fls., Monocot. (1954) 276; Kern, Fl. Males., ser. 1, 7(3) (1974) 624, as '*halpan*'; Turner, Gard. Bull. Singapore 45 (1993) 63, as '*halpan*'; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 120, fig. 223; Simpson & Koyama, Fl. Thailand 6(4) (1998) 371; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 227. **Type:** Herb. Hermann 2: 43, no. 37, 'Habitat in India, Aethiopia' (lectotype BM [BM000621657], designated by McGivney, Biol. Ser. Catholic Univ. Amer. 26 (1938) 45).

Annual or short-lived rhizomatous perennial; rhizome inconspicuous. **Culms** tufted or solitary, 10–40 cm long, 0.5–2.2 mm diam., rather weak, sharply triquetrous, smooth. **Leaves:** blade linear, 2–20 cm long, 2–5 mm wide, apex acute, flattish-plicate; sheath up to 6 cm long, reddish-purple to purplish. **Involucral bracts** 2–3, unequal, the longest up to 10 cm long. **Inflorescence** simple to decompound, open to somewhat congested, 3–15 × 3–15 cm; primary branches 10–22, 1.2–10(–20) cm long, 0.2–0.7 mm diam.; secondary and tertiary branches 1–2.5 cm long or absent. **Spikelets** 1 or in finger-like clusters of 3–6(–10), linear-oblong or linear-lanceolate, 5–10 × 1–2 mm, flattened; rachilla straight. **Glumes** distichous, ± oblong to elliptic-lanceolate or ovate, (1–)1.1–1.5 × 0.5–0.7 mm, apex obtuse, mucicous or mucronulate, straight to slightly recurved, sides membranous, nerves 0, pale-brownish and often tinged with rusty brown or purplish-brown, keel greenish or pale brown. **Stamens** 1–3; anthers 0.5 mm long, connective hispidulous. **Stigmas** 3. **Nutlets** broadly obovoid, trigonous, sides ± flat, 0.4–0.5 × 0.4–0.5 mm, creamy yellow, granulate-verruculose.

Distribution. Pantropical. Native in Singapore and recorded from Pulau Ubin, Sixth Avenue (*Duistermaat S310*, 15 Oct 2004, SING [SING0059415]), Sungei Kadut (*Duistermaat & Hillier S47*, 12 Mar 2002, SING [SING0059416]), Tampines (*Vermeulen & Ang 2214*, 29 Dec 2001, SING [SING0043689]), Tampines Avenue 8 and other localities. Previously also recorded

from MacRitchie (*Burkill HMB2132*, 1 Sep 1959, SING [SING0057620]), Chasseriau Estate, Choa Chu Kang, Pulau Damar Darat, Singapore Botanic Gardens, Tanglin (*Ridley s.n.*, 3 Jan 1889, SING [SING0057625]) and other localities.

Ecology. A common species of open wet places including rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

17. *Cyperus imbricatus* Retz.

(Latin, *imbricatus* = imbricate; referring to closely overlapping glumes in the spikelet)

Observ. Bot. 5 (1788 [‘1789’]) 12; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 69; Kern, Fl. Males., ser. 1, 7(3) (1974) 603; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 120; Simpson & Koyama, Fl. Thailand 6(4) (1998) 350; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 231. **Type:** *König s.n.*, India, Tranqubar (holotype LD [LD1281107]).

Cyperus radiatus Vahl, Enum. Pl. 2 (1805) 369; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 617; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 70; Ridley, Fl. Malay Penins. 5 (1925) 147; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 735. **Type:** *Insert s.n.*, Ghana, Greater Accra Region, Ada, 1784 (lectotype C [C10003750]), designated by Tucker & McVaugh, Fl. Novo-Galiciana 13 (1993) 304).

Rhizomatous perennial. **Culms** 37–130 cm long, 2–8 mm diam., indistinctly to distinctly trigonous, smooth. **Leaves:** blade narrowly linear, up to 60 cm long, 5–15 mm wide, apex acuminate, flattish; sheath dark brown or reddish-brown. **Involucral bracts** 3–5, the longest up to 60 cm long. **Inflorescence** simple, rarely compound, 8–22 × 10–25 cm; primary branches 5–8, up to 15 cm long; secondary branches 1–2 cm long, spikes more usually in ± sessile clusters. **Spikes** erect-patent to patent, narrowly cylindrical, 1.5–4 × 0.3–0.9 cm, pale yellowish-brown; rachis 1.5–5 cm long, winged, usually obscured by spikelets. **Spikelets** 50–70 or more, densely imbricate, suberect, lanceolate to linear-oblong, 3–6 × 1–2 mm, flattened; rachilla straight. **Glumes** distichous, 9 or more in longest spikelets, ovate to ovate-oval, 1.2–1.8 × 1 mm, apex obtuse, recurved mucronate, sides membranous, 3-nerved, yellowish-brown, keel greenish. **Stamens** 3; anthers 0.3 mm long, connective minute. **Stigmas** 3. **Nutlets** ellipsoid to ± ovoid, trigonous, 0.6–0.8 × 0.4 mm, slightly obcompressed, yellowish.

Distribution. Pantropical. Native in Singapore and recorded from Kranji Sanctuary Golf Course (*Tan M316*, 14 Aug 2003, SINU), Pulau Ubin (*Gwee et al. GAT154*, 7 Jan 2003, SING [SING0042879]), Sungei Jelutong (*Tan et al. JE11*, Jul–Aug 2001, SINU) and Tampines (*Ali Ibrahim SING2013-272*, 27 Oct 2013, SING [SING0201466]). Previously also recorded from Braddell Road (*Corner s.n.*, 30 Aug 1941, SING [SING0004833, SING0004834]).

Ecology. Swampy places, including rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

18. *Cyperus iria* L.

(name of uncertain origin)

Sp. Pl. 1 (1753) 45; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 606; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 66; Ridley, Fl. Malay Penins. 5 (1925) 142; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 150; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 734; Henderson, Malay. Wild Fls., Monocot. (1954) 278; Kern, Fl. Males., ser. 1, 7(3) (1974) 616; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 521; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 120, fig. 224; Simpson & Koyama, Fl. Thailand 6(4) (1998) 364; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 235. **Type:** *Osbeck s.n.*, 'Habitat in India' (lectotype LINN [Herb. Linn. no. 70.16], designated by Tucker, Syst. Bot. Monogr. 43 (1994) 91). **Fig. 13.**

Annual. **Culms** 1–several, 8–60 cm long, 2–3(–5 mm) diam., triquetrous, smooth. **Leaves:** blade linear, 4–18 cm long, 2–6 mm wide, apex acute, flattish to weakly channelled; sheath 2–10 mm, reddish to purplish-brown. **Involucral bracts** 3–5, the longest up to 40 cm long. **Inflorescence** simple to compound, open, 5–20 × 3–15 cm; primary branches 3–7, 2–12(–15) cm long; secondary branches very short or 0, the spikes in clusters of 3–5. **Spikes** broadly ovoid to oblong-ovate or linear-oblong, 1–5 × 0.2–0.7 cm; rachis 1–2.5 cm long. **Spikelets** spicately arranged, erect-patent, oblong-elliptic to linear-oblong, 0.9–1.3 cm long, 1.6–2 mm wide, flattened; rachilla straight. **Glumes** distichous, obovate-orbicular, 0.7–1.3 × 1–1.5 mm, apex rounded to shallowly emarginate, mucronulate, sides thinly herbaceous, 3–5-nerved, greenish to yellowish or mid-brown, margins whitish-hyaline above, keel acute, green. **Stamens** 2–3; anthers 0.2–0.3 mm long. **Stigmas** 3. **Nutlets** ellipsoid to obovoid, trigonous, 1–1.5 × 0.5–0.8 mm, dark brown, minutely punctate.

Distribution. Old World tropics and subtropics; introduced in the New World tropics and subtropics. Native in Singapore and recorded from Pulau Tekong (*Samsuri & Gwee PT280*, 3 Jan 2002, SING [SING0039951]), the British Broadcasting Corporation relay station at Kranji, Serangoon, Sungei Tengah (*Ho et al. SING2018-432*, 27 Feb 2018, SING [SING0266852]) and Tampines Avenue 8 (*Duistermaat et al. HDS374*, 10 May 2005, SING [SING0080190]). Previously also recorded from Jalan Kampong Chantek (*Sinclair SFN39439*, 24 Feb 1952, SING [SING0004841]), Singapore Botanic Gardens (*Burkill SFN6637*, 12 Oct 1921, SING [SING0239985]) and other localities.

Ecology. Cultivated ground, waysides and open, wet grassy places. Elsewhere also in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Grasshopper's cyperus* (English).

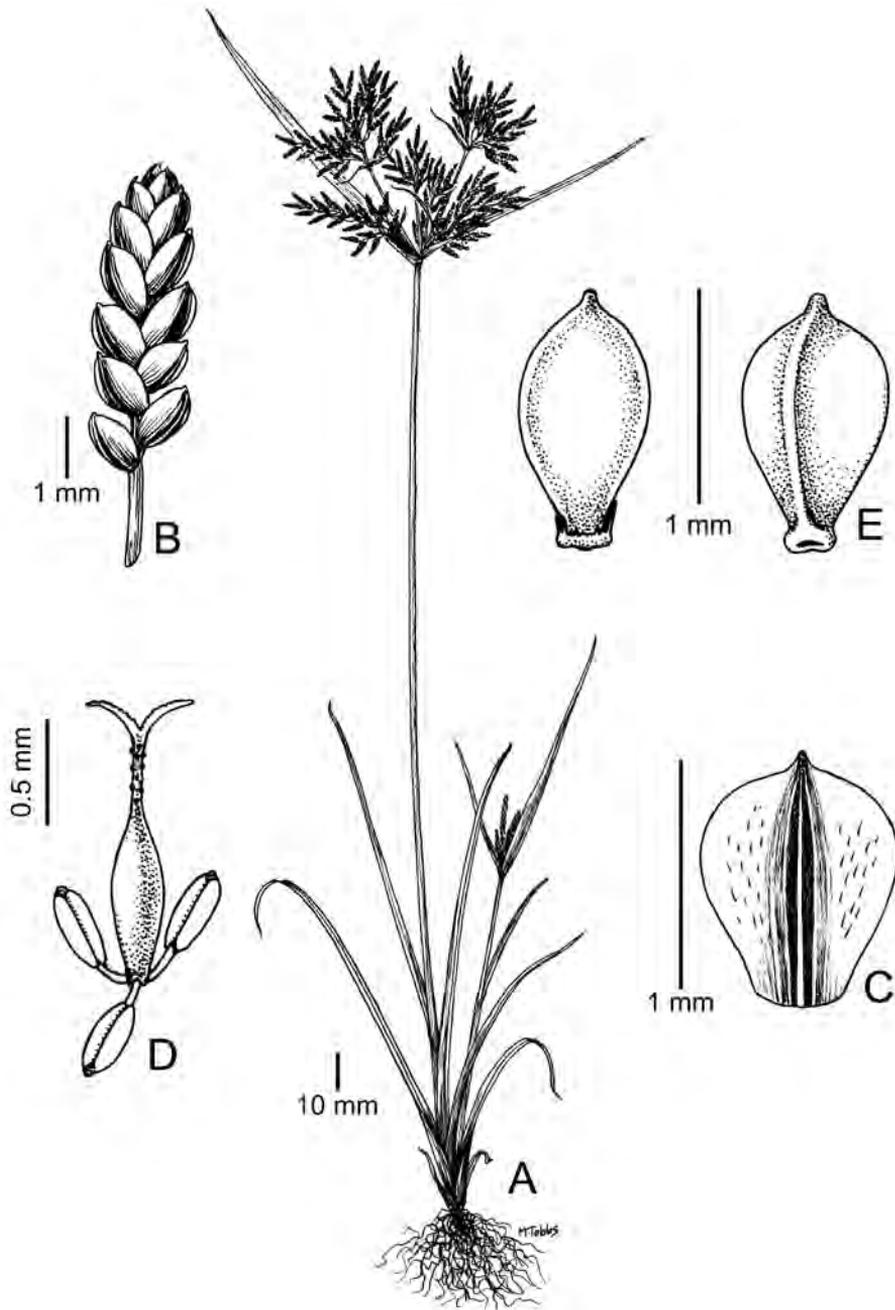


Figure 13. *Cyperus iria* L. A. Habit. B. Spikelet. C. Glume. D. Flower. E. Nutlets. (From Singapore, Sinclair SFN39439. Drawn by M. Tebbs).

19. *Cyperus javanicus* Houtt.

(of Java)

Nat. Hist. 2(13) (1782) Aanwyz. Plaat. [1], 68, pl. 88: fig. 1; Kern, Fl. Males., ser. 1, 7(3) (1974) 635; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 120, fig. 225; Simpson & Koyama, Fl. Thailand 6(4) (1998) 378; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226; Dai et al., Fl. China 23 (2010) 237. **Synonym:** *Mariscus javanicus* (Houtt.) Merr. & Metcalfe, Lingnan Sci. J. 21 (1945) 4. **Type:** *Collector unknown s.n.*, [Indonesia], Java (lectotype G-PREL [G00360105], designated by Veldkamp, Candollea 72 (2017) 173).

Cyperus pennatus Lam., Tabl. Encycl. 1, fasc. 1 (1791) 144; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 476; Henderson, Malay. Wild Fls., Monocot. (1954) 269. **Type:** *Commerson s.n.*, [Indonesia], Java, 1 October 1768 (holotype P n.v.; isotypes P [P00585582, P00585583]).

Mariscus albescens Gaudich., Voy. Uranie, fasc. 10 (1829) 415; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 623; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 74; Ridley, Fl. Malay Penins. 5 (1925) 149. **Type:** *Gaudichaud s.n.*, Philippines, Kalayaan, Rawak, 1830 (holotype P n.v.; isotype G [G00191780]).

Rhizomatous perennial. **Culms** tufted, 30–80(–110) cm long, 3–5 mm diam., trigonous, minutely papillose. **Leaves:** blade linear, 25–117 cm long, 5–12 mm wide, apex acuminate, flattish above, plicate below, septate-nodulose; sheath up to 15 cm long, chestnut to purple brown, often ± shiny. **Involucral bracts** 3–7, the longest 40–75 cm long. **Inflorescence** simple to compound, 6–15 × 7–15 cm; primary branches 6–12, up to 12 cm long; secondary branches (when present) 0.2–0.5 cm long, somewhat distant. **Spikes** oblong to cylindric, 1.5–3 × 0.8–1.5 cm; rachis 1–2 cm long. **Spikelets** up to 50 per spike, falling entire, lanceolate to oblong-lanceolate, terete 4.5–9(–13) × 1.8–2.5 mm, few-flowered; rachilla hidden. **Glumes** distichous, 4–8 or rarely more per spikelet, broadly ovate, 2.5–3.5 × 2–2.5 mm, apex abruptly acute, sides subcoriaceous, 7–9-nerved, pale to mid-brown indistinctly streaked reddish or purplish, margins whitish-hyaline, keel obtuse, greenish. **Stamens** 3; anthers 0.9–1.2 mm long. **Stigmas** 3. **Nutlets** oval to obovoid, trigonous, 1.2–1.5 × 0.7–0.9 mm, shiny blackish-brown, minutely punctate.

Distribution. Indian Ocean islands, tropical and subtropical Asia to Pacific islands. In Singapore recorded from Khatib Bongsu, Pulau Ubin (*Ali Ibrahim SING2013-296*, 29 Oct 2013, SING [SING0201477]), Pulau Salu, Pulau Semakau, Pulau Tekong (*Samsuri & Gwee PT283*, 3 Jan 2002, SING [SING0039954]), Sungei Buloh (*Duistermaat et al. S82*, 19 Mar 2002, SING [SING0059177]) and other localities. Previously also recorded from Bajau, Geylang, Seletar Forest Reserve (*Ridley s.n.*, 30 Oct 1889, SING [SING0057633]), Tanjong Rhu (*Goodenough s.n.*, 1892, SING [SING0057632]) and other localities.

Ecology. Moist or swampy, saline or brackish habitats.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Greater mariscus* (English).

20. *Cyperus leptocarpus* (F.Muell.) Bauters

(Greek, *lepto-* = slender, *-carpus* = fruit; with slender fruits)

Phytotaxa 166 (2014) 20. **Basionym:** *Scirpus leptocarpus* F.Muell., Trans. Philos. Soc. Victoria 1 (1855) 109. **Type:** *Mueller s.n.*, Australia, Victoria, between Mayday Hills and the Ovens (River), February 1853 (lectotype MEL [MEL69134], designated here).

Hypaelytrum microcephalum R.Br., Prodr. Fl. Nov. Holl. (1810) 220. **Synonym:** *Lipocarpha microcephala* (R.Br.) Kunth, Enum. Pl. 2 (1837) 268; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 668; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 82; Ridley, Fl. Malay. Penins. 5 (1925) 163; Henderson, Malay. Wild Fls., Monocot. (1954) 257; Kern, Fl. Males., ser. 1, 7(3) (1974) 522; Goetghebeur & Van den Borre, Wageningen Agric. Univ. Pap. 89(1) (1989) 52; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 134; Simpson & Koyama, Fl. Thailand 6(4) (1998) 409; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 56, 125, 272; Dai & Tucker, Fl. China 23 (2010) 250. **Type:** *Brown 5986*, Australia, Arnhem Bay Point, 6 February 1803 (holotype BM [BM000990979]).

Annual. **Culms** densely tufted, 5–40 cm long, 0.5–1 mm diam. **Leaves:** blade up to 10 cm long, 1–2 mm wide, apex acuminate, flattish or weakly inrolled; sheath up to 3 cm long, pale to purplish-brown. **Involucral bracts** 2–3, the longest 5–10 cm long. **Inflorescence** terminal. **Spikes** (1–)2–4(–5), ellipsoid to ovoid-ellipsoid, 3–8 × 2–3 mm, comprising numerous, densely spirally imbricate spikelets, each subtended and hidden by a single glume-like spikelet bract. **Spikelet bract** obovate-oblong, 1–1.5 × 0.2–0.4 mm, apex acuminate, the apical part recurved, 0.5–0.8 mm long, scaberulous at tip, yellowish to brown, mid-nerve green. **Spikelet** hidden by spikelet bract, comprising 2 glumes and 1 flower. **Glumes:** lower glume elliptic, c. 1 mm long, apex obtuse, sides hyaline; upper glume oblong to oblong-lanceolate, 1 mm long, apex acute, subtending the flower. **Stamens** 1–2; anthers 0.25 mm long. **Stigmas** 2(–3). **Nutlets** linear-oblong, often slightly curved, trigonous, 0.9–1 × 0.2–0.3 mm, trigonous, maturing yellowish-brown.

Distribution. Tropical, subtropical and parts of warm-temperate Asia to Australia. Native in Singapore but no recent records. Previously recorded from Bukit Mandai (*Ridley 5807*, 1892, SING [SING0005037]), Bukit Timah (*Ridley s.n.*, 1900, SING [SING0058278]), Chan Chu Kang Forest Reserve (*Clarke 1722*, Oct 1889, SING [SING0058276]) and MacPherson Road (*Ridley s.n.*, 1905, SING [SING0058281]).

Ecology. Open wet grasslands, pond margins, river banks, rice fields and on wet sand.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

21. *Cyperus malaccensis* Lam.

(of Malacca, now Melaka)

Tabl. Encycl. 1, fasc. 1 (1791) 146; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 608; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 70; Ridley, Fl.

Malay Penins. 5 (1925) 147; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 86; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 734; Henderson, Malay. Wild Fls., Monocot. (1954) 278; Kern, Fl. Males., ser. 1, 7(3) (1974) 613; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 122; Simpson & Koyama, Fl. Thailand 6(4) (1998) 359; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226; Dai et al., Fl. China 23 (2010) 234. **Type:** *Sonnerat s.n.*, ‘de Malac’ (holotype P-LA).

Rhizomatous perennial; rhizome long-creeping. **Culms** 1–few, 60–180 cm long, 7–12(–15) mm diam., smooth, sharply triquetrous. **Leaves:** reduced to bladeless sheaths except for upper 1–3 leaves; blade linear to linear-lanceolate, 5–25 cm long, 3–16 mm wide, apex acute or shortly acuminate, ± flattened; sheath 8–20 cm long, greenish to reddish-brown. **Involucral bracts** 3–4, the longest up to 30 cm long, 8–15 mm wide. **Inflorescence** simple to compound, somewhat congested, subglobose, 2–10 × 4–15 cm; primary branches 3–8, unequal, 3–10 cm long; secondary branches 0.3–1.6 cm long. **Spikes** ovoid, 1–2.5 cm long; rachis 0.2–1 cm long, smooth, glabrous. **Spikelets** 2–15 per spike, linear, 10–13 × 1.2–1.8 mm, subterete; rachilla straight. **Glumes** distichous, 9 or more on the longest spikelets, elliptic to ovate, 2–2.2 × 1–1.5 mm, apex obtuse, sides chartaceous, indistinctly 5–7-nerved around keel, glaucous and tinged or flecked with brown or dark reddish, the margins widely pale-membranous, keel rounded, brownish. **Stamens** 3; anthers 0.8–1 mm long. **Stigmas** 3. **Nutlets** cylindrical, trigonous, 1.7–2 × 0.5 mm, blackish-brown, minutely punctate.

Distribution. Tropical and subtropical Asia to northern Australia. Native in Singapore but no recent records. Previously recorded from Balestier (*Ridley 5883*, 1894, SING [SING0004864]), Kebun Limau (*Ridley 12231*, 1906, SING [SING0004863]) and an unknown locality (*Hullett 238*, Aug 1885, K [K000626702]).

Ecology. Marshy places near brackish or salt water.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

22. *Cyperus mindorensis* (Steud.) Huygh

(of Mindoro)

Phytotaxa 166 (2014) 39. **Basionym:** *Kyllinga mindorensis* Steud., Syn. Pl. Glumac. 2, fasc. 7 (1854) 67. **Type:** *Cuming 1558*, Philippines, Luzon, Calabarzon, Batangas, 1841 (holotype BM [BM000959042]; isotypes K [K000290929], P [P00578843]).

Thryocephalon nemoralis J.R.Forst. & G.Forst., Char. Gen. Pl. (1776) 130. **Synonym:** *Kyllinga nemoralis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel, Fl. W. Trop. Afr. 2 (1936) 487; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Simpson & Koyama, Fl. Thailand 6(4) (1998) 401; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 53, 125, 271; Dai et al., Fl. China 23 (2010) 249. **Type:** *Forster & Forster s.n.*, French Polynesia, Tahiti (lectotype BM [BM000990844], designated by Nicolson & Fosberg, Forsters Bot. Sec. Cook Exped. (2004) 185).

Kyllinga monocephala auct. non Rottb.: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 58; Ridley, Fl. Malay Penins. 5 (1925) 138; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1289.

Cyperus kyllingia auct. non Endl.: Turner, Gard. Bull. Singapore 45 (1993) 63; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 121, fig. 226.

Rhizomatous perennial; rhizome long-creeping. **Culms** crowded or distant in series along rhizome, 10–45 cm long, 1–1.5 mm diam., triquetrous, smooth. **Leaves:** blade linear, 1–16 cm long, 2–5 mm wide, apex acute, flattish; sheath 1–9 cm long, brown to purplish-brown. **Involucral bracts** 3–4, the longest up to 30 cm long. **Inflorescence** capitate. **Spikes** 1–4, globose, terminal spike 0.5–1.2 × 0.7–1 cm, lateral spikes much smaller. **Spikelets** ovate-elliptic to ovate-lanceolate, 2.7–3.5 × 1.5 mm, 1–2-flowered. **Glumes** distichous, usually 5, elliptic to broadly elliptic, 1–3.5 mm long, apex shortly recurved-cuspidate, sides thinly membranous, 3–4-nerved, white becoming pale brown, keel broadly winged, serrulate, green. **Stamens** 3; anthers 0.8–1 mm long. **Stigmas** 2. **Nutlets** oblong-obovate or suborbicular, laterally biconvex, 1.2–1.5 × 0.5–0.7 mm, maturing brownish.

Distribution. Old World tropics and subtropics. Introduced into parts of the New World. Native in Singapore and recorded from Holland Road (*Duistermaat S10*, 8 Jan 2002, SING [SING0059406]), Mt Sanai Drive (*Duistermaat HDS325*, 26 Nov 2004, SING [SING0080174]), Pulau Hantu, Punggol (*Tan 868*, 3 Dec 2003, SINU), Sungei Buloh (*Duistermaat S67*, 19 Mar 2002, SING [SING0059782]) and other localities. Previously also recorded from Choa Chu Kang, Serangoon (*Ridley s.n.*, Dec 1892, SING [SING0057637]) and Tanglin (*Ridley 9*, Dec 1880, SING [SING0057636]) and other localities.

Ecology. Open or slightly shaded grasslands, waysides and margins of forest.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *White kyllinga* (English).

23. *Cyperus neochinensis* (Tang & F.T.Wang) Bauters

(Latin, *neo-* = new, *-chinensis* = of China)

Phytotaxa 166 (2014) 21. **Basionym:** *Scirpus neochinensis* Tang & F.T.Wang, Fl. Reipubl. Popularis Sin. 11 (1961) 223. **Type:** *Chen 8160*, China, Guangdong, Guangzhou, 12 November 1952 (holotype SCBI).

Scirpus squarrosus L., Mant. Pl. Altera (1771) 181; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 663; Kern, Fl. Males., ser. 1, 7(3) (1974) 516; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 140. **Synonyms:** *Isolepis squarrosa* (L.) Roem. & Schult., Syst. Veg., ed. 15 bis, 2 (1817) 111, nom. illeg. non Kunth (1816), nec Carmich. (1819); Nees in Wight, Contr. Bot. India (1834) 106. – *Lipocarpha squarrosa* (L.) Goetgh., Wageningen Agric. Univ. Pap. 89(1) (1989) 71; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Simpson & Koyama, Fl. Thailand 6(4) (1998) 409; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 56, 125, 229; Dai & Tucker, Fl. China 23 (2010) 250. **Type:** *König*

s.n., India (lectotype LINN [Herb. Linn no. 71.49], designated by Raynal, Adansonia, sér. 2, . 8 (1968) 86; isolectotypes BR [BR000000659439], C, S [S-G-6816]). **Fig. 14.**

Annual. **Culms** tufted, 5–20 cm long, 0.2–0.5 mm diam. **Leaves:** blade 1–7 cm long, 0.6–1 mm wide, apex acuminate, weakly canaliculate; sheath 0.5–2.5 cm long, pale brown tinged with light reddish-brown. **Involucral bracts** 1–2(–4), the longest erect, 1.2–5 cm long. **Inflorescence** pseudolateral. **Spikes** 1–3, ovate-elliptic, 3–6 × 2–3.5 mm, comprising numerous, densely spirally imbricate spikelets, each subtended and hidden by a single glume-like spikelet bract. **Spikelet** bract obdeltoid-obovate, 0.6–0.9 × 0.4–0.5 mm, apex long-acuminate, the apical part recurved, 0.5–0.8 mm long, pale brown to reddish-brown, mid-nerve pale green. **Spikelet** with glumes absent and 1 flower. **Stamens** 1–2; anthers 0.2–0.3 mm long. **Stigmas** 3. **Nutlets** obovoid, trigonous, 0.5–0.6 × 0.2–0.3 mm, pale brown, minutely punctate.

Distribution. India to southern China and Malay Peninsula. Native in Singapore and recorded from Bishan (*Chen SING2017-700*, 16 Nov 2017, SING [SING0267376]) and Singapore Botanic Gardens (*Chen SING2018-581*, 2018, SING [SING0266851]). Previously also recorded from Geylang (*Ridley 10354*, 1899, SING [SING005880]), *Teruya 2447*, Nov 1934, SING [SING0005879]) and Pasir Panjang (*Sinclair SFN40197*, 13 Apr 1954, SING [SING0005878]).

Ecology. Open, wet, sandy or clay soils.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore it was not collected between 1954 and 2017 but is now known from a park and a garden and was likely simply overlooked for a long period. It is probably Least Concern (LC) in Singapore but an effort to assess the population size needs to be made to ensure that this is the case.

24. *Cyperus odoratus* L.

(Latin, *odoratus* = having a smell; probably referring to the pleasant smell of the whole plant)

Sp. Pl. 1 (1753) 46; Kern, Fl. Males., ser. 1, 7(3) (1974) 646; Simpson & Koyama, Fl. Thailand 6(4) (1998) 385; Dai & Tucker, Fl. China 23 (2010) 240. **Synonym:** *Torulinium odoratum* (L.) S.S.Hooper, Kew Bull. 26 (1972) 579. **Type:** [Published illustration] ‘*Cyperus longus odoratus*, panicula sparsa, spicis strigosioribus viridibus’ in Sloane, Voy. Jamaica 1 (1707) 116, t. 74: fig.1 (lectotype designated by Dandy in Exell (ed.), Cat. Vasc. Pl. S. Tomé (1944) 360.

Cyperus ferax Rich., Actes Soc. Hist. Nat. Paris 1 (1792) 106; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 615. **Synonym:** *Mariscus ferax* (Rich.) C.B.Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 624. **Type:** *Leblond s.n.*, French Guiana, Cayenne, 1792 (holotype P [P00254597]).

Mariscus sieberanus var. *evolutior* auct. non C.B.Clarke: Ridley, Fl. Malay Penins. 5 (1925) 149, p.p.

Mariscus sieberianus var. *subcompositus* auct. non C.B.Clarke: Ridley, Fl. Malay Penins. 5 (1925) 149, p.p.



Figure 14. *Cyperus neochinensis* (Tang & F.T. Wang) Bauters. (From Singapore, Bishan, *Chen SING2017-700*. Photos: L.M.J. Chen).

Annual or possibly short-lived perennial. **Culms** 1–few, 30–100 cm long, 3–6 mm diam., triquetrous, smooth, base bulbous. **Leaves:** blade linear, up to 30 cm long, 4–12 mm wide, apex shortly acuminate, flattish; sheaths up to 30 cm long, brownish or purplish-brown. **Involucral bracts** 6–8, patent, the longest up to 50 cm long. **Inflorescence** simple to compound, open to rather congested, 5–20 × 5–20 cm; primary branches 5–12, up to 20 cm long; secondary branches (when present) up to 3 cm long or spikes in clusters of 3–5. **Spikes** oblong-cylindric, 2–3 × 1.5 cm; rachis 1–2 cm long. **Spikelets** 20–60 per spike, spreading to reflexed, linear, 10–25 × 1–1.5 mm, subterete; rachilla flexuous, thick, ± corky, breaking into 1-flowered sections. **Glumes** distichous, ovate or ovate-elliptic, 2–3.5 × 0.9–1 mm, apex obtuse, sides chartaceous, nerves 0, margins hyaline, yellowish, striate with reddish-brown, keel obtuse, 7–9-nerved, greenish. **Stamens** 3; anthers 0.7–1 mm long. **Stigmas** 3. **Nutlets** partially obscured by rachilla wings, cylindric to cylindric-obovoid, trigonous, 1.5–2 × 0.5–0.7 mm, dusky brown.

Distribution. Pantropical, extending north to central Japan; rare, probably introduced into continental Southeast Asia and Malaysia. In Singapore recorded from Railway, old RJC to Bukit Timah Station (*Gwee SING2011-400*, 5 Oct 2011, SING [SING0166319]), Sembawang (*Lee et al. LA27*, 29 May 2003, SING [SING0045042]; *Boo SING2011-159*, 18 Mar 2011, SING [SING0045042]) and Sungei Tengah (*Ho et al. SING2018-434*, 27 Feb 2018, SING [SING0266853]).

Ecology. Open wet or marshy, grassy places, waysides, and wet sandy places near the coast. In other parts of range in rice fields and generally at low altitudes.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Notes. This species has spikelets which easily break into 1-glumed sections when gently rubbed between the fingers. The spikelet rachilla is thick and ± corky, and partially to totally obscures the nutlet.

25. *Cyperus pedunculatus* (R.Br.) J.Kern

(Latin, *pedunculatus* = pedunculate; possibly referring to the culm or creeping rhizome as the inflorescence is not strictly pedunculate)

Acta Bot. Neerl. 7 (1959) 798; Kern, Fl. Males., ser. 1, 7(3) (1974) 644; Turner, Gard. Bull. Singapore 45 (1993) 63; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 122, fig. 228. **Basionym:** *Remirea pedunculata* R.Br., Prodr. Fl. Nov. Holland. (1810) 236. **Synonym:** *Mariscus pedunculatus* (R.Br.) T.Koyama, Gard. Bull. Singapore 30 (1977) 159. **Type:** *Banks & Solander s.n.*, Australia, Endeavour River (holotype BM [BM000901438]; isotype BRI [BRI-AQ0433547]).

Remirea maritima Aubl., Hist. Pl. Guiane 1 (1775) 45; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 677; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 99; Ridley, Fl. Malay Penins. 5 (1925) 169; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1888; Henderson, Malay. Wild Fls., Monocot. (1954) 286; Turner, Gard. Bull. Singapore 47 (1997) [‘1995’]

529; Simpson & Koyama, Fl. Thailand 6(4) (1998) 402; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 74, 126, 230; Dai et al., Fl. China 23 (2010) 242. **Type:** *Aublet s.n.*, French Guiana (lectotype P-JJR, designated by Lanjouw & Uittien, Recueil Trav. Bot. Néerl. 37 (1940) 149; isolecotype BM [BM000938345]).

Rhizomatous perennial; rhizome often long-creeping. **Culms** 3–15 cm long, 1–2 mm diam. **Leaves:** blade linear, 3–8 cm long, 4–5 mm wide, apex acute, canaliculate; sheath 1–1.5 cm long, light to reddish-brown. **Involutral bracts** 3–6(–8), the lowest one up to 8 cm long. **Inflorescence** capitate, 1–2 × 1–3 cm. **Spikes** 3–8, ellipsoid to ovoid, 1–3 × 0.7–1 cm. **Spikelets** ovoid, terete to weakly laterally flattened, 4–5 × 1–2 mm, falling off entire when mature, comprising 1 fertile glume above and 1–3 sterile glumes below (excluding basal prophyll); rachilla corky-thickened. **Glumes** distichous, ovate to broadly ovate, 3–4.5 × 1.5–1.7 mm, apex acute to mucronate, sides membranous to chartaceous, 3–5-nerved, pale to mid-brown, keel obtuse, brown. **Stamens** 3; anthers 2 mm long. **Stigmas** 3. **Nutlet** oblong to ellipsoid, c. 2.5 × 0.7 mm, trigonous, maturing greyish-brown, smooth.

Distribution. Pantropical. Native in Singapore and recorded from Pulau Pawai (*Koh et al. SING2012-105*, 10 Apr 2013, SING [SING0173353]), Pulau Serangoon (*Lua SING2015-242*, 3 Sep 2015, SING [SING0229584]), Pulau Unum (*Boo SING2011-109*, 10 Mar 2011, SING [SING0170101]) and Sentosa (*Duistermaat S89*, 28 Mar 2002, SING [SING0059783]). Previously also recorded from Beting Kusah, Pulau Semakau, Pulau Sudong, Singapore Botanic Gardens, Tanjong Katong, Tanjong Rhu and Tanah Merah (*Ridley s.n.*, Oct 1899, SING [SING0057645]) and other localities.

Ecology. Sandy seashores, often growing in large colonies on sides of dunes.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

26. *Cyperus pilosus* Vahl

(Latin, *pilosus* = pilose; referring to the soft hairs on the rachis of the spike)

Enum. Pl. 2 (1805) 354; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 609; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 67; Ridley, Fl. Malay Penins. 5 (1925) 144; Kükenthal in Engler Pflanzenr., IV, fam. 20 (Heft 101) (1935) 92; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 734; Henderson, Malay. Wild Fls., Monocot. (1954) 278; Kern, Fl. Males., ser. 1, 7(3) (1974) 611; Turner, Gard. Bull. Singapore 45 (1993) 63; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 123; Simpson & Koyama, Fl. Thailand 6(4) (1998) 362; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270; Dai et al., Fl. China 23 (2010) 234. **Type:** *Collector unknown s.n.*, India (holotype C [C10010289]).

Stoloniferous perennial. **Culms** 1–few, 25–85(–120) cm long, 5–8 mm diam., sharply triquetrous, smooth or scabrid on angles below inflorescence. **Leaves:** blade broadly linear, 13–47 cm long, 6–13 mm wide, apex acute, flattish to plicate; sheath 3–10 cm long, pale

greenish to purplish-brown. **Involucral bracts** 3–5, the longest up to 50 cm long. **Inflorescence** simple to compound, open to rather congested; primary branches 4–7(–10), 12–14(–20) cm long; secondary branches 0.5–2 cm long or spikes in \pm sessile clusters. **Spikes** \pm oblong, 2–3 \times 1–2 cm; rachis 1.5–3 cm long, densely shortly pilose. **Spikelets** 5–25 per spike, rather distant, spreading, linear-lanceolate to elliptic-oblong, 4–15 \times 1–2 mm, flattened to subterete; rachilla straight. **Glumes** distichous, 5–9 or more on the longest spikelets, ovate to broadly deltoid-ovate, 1.8–2.5 \times 1.2–1.5 mm, apex acute, often mucronulate, sides thinly chartaceous to membranous, 5–7-nerved, pale brown tinged with reddish-brown, margins whitish-hyaline, keel obtuse, green, smooth. **Stamens** 3; anthers 0.5–0.8 mm long. **Stigmas** 3. **Nutlets** broadly ellipsoid to obovoid, trigonous, 1–1.5 \times 0.5–0.8 mm, maturing dark brown, \pm smooth.

Distribution. Tropical and subtropical Asia to eastern Australia. Native in Singapore but no recent records. Previously recorded from Ang Mo Kio, Braddell Road (*Corner s.n.*, 30 Aug 1941, SING [SING0004860]), Chan Chu Kang Forest Reserve, Changi (*Sinclair SFN40539*, 10 Mar 1955, SING [SING0004861]), Changi Road, Geylang (*Ridley 9169*, 1898, SING [SING0004861]), Holland Road (*Ridley s.n.*, SING [SING0004848]), Jurong, Singapore Botanic Gardens, Sungei Buloh (*Samsuri SA22*, 22 May 1991, SINU), Tanglin (*Ridley s.n.*, 24 Jan 1889, SING [SING0004855]) and other localities.

Ecology. Wet grasslands, swamps and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Vernacular name. *Hairy cyperus* (English).

27. *Cyperus polystachyos* Rottb.

(Greek, *poly-* = many, *-stachyos* = spike;
referring to the many crowded spikelets in the inflorescence)

Descr. Icon. Rar. Pl. (1773) 39; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 367; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1843; Henderson, Malay. Wild Fls., Monocot. (1954) 273; Kern, Fl. Males., ser. 1, 7(3) (1974) 649; Turner, Gard. Bull. Singapore 45 (1993) 64; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 123, fig. 229. **Synonym:** *Pycreus polystachyos* (Rottb.) P.Beauv., Fl. Oware 2, fasc. 15 (1816) 48, pl. 86: fig. 2.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 592, as '*polystachyus*'; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180, as '*polystachyus*'; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 60, as '*polystachyus*'; Ridley, Fl. Malay Penins. 5 (1925) 139, as '*polystachyus*'; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1843, as '*polystachyus*'; Turner, Gard. Bull. Singapore 47 (1997 [¹⁹⁹⁵]) 529; Simpson & Koyama, Fl. Thailand 6(4) (1998) 394; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 74, 126, 230; Dai et al., Fl. China 23 (2010) 244. **Type:** *König s.n.*, India (holotype C [C10010298]; isotype C [C10010297]). **Fig. 15.**

Annual or short-lived perennial. **Culms** tufted, 10–80 cm long, 1–3 mm diam., trigonous to triquetrous above, smooth. **Leaves:** blade linear, 4–25 cm long, 1.5–3(–4) mm wide, apex acuminate, flattish-plicate, soft or subrigid; sheaths reddish-brown. **Involucral bracts** 3–5,

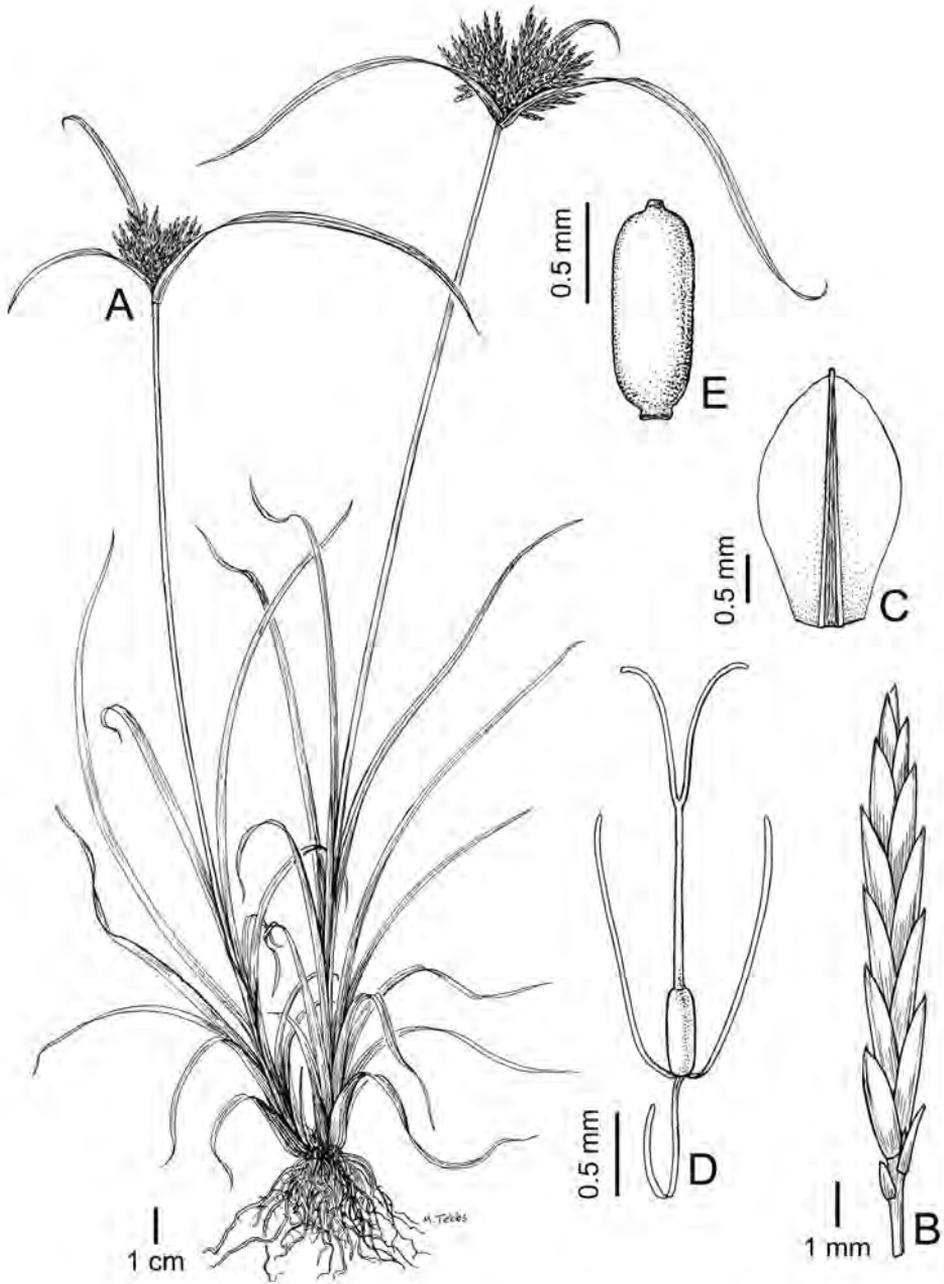


Figure 15. *Cyperus polystachyos* Rottb. **A.** Habit. **B.** Spikelet. **C.** Glume. **D.** Flower. **E.** Nutlet. (From Peninsular Malaysia, *Nur* 4528. Drawn by M. Tebbs).

lowest up to 20 cm long. **Inflorescence** simple, open to congested or \pm capitate; primary branches (when present) 2–8, up to 7 cm long. **Spikes** 1.8–3 \times 1.3–2.2 cm; rachis 0.1–0.8 cm long. **Spikelets** 4–25 per spike, erect or erect-patent, crowded, linear to linear-lanceolate, 5–13 \times 1.5–2 mm, flattened; rachilla zigzag. **Glumes** distichous, oblong-ovate to ovate-elliptic, 1.7–2.5 \times 0.8–1 mm, apex acute to sometimes narrowly obtuse, mucronulate, sides thinly chartaceous, nerves 0, pale brown or greenish to reddish-brown, margins narrowly white-hyaline, keel acute, 3-nerved, greenish. **Stamens** (1–)2; anthers 0.5–1 mm long. **Stigmas** 2. **Nutlets** oblong to oblong-obovate, laterally biconvex, 1–1.5 \times 0.5 mm, maturing dark brown, minutely punctate.

Distribution. Tropics and subtropics extending into warm temperate regions worldwide. Native in Singapore and recorded from British Broadcasting Corporation relay station at Kranji, Khatib Bongsu, Palau Ubin (*Ali Ibrahim SING2013-273*, 29 Oct 2013, SING [SING0201467]), Sembawang (*Boo SING2011-164*, 18 Mar 2011, SING [SING0170108]), Serangoon, Sungei Buloh (*Duistermaat et al. S60*, 19 Mar 2002, SING [SING0059413]), Tampines (*Ali Ibrahim SING2013-261*, 27 Oct 2013, SING [SING0201455]) and other localities. Previously also recorded from Clementi Road, National University of Singapore (Bukit Timah Campus), Senoko, Turut Track (Kranji) and an unknown locality (*Teruya 1259*, 1930, SING [SING0059717]).

Ecology. Open, moist or dry ground, frequently seen in sandy soil near seashores, grassy fields, waysides and on river banks.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Common cyperus* (English).

28. *Cyperus procerus* Rottb.

(Latin, *procerus* = very tall, high; referring to the size of the plant)

Descr. Icon. Rar. Pl. (1773) 29; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 610; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 70; Ridley, Fl. Malay Penins. 5 (1925) 147; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 91; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 735; Kern, Fl. Males., ser. 1, 7(3) (1974) 611; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 522; Simpson & Koyama, Fl. Thailand 6(4) (1998) 360; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 226; Dai et al., Fl. China 23 (2010) 235. **Type:** *Forsskål s.n.*, Egypt (holotype C).

Cyperus procerus Rottb. var. *lasiorrhachis* C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 610; Kern, Fl. Males., ser. 1, 7(3) (1974) 611; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 123. **Type:** *Clarke*, India, Chota Nagpur (not traced).

Stoloniferous perennial. **Culms** 1 or few, 50–100(–150) cm long, 4–7(–10) mm diam., smooth, triquetrous. **Leaves:** blade linear, up to 60–150 cm long, 7–10(–15) mm wide, apex long-acute, often subtriquetrous toward apex, canaliculate; sheath 8–28 cm long, pale greenish to

purplish-brown. **Involucral bracts** 3–4, the longest 20–70 cm long. **Inflorescence** simple to compound, rather open, 10–15 × 8–12 cm; primary branches 3–7, 6–15(–20) cm long; secondary branches up to 2 cm long or spikes sometimes solitary. **Spikes** broadly ovoid, 2–4 cm long; rachis 2–3 cm long, scabrid. **Spikelets** 4–8 per spike, rather distant, patent to spreading, oblong to linear-lanceolate, 5–18 × 2.5–3.5 mm, flattened; rachilla straight. **Glumes** distichous, 9 or more on the longest spikelets, oval or ovate, 2.5–3 × 2–2.2 mm, apex obtuse, sides membranous, 5–7-nerved, pale brown to reddish-brown, margins broadly white-hyaline near apex, keel obtuse, reddish-brown, smooth. **Stamens** 3; anthers 1.2–1.8 mm long. **Stigmas** 3. **Nutlets** ellipsoid, trigonous, 1.3–1.5 × 0.6–0.8 mm, maturing dark brown, ± smooth.

Distribution. Old World tropics and subtropics. Native in Singapore but no recent records. Previously recorded from Sembawang (*Sinclair SFN40627*, 20 May 1955, SING [SING0057656]) and Target Road (*Ridley 14040*, Jan 1909, K [K000626703], SING [SING0057655]).

Ecology. Open, swamps and wet places, sometimes in brackish marshes.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

29. *Cyperus pumilus* L.

(Latin, *pumilus* = dwarf, close-growing, short; referring to the small size of the plant)

Cent. Pl. 2 (1756) 6; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 375; Kern, Fl. Males., ser. 1, 7(3) (1974) 650; Turner, Gard. Bull. Singapore 45 (1993) 64. **Synonym:** *Pycneus pumilus* (L.) Nees, Linnaea 9 (1834) 283; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 591; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 529; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 124; Simpson & Koyama, Fl. Thailand 6(4) (1998) 395; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 74, 126, 230; Dai et al., Fl. China 23 (2010) 245. **Type:** *Collector unknown s.n.*, India, right specimen (lectotype LINN [Herb. Linn. no. 70.34], designated by Kukkonen, Taxon 53 (2004) 179).

Cyperus nitens Retz., Observ. Bot. 5 (1788 [‘1789’]) 13. **Synonym:** *Pycneus nitens* (Retz.) Nees, Cyperaceae (1841) 1 [preprint of Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19, Suppl. 1 (1843) 53]; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 591; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 61; Ridley, Fl. Malay Penins. 5 (1925) 140; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1843. **Type:** *König s.n.*, India (lectotype LD [LD1293167], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 67).

Annual. **Culms** tufted, 1–20 cm long, 0.5–1 mm diam., triquetrous, smooth. **Leaves:** blade narrowly linear, 1–19 cm long, 1–2 mm wide, apex gradually narrowed, long-acuminate, flat; sheath 0.5–4 cm, pale brown to light reddish-brown. **Involucral bracts** 3–5, the lowest 3–20 cm long. **Inflorescence** capitate or simple; primary branches 0–6, up to 3 cm long. **Spikes** ovoid to subglobose, 0.6–1.5 × 1–1.2 cm; rachis up to 0.3 cm, often indistinct. **Spikelets** 3–many, spreading, oblong to oblong-lanceolate, 3–10 × 1.5–2.5 mm, flattened; rachilla straightish. **Glumes** distichous, ovate to ovate-elliptic, 1–1.8 × 1–1.3 mm, apex rounded-

truncate to emarginate, mucronate, sides translucent, nerves 0, pale greenish or brownish, keel acute, 3–5-nerved, green to reddish-brown. **Stamens** 2; anthers 0.3 mm long. **Stigmas** 2. **Nutlets** elliptic to elliptic-lanceolate, laterally biconvex, 0.5–0.8 × 0.3–0.5 mm, maturing brownish, minutely punctate.

Distribution. Old World tropics and subtropics to northern Australia. In Singapore recorded from Pulau Salu (*Tan et al.* 1302, 2 Aug 2004, SINU). Previously recorded from Changi (*Ridley s.n.*, Apr 1889, SING [SING0004846]), MacPherson Road (*Ridley s.n.*, 1898, SING [SING0004844]), Seletar (*Ridley* 17, 4 Nov 1889, SING [SING0004843]), Pasir Panjang, Singapore Botanic Gardens (*Purseglove* P4046, 8 Feb 1955, K [K000626704]) and Tanjong Katong (*Ridley s.n.*, 1906, SING [SING0004842]).

Ecology. Open, wet to semi-dry grassy places, often in sandy soil.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Critically Endangered (CR/D) in Singapore.

30. *Cyperus radians* Nees & Meyen ex Kunth

(Latin, *radians* = radiating, spreading outwards; referring to the radiating appearance of the spikelets in the spikelet clusters)

[Nees & Meyen, *Linnaea* 9 (1835) 285, nom. nud.] Enum. Pl. 2 (1837) 95, as '*radicans*'; Clarke in Hooker, *Fl. Brit. India* 6, fasc. 19 (1893) 605; Ridley, *J. Straits Branch Roy. Asiat. Soc.* 33 (1900) 180; Ridley, *Mat. Fl. Malay. Penins.* 3 (1907) 66; Ridley, *Fl. Malay Penins.* 5 (1925) 143; Kükenthal in Engler, *Pflanzenr.*, IV, fam. 20 (Heft 101) (1936) 214; Henderson, *Malay. Wild Fls., Monocot.* (1954) 274; Kern, *Fl. Males.*, ser. 1, 7(3) (1974) 623; Turner, *Gard. Bull. Singapore* 45 (1993) 64; Turner, *Gard. Bull. Singapore* 47 (1997 ['1995']) 522; Keng et al., *Concise Fl. Singapore*, vol. 2, Monocot. (1998) 124; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 370; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 31, 124, 270; Dai et al., *Fl. China* 23 (2010) 225. **Synonym:** *Mariscus radians* (Nees & Meyen ex Kunth) Tang & F.T.Wang, *Fl. Reipubl. Popularis Sin.* 11 (1961) 177. **Type:** *Hance 10135*, China, Macao, September 1863 (neotype K [K00626713], designated here).

Cyperus griffithii Steud., *Syn. Pl. Glumac.* 2, fasc. 8–9 (1855) 136. **Type:** *Griffith s.n.*, India (holotype P [P00587058]).

Shortly rhizomatous perennial. **Culms** loosely tufted, 0.5–6(–10) cm long, 1–2 mm diam., triquetrous, smooth, often hidden by leaf sheath. **Leaves:** blade linear, 5–20 cm long, 2–5(–8) mm wide, apex acute, ± recurved; sheath 1–6 cm long, reddish-purple. **Involucral bracts** 3–7, unequal, the longest 3–8 cm long. **Inflorescence** simple, rarely compound, lax, 5–20 × 8–25 cm; primary branches 2–7, 3–20(–30) cm long; secondary branches (when present) up to 3 cm long. **Spikelets** in stellate or globose clusters of 3–15(–25), ovate or ovate-lanceolate, ± terete, 5–8(–20) × 4 mm; rachilla weakly zigzag. **Glumes** distichous, broadly ovate, 3–3.8 × 3 mm, apex abruptly acute, mucronate with awn 0.5–1.2 mm long, sides chartaceous to herbaceous, 11–13-nerved, pale brown tinged with reddish-brown or red, margins narrowly white-scarious, keel broad, obtuse, pale green. **Stamens** 3; anthers 0.5–0.8 mm. **Stigmas** 3. **Nutlets** ellipsoid to ovoid, trigonous, 1.5–1.8 × 1–1.2 mm, dark brown.

Distribution. Sri Lanka to southern and eastern China and western Malesia. Native in Singapore and recorded from Pulau Serangoon (*Tan 1179*, 22 Dec 2003, SINGU) and Sungei Serangoon. Previously recorded from Changi (*Ridley 78*, 13 Jan 1889, SING [SING0004873]; *Ridley 1747*, Nov 1890, K [K000626705], SING [SING0004872, SING0004874]; *Corner s.n.*, Sep 1941, SING [SING004877]), Geylang and an unknown locality (*Wallich s.n.* [EIC 3371B], 1822, K [K000626706], K-W [K001119282]).

Ecology. Over its range, in sand and on wet rocks by coast.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Critically Endangered (CR/D) in Singapore.

Vernacular name. *Short-stemmed cyperus* (English).

31. *Cyperus rotundus* L.

(Latin, *rotundus* = almost circular; application uncertain)

Sp. Pl. 1 (1753) 45; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 614; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 68; Ridley, Fl. Malay Penins. 5 (1925) 145; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 107; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 735; Henderson, Malay. Wild Fls., Monocot. (1954) 278; Kern, Fl. Males., ser. 1, 7(3) (1974) 604; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 124, fig. 230; Simpson & Koyama, Fl. Thailand 6(4) (1998) 353; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 125, 270; Dai et al., Fl. China 23 (2010) 232. **Type:** Herb. Hermann 1: 3, no. 36, Sri Lanka (lectotype BM [BM000621233], first step designated by Tucker, Syst. Bot. Monogr. 43 (1994) 100, second step designated here). **Fig. 16.**

Stoloniferous perennial. **Culms** tuberous at base, 10–60 cm long, 1–2 mm diam., triquetrous, smooth. **Leaves:** blade linear, up to 60 cm long, 2–5 mm wide, apex acuminate, flattish; sheath pale brown. **Involucral bracts** 2–3(–5), the longest usually equalling or shorter than inflorescence, 2–35 cm long. **Inflorescence** simple, rarely compound, 3–8(–15) × 2–5(–10) cm; primary branches 2–10, 1–8(–12) cm long; secondary branches (when present), 0.7–2 cm long, spikes usually solitary. **Spikes** obovoid, 1.5–5 cm long; rachis 0.2–0.8 cm long. **Spikelets** 3–10 per spike, suberect to patent, narrowly oblong to linear, 10–30 × 1.5–3 mm, flattened; rachilla ± straight, winged. **Glumes** distichous, 9 or more on the longest spikelets, ovate to ovate-elliptic, 3–3.5 × 2 mm, apex obtuse, mucronate, ± recurved, sides membranous, 5–7-nerved, reddish or slightly purplish-brown with pale narrow hyaline margins, keel greenish. **Stamens** 3; anthers 1 mm long. **Stigmas** 3. **Nutlets** cylindrical to obovoid-cylindrical, trigonous, 1.3–1.5 × 0.5–0.7 mm, brown, minutely punctate.

Distribution. Pantropical. Native in Singapore and recorded from Bishan, Holland Road (*Duistermaat 322*, 26 Nov 2004, SING [SING0080196]), Pulau Tekong, Pulau Ubin (*Ali Ibrahim & Lai SING2011-501*, Nov 2011, SING [SING0182055]), Tampines (*Ali Ibrahim SING2013-270*, 27 Oct 2013, SING [SING0201464]), Tampines Avenue 8, the Western



Figure 16. *Cyperus rotundus* L. **A.** Inflorescence. **B.** Spikelets. (From Singapore, Bishan, *Chen SING2017-759*. Photos: L.M.J. Chen).

Catchment (*Samsuri et al. WC40*, 21 Apr 2004, SING [SING0054300]) and other localities. Previously also recorded from Singapore Botanic Gardens, Tanglin (*Ridley 74*, 20 Jan 1889, SING [SING0004866]) and other localities.

Ecology. Open or slightly shaded ground.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Uses. The tubers are sometimes used in local medicine as an antifebric and diuretic. They are also used for perfumery.

Vernacular names. *Purple nutgrass* (English), *rumput halia hitam* (Malay).

Notes. *Cyperus rotundus* is well known as a serious and persistent weed throughout the tropics. It is common in Singapore.

32. *Cyperus sanguinolentus* Vahl

(Latin, *sanguino-* = bloody, blood-coloured, *-lentus* = pliant, flexible;
referring to the often dark reddish or purple-brown colour of the glumes)

Enum. Pl. 2 (1805) 351, nom. cons.; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 385; Kern, Fl. Males., ser. 1, 7(3) (1974) 646. **Synonym:** *Pycreus sanguinolentus* (Vahl) Nees ex C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 590; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 60; Ridley, Fl. Malay Penins. 5 (1925) 139; Turner, Gard. Bull. Singapore 47 (1997 [¹⁹⁹⁵]) 529; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 124; Simpson & Koyama, Fl. Thailand 6(4) (1998) 392; Dai et al., Fl. China 23 (2010) 245. **Type:** *Gamble 15117*, India, Uttar Pradesh, Tehri Garhwal (neotype L [L0042450]), designated by Kern, Reinwardtia 3(1) (1954) 54).

Cyperus eragrostis Lam. var. *cyrtostachys* Miq., Fl. Ned. Ind. 3, fasc. 2 (1856) 257. **Synonyms:** *Cyperus sanguinolentus* Vahl subsp. *cyrtostachys* (Miq.) J. Kern, Reinwardtia 3(1) (1954) 57; Turner, Gard. Bull. Singapore 45 (1993) 64. – *Pycreus sanguinolentus* (Vahl) Nees ex C.B. Clarke var. *cyrtostachys* (Miq.) L.K. Dai, Fl. Hainan. 4 (1977) 538. – *Pycreus sanguinolentus* (Vahl) Nees ex C.B. Clarke subsp. *cyrtostachys* (Miq.) Karthik., Fl. Ind. Enum., Monocot. (1989) 66; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 74, 126, 273. **Type:** *Junghuhn 452*, [Indonesia], Java (holotype L [L0042450]).

Annual or short-lived perennial. **Culms** tufted, 10–60 cm long, 0.7–2 mm diam., trigonous, smooth, lower part with several nodes. **Leaves:** blade linear, 4–11 cm long, 2–4 mm wide, apex acuminate, flattish-plicate; sheath 1–3 cm long, pale green to reddish-brown. **Involucral bracts** 3–5, the longest 10–15 cm long. **Inflorescence** ± capitate or simple; primary branches 2–5, 1–4 cm long. **Spikes** ovoid, 0.9–2 × 1–2 cm; rachis 1–4 mm long. **Spikelets** 3–17, narrowly ovate or oblong-lanceolate, 7–20 × 2–3.5 mm; rachilla straight. **Glumes** distichous, ovate or broadly ovate, 2–2.5 × 1.5–2 mm, apex obtuse, sides membranous, nerves 0, pale brown to reddish- or purplish-brown, keel rather broad, often distinctly furrowed on both sides of keel, 3–5-nerved, green. **Stamens** 3; anthers 0.7–1 mm long. **Stigmas** 2. **Nutlets** broadly obovate, laterally biconvex, 1–1.3 × 0.8–1 mm, maturing black, minutely punctate.

Distribution. Eritrea to Zambia, Asia to Australia. Native in Singapore and recorded from Sungei Kadut (*Duistermaat 548*, 12 Mar 2002, SING [SING59417]) and Tampines (*Duistermaat et al. HDS375*, 10 May 2005, SING [SING0080191]). Previously also recorded from Changi (*Sinclair SFN40538*, 10 Mar 1955, K [K000626707], SING [SING0004878]).

Ecology. Wet grassy fields, ditches, margin of swamps and elsewhere in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore assessed here as Vulnerable (VU/D).

33. *Cyperus sphacelatus* Rottb.

(Latin, *sphacelatus* = with brown or black speckling;
referring to the dark reddish-brown patch on the side of the glumes)

Descr. Icon. Rar. Pl. (1773) 26; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 129; Kern, Fl. Males., ser. 1, 7(3) (1974) 609; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull.

Singapore 47 (1997 ['1995']) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 124; Simpson & Koyama, Fl. Thailand 6(4) (1998) 359; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 125, 266. **Type:** *Rolander s.n.*, Surinam (holotype C). **Fig. 17.**

Annual. **Culms** tufted or solitary, 20–60 cm long, 1–2 mm diam., smooth, triquetrous. **Leaves:** blade linear, 5–17 cm long, 2–4 mm wide, apex acute, flattish-plicate; sheath 1–8 cm long, pale brown to darker brown. **Involucral bracts** 3–5, the longest 10–20 cm long. **Inflorescence** simple, lax, 4–10 × 4–14 cm; primary branches 3–8, unequal, up to 8 cm long, spike 1. **Spikes** broadly ovate, 1–2 cm long; rachis 0.5–1 cm long. **Spikelets** 5–12 per spike, spreading, linear-lanceolate, 6–20 × (1.2–)1.5–2 mm, flattened; rachilla weakly zigzag, winged. **Glumes** distichous, 9 or more on the longest spikelets, elliptic to ovate, 2–2.8 × 1.5–2 mm, apex subobtuse to subacute, mucronate, sides membranous, 5–9-nerved, very pale brown often with dark reddish-brown patch, keel greenish. **Stamens** 3; anthers c. 0.5 mm long. **Stigmas** 3. **Nutlets** oval or obovate, triquetrous with concave sides, 1–1.5 × 0.8–1 mm, maturing brown, minutely punctate.

Distribution. Tropical America, tropical Africa and Madagascar; introduced elsewhere. In Singapore recorded from Pasir Panjang (*Chen SING2017-746*, 6 Dec 2017, SING [SING0266854]), Punggol (*Boo SING2011-183*, 31 Mar 2011, SING [SING0170121]), Sungei Buloh (*Duistermaat et al. S61*, 19 Mar 2002, SING [SING0059410]) and Tampines (*Ali Ibrahim SING2013-269*, 27 Oct 2013, SING [SING0201463]). Previously also recorded from Singapore Botanic Gardens (*Purseglove P4038*, 8 Feb. 1955, SING [SING0057657]).

Ecology. Open grassy fields, river banks.

Provisional conservation assessment. Globally Least Concern (LC). Not native in Singapore.

Notes. In general appearance this species resembles *Cyperus rotundus*. However, it is characterised by its pale brown glumes which often have a dark reddish-brown patch on their sides.

34. *Cyperus stolonifer* Retz.

(Latin, *stoloni-* = stolon, *-fer* = carrying; referring to the presence of stolons)

Observ. Bot. 4 (1786–1787) 10, as '*stoloniferus*'; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 615; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 69; Ridley, Fl. Malay Penins. 5 (1925) 145; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 106; Henderson, Malay. Wild Fls., Monocot. (1954) 274; Kern, Fl. Males., ser. 1, 7(3) (1974) 606; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 125, fig. 231; Simpson & Koyama, Fl. Thailand 6(4) (1998) 353; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 125, 226; Dai et al., Fl. China 23 (2010) 231, all as '*stoloniferus*'. **Type:** *König s.n.*, India, Tranquabar (lectotype LD [1299527], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 68).

Stoloniferous perennial. **Culms** 1–2, 8–40 cm long, 0.7–3 mm diam., trigonous, smooth, base swollen. **Leaves:** blade linear, up to 50 cm long, 2–4 mm wide, apex acuminate, flattish to



Figure 17. *Cyperus sphacelatus* Rottb. (From Singapore, Pasir Panjang, *Chen SING2017-746*. Photos: L.M.J. Chen).

canaliculate; sheath pale brown, becoming fibrous. **Involucral bracts** 2–3, the longest 10–30 cm long. **Inflorescence** simple, often congested, up to 6 × 6 cm; primary branches 2–5, 0.5–6 cm long; spikes solitary. **Spikes** ovoid, 1.5–2.5 cm long; rachis 0.1–0.5 cm long. **Spikelets** 3–8 per spike, suberect to patent, linear oblong to oblong-lanceolate, 6–15 × 1.5–2 mm, subterete, often weakly curved; rachilla slightly zigzag, winged. **Glumes** distichous, 9 or more on the longest spikelets, broadly ovate, 2.2–2.7 × 2–2.3 mm, apex obtuse, mucronate, sides thickly membranous, 5–7-nerved, pale brown to dark reddish-brown, keel pale green. **Stamens** 3; anthers 1.5–2 mm long. **Stigmas** 3. **Nutlets** ovoid, trigonous, 1–1.5 × 1 mm, dark brown, minutely punctate.

Distribution. Madagascar, Mauritius, India to Australia and Melanesia. Native in Singapore and recorded from Pulau Tekong (*Samsuri et al. PT97*, 1 Nov 2001, SING [SING0039773]), Sembawang beach (*Lai LJ480*, 1999, SING [SING0019939]), Sungei Buloh, Sungei Pang Sua (*Samsuri et al. KJ6*, 20 May 2003, SING [SING0044603]), Tampines (*Ali Ibrahim SING2013-271*, 27 Oct 2013, SING [SING0201465]) and other localities. Previously also recorded from Changi, Loyang, Pasir Ris, Pulau Satumu (*Ridley s.n.*, 2 Jan 1889, SING [SING0057667]), Tanah Merah, Tanjong Katong, Tanjong Rhu, Telok Kurau and other localities.

Ecology. In brackish marshes and wet coastal sands at about high tide level, often in large stands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Tuberous cyperus* (English).

Notes. This species is closely related to *Cyperus rotundus* but has subterete spikelets and broadly ovate glumes. It is confined to coastal areas.

35. *Cyperus surinamensis* Rottb.

(of Suriname)

Descr. Icon. Rar. Pl. (1773) 35. **Type:** *Rolander s.n.*, Suriname (holotype C, n.v.).

Annual or short-lived perennial; rhizomes absent. **Culms** 30–80 cm long, 0.5–3 mm diam., trigonous, minutely scabrid. **Leaves:** blade linear, 25–60 cm long, 2–10 mm wide; apex acute, flattish or v-shaped. **Involucral bracts** 3–8, the longest up to 34 cm long. **Inflorescence** umbel-like, simple to compound, rarely decompound, 1–3 cm diam.; primary branches 4–12, 1–6 cm long, minutely scabridulous; secondary branches often present, 1–3 cm long; tertiary branches rarely present, 0.5–1.5 cm long. **Spikelets** numerous, linear to linear-oblong, 4–15 × 1.5–2.5 mm, flattened, rachilla straight. **Glumes** distichous, lanceolate, 1–1.5 × 0.8–0.9 mm, apex acute, often mucronulate, sides membranous, nerves 3, pale yellow, light brown, or reddish-brown, scabridulous near apex, keel pale brown. **Stamen** 1; anthers 0.5 mm long. **Stigmas** 3. **Nutlets** narrowly ellipsoid, 0.7–0.9 × 0.2–0.4 mm, apex apiculate, brown to reddish-brown, papillate or obscurely reticulate to rugulose.

Distribution. Tropical and subtropical America. Introduced elsewhere, especially tropical Asia. In Singapore recorded from Sungei Tengah (*Ho et al. SING2018-436*, 27 Feb 2018, SING [SING0267373]).

Ecology. Moist, open sunny areas with disturbed soils.

Provisional Conservation Assessment. Globally Least Concern (LC). Not native in Singapore.

36. *Cyperus tenuiculmis* Boeckeler

(Latin, *tenui-* = slender, *-culmis* = culm; with slender culms)

Linnaea 36 (1870) 286; Kern, Fl. Males., ser. 1, 7(3) (1974) 608; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 522; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 125; Simpson & Koyama, Fl. Thailand 6(4) (1998) 357; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 125, 226; Dai et al., Fl. China 23 (2010) 233. **Type:** *Wallich s.n.* [EIC 3321], Nepal (holotype B, destroyed; isotypes BR [BR0000006595869], K [K000592514]).

Cyperus zollingeri auct. non Steud.: Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 613; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 68; Ridley, Fl. Malay Penins. 5 (1925) 144; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1935) 133; Henderson, Malay. Wild Fls., Monocot. (1954) 275.

Shortly rhizomatous perennial. **Culms** 1–few, 35–70(–90) cm long, 1–2 mm diam., triquetrous, smooth. **Leaves:** blade narrowly linear, 9–28 cm long, 2–6 mm wide, apex sharply acute, folded; sheath 2–16 cm long, light brown. **Involucral bracts** 2–7, the longest up to 20 cm long. **Inflorescence** simple, lax, occasionally congested, up to 15 cm long; primary branches 2–8, 1–16 cm long; spikes solitary. **Spikes** ovoid, up to 5 cm long; rachis 0.5–1.3 cm long. **Spikelets** 7–14 per spike, suberect to patent, often appearing ± finger-like, linear to linear-lanceolate, 10–30 × 1.5–2 mm, slightly flattened; rachilla zigzag, winged. **Glumes** distichous, 9 or more on the longest spikelets, ovate-elliptic to elliptic, 3.5–4 × 2–2.5 mm, apex obtuse to ± acute, sides chartaceous, 7–9-nerved, yellowish-brown to mid-brown, keel similar. **Stamens** 3; anthers 1–1.5 mm long. **Stigmas** 3. **Nutlets** elliptic or obovate, triquetrous with concave sides, 1.7–2 × 0.8–1 mm, maturing blackish, minutely punctate.

Distribution. Tropical Africa to southern Japan and northern Australia. Native in Singapore but no recent records. Previously recorded from Changi (*Ridley s.n.*, 1892, SING [SING0004880]), Geylang (*Teruya 1966*, 17 Oct 1932, SING [SING0058161]), Singapore Botanic Gardens (*Deshmukh, s.n.*, 24 Oct 1921, SING [SING57670]) and Tanglin (*Ridley s.n.*, 1 Jun 1889, SING [SING0004879]).

Ecology. Open grasslands, grassy waysides, open forest.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

37. *Cyperus tenuifolius* (Steud.) Dandy

(Latin, *tenui-* = slender, *-folius* = leaf; referring to the narrowly linear leaves)

in Exell (ed.), Cat. Vasc. Pl. S. Tomé (1944) 363. **Basionym:** *Kyllinga tenuifolia* Steud., Syn. Pl. Glumac. 2, fasc. 7 (1854) 69. **Type:** *Leprieur s.n.*, Senegal (lectotype P [P00070267], designated here).

Cyperus triceps auct. non Endl.: Kern, Fl. Males., ser. 1, 7(3) (1974) 659; Turner, Gard. Bull. Singapore 45 (1993) 65; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 126.

Kyllinga triceps auct. non Rottb.: Simpson & Koyama, Fl. Thailand 6(4) (1998) 397.

Rhizomatous perennial; rhizome short. **Culms** densely tufted, 5–17(–35) cm long, 0.5–1 mm diam., trigonous, smooth, base swollen. **Leaves:** blade narrowly linear, 3–28 cm long, 1–3 mm wide, apex acuminate, flattish-plicate; sheath 1–4 cm long, pale to mid-brown. **Involucral bracts** 3–4, the longest up to 10 cm long. **Inflorescence** capitate, 0.8–1 × 0.8–0.9 cm. **Spikes** (1–)3(–5), central spike globose or ovoid-globose, 0.5–0.8 × 0.5 cm, lateral spikes globose, smaller. **Spikelets** oblong or oblong-lanceolate, 1.7–2 × 0.6 mm, 1-flowered. **Glumes** distichous, usually 4, oblong-ovate to oblong-lanceolate, 0.5–2 mm long, apex acute, sides hyaline, pale greenish, 1–7-nerved, keel smooth. **Stamens** 2; anthers 0.9–1 cm long. **Stigmas** 2. **Nutlet** 1 per spikelet, oblong, laterally biconvex, 1–1.3 × 0.5 mm, maturing brownish.

Distribution. Tropical and southern Africa, India to Thailand and Myanmar. Native in Singapore but no recent records. Previously recorded from Raffles Institution (before 1972) (*Hullett* 2195, 1885, SING [SING0058159, SING0058162]) and an unknown locality (*Hullett* 495, 1885, K [K000626998]).

Ecology. Wet to semi-dry sandy soil.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Taxonomy. This taxon has previously been referred to *Cyperus triceps* Endl. or *Kyllinga triceps* Rottb. However, both these names are illegitimate because an earlier name, *Scirpus glomeratus* L. was published as a synonym in the protologue of *K. triceps*. Kükenthal (in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 563) synonymised *S. glomeratus* under an unrelated species, *Cyperus dubius* Rottb. Subsequently, Govaerts et al. (World Checklist of Cyperaceae, 2019) placed both *Cyperus triceps* and *K. triceps* into the synonymy of *C. dubius*, on the basis that *triceps* is homotypic with *S. glomeratus*, so it automatically also becomes a synonym of *C. dubius*, even though it may have been misapplied (R. Govaerts, pers. comm). However, Jarvis (Order Out of Chaos (2007) 829) earlier noted that the application of *S. glomeratus* was uncertain and that the original material comprises several taxa. A proposal to conserve *Kyllinga triceps* (Kukkonen, Taxon 44(4) (1995) 625–627) was rejected (Brummitt, Taxon 47(4) (1998) 863–872), with an alternative available name, *Cyperus tenuifolius*, being recommended instead. This name is used here.

38. *Cyperus tenuispica* Steud.

(Latin, *tenui*- = slender, *-spica* = spike; referring to the narrowly linear spikelets)

Syn. Pl. Glumac. 2, fasc. 7 (1854) 11; Kükenthal in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 245; Kern, Fl. Males., ser. 1, 7(3) (1974) 625; Simpson & Koyama, Fl. Thailand 6(4) (1998) 372; Dai et al., Fl. China 23 (2010) 227. **Type:** *Hohenacker 1670* (cited as *1607*), India, Mangalore (holotype P [P00798693]; isotypes BM [BM000959001, BM000959030, BM000959031], CORD [CORD00002127], FR [FR0031443, FR0031444], MPU [MPU028209]). **Fig. 18.**

Cyperus flavidus auct. non Retz.: Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 600.

Annual or rarely short-lived perennial. **Culms** tufted, (3–)5–35 cm long, 1–2 mm diam., triquetrous, smooth. **Leaves:** blade linear, up to 20 cm long, 2–4 mm wide, apex acute, flat, soft; sheath up to 5 cm long, reddish-brown to purplish-brown. **Involucral bracts** 1–3, unequal, the longest up to 20 cm long. **Inflorescence** simple to compound, open to rather congested, 3–10 × 3–10 cm; primary branches 5–10, 3–10 cm long, 0.4–0.7 mm diam.; secondary branches absent or 0.4–2 cm long. **Spikelets** 1 or in finger-like clusters of 2–9, linear-oblong, 3–12 × 1–1.5 mm, flattened; rachilla slightly zigzag. **Glumes** distichous, ovate to oblong-ovate, 0.8–1 × 0.5–0.8 mm, apex truncate or obtuse, straight to shortly recurved-mucronate, sides membranous, nerves inconspicuous, reddish-brown or purplish-brown, keel yellowish-green. **Stamens** 1–2; anthers 0.2–0.4 mm long. **Stigmas** 3. **Nutlets** obovoid-orbicular or ovoid, broadly trigonous, sides rounded, 0.3–0.5 × 0.2–0.3 mm, maturing white or creamy yellow, usually minutely tuberculate.

Distribution. Tropical Africa, India, Nepal and Sri Lanka east to Malesia, China and Japan. Probably native in Singapore and recorded from MacRitchie (*Leong-Škorničková & Leong SING2019-036*, 19 Feb 2019, SING [SING0260968]).

Ecology. Open wet places, elsewhere often as a weed in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Data Deficient (DD).

Notes. *Cyperus tenuispica* is probably under-recorded and may easily be confused with *C. haspan*. However, in *Cyperus tenuispica* the glumes are up to 1 mm long and the nutlets up to 0.3 mm wide.

39. *Cyperus trialatus* (Boeckeler) J.Kern

(Latin, *tri*- = three, *-alatus* = winged; possibly referring to the triquetrous nutlet)

Reinwardtia 3(1) (1954) 32; Kern, Fl. Males., ser. 1, 7(3) (1974) 621; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 125; Simpson & Koyama, Fl. Thailand 6(4) (1998) 405; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 125, 270; Dai et al., Fl. China 23 (2010) 369. **Basionym:** *Scirpus trialatus* Boeckeler, Flora 42 (1859) 225. **Synonyms:** *Cyperus turgidulus* C.B.Clarke, J. Linn. Soc., Bot.



Figure 18. *Cyperus tenuispica* Steud. **A.** Habit. **B.** Whole plant. (From Singapore, MacRitchie, Leong-Škorničková & Leong SING2019-036. Photos: J. Leong-Škorničková).

21(132&133) (1884) 130, nom. illeg. superfl.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 604. – *Mariscus trialatus* (Boeckeler) Tang & F.T.Wang, Fl. Reipubl. Popularis Sin. 11 (1961) 176. **Type:** *Griffith s.n.*, [Malaysia], Malacca (lectotype BM, designated here; isolectotype FI n.v.).

Cyperus bancanus Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 599; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 65; Ridley, Fl. Malay Penins. 5 (1925) 143. **Synonym:** *Cyperus diffusus* Vahl. subsp. *bancanus* (Miq.) Kük. in Engler, Pflanzenr., IV, fam. 20 (Heft 101) (1936) 209. **Type:** *Kurz s.n.*, [Indonesia], Sumatra, Banka (holotype U [U0001504]).

Shortly rhizomatous perennial. **Culms** 1–few, 11–82 cm long, 1.8–5 mm diam., triquetrous, angles winged, smooth. **Leaves:** blade linear, 7–52 cm long, 4–13 mm wide, apex acute to shortly acuminate, flattish; sheath 2–11 cm long, reddish- to purplish-brown. **Involucral bracts** 4–7, unequal, the longest up to 30 cm long. **Inflorescence** simple to compound, open to rather dense, 4–18 × 6–15 cm; primary branches 10–20, 2–10 cm long; secondary branches 0.4–3 cm long. **Spikelets** in compact, often ± globose clusters of 2–16, ovate, 3–5 × 2–3.5 mm, subterete; rachilla straight. **Glumes** distichous, broadly ovate, 1.5–2.1 × 1–1.7 mm, apex acute, recurved-mucronate, sides membranous, 5–6-nerved, pale greenish to dark reddish-brown, keel obtuse, greenish. **Stamens** 3; anthers 0.8 mm long. **Stigmas** 3. **Nutlets** ovoid, triquetrous, sides shallowly concave, 1.5–1.8 × 0.6–0.8 mm, brown.

Distribution. China to Western Malesia. Native in Singapore and recorded from Pulau Ubin (Duistermaat *et al.* S179, 23 Sep 2003, SING [SING0059178]; Gwee *et al.*, GAT190, 21 Jan

2003, SING [SING0042955]; *Teo SING2011-454*, Nov 2011, SING [SIN0182002]) and Pulau Tekong (*Samsuri et al. PT43*, 31 Oct 2001, SING [SING0039720]). Previously also recorded from Geylang (*Ridley 11511*, Apr 1903, SING [SING0004883]).

Ecology. Open areas mostly within forest.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Notes. Close to *Cyperus diffusus* but the spikelets are in compact, ± globose clusters.

5. DIPLACRUM R.Br.

(Greek, *dipl-* = double, *-acros* = edge; alluding to the distichous glumes, most noticeable in the female spikelet, that tightly surround the mature nutlet)

Prodr. Fl. Nov. Holland. (1810) 240; Goetghebeur in Kubitzki et al. (ed.), *Fam. Gen. Vasc. Pl.* 4 (1998) 184; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 445; Dai et al., *Fl. China* 23 (2010) 269. **Type:** *Diplacrum caricinum* R.Br.

Small or medium-sized annuals, occasionally perennials. **Leaves** basal and cauline; blade linear; ligule 0; contraligule 0. **Inflorescence** comprising few to many head-like clusters of spikelets borne at axils of leafy bracts, distributed along ± whole length of culm. **Spikelets** unisexual, the female spikelets with 3–4 glumes and terminal female flower; male spikelets usually below female. **Glumes** distichous, those below nutlets in female spikelets large, otherwise minute. **Perianth segments** 0. **Stamen** 1. **Stigmas** 3. **Nutlets** tightly enveloped in 2 subtending glumes and falling off with them, pericarp bony, irregularly rugose, reticulate or ± smooth; disk depressed, adnate to base of nutlet.

Distribution. A genus of 9 species, all in the tropics. In Singapore 1 native species.

Ecology. Open wet grassland, savannahs, swamps and rice fields.

Taxonomy. *Diplacrum* is placed by some authors in *Scleria* (tribe Scleriae) but molecular phylogenetics (e.g. Semmouri et al., *Bot. Rev. (Lancaster)* 85 (2019) 1–39) show it to be placed in a separate tribe Bisboeckelereae.

Diplacrum caricinum R.Br.

(Latin, *caric-* = pertaining to *Carex* L., *-inum* = like, resembling;
alluding to the appearance of the glumes surrounding nutlet giving the appearance of a *Carex* utricle)

Prodr. Fl. Nov. Holland. (1810) 241; Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 523; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 446, fig. 248; Chong et al., *Checkl. Vasc. Pl. Fl. Singapore* (2009) 35, 125, 270; Zhang et al., *Fl. China* 23 (2010) 269. **Synonym:** *Scleria caricina* (R.Br.) Benth., *Fl. Austral.* 7

(1878) 426; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 688; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 111; Ridley, Fl. Malay Penins. 5 (1925) 178; Kern, Blumea 11(1) (1961) 208; Kern, Fl. Males., ser. 1, 7(3) (1974) 749; Turner, Gard. Bull. Singapore 45 (1993) 68; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 141. **Type:** *Banks & Solander s.n.*, Australia, Endeavour River, 1770 (holotype BM [BM000833639]). **Fig. 19, 20.**

Slender annual. **Culms** loosely tufted, (3–)6–30 cm long, c. 1 mm diam., triquetrous, smooth. **Leaves** basal and cauline; blade linear, 1–5 cm long, 2–5 mm wide, apex shortly acute, flattish; sheath 3–10 mm long, wingless. **Inflorescence** comprising up to 20, sessile or shortly pedunculate, globose spikelet clusters, 3–5 mm diam., each arising from axil of leaf-like involucre bract. **Spikelets** unisexual, 1–2 mm long. **Glumes** lanceolate to elliptic, 1–2.5 mm long, 3-lobed, sides thinly membranous, 5–8-nerved, pale greenish. **Stamen** 1. **Nutlets** globose, 0.7–1 mm diam., white, irregularly longitudinally ribbed, slightly hispid at apex; disk triangular, obtuse.

Distribution. Tropical and subtropical Asia to western Pacific islands. Native in Singapore and recorded from Nee Soon (*Lai LI426*, 1998, SING [SING0019910]) and Tampines Avenue 8 (*Duistermaat et al. HDS378*, 10 May 2005, SING [SING0080194]). Previously also recorded from Bukit Mandai (*Ridley 3806*, 1892, SING [SING0058266]), Bukit Timah (*Ridley s.n.*, 1894, SING [SING58264]), Lower Peirce, MacRitchie, Choa Chu Kang and Twali (*Ridley s.n.*, 1890, SING [SING0058270]).

Ecology. Open wet grassland, savannahs, swamps and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Notes. *Diplacrum reticulatum* Holttum is a closely related species that occurs in the region. It has broadly ovate glumes with an acute apex and nutlets with an irregularly reticulate surface pattern. Although not recorded from Singapore it may be overlooked.

6. ELEOCHARIS R.Br.

(Greek, *heleo-* = dwelling in a marsh, *-charis* = charm, grace;
alluding to the favoured habitat of the plants)
Spike-rush, spike-sedge (English)

Prodr. Fl. Nov. Holland. (1810) 224; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 625; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 75; Ridley, Fl. Malay Penins. 5 (1925) 150; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 906; Kern, Fl. Males., ser. 1, 7(3) (1974) 522; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 166; Simpson & Koyama, Fl. Thailand 6(4) (1998) 284; Dai & Strong, Fl. China 23 (2010) 188. **Type:** *Scirpus palustris* L., lectotype designated by Britton, Bull. Dept. Agric. Jamaica 5, Suppl. 1 (1907) 10 (= *Eleocharis palustris* (L.) Roem. & Schult.).

Limnochloa P.Beauv. ex T.Lestib., Essai Cypér. (1819) 41. **Type:** *Limnochloa mutata* (L.) Nees, lectotype designated by González & Reznicek, Taxon 46 (1997) 443 (= *Eleocharis mutata* (L.) Roem. & Schult.).

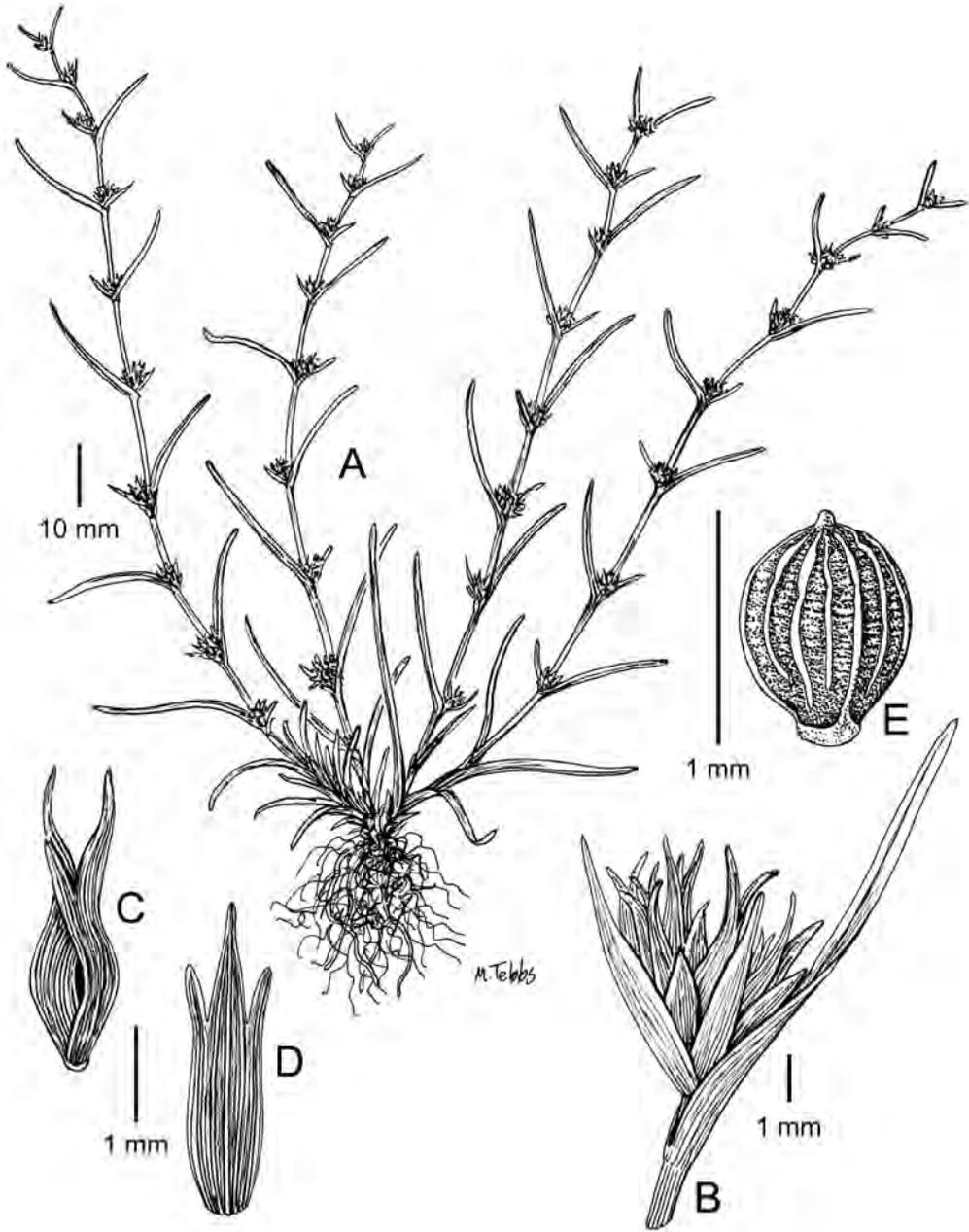


Figure 19. *Diplacrum caricinum* R.Br. A. Habit. B. Spikelets. C. Glumes. D. Glume. E. Nutlet. (From Thailand, *de Wilde et al.* 1949. Drawn by M. Tebbs).



Figure 20. *Diplacrum caricinum* R.Br. **A.** Habit. **B.** Whole plant. (From Singapore, Nee Soon, *Chen SING2017-783*. Photos: L.M.J. Chen).

Chaetocyperus Nees, *Linnaea* 9 (1834) 289. **Type:** *Cyperus setaceus* Retz., lectotype designated by Pfeiffer, *Nomencl. Bot.* 1(1) (1873) 684 (= *Eleocharis retroflexa* (Poir.) Urb. subsp. *chaetaria* (Roem. & Schult.) T.Koyama).

Annuals or rhizomatous perennials. **Culms** terete or angular, sometimes transversely septate. **Leaves** reduced to bladeless sheaths; ligule 0. **Involucral bracts** 1–2, glume-like. **Inflorescence** a single, terminal spikelet. **Spikelet** ovoid, ellipsoid or cylindrical. **Glumes** several to many per spikelet, usually spirally imbricate, rarely distichous. **Flowers** bisexual. **Perianth segments** up to 8, bristle-like, sometimes 0. **Stamens** 1–3. **Stigmas** 2–3; style base persistent on nutlets. **Nutlets** trigonous or biconvex, mostly obovate, surface smooth, reticulate (cancellate), pitted, longitudinally grooved or transversely ridged, the style-base variously-shaped.

Distribution. A genus of 295 species, almost cosmopolitan. In Singapore 5 native species.

Ecology. Predominantly occurring in marshy to wet habitats, along streams, in swamps and in shallow water.

Taxonomy. *Eleocharis* is a genus that is well characterised by the bladeless leaves, culms terminating in a single spikelet subtended by glume-like involucral bracts and a variously-shaped style-base on the nutlet. Morphologically it has long been treated as close to *Scirpus*, *Fimbristylis* and *Bulbostylis* (Kern, *Fl. Males.*, ser. 1, 7(3) (1974) 523) but placed in a separate tribe Eleocharideae. This is confirmed by phylogenetic work (e.g. Muasya et al., *Bot. Rev. (Lancaster)* 75 (2009) 52–66; Semmouri et al., *Bot. Rev. (Lancaster)* 85 (2019) 1–39).

Eleocharis acutangula (Roxb.) Schult. is included in the key in italics below as it has been included in the literature for Singapore even though no specimens have been found (see Excluded species).

Key to *Eleocharis* species

1. Spikelets cylindrical (if ovoid then glumes 4 mm or more long), usually 11 mm or more long 2
Spikelets ovoid or ellipsoid, up to 11 mm long 5
2. Culms transversely septate **1. *E. dulcis***
Culms not transversely septate 3
3. Culms terete to weakly angular **3. *E. ochrostachys***
Culms triquetrous or 4–5-angled at least above 4
4. Sheath apex often with setaceous blade up to 4 mm long; glumes broadly obovate, closely imbricate **5. *E. spiralis***
Sheath apex without blade; glumes ovate to ovate-elliptic, narrowly ovate to oblong-ovate, loosely imbricate *E. acutangula*

5. Glumes distichous; stigmas 3; nutlets trigonous, maturing pale yellow **4. E. retroflexa**
 Glumes spirally arranged; stigmas 2; nutlets biconvex, maturing black
 **2. E. geniculata**

1. *Eleocharis dulcis* (Burm.f.) Trin. ex Hensch.

(Latin, *dulcis* = sweet, pleasant; referring to the edible tubers)

Vita Rumphii (1833) 186; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 906; Koyama, Contr. Inst. Bot. Univ. Montréal 70 (1957) 35; Kern, Fl. Males., ser. 1, 7(3) (1974) 529; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 126; Simpson & Koyama, Fl. Thailand 6(4) (1998) 287; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 38, 125, 227; Dai & Strong, Fl. China 23 (2010) 191. **Basionym:** [Published illustration] *Andropogon dulce* Burm.f., Fl. Ind. (1768) 219. **Type:** [Published illustration] ‘*Cyperus dulcis*’. Rumphius, Herb. Amboin. 6 (1750) 7, t. 3 [cited as t. 4]: fig.1 (lectotype designated here). **Fig. 21.**

Scirpus plantaginoides Rottb., Descr. Icon. Rar. Pl. (1773) 45; Retzius, Observ. Bot. 5 (1788 [‘1789’]) 14, as ‘*plantagineus*’, Vahl, Enum. Pl. 2 (1805) 251, as ‘*plantagineus*’. **Synonyms:** *Eleocharis plantaginoides* (Rottb.) Roem. & Schult., Syst. Veg., ed. 15 bis, 2 (1817) 150; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 625; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 75; Ridley, Fl. Malay Penins. 5 (1925) 150, all as ‘*plantaginea*’. – *Limnochloa plantaginoides* (Rottb.) Nees in Wight, Contr. Bot. India (1834) 150, as ‘*plantaginea*’ **Type:** *König s.n.*, India (holotype C [C10010371]; isotype LD [LD1283327]).

Scirpus tuberosus Roxb., Pl. Coromandel 3, fasc. 2 (1815 [‘1819’]) 25, nom. illeg. non Desf. (1798). **Synonyms:** *Eleocharis tuberosa* Schult., Mant. 2 (1824) 86; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 906. – *Eleocharis dulcis* (Burm.f.) Trin. ex Hensch. var. *tuberosa* (Schult.) T.Koyama, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 8 (1961) 97. **Type:** not traced.

Eleocharis equisetina J.Presl & C.Presl in C.Presl, Reliq. Haenk. 1, fasc. 3 (1828) 195; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 626; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 75; Ridley, Fl. Malay Penins. 5 (1925) 150. **Type:** *Haenke s.n.*, Philippines, Luzon (holotype PR n.v.).

Perennial. **Stolons** elongated, terminated by a small tuber. **Tubers** 5–7 mm wide. **Culms** tufted, 40–90 cm long, 3–7 mm diam., terete, transversely septate, spongy, easily flattened when dry. **Sheaths** 3–20 cm long, apex truncate, reddish-brown. **Spikelets** cylindric, 20–50 × 3–4 mm. **Glumes** many per spikelet, elliptic-oblong to oblong-obovate, 5–6.5 × 1.7–3.2 mm, apex obtuse to rounded-truncate, sides herbaceous or chartaceous, whitish, margins narrow, hyaline, midrib greenish. **Perianth segments** 6–8, longer than nutlets, flattened below, barbellate above. **Stamens** 3; anthers 2.5–3 mm long. **Stigmas** 2. **Nutlets** obovate, biconvex, 1.7–2.2 × 1.5–1.8 mm, apex indistinctly annulate, style-base triangular-conical, surface shiny yellowish- or greyish-brown, indistinctly cancellate.

Distribution. Old World tropics and subtropics. In Singapore possibly native and recorded from MacRitchie (*Leong-Škorničková & Leong SING2019-039*, 25 Jan 2019, SING [SING0260971]) and Sungei Buloh (*Duistermaat et al. S76*, 19 Mar 2002, SING [SING0059776]). Previously also recorded from Ayer Rajah Road, Balestier (*Hose 54*, 7 Jan 1904, SING [SING0004888]),

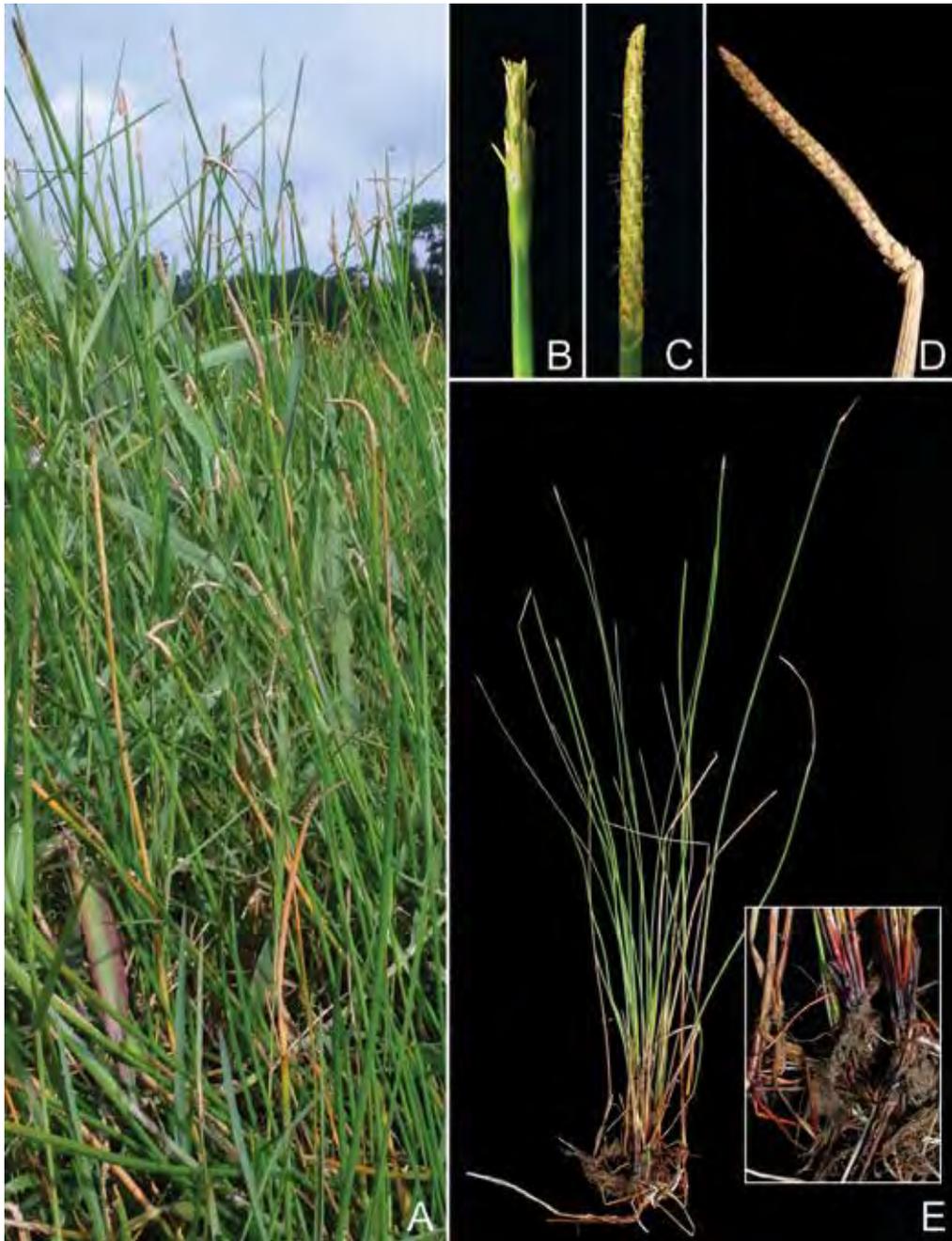


Figure 21. *Eleocharis dulcis* (Burm.f.) Trin. ex Hensch. **A.** Habit. **B–D.** Spikelets. **E.** Whole plant with detail of culm bases. (From Singapore, MacRitchie, *Leong-Škorničková & Leong SING2019-039*. Photos: J. Leong-Škorničková).

Chaban, Singapore Botanic Gardens (*Ridley 11465*, Feb 1903, SING [SING0058271]) and Ulu Pandan Road (*Sinclair SFN40613*, 5 May 1955, SING [SING0004885]).

Ecology. Open marshy places along coast and inland, often forming large stands.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Uses. This species is widely cultivated for its edible tubers.

Vernacular name. *Water chestnut* (English).

2. *Eleocharis geniculata* (L.) Roem. & Schult.

(Latin, *geniculatus* = geniculate, bent abruptly like a knee; application uncertain but possibly alluding to the spikelets being tilted somewhat at an angle in relation to the culm)

Syst. Veg., ed. 15 bis, 2 (1817) 150; Kern, Fl. Males., ser. 1, 7(3) (1974) 536; Turner, Gard. Bull. Singapore 45 (1993) 64; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 126; Simpson & Koyama, Fl. Thailand 6(4) (1998) 290; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 38, 125, 270; Dai et al., Fl. China 23 (2010) 196. **Basionym:** *Scirpus geniculatus* L., Sp. Pl. 1 (1753) 48. **Type:** Herb. Clifford [Hortus Cliffortianus], ‘Jamaica’ (lectotype BM [BM000557653], designated by Furtado, Gard. Bull. Straits Settlem. 9(3) (1937) 299). **Fig. 22, 23.**

Scirpus capitatus L., Sp. Pl. 1 (1753) 48. **Synonym:** *Eleocharis capitata* (L.) R.Br., Prodr. Fl. Nov. Holland. (1810) 225; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 627; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 77; Ridley, Fl. Malay Penins. 5 (1925) 151. **Type:** Clayton 380, ‘Habitat in Virginia’ [USA] (lectotype BM [BM000051193], designated by Blake, Rhodora 20 (1918) 23).

Annual. **Culms** densely tufted, 7–40 cm long, 0.2–0.4(–0.7) mm diam., terete. **Sheaths** 0.5–3 cm long, apex obliquely truncate, pale green to reddish- or purplish-brown below. **Spikelets** ovoid-globose to ovoid-ellipsoid, 3–7 × 3–4 mm. **Glumes** many per spikelet, closely imbricate broadly elliptic to ovate, 1.8–2 mm long, apex obtuse, sides membranous, pale brown, midrib green. **Perianth segments** 6–8, slightly longer than nutlets, sparsely barbellate. **Stamens** 2–3; anthers 0.5 mm long. **Stigmas** 2. **Nutlets** broadly obovate, biconvex, 0.9–1 × 0.7–0.8 mm, rounded, maturing shiny black, ± smooth; style-base depressed-conical.

Distribution. Pantropical. Native in Singapore and recorded from Bedok Road (*Ali Ibrahim SING2013-267* 27 Oct 2013, SING [SING0201461]), Bishan, Mandai (*Lee et al., SING2005-75*, 28 Mar 2005, SING [SING0060022]), Sungei Kadut (*Duistermaat & Hillier S50*, 12 Mar 2002, SING [SING0059777]), Sungei Serangoon and Sungei Tengah. Previously also recorded from Changi (*Ridley 133*, Feb 1889, K [K000626708], SING [SING0004891]), Teban, Tampines and Woodlands (*Sinclair SFN39236*, 21 Apr 1951, SING [SING0004890]).

Ecology. Open wet ground.

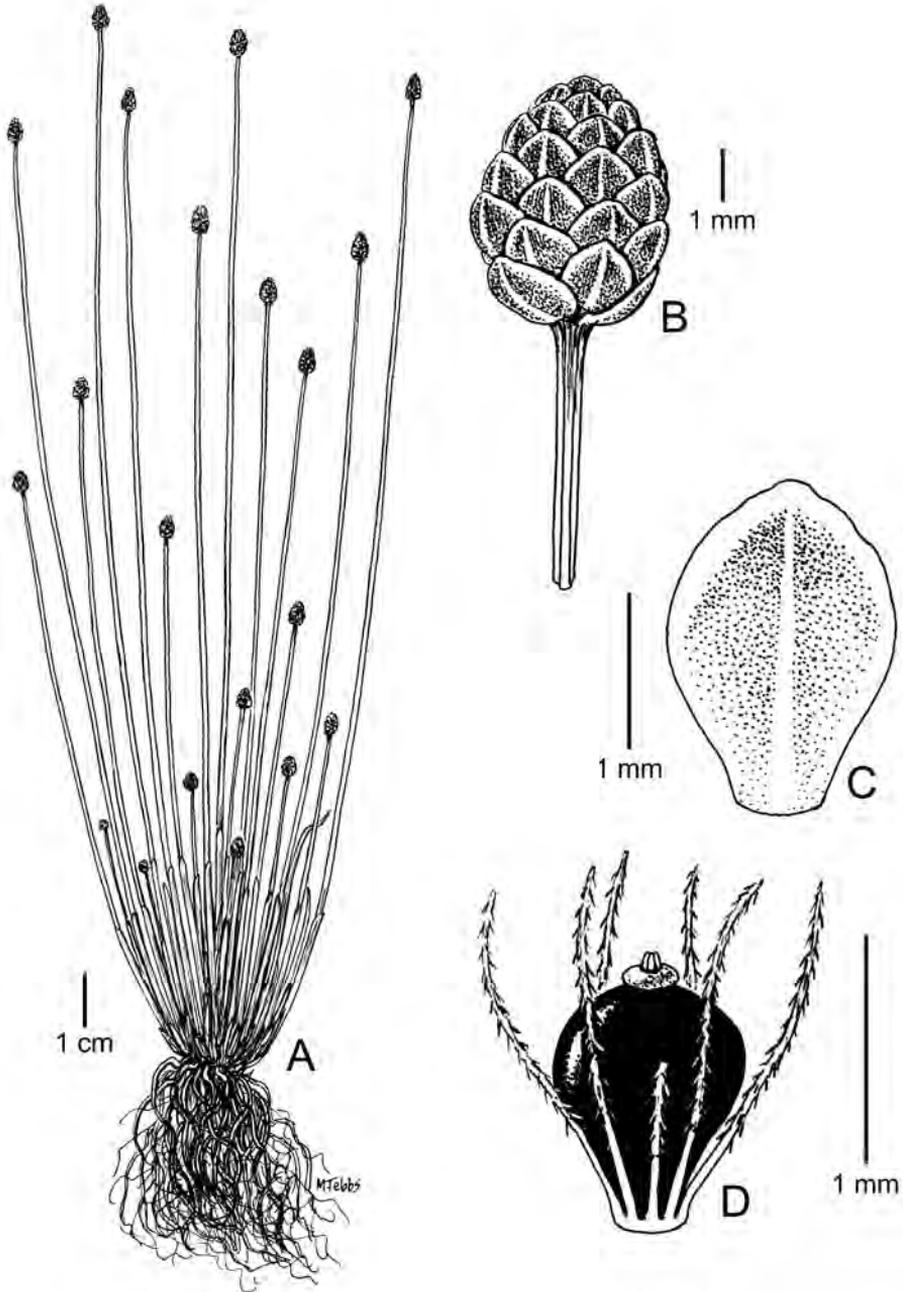


Figure 22. *Eleocharis geniculata* (L.) Roem. & Schult. **A.** Habit. **B.** Spikelet. **C.** Glume. **D.** Nutlet with perianth segments. (From Thailand, *Kerr* 9286. Drawn by M. Tebbs).



Figure 23. *Eleocharis geniculata* (L.) Roem. & Schult. (From Singapore, Bishan, Chen SING2017-699. Photos: L.M.J. Chen).

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

3. *Eleocharis ochrostachys* Steud.

(Greek, *ochro-* = pale, *-stachys* = spike; referring to the pale colour of the spikelet)

Syn. Pl. Glumac. 2, fasc. 7 (1854) 80; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 626; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 76; Ridley, Fl. Malay Penins. 5 (1925) 151; Kern, Fl. Males., ser. 1, 7(3) (1974) 528; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 126, fig. 232; Simpson & Koyama, Fl. Thailand 6(4) (1998) 287; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 38, 125, 270; Dai & Strong, Fl. China 23 (2010) 192. **Type:** *Zollinger 291*, [Indonesia], Java, 17 August 1842 (holotype P [P00329735]; isotypes FI [FI012153], GH [GH00027802], L [L0042502], P [P00329736]). **Fig. 24.**

Scirpus laxiflorus Thwaites, Enum. Pl. Zeyl., fasc. 5 (1864) 435. **Synonyms:** *Eleocharis variegata* (Poir.) C.Presl var. *laxiflora* (Thwaites) C.B.Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 626; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 76; Ridley, Fl. Malay Penins. 5 (1925) 151. – *Eleocharis laxiflora* (Thwaites) H.Pfeiff., Mitt. Inst. Allg. Bot. Hamburg 7 (1928) 169. **Type:** *Thwaites CP3762*, Sri Lanka (lectotype K [K000592588], designated here; isolectotype P [P00067704, P00067705]).

Perennial. **Stolons** elongated, 1.5–2.5 mm thick. **Culms** tufted, 40–80 cm long, 2–3 mm diam., terete to weakly angular. **Sheaths** up to 10 cm long, apex mucronulate, pale brown to reddish-brown. **Spikelets** cylindrical to ovoid, 10–25 × 3–4 mm. **Glumes** several to many per spikelet, ovate to ovate-oblong, 4–5 × 2–2.2 mm, apex obtuse, sides herbaceous, pale green, finely striate, margins broadly membranous. **Perianth segments** 6–7, much exceeding nutlets, barbellate. **Stamens** 3; anthers 0.7–0.8 mm long. **Stigmas** 3. **Nutlets** broadly obovate, compressed-triangular, 1.5–2 × 1.3–1.6 mm, apex annulate, surface yellowish-brown, shiny, with longitudinal rows of transversely linear-oblong epidermal cells.

Distribution. Tropical and subtropical Asia to western Pacific islands. Native in Singapore and recorded from MacRitchie, Nee Soon (*Samsuri et al. NES387*, 15 Jun 2004, SING [SING0055079]), Pasir Laba Camp (*Gwee et al. SING2007-459*, 14 Aug 2007, SING [SING0093685]), Tampines (*Ali Ibrahim SING2013-266*, 27 Oct 2013, SING [SING0201460]) and Tampines Avenue 8 (*Duistermaat et al. HDS377*, 10 May 2005, SING [SING0080193]). Previously also recorded from Ayer Rajah Road-Ulu Pandan Road, Upper Peirce, Changi, Chasseriau Estate, Geylang, Telok Kurau, Seletar, Sentosa, Singapore Botanic Gardens, Stagmont, Tanglin (*Ridley 1721*, 26 Dec 1889, SING [SING0004914]), Twali and Tyersall.

Ecology. Marshy or flooded ground.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

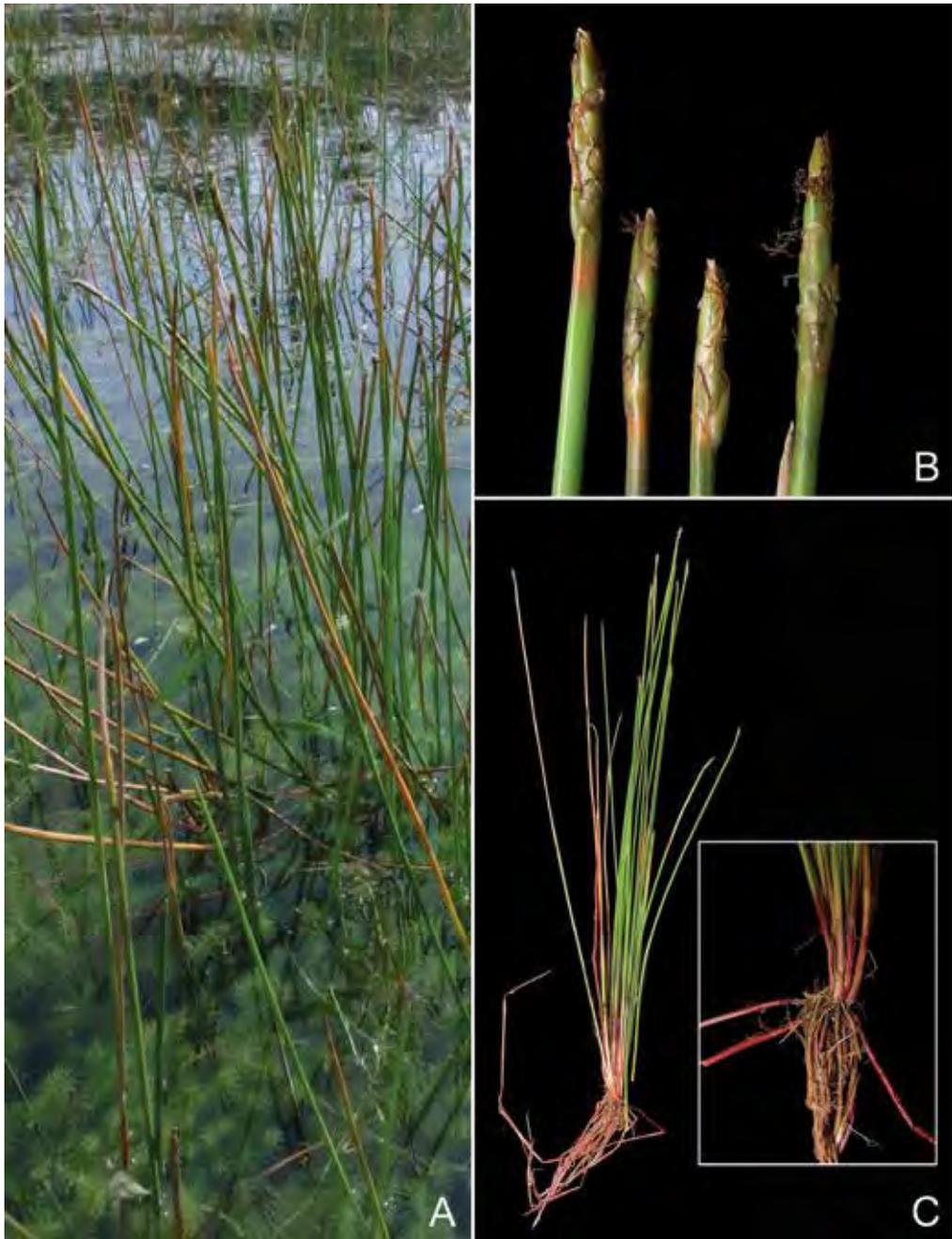


Figure 24. *Eleocharis ochrostachys* Steud. **A.** Habit. **B.** Spikelets. **C.** Whole plant and rhizomes. (From Singapore, MacRitchie, Leong-Škorničková & Leong SING2019-037. Photos: J. Leong-Škorničková).

4. *Eleocharis retroflexa* (Poir.) Urb.

(Latin, *retro*- = backwards, *-flexus* = bent; application uncertain)

Symb. Antill. 2(2) (1900) 165; Kern, Fl. Males., ser. 1, 7(3) (1974) 534; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [¹⁹⁹⁵]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 126; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 38, 125, 270; Dai & Strong, Fl. China 23 (2010) 193. **Basionym:** *Scirpus retroflexus* Poir. in Lamarck, Encycl. 6, fasc. 2 (1805) 753. **Type:** *Ledru s.n.*, Puerto Rico (lectotype P [P00231697], designated here).

Distribution. Tropics and subtropics worldwide.

Taxonomy. The species has 4 subspecies of which one occurs in Asia.

subsp. *chaetaria* (Roem. & Schult.) T.Koyama

(Greek, *chaeto*- = bristles; referring to the appearance of the perianth segments)

Bull. Natl. Sci. Mus., Tokyo, new ser., 17 (1974) 68; Simpson & Koyama, Fl. Thailand 6(4) (1998) 291. **Basionym:** *Eleocharis chaetaria* Roem. & Schult., Syst. Veg., ed. 15 bis, 2 (1817) 154; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 629; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 77; Ridley, Fl. Malay Penins. 5 (1925) 151; Henderson, Malay. Wild Fls., Monocot. (1954) 259. **Synonym:** *Cyperus setaceus* Retz., Observ. Bot. 5 (1788 [¹⁷⁸⁹]) 10. **Type:** *König s.n.*, India (lectotype LD [LD1299347], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 69).

Annual. **Culms** tufted, often recurved, 4–14 cm long, 0.2–0.3 mm wide, angular. **Sheaths** 0.3–0.5 cm long, apex acute, pale brown to reddish-brown below. **Spikelets** broadly ovate, 3–4.2 × 1.7–2.5 mm, weakly laterally flattened. **Glumes** 3–8 per spikelet, ± distichous, ovate to ovate-elliptic, 2.5–3 mm long, apex subacute, sides membranous, pale brown to reddish, margins broad-hyaline, the glumes keeled, keel ± acute. **Perianth segments** 6, flattened, equalling to slightly longer than nutlets, sparsely scabrid above. **Stamens** 2. **Stigmas** 3. **Nutlets** broadly obovoid, trigonous, 0.7–0.8 × 0.6–0.7 mm, apex rounded, style-base depressed-conical, decurrent with apex, surface trabeculate with 7–9 rows of deeply pitted epidermal cells, maturing pale yellow.

Distribution. Congo to Angola, Mauritius to north-eastern Australia. Native in Singapore and recorded from Pasir Panjang (*Ali Ibrahim SING2013-268*, 27 Oct 2013, SING [SING0201462]). Previously also recorded from Geylang (*Ridley s.n.*, 1900, SING [SING0004918]), Lim Chu Kang, Seletar (*Ridley s.n.*, 1890, SING [SING0004922]), Singapore Botanic Gardens (*Ridley STI*, 10 Dec 1888, SING [SING0004917]) and Tanglin (*Ridley s.n.*, 20 Jul 1889, SING [SING0004921]).

Ecology. Wet grassy places, margins of ponds and ditches, and elsewhere in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore it is only known from one recent collection so is assessed here as Critically Endangered (CR/D).

Vernacular names. *Hair sedge* (English), *rumpul lumut* (Malay).

5. *Eleocharis spiralis* (Rottb.) Roem. & Schult.

(Latin, *spiralis* = twisted, spiral; referring to the spirally-arranged glumes in the spikelet)

Syst. Veg., ed. 15 bis, 2 (1817) 155; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 627; Kern, Fl. Males., ser. 1, 7(3) (1974) 527; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 127; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 127; Simpson & Koyama, Fl. Thailand 6(4) (1998) 286; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 38, 125, 227; Dai & Strong, Fl. China 23 (2010) 191. **Basionym:** *Scirpus spiralis* Rottb., Descr. Icon. Rar. Pl. (1773) 45. **Synonym:** *Limnochloa spiralis* (Rottb.) Nees in Wight, Contr. Bot. India (1834) 114. **Type:** *König s.n.*, India, Malabar (lectotype C [C10010401], designated by Rosen et al., Blumea 53 (2008) 242; isolectotypes C [C10010398, C10010399, C10010400]).

Stoloniferous perennial. **Stolons** 3 mm thick. **Culms** tufted, 30–60 cm long, 2–4 mm wide, usually triquetrous, rarely subterete, smooth. **Sheaths** up to 17 cm long, light green to purplish, apex often with setaceous blade 1–4 mm long. **Spikelets** cylindrical, 15–30 × 4–6 mm. **Glumes** many per spikelet, densely imbricate, broadly obovate, 3.2–4 × 2–2.5 mm, apex very broadly obtuse to truncate, sides subcoriaceous, yellowish-brown. **Perianth segments** 5–6, slender, shorter than or equalling nutlets, rarely longer, pale brownish, sparsely patent-spinulose. **Stamens** 3; anthers 2–2.3 mm long. **Stigmas** 3. **Nutlets** obovate to oval, biconvex, 1.5–1.7 × 1.2–1.4 mm, apex rounded or indistinctly annulate, style-base conical, surface maturing dark brown, indistinctly cancellate.

Distribution. Madagascar and Mauritius to western Pacific islands. Native in Singapore but no recent records. Previously recorded from Lim Chu Kang (*Henderson s.n.*, 1924, SING [SING0004923]).

Ecology. Open wet places with brackish or saline water.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

7. *FIMBRISTYLIS* Vahl

(Latin, *fimbri-* = fringe, *-stylus* = style; referring to the fringe of hairs on the style in some species)

Enum. Pl. 2 (1805) 285, nom. cons.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 630; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 87; Ridley, Fl. Malay Penins. 5 (1925) 152; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1016; Kern, Fl. Males., ser. 1, 7(3) (1974) 540; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 166; Simpson & Koyama, Fl. Thailand 6(4) (1998) 292; Zhang et al., Fl. China 23 (2010) 200. **Type:** *Scirpus dichotomus* L. (= *Fimbristylis dichotoma* (L.) Vahl).

Abildgaardia Vahl, Enum. Pl. 2 (1805) 296; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 167. **Type:** *Cyperus monostachyos* L., lectotype designated by Svenson, N. Amer. Fl. (1957) 556 (= *Fimbristylis ovata* (Burm.f.) J.Kern).

Small to medium annuals or perennials. **Culms** usually tufted, angled, trigonous or flattened. **Leaves** basal, bladed or reduced to bladeless sheaths; blades linear to filiform, often canaliculate, often cellular-reticulate on upper surface; ligule sometimes present, pubescent or membranous. **Involucral bracts** leaf-like, setaceous or glume-like. **Inflorescence** simple to decompose, umbel-like or capitate or a single spikelet. **Spikelets** mostly ovoid or ellipsoid, terete, angular or ± laterally flattened. **Glumes** few to many per spikelet, spirally arranged or some or all distichous. **Flowers** bisexual. **Perianth segments** 0. **Stamens** 1–3. **Stigmas** 2–3; style base not persistent on nutlets. **Nutlets** trigonous or biconvex, surface variously patterned.

Distribution. A genus of 321 species, tropics to warm temperate regions. In Singapore 19 native species.

Ecology. Mostly found in open in open, moist to wet places. A few species are found on forest floors or on seashores. A number of species are important weeds of cultivation.

Taxonomy. *Fimbristylis* is morphologically close to *Bulbostylis*, which is confirmed phylogenetically (e.g. Muasya et al., Bot. Rev. (Lancaster) 75 (2009) 52–66; Semmouri et al., Bot. Rev. (Lancaster) 85 (2019) 1–39). Some authors treat *Abildgaardia* as separate genus (Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 167). This has some phylogenetic support (Roalson et al., Phytotaxa 395(3) (2019) 199–208) but the limits between the genera are still uncertain and *Abildgaardia* is not recognised here.

Key to *Fimbristylis* species

Note: For accurate identification it is important to have material with nutlets wherever possible.

1. Nutlets linear-oblong to oblong **17. F. tetragona**
 Nutlets not as above 2
2. Stigmas 3 3
 Stigmas 2 12
3. Glumes spirally arranged 4
 Glumes distichous at least in lower part of spikelet (some spikelets spirally twisted or glumes spirally arranged in the upper part of the spikelet) 10
4. Inflorescence a single spikelet **14. F. pauciflora**
 Inflorescences with 2 to many spikelets, capitate or umbel-like 5
5. Glumes densely gland-dotted, margins fimbriate-ciliate, apex often emarginate
 **9. F. leptoclada**

- Glumes not gland-dotted, margins not fimbriate-ciliate, apex not emarginate 6
6. Ligule a fringe of short hairs **2. F. complanata**
Ligule absent 7
7. Cauline leaves with short blade or reduced to bladeless sheaths 8
Cauline leaves with long blade or all leaves basal 9
8. Culms trigonous to subterete; largest spikelets more than 3 mm wide **19. F. umbellaris**
Culms 4–5-angled; largest spikelets less than 1.2 mm wide **10. F. littoralis**
9. Culms 4-angled; longest involucrel bract exceeding inflorescence **5. F. dura**
Culms trigonous; longest involucrel bract shorter than inflorescence **3. F. cymosa**
10. Inflorescence with 1(–3) spikelets **13. F. ovata**
At least some inflorescences with more than 3 spikelets 11
11. Glumes glabrous; glumes broadly ovate, up to 1.5 mm long **12. F. obtusata**
Glumes hairy sometimes minutely so; glumes lanceolate, 4 mm or more long
..... **7. F. fusca**
12. All leaves reduced to bladeless sheaths 13
At least some leaves with blade 15
13. Spikelets 2 or more per inflorescence; nutlets not coarsely transversely wrinkled
..... **19. F. umbellaris**
Spikelet 1 per inflorescence; nutlets coarsely transversely wrinkled 14
14. Spikelets 4 mm or more wide, patent to ± horizontal; glumes 2.5 mm or more wide
..... **11. F. nutans**
Spikelets less than 4 mm wide, erect; glumes less than 2.5 mm wide **1. F. acuminata**
15. Ligule present, a fringe of short hairs or membranous 16
Ligule absent 19
16. Nutlets with longitudinal rows of epidermal cells **4. F. dichotoma**
Nutlets smooth, without longitudinal rows of epidermal cells 17
17. Culms usually crowded along a somewhat creeping rhizome; glumes somewhat hairy;
nerves on glume (other than 1-nerved keel) absent **6. F. ferruginea**
Culms not as above; glumes glabrous; nerves on glume present 18
18. Spikelets usually 3 or more, over 4 mm wide; glumes 4 mm or more long
..... **18. F. tristachya**
Spikelets usually 1–2, up to 4 mm wide; glumes less than 4 mm long **16. F. schoenoides**

19. Inflorescence a single spikelet 20
 Inflorescence with more than 1 spikelet 21
20. Spikelets up 1 mm wide, with up to 9 glumes; glumes whitish to pale greenish-brown ...
 **14. F. pauciflora**
 Spikelets 2.5 mm or more wide, with more than 9 glumes; glumes pale brown to pale
 reddish-brown **15. F. polytrichoides**
21. Annual; involucre bracts 4–6 **8. F. griffithii**
 Perennial; involucre bracts 2–4 22
22. Leaves cauline, mostly reduced to bladeless sheaths; spikelets broadly ovoid to ovoid-
 ellipsoid or globose, 3 mm or more wide **19. F. umbellaris**
 Leaves basal, rosette-forming, Spikelets ellipsoid-cylindric to ovoid-cylindric or
 lanceolate-cylindric, up 2.5 mm wide **3. F. cymosa**

1. *Fimbristylis acuminata* Vahl

(Latin, *acuminatus* = with a long, narrow, pointed tip; application uncertain)

Enum. Pl. 2 (1805) 285; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 631; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 89; Ridley, Fl. Malay Penins. 5 (1925) 153; Kern, Fl. Males., ser. 1, 7(3) (1974) 588; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 523; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 127, fig. 233; Simpson & Koyama, Fl. Thailand 6(4) (1998) 339; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 271; Zhang et al., Fl. China 23 (2010) 215. **Type:** *König s.n.*, India (holotype C [C10010413]). **Fig. 25.**

Fimbristylis setacea auct. non Benth.: Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 632; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 89; Ridley, Fl. Malay Penins. 5 (1925) 153.

Short-lived perennial. **Culms** densely tufted, 3–35 cm long, 0.2–0.6 mm wide, trigonous, smooth. **Leaves** reduced to basal sheaths; sheaths cylindric, 1.5–5 cm long, pale green to light brown; ligule 0. **Involucre bract** 1, glume-like. **Inflorescence** a single terminal spikelet. **Spikelet** ovoid to ovoid-conical, terete, (4–)6–13 × 2–3 mm. **Glumes** 5–15 per spikelet, 2.7–4 × 1.5–2 mm, apex subacute, sides thinly chartaceous to membranous, pale greenish, yellow brown or reddish-brown, margins pale-hyaline, keel obtuse. **Stamens** 2; anthers 0.8–1 mm long. **Stigmas** 2. **Nutlets** obovate to orbicular, biconvex, 1–1.3 by 1–1.3 mm, whitish to cream, coarsely transversely wrinkled, very finely striate.

Distribution. Tropical & subtropical Asia to northern Australia. Native in Singapore and recorded from Bishan (*Chen SING2017-848*, 16 Nov 2017, SING [SING0266855]), MacRitchie, Chinese Garden, Nee Soon (*Samsuri et al. NES386*, 15 Jun 2004, SING [SING0055059]), Pulau Ubin (*Ali Ibrahim et al. SING2012-205*, 18 Apr 2012, SING [SING0173929]), Tampines and Tampines Avenue 8 (*Duistermaat et al. HDS373*, 10 May 2005, SING [SING0080189]).

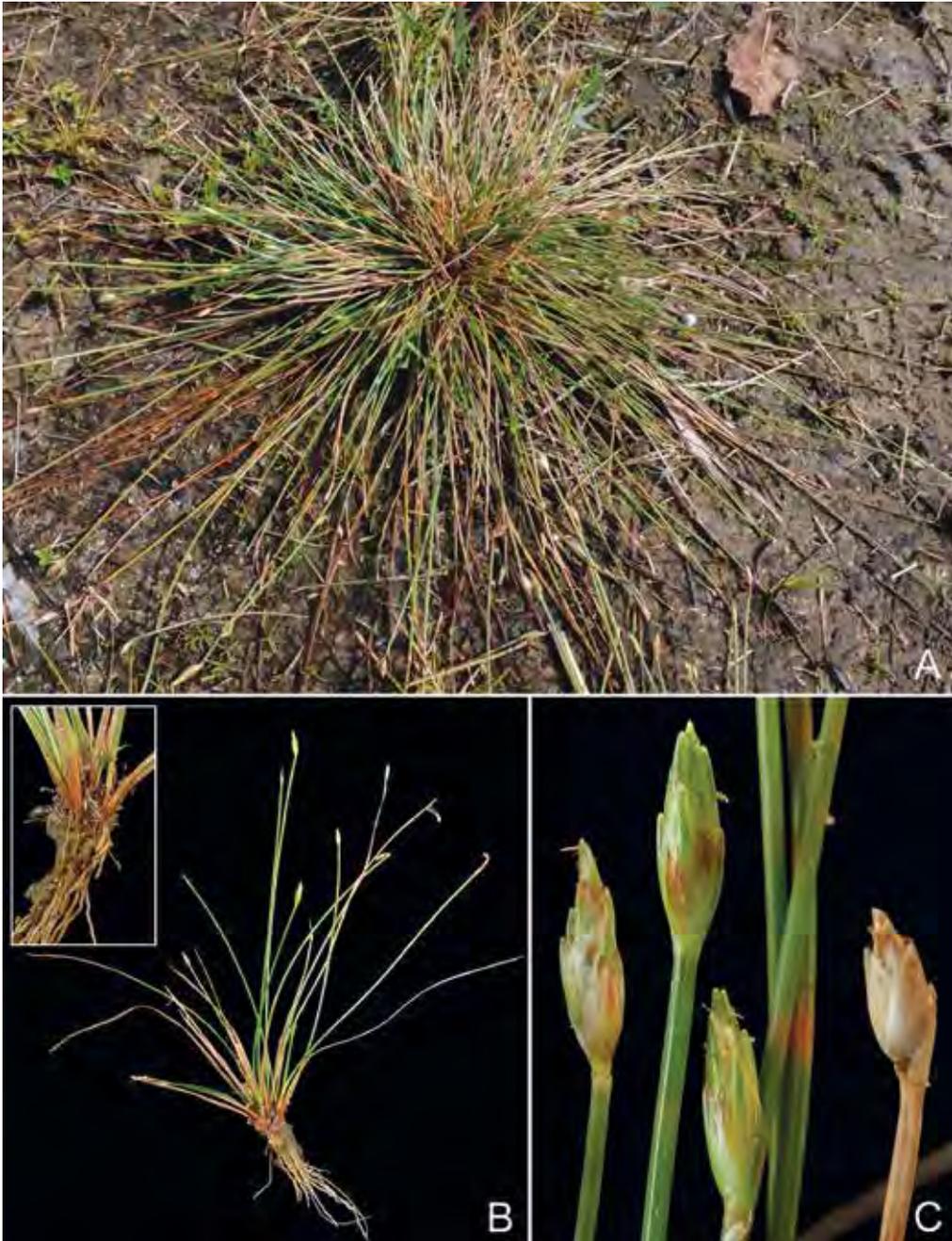


Figure 25. *Fimbristylis acuminata* Vahl. **A.** Habit. **B.** Whole plant. **C.** Spikelets. (From Singapore, MacRitchie, Leong-Škorničková & Leong SING2019-042. Photos: J. Leong-Škorničková).

Previously also recorded from Bukit Timah, Changi, Geylang, Mandai, Sentosa, Singapore Botanic Gardens, Sungei Buloh and Tanglin (*Ridley 107*, 1889, K [K000626709], SING [SING0055335]).

Ecology. Open, wet or muddy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

2. *Fimbristylis complanata* (Retz.) Link

(Latin, *complanatus* = flattened; application uncertain)

Hort. Berol. 1 (1827) 292; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 646; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 96; Ridley, Fl. Malay Penins. 5 (1925) 158; Kern, Fl. Males., ser. 1, 7(3) (1974) 548; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 128; Simpson & Koyama, Fl. Thailand 6(4) (1998) 295; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 227; Zhang et al., Fl. China 23 (2010) 200. **Basionym:** *Scirpus complanatus* Retz., Observ. Bot. 5 (1788 [‘1789’]) 14. **Synonyms:** *Trichelostylis complanata* (Retz.) Nees in Wight, Contr. Bot. India (1834) 103. – *Fimbristylis autumnalis* Roem. & Schult. var. *complanata* (Retz.) Kük., Bot. Jahrb. Syst. 56 (1924) 50. **Type:** *König s.n.*, ‘India orientalis’ (holotype LD [LD1281947]; isotype C [C10010430]).

Rhizomatous perennial. **Culms** crowded in series along rhizome to ± tufted, 30–70 cm long, 0.9–5 mm wide, flattened, smooth to scabrid, narrowly winged above. **Leaves** basal; blade linear, up to 26 cm long, 2–5 mm wide, apex obtuse to rounded, flat, margins incurved; sheath bilaterally compressed, 1–8 cm long, obliquely truncate, pale to rusty brown; ligule a fringe of short hairs. **Involucral bracts** 2–4, the longest suberect, 1–8 cm long. **Inflorescence** umbel-like, compound, 4–10 cm long; primary branches 4–7, 1–5 cm long. **Spikelets** ellipsoid to ovoid-lanceolate, terete, 4–9 × 1–2 mm. **Glumes** 5–20 per spikelet, spirally arranged, ovate to ovate-lanceolate, 1.8–2.5(–3) mm long, apex mucronate, sides chartaceous, yellowish-brown to brown, margins paler, keel acute, green. **Stamens** 2–3; anthers 1 mm long. **Stigmas** 3. **Nutlets** broadly obovoid, trigonous, 0.5–0.7 × 0.3–0.4 mm, whitish, finely cancellate with several rows of transversely oblong epidermal cells.

Distribution. Pantropical. Native in Singapore and recorded from Palau Ubin (*Teo SING2011-500*, Nov 2011, SING [SING0171396]) and Sungei Kadut (*Duistermaat & Hillier 52*, 12 Mar 2002, SING [SING0059778]). Previously also recorded from Balestier, Chan Chu Kang Forest Reserve (*Ridley 5805*, 1892, SING [SING0004924]), National University of Singapore (Bukit Timah Campus) (*Sinclair SFN40534*, 3 Mar 1955, SING [SING0004927, SING0004928]) and Singapore Botanic Gardens (*Ridley s.n.*, 2 Jan 1889, SING [SING0004925]).

Ecology. Wet grassland, rice fields, seashores and cultivated ground.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

3. *Fimbristylis cymosa* R.Br.

(Latin, *cymosus* = having flowers borne in a cyme; referring to the inflorescence structure)

Prodr. Fl. Nov. Holland. (1810) 228; Clarke in Schmidt, Bot. Tidsskr. 24 (1901) 89; Henderson, Malay. Wild Fls., Monocot. (1954) 263; Kern, Fl. Males., ser. 1, 7(3) (1974) 557; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 128; Simpson & Koyama, Fl. Thailand 6(4) (1998) 313; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 228; Zhang et al., Fl. China 23 (2010) 206. **Type:** *Brown s.n.* [Iter Austral. 5959], Australia, Carpentaria (lectotype BM [BM000630190], designated by St John, Pacific Sci. 6 (1952) 149–150). **Fig. 26.**

Fimbristylis spathacea Roth, Nov. Pl. Sp. (1821) 24; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 93; Ridley, Fl. Malay Penins. 5 (1925) 156; Henderson, Malay. Wild Fls., Monocot. (1954) 263. **Synonyms:** *Fimbristylis cymosa* R.Br. subsp. *spathacea* (Roth) T.Koyama, Micronesica 1 (1964) 83. – *Fimbristylis cymosa* R.Br. var. *spathacea* (Roth) T.Koyama, J. Jap. Bot. 46 (1971) 66. **Type:** *Heyne s.n.* [EIC 3309B], India (lectotype K-W [K001119035], designated here; isolectotype K [K000626710]).

Rhizomatous perennial; rhizome not or hardly elongated. **Culms** tufted, 5–60 cm long, 1–2 mm wide, trigonous, smooth. **Leaves** basal, rosette-forming; blade narrowly linear, 5–30 cm long, 1–4 mm wide, apex subobtuse, subcoriaceous, flattish to weakly inrolled; sheath up to 3 cm long, whitish or cinnamon brown; ligule 0. **Involucral bracts** 1–3, leaf-like, the longest shorter than inflorescence, 0.5–1.8 cm long. **Inflorescence** umbel-like, simple to compound, open to congested; primary branches, 2–6, 1–3 cm long. **Spikelets** few to numerous per inflorescence, ellipsoid-cylindric to ovoid-cylindric or lanceolate-cylindric, 2–6 × 1–2 mm. **Glumes** many per spikelet, closely imbricate, ovate to broadly ovate, 1–2.2 × 0.5–1.5 mm, apex obtuse, sides membranous, mid-brown, margins broadly white-hyaline, keel obtuse, obscurely 3–5-nerved, paler brown. **Stamens** 1–3; anthers 0.8–1 mm long, connective smooth. **Stigmas** 2(–3). **Nutlets** obovate, biconvex to rarely compressed-trigonous, 0.7–0.9 × 0.5–0.7 mm, maturing dark brown to black, smooth to indistinctly cancellate.

Distribution. Tropics and subtropics. Native in Singapore and recorded from Bishan, Pulau Tekong (*Samsuri et al. PT294*, 3 Jan 2002, SING [SING0039965]), Pulau Ubin (*Lai SING2014-184*, 4 Jun 2014, SING [SING0205587]), Sungei Buloh, Sungei Kadut (*Duistermaat et al. S49*, 12 Mar 2002, SING [SING00059409]), Tampines (*Ali Ibrahim SING2013-278*, 27 Oct 2013, SING [SING0201472]) and other localities. Previously also recorded from Changi, Bukit Mandai (*Ridley s.n.*, Nov 1890, SING [SING0004937]), Geylang, Pulau Satsumu, Serangoon, Tanjong Rhu, Telok Ayer, Thomson Road and other localities.

Ecology. Open sandy or rocky places near sea.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Seashore fimbristylis* (English).

Notes. *Fimbristylis cymosa* has spikelets up to 6 mm long and glumes up to 2.2 mm long. However, it is a highly variable species. Plants with two stigmas and biconvex nutlets have



Figure 26. *Fimbristylis cymosa* R.Br. **A.** Whole plant. **B.** Inflorescence. (From Singapore, Bishan, *Chen SING2017-761*. Photos: L.M.J. Chen).

often been recognised as *Fimbristylis spathacea*, *F. cymosa* subsp. *spathacea* or *F. cymosa* var. *spathacea*. However, there is overlap in these characters, sometimes in the same plant. Therefore only *Fimbristylis cymosa* is recognised here.

4. *Fimbristylis dichotoma* (L.) Vahl

(Latin, *dichotomus* = dichotomous, divided into two; referring to the inflorescence structure)

Enum. Pl. 2 (1805) 287; Henderson, Malay. Wild Fls., Monocot. (1954) 26; Kern, Fl. Males., ser. 1, 7(3) (1974) 575; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 128, fig. 234; Simpson & Koyama, Fl. Thailand 6(4) (1998) 321; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 271; Zhang et al., Fl. China 23 (2010) 210. **Basionym:** *Scirpus dichotomus* L., Sp. Pl. 1 (1753) 50. **Type:** Herb. Hermann 2: 63, no. 40, India (lectotype BM [BM000621720], designated by Koyama in Smith, Fl. Vit. Nova 1 (1979) 244). **Fig. 27, 28.**

Scirpus diphyllus Retz., Observ. Bot. 5 (1788 [‘1789’]) 15. **Synonym:** *Fimbristylis diphylla* (Retz.) Vahl, Enum. Pl. 2 (1805) 289; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 636; Ridley, J. Straits Branch

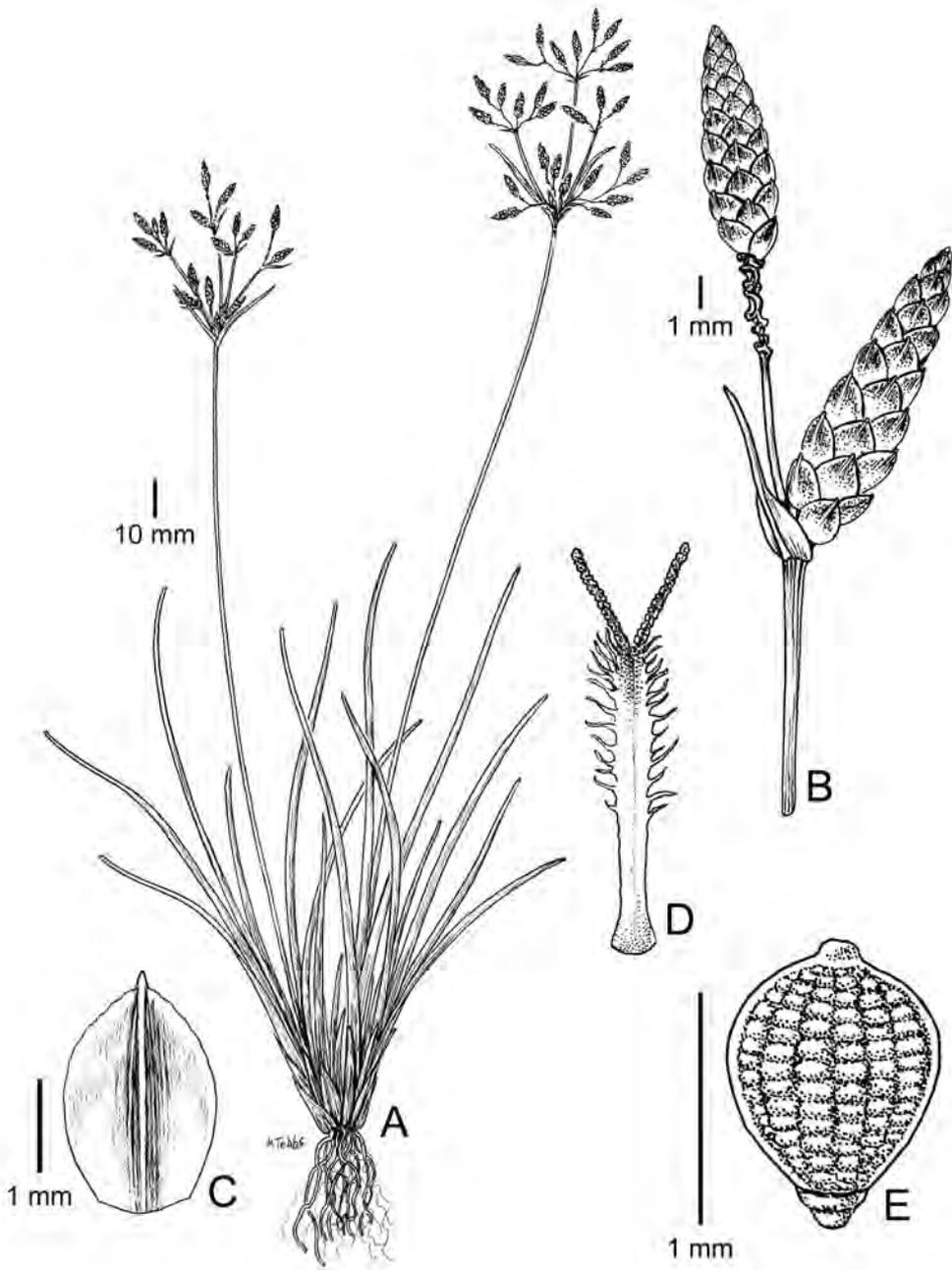


Figure 27. *Fimbristylis dichotoma* (L.) Vahl. **A.** Habit. **B.** Spikelets. **C.** Glume. **D.** Stigmas and style. **E.** Nutlet. (From Peninsular Malaysia, *Simpson 89/15*. Drawn by M. Tebbis).



Figure 28. *Fimbristylis dichotoma* (L.) Vahl. **A.** Habit. **B.** Inflorescence. **C.** Spikelets. **D.** Base of plant. **E.** Whole plant. (From Singapore, MacRitchie, Leong-Škorničková & Leong SING2019-041. Photos: J. Leong-Škorničková).

Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 91; Ridley, Fl. Malay Penins. 5 (1925) 155; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1017; Henderson, Malay. Wild Fls., Monocot. (1954) 264. **Type:** *König s.n.*, India (lectotype LD [LD1282067], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 69).

Annual to short-lived perennial. **Culms** loosely tufted, 10–70 cm long, 0.5–2.5 mm wide, trigonous, glabrous to sparsely pubescent smooth. **Leaves** basal; blade narrowly linear, (3–)10–30 cm long, 1.5–5 mm wide, apex obtuse, flattish, margins \pm incurved; sheath 2–12 cm long, pale green to mid-brown, apex truncate; ligule a fringe of dense hairs. **Involucral bracts** 2–7, the longest 1–2 leaf-like, 2–8 cm long. **Inflorescence** umbel-like, simple to decompound, open to congested, 2–17 \times 1–15 cm; primary branches 2–12, 1–8 cm long. **Spikelets** 2–many per inflorescence, solitary or in clusters of 2–3, ovoid to ovoid-ellipsoid, 3–10 \times 2.5–3.5 mm. **Glumes** many per spikelet, spirally arranged, broadly ovate to suborbicular, 1.5–3(–4) \times 1.5–2.2 mm, apex subacute, mucronate, sides thinly chartaceous, 2–4-nerved or nerves 0, mid-brown to dark reddish-brown, margins pale-hyaline, keel obtuse, greenish to pale brown. **Stamens** (1–)2–3; anthers 0.5–1.7 mm long. **Stigmas** 2. **Nutlets** obovate to broadly obovate, biconvex, 0.7–1.3 \times 0.8–1 mm, maturing cream or pale brown, deeply cancellate with 5–13 rows of transversely oblong epidermal cells, occasionally verrucose on shoulder.

Distribution. Tropical, subtropical and warm-temperate regions worldwide. In Singapore recorded from Chinese Garden (*Phan NTP15004*, 10 Jan 2015, SING [SING0207017]), Lentor Avenue, Nanyang, Pulau Tekong, Rifle Range Road (*Duistermaat S106*, 9 Aug 2002, SING [SING0059179]), Sembawang, Singapore Island Country Club, Tampines (*Ali Ibrahim SING2013-275*, 27 Oct 2013, SING [SING0201469]), the Western Catchment (*Samsuri et al. WC22*, 20 Apr 2004, SING [SING0054282]) and other localities. Previously also recorded from Bajau, Bukit Timah, Changi, Chasseriah Estate, Choa Chu Kang, Nee Soon, Seletar, Singapore Botanic Gardens (*Ridley 6*, 10 Dec 1888, SING [SING0054282]), Tanglin and other localities.

Ecology. Across its range found in grassland, cultivated ground, margins of rice fields, plantations and swamps.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Common fimbristylis* (English).

Notes. *Fimbristylis dichotoma* is probably the commonest member of the genus in Singapore and, indeed, worldwide. It is easily recognised by the ovate to suborbicular spikelets and the nutlets which have 5–13 rows. It is also one of the most variable species of Cyperaceae with well over 400 synonyms.

5. *Fimbristylis dura* (Zoll. & Moritz) Merr.

(Latin, *durus* = hard; application uncertain)

Philipp. J. Sci., C 11 (1916) 53; Kern, Fl. Males., ser. 1, 7(3) (1974) 554; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 128; Simpson & Koyama, Fl. Thailand 6(4) (1998) 297; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 205; Zhang et al., Fl. China 23 (2010) 206. **Basionym:** *Isolepis dura* Zoll. & Moritz in Moritz, Syst. Verz. (1846) 97. **Type:** *Zollinger 334*, [Indonesia], Java (lectotype L [L0042551], designated here; isolectotypes FI [FI010238, FI012178], K [K000290985]).

Fimbristylis asperrima Boeckeler, Linnaea 37 (1871) 40; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 643; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 96; Ridley, Fl. Malay Penins. 5 (1925) 158. **Type:** *Thwaites CP837*, Sri Lanka (lectotype P [P00045212], designated here; isolectotypes E [E00393394], P [P00045213, P00045214]).

Perennial. **Rhizome** stout, woody. **Culms** 1–several, 35–120 cm long, 1.5–3 mm wide, 4-angled, scabrous on angles. **Leaves** basal, distichous; blade linear, (15–)20–80 cm long, 3–6 mm wide, apex subacute, flattish, margins incurved; sheath 2–15 cm long, truncate, light brown to chestnut brown; ligule 0. **Involucral bracts** 3–5, the longest exceeding inflorescence, 7–27 cm long. **Inflorescence** umbel-like, compound, 6–20 × 6–18 cm; primary branches 8–15, 5–15 cm long. **Spikelets** solitary, narrowly linear-cylindric, somewhat angular, 6–11 × 1.3–1.5 mm. **Glumes** many per spikelet, spirally imbricate, ovate-deltoid, 1.8–2 × 1.4–1.5 mm, apex acute, mucronulate, sides membranous, shiny brown or reddish-brown, margins paler, hyaline, keel acute, 3-nerved, greenish-brown. **Stamens** 2–3; anthers 0.8–1 mm long. **Stigmas** 3. **Nutlets** oblong-obovoid to ± ellipsoid, trigonous, 0.7–1 × 0.5–0.6 mm, pale brown, finely transversely lineolate.

Distribution. India and Sri Lanka, China (Hainan), Myanmar, Thailand, Vietnam to Borneo. In Singapore likely to be native and only once recently recorded from Pulau Tekong (*Samsuri et al. PT136*, 15 Nov 2001, SING [SING0039812]). Previously also recorded from Bukit Mandai (*Ridley 5804*, 1892, SING [SING0004976]).

Ecology. Across its range in grassy places in open forest, more rarely in rice fields and along river banks.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Critically Endangered (CR/D).

Notes. Characteristically occurs in open forested areas. Small individuals resemble larger plants of *Fimbristylis complanata*. However, the former can be distinguished by the absence of a ligule and longer involucral bracts.

6. *Fimbristylis ferruginea* (L.) Vahl

(Latin, *ferrugineus* = rusty brown; referring to the coloration of the spikelets and glumes)

Enum. Pl. 2 (1805) 291; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 638; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 92; Ridley, Fl. Malay Penins. 5 (1925) 156; Henderson, Malay. Wild Fls., Monocot. (1954) 263; Kern, Fl. Males., ser. 1, 7(3) (1974) 572; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 129; Simpson & Koyama, Fl. Thailand 6(4) (1998) 317; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 228. **Basionym:** *Scirpus ferrugineus* L., Sp. Pl. 1 (1753) 50. **Type:** *Collector unknown s.n.* [Herb. van Royen], Jamaica (lectotype L [L0052731], designated by Adams, Taxon 53 (2004) 180).

Rhizomatous, often clump-forming perennial, the rhizome often somewhat creeping. **Culms** tufted, or crowded along creeping rhizome, 15–75 cm long, 0.5–1.5 mm wide, trigonous, smooth. **Leaves** arising on lower part of culm; blade narrowly linear, 1–15 cm long, 0.6–2.5 mm wide, apex obtuse, canaliculate to inrolled-margined; sheath cylindric, 2–12 cm long, pale glaucous to brown or orange brown, apex truncate; ligule a fringe of short hairs. **Involucral bracts** 1–3, leaf-like, the longest ± erect, shorter to longer than inflorescence, 1–3 cm long. **Inflorescence** umbel-like, simple, rarely compound, rather compact, 1.2–5 × 1–3.5 cm; primary branches 3–7, 0.7–4 cm long. **Spikelets** 3–15 per inflorescence, usually solitary, ovoid-conical or ellipsoid-conical, terete, 8–20 × 2.5–4 mm. **Glumes** many per spikelet, spirally imbricate, broadly ovate-elliptic or broadly ovate, 3.5–4.2 × 1.8–2.8 mm, apex obtuse, mucronate, sides thinly chartaceous, pale to dark rusty brown, sparsely to densely shortly pubescent, margins ciliate, keel obtuse, 1-nerved. **Stamens** 3; anthers 1.5–1.7 mm long. **Stigmas** 2. **Nutlets** broadly obovate, biconvex, 1–1.2 × 0.7–0.8 mm, maturing light orange brown or yellowish-brown, ± smooth, with indistinct isodiametric epidermal cells.

Distribution. Pantropical. In Singapore recorded from Lazarus Island, Pulau Tekong (*Samsuri et al.* PT178, 6 Dec 2001, SING [SING0039854]), Pulau Ubin (*Duistermaat HDS381*, 10 Jul 2005, SING [SING0080195]) and Sungei Serangoon. Previously also recorded from Chan Chu Kang Forest Reserve (*Goodenough s.n.*, 30 Oct 1889, SING [SING0004964]), Choa Chu Kang, Geylang, Jurong (*Whitmore* 22, 25 Jan 1957, SING [SING0004967]), Kranji, Marina South (*Ali Ibrahim AI94*, 25 Jun 1987, SING [SING0004968]), Pasir Ris, Pulau Sakeng, Singapore Botanic Gardens, Sungei Buloh, Tanjong Katong and other localities.

Ecology. Margins of brackish swamps and open, wet areas of clay or sandy soil near sea.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

7. *Fimbristylis fusca* (Nees) C.B. Clarke

(Latin, *fuscus* = dark or dusky brown; referring to the coloration of the spikelets and glumes)

in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 649; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 97; Ridley, Fl. Malay Penins. 5 (1925) 160; Kern, Fl. Males., ser. 1, 7(3) (1974) 567; Turner, Gard. Bull. Singapore 45

(1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 129; Simpson & Koyama, Fl. Thailand 6(4) (1998) 300; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 271; Zhang et al., Fl. China 23 (2010) 217. **Basionym:** *Abildgaardia fusca* Nees, Contr. Bot. India (1834) 95. **Type:** *Wallich s.n.* [EIC 3530], Nepal (holotype B, destroyed; isotypes BR [BR00000659633], G [G00439901, G00439902, G00439903], GH [GH00027097], K [K001089257, K001089258], K-W [K001119664], L [L0042562], P [P00045411, P00045412]).

Fimbristylis rigidifolia Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 223; Ridley, Fl. Malay Penins. 5 (1925) 159. **Type:** *Ridley 14877*, Thailand, Setul [Satun], March 1910 (lectotype SING [SING0064489], designated here; isolectotypes BM [BM000959080], K [K000290963]).

Rhizomatous perennial; rhizome covered with fibrous leaf sheath remnants. **Culms** few–several, (15–)30–55 cm long, 0.5–1 mm wide, angular, smooth to hispid-scrabrid above. **Leaves** basal; blade linear, often weakly falcate, 4–15 cm long, (1–)2–4 mm wide, apex obtuse to rounded shortly acuminate, flat; sheath c. 0.5 cm long, yellowish-brown; ligule 0. **Involucral bracts** 3–5, setaceous, longest up to 3 cm long. **Inflorescence** umbel-like, simple to compound, open, 2–15 × 1–12 cm; primary branches up to 10 cm long. **Spikelets** 3–many per inflorescence, lanceolate, subterete to ± flattened, 5–10 × 1.7–2.5 mm. **Glumes** 3–10 per spikelet, distichous, lanceolate, 4–6.5 × 2–2.5 mm, apex gradually acuminate, sides herbaceous to ± chartaceous, shortly hispid, chestnut brown, margins narrow, hyaline, keel subacute, 1-nerved, brown. **Stamens** 3; anthers 1.5–2 mm long. **Stigmas** 3. **Nutlets** obovoid, trigonous, 0.9–1 × 0.6–0.8 mm, light brownish, densely verrucose, obscurely reticulate.

Distribution. Tropical and subtropical Asia to northern Australia. Likely native in Singapore but no recent records. Previously recorded only from Holland Road (*Ridley 11377*, SING [SING0004977]).

Ecology. Open grasslands and grassy hillsides.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

8. *Fimbristylis griffithii* Boeckeler

(William Griffith, 1810–1845, English botanist known for his work in India and Malaya)

Flora 43 (1860) 241; Kern, Fl. Males., ser. 1, 7(3) (1974) 584; Turner, Gard. Bull. Singapore 45 (1993) 65; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 129; Simpson & Koyama, Fl. Thailand 6(4) (1998) 292; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 271. **Type:** *Griffith 6311*, Myanmar, Mergui (neotype K [K000794993], designated by Kern, Fl. Males., ser. 1, 7(3) (1974) 585).

Fimbristylis aestivalis auct. non (Retz.) Vahl: Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 637; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 92; Ridley, Fl. Malay Penins. 5 (1925) 155; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1017.

Annual. **Culms** densely tufted, (3–)10–30 cm long, 0.5–1.2 mm wide, 3–5-angled, smooth. **Leaves** basal; blade narrowly linear, occasionally subfalcate, 4–20 cm long, 1–2 mm wide, apex subacute, flattish or with inrolled margins, glabrous; sheath up to 3 cm long, pale green or light reddish-brown; ligule 0. **Involucral bracts** 4–6, leaf-like, the longest 1.2–2 cm long. **Inflorescence** umbel-like, simple to decompound, 4–8 × c. 4.8 cm, rather dense; primary branches 2–7, up to 3 cm long. **Spikelets** many per inflorescence, usually crowded, solitary, ovoid, ellipsoid or narrowly conical, 3–7 × 1–1.5 mm. **Glumes** many per spikelet, spirally arranged, ovate-deltoid, 1.2–1.5 × 0.9–1 mm, apex subacute, shortly mucronate, sides thinly membranous, pale reddish-brown, margins whitish-hyaline, keel subacute, greenish. **Stamens** 1–2; anthers 0.2–0.3 mm long. **Stigmas** 2. **Nutlets** obovate to obovate-orbicular, biconvex, 0.5–0.7 × 0.4–0.5 mm, shiny, yellowish-brown, smooth.

Distribution. Tropical Asia. Native in Singapore and recorded from Mandai (*Lai LI205*, 25 Feb 1997, SING [SING0008054]). Previously also recorded from Dalvey Road (*Hullett s.n.*, 16 Nov 1893, K [K000626711]), Singapore Botanic Gardens (*Burkill s.n.*, 1 Jun 1957, SING [SING0004983]), Tanglin (*Ridley 1739*, 1889, SING [SING0004981]) and Tyersall (*Ridley s.n.*, 1892, SING [SING0004980]).

Ecology. Swampy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore the only relatively recent collection is one from 1997 so it is assessed here as Critically Endangered (CR/D).

9. *Fimbristylis leptoclada* Benth.

(Greek, *lepto-* = slender, *-cladus* = shoots; referring to the slender culms)

Fl. Hongk. (1861) 393; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 647; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 96; Ridley, Fl. Malay Penins. 5 (1925) 159; Kern, Fl. Males., ser. 1, 7(3) (1974) 560; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130; Simpson & Koyama, Fl. Thailand 6(4) (1998) 315; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 42, 125, 228; Zhang et al., Fl. China 23 (2010) 207. **Type:** *Wright 579*, China, Hong Kong (holotype K [K000974121]).

Rhizomatous perennial. **Culms** tufted, 15–60 cm long, 0.2–1.5 mm wide, trigonous, smooth to scabrid. **Leaves** basal, few; blade filiform, 10–30 cm long, 0.3–0.5 mm wide, apex obtuse, margins ± incurved; sheath 1.5–4 cm long, pale-hyaline to mid-brown, apex oblique; ligule 0. **Involucral bracts** 1–3, glume-like or setaceous, the longest 5–20 mm long. **Inflorescence** umbel-like, simple or capitate, 5–20 × 5–8 mm; primary branches (when present) up to 2 cm long. **Spikelets** 3–12 per inflorescence, in clusters of 2–8, ellipsoid, 2.2–3.5 × 1.5–2 mm. **Glumes** 10–15 per spikelet, spirally imbricate, broadly ovate, 1–1.5 × 0.7–1.3 mm, apex rounded-truncate or shallowly emarginate, mucronulate, sides membranous, brown, densely

gland-dotted, margins pale-hyaline, fimbriate-ciliate above, keel obtuse, 3-nerved, pale brown. **Stamens** 1–2; anthers 0.5 mm long. **Stigmas** 3. **Nutlets** obovoid, trigonous, 0.7–0.9 × 0.5–0.7 mm, cream, verruculose.

Distribution. Southern China to tropical Asia. Native in Singapore but no recent records. Previously recorded from Balestier (*Ridley s.n.*, 1894, SING [SING0004985]), Bukit Timah (*Ridley 1551a*, 1890, SING [SING0004986]), Changi (*Ridley 1551b*, 1890, SING [SING0004988]), Holland Road, Tanglin (*Ridley s.n.*, 1892, SING [SING0004989]) and Telok Kurau (*Ridley 10448*, 1899, SING [SING0004990]).

Ecology. Dry sandy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

10. *Fimbristylis littoralis* Gaudich.

(Latin, *littoralis* = pertaining to the sea-shore; referring to one of the habitats in which the plant is found)

Voy. Uranie, fasc. 10 (1829) 413; Kern, Fl. Males., ser. 1, 7(3) (1974) 551; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 524; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Zhang et al., Fl. China 23 (2010) 208. **Type:** *Gaudichaud s.n.*, North Mariana Islands (holotype P [P00641865]). **Fig. 29.**

Scirpus miliaceus L., Syst. Nat., ed. 10, 2 (1759) 868, nom. rej. **Synonym:** *Fimbristylis miliacea* (L.) Vahl, Enum. Pl. 2 (1805) 287, nom. rej.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 644; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 95; Ridley, Fl. Malay Penins. 5 (1925) 158; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1018; Henderson, Malay. Wild Fls., Monocot. (1954) 263; Simpson & Koyama, Fl. Thailand 6(4) (1998) 311. **Type:** see notes below.

Annual or short-lived perennial. **Culms** arising from leaf axils, several, 10–60(–90) cm long, 1–3 mm wide, 4–5-sided, smooth. **Leaves** basal, or cauline and reduced to bladeless sheaths; blade linear, 10–50 cm long, 1–1.4 mm wide, apex subacute, bilaterally flattened; basal sheaths 1–18 cm long, open, cauline sheaths tubular, 2–10 cm long; ligule 0. **Involucral bracts** 2–4, setaceous, the longest 1–3 cm long. **Inflorescence** umbel-like, compound to decompound, open, 3–10 × 3–10 cm; primary branches 3–7, 1–7 cm long. **Spikelets** many per inflorescence, ovoid-globose to globose, 1.5–3(–5) × 1–2.1 mm. **Glumes** many per spikelet, spirally arranged, broadly ovate, 1–1.2 × 0.6–0.8 mm, apex obtuse, sides membranous, reddish-brown, margins broadly hyaline, keel obtuse, yellowish, obscurely 3-nerved. **Stamens** 1(–2); anthers c. 0.6 mm long. **Stigmas** 3. **Nutlets** obovoid, trigonous, 0.6–0.8 × 0.3–0.5 mm, creamy yellow, sparsely verruculose especially on angles, cancellate with 5–7 longitudinal rows of transversely linear-oblong cells.



Figure 29. *Fimbristylis littoralis* Gaudich. (From Singapore, Pasir Panjang, *Chen SING2017-745*. Photos: L.M.J. Chen).

Distribution. Pantropical. Native in Singapore and recorded from Chinese Garden (*Phan NTP15003*, 10 Jan 2015, SING [SING0207018]), Pasir Panjang, Sarimbun (*Gwee SING2007-597*, 23 Oct 2007, SING [SING0170107]), Sembawang (*Boo SING2011-162*, 18 Mar 2011, SING [SING0170107]), the Western Catchment (*Samsuri et al. WC33*, 20 Apr 2004, SING [SING0054293]) and other localities. Previously also recorded from Braddell Road, Changi, Choa Chu Kang, Seletar, Singapore Botanic Gardens, Sungei Murai, Tanglin (*Ridley s.n.*, 24 Jan 1889, SING [SING0055346]), Tuas Forest Reserve and other localities.

Ecology. Open wet places, elsewhere often in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Notes. *Fimbristylis miliacea* is a rejected name that has been applied to *F. littoralis* and the closely related *F. quinquangularis* (Vahl) Kunth, due to long-standing confusion over the type material of the basionym *Scirpus miliaceus* L. (Strong, *Taxon* 53(4) (2004) 1069–1070). *Fimbristylis quinquangularis* is distinguished from *F. littoralis* in having dorsiventrally

flattened leaves (versus bilaterally flattened in *F. littoralis*). There are three early twentieth century collections of *F. quinquangularis* from Singapore Botanic Gardens but it seems likely that these were introductions in cultivation and not wild or naturalised plants. There are no records from outside the Gardens or in Peninsular Malaysia.

11. *Fimbristylis nutans* (Retz.) Vahl

(Latin, *nutans* = drooping, nodding; referring to the patent to horizontal disposition of the spikelets at maturity)

Enum. Pl. 2 (1805) 285; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 632; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 89; Ridley, Fl. Malay Penins. 5 (1925) 158; Kern, Fl. Males., ser. 1, 7(3) (1974) 589; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130; Simpson & Koyama, Fl. Thailand 6(4) (1998) 338; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 192; Zhang et al., Fl. China 23 (2010) 215. **Basionym:** *Scirpus nutans* Retz., Observ. Bot. 4 (1786–1787) 12. **Type:** *König s.n.*, [Malaysia], Malacca (lectotype LD [LD1283267], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 69).

Rhizomatous perennial. **Culms** 20–75 cm long, 0.5–1.5 mm wide, subterete to trigonous above, smooth. **Leaves** reduced to basal sheaths; sheaths cylindrical, 1–12 cm long, light green to pale brownish, apex obliquely truncate; ligule 0. **Involucral bract** 1, glume-like. **Inflorescence** a single terminal spikelet, erect at first, soon becoming patent to ± horizontal. **Spikelet** ovoid to ovoid-ellipsoid, terete, 8–16 × 4–6 mm. **Glumes** many per spikelet, spirally imbricate, broadly ovate to oval, 4–5 × 2.5–3 mm, apex rounded, mucronate, sides membranous to thinly chartaceous, mid-brown, striate with dark brown below keel, margins broadly pale-hyaline, keel flattish to obtuse, indistinctly 4–5-nerved, yellowish-brown. **Stamens** 3; anthers 2 mm long. **Stigmas** 2. **Nutlets** broadly obovate, unequally biconvex, 1.2–1.5 × 0.8–1 mm, maturing cream or slightly brownish, coarsely transversely wrinkled.

Distribution. Tropical and subtropical Asia to northern and eastern Australia. Native in Singapore but no recent records. Previously recorded from Bedok (*Ridley s.n.*, 1903, SING [SING0004991]).

Ecology. Wet grasslands, forest floors, rice fields and occasionally brackish marshes.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Notes. The inflorescence of this species comprises a single spikelet which is erect at first but characteristically becomes angled to almost horizontal as it matures. In addition, the nutlet is transversely, coarsely wrinkled.

12. *Fimbristylis obtusata* (C.B. Clarke) Ridl.

(Latin, *obtusatus* = obtuse; application uncertain)

Fl. Malay Penins. 5 (1925) 157; Kern, Fl. Males., ser. 1, 7(3) (1974) 559; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130; Simpson & Koyama, Fl. Thailand 6(4) (1998) 299; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271. **Basionym:** *Fimbristylis tenera* Roem. & Schult. var. *obtusata* C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 642; Ridley, J. Straits Branch Roy. Asiatic Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 94. **Type:** *Ridley 8430*, Singapore, Bidadari, April 1897 (lectotype K [K000290958], designated here).

Annual. **Culms** tufted, filiform, 5–15 cm long, 0.3–0.5 mm wide. **Leaves** basal, rosette-forming; blade broadly linear, falcate, twisted, 3–7 cm long, 1.5–2.5 mm wide, apex obtuse, flattish, sheath up to 0.8 cm long, rusty brown to yellowish-brown; ligule 0. **Involucral bracts** 2–3, glume-like to shortly setaceous, 2–3 mm long. **Inflorescence** umbel-like, simple; primary branches 1–3, 5–10 mm long. **Spikelets** (1–)3–6 per inflorescence, lanceolate, angular, 5–8 × 1.2–1.5 mm. **Glumes** 4–14 per spikelet, distichous below, spirally arranged above, broadly ovate, 1.4–1.5 × 1.4–1.5 mm, apex acute, sometimes minutely apiculate, sides membranous, rusty brown, margins hyaline, keel obtuse, 3-nerved, green. **Stamen** 1; anther c. 0.5 mm long. **Stigmas** 3. **Nutlets** obovate-orbicular, trigonous, 0.6–0.8 × 0.5–0.6 mm, whitish or yellowish-brown, densely verruculose, obscurely reticulate.

Distribution. Bangladesh to Sulawesi. Native in Singapore and relatively recently recorded from Sungei Serangoon (*Tan 1202*, 17 Dec 2003, SINGU). Previously recorded from Bidadari (*Ridley 8430*, Apr 1897, SING [SING0004995]), Bukit Timah (*Ridley s.n.*, 1894, SING [SING0004997]), Jurong (*Ridley 1740b*, 1890, SING [SING0004996]), Seletar (*Ridley s.n.*, May 1894, SING [SING0004993]), Singapore Botanic Gardens (*Ridley 1740*, Apr 1889, SING [SING0004992]) and Tanglin.

Ecology. Grassy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore it has only been collected once in the last 100 years, in 2003, and is assessed here as Critically Endangered (CR/D).

13. *Fimbristylis ovata* (Burm.f.) J. Kern

(Latin, *ovatus* = egg-shaped; referring to the shape of the spikelets)

Blumea 15(1) (1967) 126; Kern, Fl. Males., ser. 1, 7(3) (1974) 565; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130, fig. 235; Simpson & Koyama, Fl. Thailand 6(4) (1998) 308; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Zhang et al., Fl. China 23 (2010) 217. **Basionym:** *Carex ovata* Burm.f., Fl. Ind. (1768) 194. **Type:** *Burman s.n.*, [Indonesia], Java (lectotype G, designated by Kern, Blumea 15(1) (1967) 126. **Fig. 30.**



Figure 30. *Fimbristylis ovata* (Burm.f.) J.Kern. (From Singapore, Nee Soon, *Chen SING2017-794*. Photos: L.M.J. Chen).

Cyperus monostachyos L., Mant. Pl. Altera (1771) 180. **Synonyms:** *Abildgaardia monostachya* (L.) Vahl, Enum. Pl. 2 (1805) 296. – *Fimbristylis monostachyos* (L.) Hassk., Pl. Jav. Rar. (1848) 61; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 649; Ridley, Fl. Malay Penins. 5 (1925) 159. **Type:** König *s.n.*, India (lectotype LINN [Herb. Linn. no. 70.3], designated by Gordon-Gray, J. S. African Bot. 32 (1966) 144).

Rhizomatous perennial. **Culms** 1–few, 60–40 cm long, 0.3–0.8 mm wide, trigonous, smooth below, spinulose-scabrous above. **Leaves** basal; blade narrowly linear, up to 30 cm long, 0.5–1.2 mm wide, apex acute, flattish with weakly incurved margins or weakly inrolled; sheath 1–6 cm long, dorsally pale green to pale brown, ventrally whitish-hyaline; ligule 0. **Involucral bracts** 2–3, glume-like or with setaceous blade 0.5–1 cm long. **Inflorescence** of 1(–3) spikelets, upper one with a 1–2 cm long peduncle. **Spikelets** ovate, ovate-lanceolate, somewhat flattened, 8–15 × 3–7 mm. **Glumes** 8–20 per spikelet, distichous below, ± spirally arranged above, ovate to broadly ovate, 3–6 × 2–4 mm, apex acute, mucronate, sides chartaceous, whitish to pale yellowish, weakly shiny, keel acute, slightly incurved, 3-nerved, greenish. **Stamens** 3; anthers 2 mm long. **Stigmas** 3. **Nutlets** broadly obovoid, trigonous, 2–2.5 × 1.3–1.5 mm, white or cream, ± densely verruculose.

Distribution. Pantropical, with range extending north in Asia to central Japan. Native in Singapore and recorded from Nee Soon, Sembawang (*Boo SING2011-157*, 18 Mar 2011, SING [SING0170104]), Sungei Pandan (*Lai LJ132*, 1996, SING [SING0008003]) and Tampines

Avenue 8 (*Duistermaat et al. HDS369*, 10 May 2005, SING [SING080185]). Previously also recorded from Balestier (*Corner 37285*, 10 Oct 1941, SING [SING0004999]), Groval Hospital (*Sinclair SFN39150*, 16 Mar 1951, SING [SING0004998]) and National University of Singapore (Bukit Timah Campus).

Ecology. Across its range in dry or wet open grasslands, open forests, coastal rock outcrops.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

14. *Fimbristylis pauciflora* R.Br.

(Latin, *pauci-* = few, *-flora* = flower; referring to the low number of glumes per spikelet)

Prodr. Fl. Nov. Holland. (1810) 225; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 633; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 90; Ridley, Fl. Malay Penins. 5 (1925) 154; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1018; Henderson, Malay. Wild Fls., Monocot. (1954) 261; Kern, Fl. Males., ser. 1, 7(3) (1974) 564; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130, fig. 236; Simpson & Koyama, Fl. Thailand 6(4) (1998) 316; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 205; Zhang et al., Fl. China 23 (2010) 215. **Type:** *Brown s.n.* [Iter Austral. 5937], Australia, Northern Territory, Carpentaria (lectotype BM [BM000990917], designated here by K.L. Wilson).

Trichelostylis filiformis Nees in Wight, Contr. Bot. India (1834) 102. **Synonym:** *Fimbristylis filiformis* (Nees) Kunth, Enum. Pl. 2 (1837) 221. **Type:** *Wallich s.n.* [EIC 3488B], Singapore, 1822 (lectotype K-W [K001119535], designated here).

Perennial. **Culms** densely tufted, (5–)10–30 cm long, 0.3–0.5 mm wide, wiry, smooth. **Leaves** mostly reduced to bladeless sheaths, or upper 1–2 with a filiform blade up to 6 cm long; sheaths up to 5 cm long, rusty or cinnamon brown, apex truncate; ligule 0. **Involucral bracts** glume-like, ± as long as spikelet. **Inflorescence** a single, terminal spikelet. **Spikelet** linear-cylindric to narrowly obconical, terete, 3–6 × 1 mm. **Glumes** 4–9 per spikelet, spirally arranged, lanceolate, 2.5–3 × 1.5 mm, apex acute, sides somewhat cartilaginous whitish to pale green-brown, keel obtuse, faintly 3–5-nerved, greenish. **Stamens** 1–2(–3); anthers 1.3–2 mm long. **Stigmas** (2–)3. **Nutlets** obovate to obovoid, biconvex to trigonous, 0.8–0.9 × 0.5–0.6 mm, yellowish-brown, verruculose with irregular epidermal cells.

Distribution. Myanmar, Thailand and Vietnam to northern Australia, Hainan to the Caroline Islands. Native in Singapore and relatively recently recorded from Bukit Timah (*Duistermaat S104*, 9 Aug 2002, SING [SING0059180]), Pulau Serangoon, Sungei Serangoon and Tampines Avenue 8 (*Duistermaat et al. HDS371*, 10 May 2005, SING [SING0080187]). Previously also recorded from Chan Chu Kang Forest Reserve (*Ridley s.n.*, 1889, SING [SING0005012]), Changi (*Ridley 122*, Feb 1889, SING [SING0005011]), Pulau Ubin, Singapore Botanic Gardens (*Deshmukh s.n.*, 10 Jan 1921, SING [SING0240003]) and Sungei Buloh.

Ecology. Wet grasslands, savannahs, forest floors and swamp margins.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

15. *Fimbristylis polytrichoides* (Retz.) R.Br.

(Latin, *polytrich-* = pertaining to *Polytrichum* Hedw., *-oides* = like, resembling; alluding to a resemblance of the inflorescence to the reproductive parts of the moss genus *Polytrichum* Hedw.)

Prodr. Fl. Nov. Holland. (1810) 226; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 632; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 90; Ridley, Fl. Malay Penins. 5 (1925) 154; Kern, Fl. Males., ser. 1, 7(3) (1974) 586; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 130; Simpson & Koyama, Fl. Thailand 6(4) (1998) 336; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 221; Zhang et al., Fl. China 23 (2010) 213. **Basionym:** *Scirpus polytrichoides* Retz., Observ. Bot. 4 (1786–1787) 11. **Type:** *König s.n.*, Sri Lanka (lectotype LD [LD1283447], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 69).

Short-lived perennial. **Culms** 5–30 cm long, 0.3–0.5 mm wide, subterete to trigonous, smooth, glabrous. Leaves basal; blade filiform, up to 4 cm long, 0.2–0.5 mm wide, apex obtuse, shallowly canaliculate, often reduced to bladeless sheath; sheath 1–4 cm long, yellowish-brown, apex obliquely truncate; ligule 0. **Involucral bract** 1, glume-like or setaceous, 0.3–2.5 cm long. **Inflorescence** a single, terminal spikelet. **Spikelets** ellipsoid to oblong-ovoid 5–9 × 2.5–3.5 mm, obtuse. **Glumes** many per spikelet, spirally imbricate, elliptic to oblong-elliptic, 2.5–3.2 × 1–1.3 mm, apex obtuse, sides thinly membranous, pale brown on upper part, margins hyaline, keel obtuse, 1-nerved. **Stamens** 1–2; anther(s) 0.7–1 mm long. **Stigmas** 2. **Nutlet** obovate, biconvex, 0.8–1 × 0.5 mm, maturing brown to greyish-purple, minutely cancellate with 15–20 longitudinal rows of transversely linear epidermal cells, often verruculose above.

Distribution. East Tropical Africa, Madagascar, tropical and subtropical Asia to northern and eastern Australia. Presumably native in Singapore and recorded from Sungei Serangoon (*Tan 1202*, 17 Dec 2003, SINU). Previously also recorded from Pasir Ris (*Maxwell 81-242*, 9 Dec 1981, SING [SING0005000]) and Pulau Ubin (*Latifah 11*, 17 Jun 1990, SINU).

Ecology. Across its range in open, moist, saline places, usually on sandy ground near the sea, occasionally in swampy areas bordering brackish lagoons or mangroves.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

16. *Fimbristylis schoenoides* (Retz.) Vahl

(Latin, *schoen-* = pertaining to *Schoenus* L., *-oides* = like, resembling;
alluding to the superficial resemblance of the plant to *Schoenus*)

Enum. Pl. 2 (1805) 286; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 634; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 90; Ridley, Fl. Malay Penins. 5 (1925) 154; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1018; Henderson, Malay. Wild Fls., Monocot. (1954) 263; Kern, Fl. Males., ser. 1, 7(3) (1974) 573; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 131, fig. 237; Simpson & Koyama, Fl. Thailand 6(4) (1998) 320; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Zhang et al., Fl. China 23 (2010) 213. **Basionym:** *Scirpus schoenoides* Retz., Observ. Bot. 5 (1788 [‘1789’]) 14. **Type:** *König s.n.*, India (lectotype LD [LD1283567]), designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 69. **Fig. 31.**

Rhizomatous perennial. **Culms** tufted, 5–50 cm long, 0.3–0.8 mm diam., compressed-terete, smooth. **Leaves** basal; blade narrowly linear to ± filiform, 2–16 cm long, 0.5–1 mm wide, apex acute, flattish or with inrolled margins; sheath 2–6 cm long, cinnamon brown, apex obliquely truncate, ciliolate; ligule a fringe of dense short hairs. **Involucral bracts** 1–2, glume-like, rarely with short setaceous blade. **Inflorescence** usually a solitary spikelet, sometimes umbel-like, simple; primary branches (when present) 1–2, 1–3 cm long. **Spikelets** 1–2(–3) per inflorescence, ovoid to ellipsoid, 5–10 × 3–4 mm. **Glumes** many per spikelet, ovate-orbicular, 2–3.2 × 2–3 mm, apex broadly obtuse to rounded, shortly mucronate, sides thinly chartaceous, 5–7-nerved, pale to orange brown, slightly shiny, keel rounded. **Stamens** 2; anthers c. 0.5 mm long. **Stigmas** 2. **Nutlets** obovate-orbicular, biconvex, 1.1–1.3 × 1–1.2 mm, ± rounded, maturing yellowish-white, smooth with minute, isodiametric epidermal cells.

Distribution. West Tropical Africa to Tanzania, tropical and subtropical Asia to northern Australia. Native in Singapore and recorded from Khatib Bongsu, Pulau Tekong (*Lai LJ403*, 1998, SING [SING0019880]), Sembawang (*Boo SING2011-168*, 18 Mar 2011, SING [SING0159062]), Sixth Avenue (*Duistermaat S311*, 15 Oct 2004, SING [SING0059407]) and Tampines (*Ali Ibrahim SING2013-277*, 27 Oct 2013, SING [SING0201471]). Previously also recorded from Sepoy Seui (*Hose s.n.*, 1900, SING [SING0005002]) and Sungei Kangkar.

Ecology. Wet open grasslands and on wet forest floors. Elsewhere also in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

17. *Fimbristylis tetragona* R.Br.

(Greek, *tetra-* = four, *-gona* = angled; referring to the shape of the culm in cross-section)

Prodr. Fl. Nov. Holland. (1810) 226; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 631; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 88; Ridley, Fl.

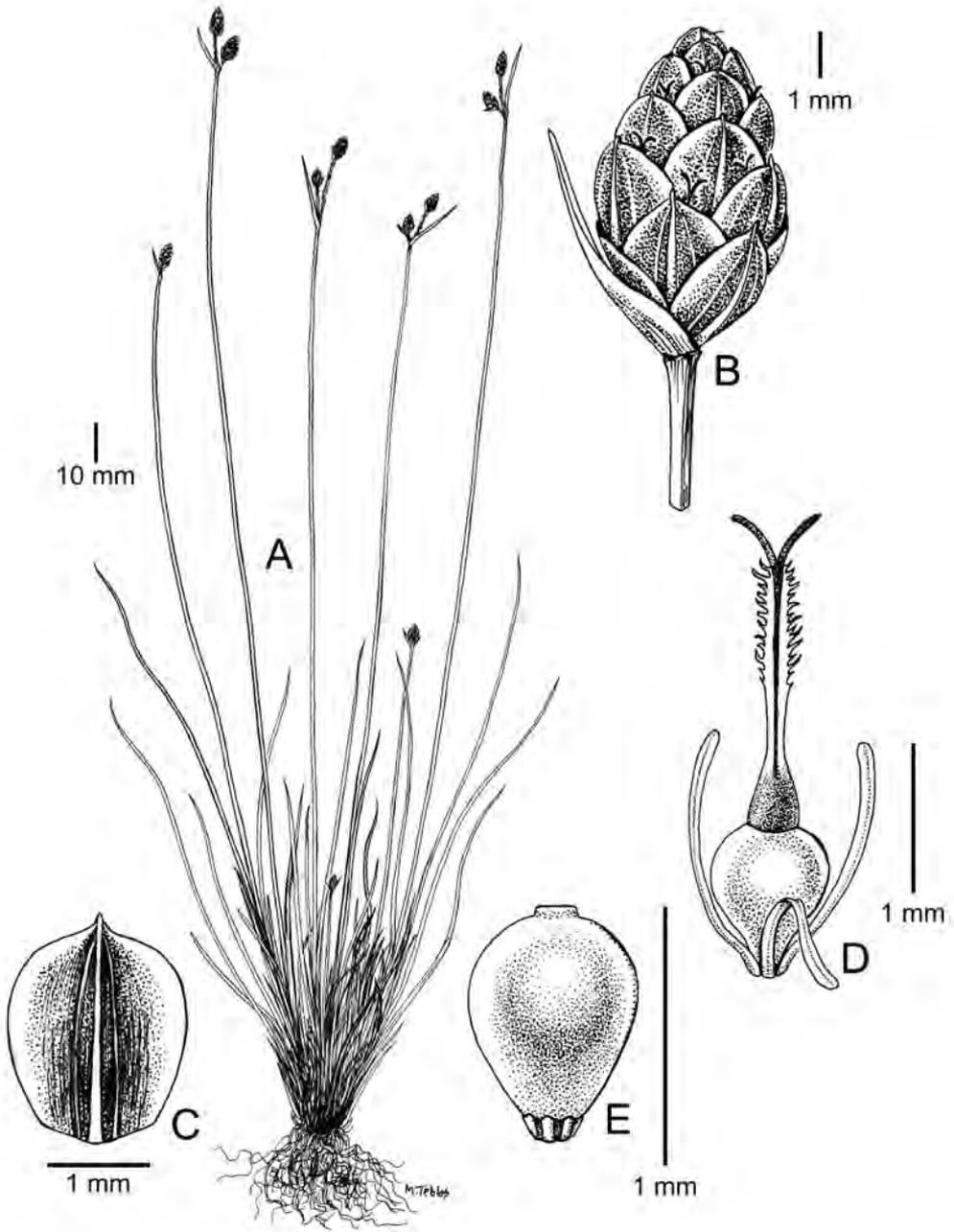


Figure 31. *Fimbristylis schoenoides* (Retz.) Vahl. **A.** Habit. **B.** Spikelet. **C.** Glume. **D.** Flower with maturing nutlet. **E.** Nutlet. (From Peninsular Malaysia, *Holtum* 38301. Drawn by M. Tebbs).

Malay Penins. 5 (1925) 153; Kern, Fl. Males., ser. 1, 7(3) (1974) 590; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 132, fig. 238; Simpson & Koyama, Fl. Thailand 6(4) (1998) 340; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Zhang et al., Fl. China 23 (2010) 215. **Type:** *Brown s.n.* [Iter Austral. 5944], Australia, Northern Territory, Carpentaria Island h [North Island], December 1802 (lectotype BM [000990941], designated here by K.L. Wilson).

Perennial. **Culms** densely tufted, 10–60 cm long, 0.8–1.3 mm wide, sharply 4-angled, smooth. **Leaves** reduced to bladeless sheaths; sheaths 1–15 cm long, pale greenish above yellowish-brown below, apex obliquely truncate, broadly hyaline; ligule 0. **Inflorescence** a single, terminal spikelet. **Involucral bract** glume-like, inconspicuous. **Spikelet** broadly ellipsoid to ovoid-ellipsoid, terete, 5–12 × 4–6 mm. **Glumes** many per spikelet, spirally imbricate, oblong-elliptic, incurved, 3–4.5 × 1.2–1.5 mm, apex rounded, sides membranous, finely many-veined, yellowish-brown and often tinged darker brown below keel, keel broad, 3-nerved. **Stamen** 1; anther 1–1.5 mm long. **Stigmas** 2–3. **Nutlets** linear-oblong to oblong, biconvex, 1.5–1.7 × 0.3–0.4 mm, cream, cancellate with 5–8 longitudinal rows of transversely oblong-hexagonal epidermal cells.

Distribution. Tropical and subtropical Asia to northern Australia. Native in Singapore and recorded from Chinese Garden (*Phan NTP15005*, 10 Jan 2015, SING [SING0207014]), Singapore Botanic Gardens (*Nura SING2009-432*, 29 Oct 2009, SING [SING0131752]), Sungei Tengah (*Chen & Lua SING2018-343*, 29 Mar 2018, SING [SING0266856]) and Tampines (*Vermeulen & Ang 2206*, 29 Dec 2001, SING [SING0043681]). Previously also recorded from Balestier (*Ridley s.n.*, 1894, SING [SING0005003]).

Ecology. In open swamps and moist, grassy places, elsewhere rarely in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

18. *Fimbristylis tristachya* R.Br.

(Greek, *tri-* = three, *-stachya* = spikes; 3-spiked, referring to the grouping of spikelets in the inflorescence)

Prodr. Fl. Nov. Holland. (1810) 226; Kern, Fl. Males., ser. 1, 7(3) (1974) 573; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 132; Simpson & Koyama, Fl. Thailand 6(4) (1998) 292; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Zhang et al., Fl. China 23 (2010) 213. **Type:** *Brown s.n.* [Iter Austral. 5941], Australia, Islands of the Gulf of Carpentaria, North Coast (lectotype BM [BM000990944], designated here by K.L. Wilson). **Fig. 32.**

Rhizomatous perennial. **Culms** tufted, 30–70(–100) cm long, 1–1.5 mm wide, angular, smooth to scabrid above. **Leaves** basal; blade narrowly linear, 7–27 cm long, 0.5–1.5 mm wide, apex obtuse to shortly acuminate, flattish to canaliculate; sheath up to 15 cm long, yellowish to brown, apex truncate; ligule a fringe of short hairs. **Involucral bracts** 1–2, leaf-like, the



Figure 32. *Fimbristylis tristachya* R.Br. **A.** Whole plant. **B.** Spikelets. **C.** Base of plant. (From Singapore, Tampines, Niissalo SING2019-190. Photos: J. Leong-Škorničková).

longest suberect, 0.5–3 cm long. **Inflorescence** a single spikelet or umbel-like and simple to compound, open; primary branches (when present) 0.8–4 cm long. **Spikelets** (1–)3–10 per inflorescence, solitary, ovoid to ovoid-cylindric, terete, (6–)10–25 × 4–6 mm. **Glumes** many per spikelet, spirally arranged, broadly ovate, 4–6 × 3–4.5 mm, obtuse, mucronulate, sides chartaceous, indistinctly 7–10-nerved, mid- to chestnut brown, margins scarious, keel obtuse. **Stamens** 3; anthers 1.8–2.5 mm long. **Stigmas** 2. **Nutlets** obovate, biconvex, (1–)1.2–1.5 × 0.8–1 mm, rounded, yellowish-brown, smooth, somewhat shiny, with minute, isodiametric epidermal cells.

Distribution. Tropical Asia to the Kuril Islands and western Pacific islands. Native in Singapore and recorded from St. John’s Island, Seletar Camp, Sungei Tengah (*Chen & Lua SING2018-340*, 29 Mar 2018, SING [SING0266857]), Tampines (*Ali Ibrahim SING2013-276*, 27 Oct 2013, SING [SING0201470]), Tampines Avenue 8 (*Duistermaat et al. HDS370*, 10 May 2005, SING [SING0201470]) and the Western Catchment (*Samsuri et al. WC52*, 21 Apr 2004, SING [SING0054312]). Previously also recorded from Balestier (*Corner s.n.*, 10 Oct 1941, SING [SING0005004, SING0005006]), Upper Peirce and Thomson Road.

Ecology. Open wet grassy fields, sometimes in open forest.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Notes. This species has glabrous glumes with nerves. Smaller individuals of this species resemble *Fimbristylis schoenoides*. However, *Fimbristylis tristachya* is always separable by its larger glumes.

19. *Fimbristylis umbellaris* (Lam.) Vahl

(Latin, *umbell-* = umbel, *-aris* = pertaining to, resembling;
referring to the structure of the inflorescence)

Enum. Pl. 2 (1805) 291; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 525; Simpson & Koyama, Fl. Thailand 6(4) (1998) 310; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Zhang et al., Fl. China 23 (2010) 210. **Basionym:** *Scirpus umbellaris* Lam., Tabl. Encycl. 1, fasc. 1 (1791) 141. **Type:** not traced.

Scirpus globulosus Retz., Observ. Bot. 6 (1791) 19. **Synonym:** *Fimbristylis globulosa* (Retz.) Kunth, Enum. Pl. 2 (1837) 231; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 644; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 95; Ridley, Fl. Malay Penins. 5 (1925) 158; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1017; Henderson, Malay. Wild Fls., Monocot. (1954) 263; Kern, Fl. Males., ser. 1, 7(3) (1974) 551; Turner, Gard. Bull. Singapore 45 (1993) 65; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 129. **Type:** *Collector unknown s.n.* [Herb. Retz.] India (lectotype LD [LD1282487], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 69).

Perennial. **Culms** tufted, 20–80(–120) cm long, 1–5 mm wide, trigonous to subterete, smooth. **Leaves** cauline reduced to bladeless sheaths, sometimes basal with blade present; blade (when

developed) linear, 7–25 cm long, 1.5–2 mm wide, apex acute, flattish to channelled; sheaths 2–20 cm long, apex acute, obliquely truncate; ligule 0. **Involucral bracts** 2–3, narrowly lanceolate, the longest 0.5–1 cm long. **Inflorescence** umbel-like, simple to compound, 2–10 × 1.5–8 cm; primary branches 2–8, 1–5 cm long. **Spikelets** 3–40 per inflorescence, broadly ovoid to broadly ellipsoid or globose, 3–8 × 3–4 mm, obtuse. **Glumes** many per spikelet, spirally arranged, ovate to ovate-elliptic, 1.8–2.5 × 1–1.5 mm, apex obtuse, sometimes mucronate, sides membranous, yellowish- to mid-brown, margins broadly white-hyaline, keel broadly obtuse, greenish. **Stamens** (2–)3; anthers 0.7 mm long. **Stigmas** (2–)3. **Nutlets** obovate or obovoid-orbicular, biconvex to trigonous, 0.7–1 × 0.5–0.7 mm, creamy yellow, cancellate, sparsely verruculose.

Distribution. Tropical and subtropical Asia to north-western Pacific islands. Native in Singapore and recorded from Mandai (*Lai LJ 222*, 1997, SING [SING0008053]) and Tampines Avenue 8 (*Duistermaat et al. HDS380*, 10 May 2005, SING [SING0080198]). Previously also recorded from Geylang (*Ridley s.n.*, 1899, SING [SING0004978]; *Ridley s.n.*, 31 Jan 1899, SING [SING0004979]), National University of Singapore (Bukit Timah Campus), Nee Soon, Singapore Botanic Gardens (*Ridley s.n.*, 1899, SING [SING0055365]) and other localities.

Ecology. Open swamps, wet grassy places, and elsewhere in rice fields.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

8. FUIRENA Rottb.

(Georg Fuiren, 1581–1628, Danish botanist and physician)

Umbrella grass (English)

Descr. Icon. Rar. Pl. (1773) 70; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 665; Ridley, Fl. Malay Penins. 5 (1925) 162; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1038; Kern, Fl. Males., ser. 1, 7(3) (1974) 516; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 164; Simpson & Koyama, Fl. Thailand 6(4) (1998) 268; Dai et al., Fl. China 23 (2010) 178. **Type:** *Fuirena umbellata* Rottb.

Annual or perennial often pubescent herbs. **Culms** (3–)4–5-angular, nodose. **Leaves** mostly cauline; blade pubescent or glabrous, 3–5-nerved; sheaths closed; ligule 0. **Involucral bracts** leaf-like, sheathing at base, equalling or longer than inflorescence. **Inflorescence** paniculate, with few to many partial inflorescences, comprising sessile to umbel-like clusters of spikelets at few to several nodes. **Spikelets** with many glumes. **Glumes** spirally imbricate, pubescent outside, usually shortly awned, 1–3-nerved, the lowest 1–3 empty. **Flowers** bisexual. **Perianth segments** 3–6 in 1–2 whorls each of 3 segments, outer whorl of simple bristles, sometimes absent, inner whorl of bristles, blades or claws. **Stamens** 2–3. **Stigmas** 3; style continuous with ovary. **Nutlets** trigonous to triquetrous, apex beaked, base cuneate to stipitate, smooth to trabeculate.

Distribution. A genus of 55 species throughout the tropics and subtropics, the largest number being in Africa. In Singapore 2 native species.

Ecology. Open wet or swampy places, sometimes in shallow, standing water.

Taxonomy. *Fuirena* is characterised by having at least some perianth segments that are blade or claw-shaped. Morphologically, it is close to *Actinoscirpus* and *Schoenoplectiella* in tribe Fuireneae (Goetghebeur in Kubitzki et al. (ed.), *Fam. Gen. Vasc. Pl.* 4 (1998) 167). These relationships have been confirmed through molecular phylogenetics (e.g. Muasya et al., *Bot. Rev. (Lancaster)* 75 (2009) 52–66; Semmouri et al., *Bot. Rev. (Lancaster)* 85 (2019) 1–39).

Key to *Fuirena* species

1. Annual without rhizome; leaf blade usually pubescent or at least ciliate along margins; perianth segments 6 **1. *F. ciliaris***
- Perennial with short rhizome; leaf blade usually glabrous or ciliate towards base only; perianth segments 3 **2. *F. umbellata***

1. *Fuirena ciliaris* (L.) Roxb.

(Latin, *ciliaris* = ciliate; referring to the ciliate hairs on the glume awn)

Fl. Ind. 1 (1820) 184; Kern, *Fl. Males.*, ser. 1, 7(3) (1974) 519; Turner, *Gard. Bull. Singapore* 47 (1997 [‘1995’]) 526; Simpson & Koyama, *Fl. Thailand* 6(4) (1998) 269; Dai et al., *Fl. China* 23 (2010) 179. **Basionym:** *Scirpus ciliaris* L., *Mant. Pl. Altera* (1771) 182. **Type:** *König s.n.*, ‘Habitat in India orientali’ (lectotype LINN [Herb. Linn. no. 71.51], designated by Clarke, *J. Linn. Soc., Bot.* 30 (1894) 314).

Annual. **Culms** tufted, 5–50 cm long, 1–2 mm wide, ciliate-pubescent above. **Cauline leaves** several; blade linear, 5–15 cm long, 3–8 mm wide, apex abruptly acute, margins pubescent or ciliate; sheath 1–3 cm long, pubescent. **Inflorescence** with 1–3 clusters of spikelets; peduncles short, ciliate-pubescent. **Spikelets** ovate or oblong-elliptic, 4–7 × 3 mm, apex subacute, squarrose, greyish-green. **Glumes** obovate to obovate-oblong or elliptic, 1.5–1.7 × 1.25 mm, apex acute or obtuse, thinly membranous, shortly pubescent outside with pilose centre, awn c. 1 mm long, ciliate. **Perianth segments** 6; outer whorl of bristles occasionally much reduced, smooth to scabrid; inner whorl of oblong or ± square blades, 3-toothed, base long-stipitate. **Stamens** 3; anthers 0.25 mm long. **Nutlets** obovoid to ellipsoid, 0.8–1 × 0.5–0.6 mm, smooth to obscurely wrinkled.

Distribution. Widely distributed in the Old World tropics and subtropics. Probably native to Singapore even though only recently recorded from Sungei Tengah (*Lua & Chen SING2018-299*, 26 Mar 2018, SING [SING0266858]; *Lua & Chen SING2018-342*, 29 Mar 2018, SING [SING0245350]).

Ecology. Across its range found in open, wet or swampy places including wet grasslands, river-banks, margins of ponds and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Critically Endangered (CR/D).

2. *Fuirena umbellata* Rottb.

(Latin, *umbellatus* = umbellate; referring to the structure of the partial inflorescences)

Descr. Icon. Rar. Pl. (1773) 70; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 666; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 80; Ridley, Fl. Malay Penins. 5 (1925) 162; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1038; Henderson, Malay. Wild Fls., Monocot. (1954) 257; Kern, Fl. Males., ser. 1, 7(3) (1974) 518; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 132, fig. 239; Simpson & Koyama, Fl. Thailand 6(4) (1998) 248; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 43, 125, 271; Dai et al., Fl. China 23 (2010) 179. **Type:** *Rolander s.n.*, Surinam (lectotype SBT 1.3.1.47, designated by Moraes, Phytotaxa 41 (2012) 65). **Fig. 33, 34.**

Fuirena glomerata Lam., Tabl. Encycl. 1, fasc. 1 (1791) 150; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 667; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 81; Ridley, Fl. Malay Penins. 5 (1925) 163. **Type:** *Commerson s.n.*, Madagascar (holotype P [P00563569]).

Rhizomatous perennial. **Culms** 3–100 cm long, 6–9 mm wide, pubescent below inflorescence. **Cauline leaves** 5–7; blade lanceolate to linear-lanceolate, 10–20 cm long, 5–25 mm wide, apex acute, ciliate at base; sheath 2–5 cm long, usually glabrous. **Inflorescence** with 3–12 partial inflorescences, each comprising a congested, umbel-like cluster of spikelets; peduncles whitish-villous. **Spikelets** ovoid or ovoid-ellipsoid, \pm squarrose, 4–10 \times 2.5–3 mm, apex acute, brownish-green or dark brownish-green. **Glumes** obovate to ovate-elliptic, 2–2.5 \times 1.2–1.5 mm, apex rounded, shortly pubescent, awn 0.8–1 mm long, often pilose. **Perianth segments** 3, in 1 whorl only, tightly enveloping nutlet, obovate or oblong, membranous, truncate, sessile, with a very short claw at base. **Stamens** 3; anthers 0.5–0.7 mm long. **Nutlets** obovoid to ellipsoid, 0.8–1.2 \times 0.6–0.7 mm, shiny, smooth to obscurely wrinkled.

Distribution. Pantropical. Native in Singapore and recorded from Gangsa Road (*Lai LJ369*, 1998, SING [SING0019878]), Kranji, Pulau Ubin (*Ali Ibrahim et al. SING2008-218*, May 2008, SING [SING0113782]), Raffles Marina, Sungei Serangoon, Tampines (*Vermeulen & Ang 2215*, 29 Dec 2001, SING [SING0043690]) and Woodlands. Previously also recorded from Bukit Mandai, Bukit Timah, Changi, Choa Chu Kang, Holland Road, MacPherson Road, Nee Soon (*Samsuri SA1406*, 16 Feb 1977, SING [SING0055352]), Singapore Botanic Gardens, Tanglin (*Ridley s.n.*, 25 Jan 1889, SING [SING0055356]) and other localities.

Ecology. Open wet or swampy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular names. *Hairy blue sedge* (English), *rumpit kelulut* (Malay).

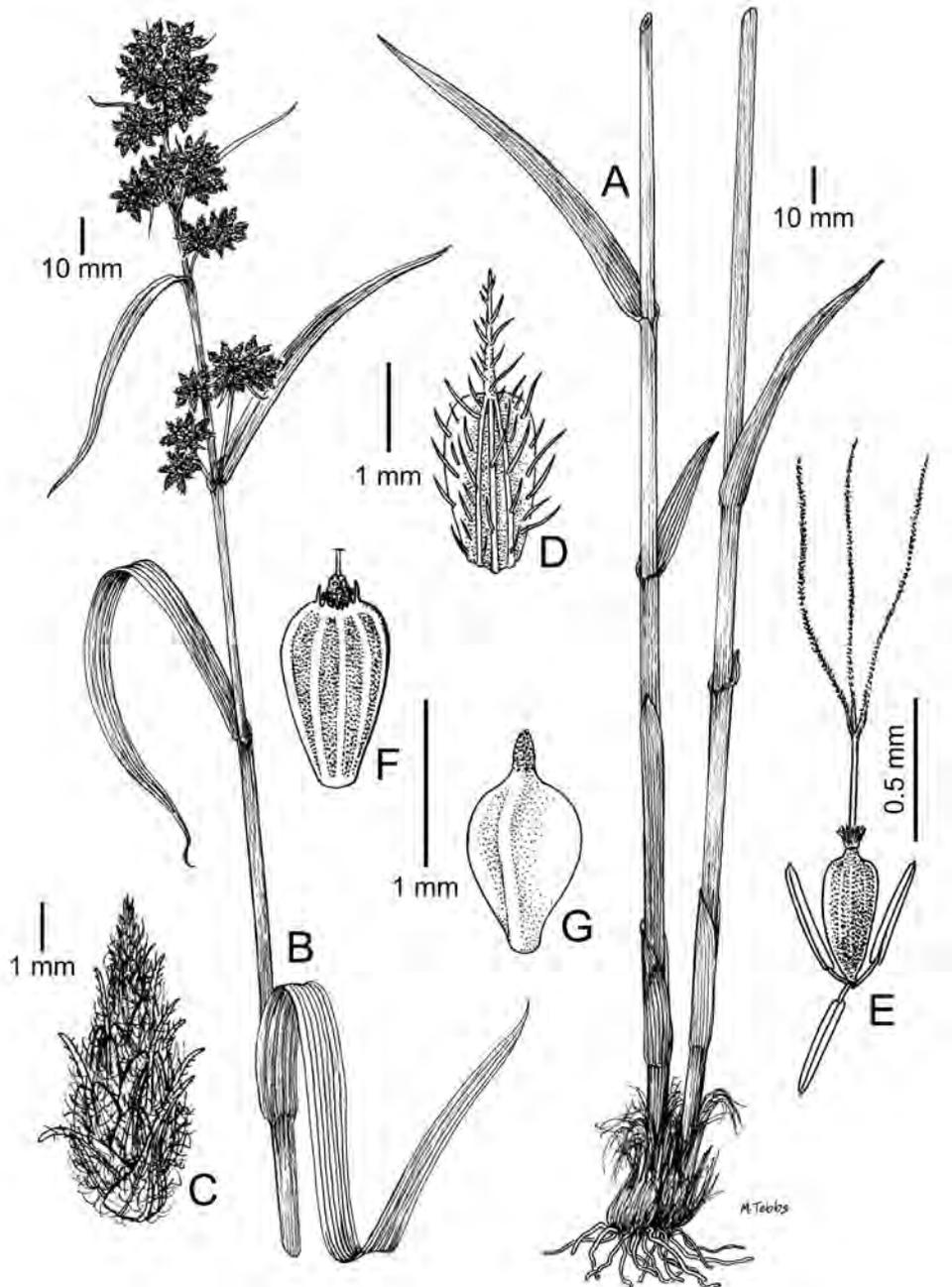


Figure 33. *Fuirena umbellata* Rottb. **A.** Base of plant. **B.** Inflorescence. **C.** Spikelet. **D.** Glume **E.** Flower. **F.** Perianth segment enclosing nutlet **G.** Nutlet. (A, E from Peninsular Malaysia, *Simpson* 89/48; B–D, F, G from Peninsular Malaysia, *Furtado SFN37336*. Drawn by M. Tebbs).

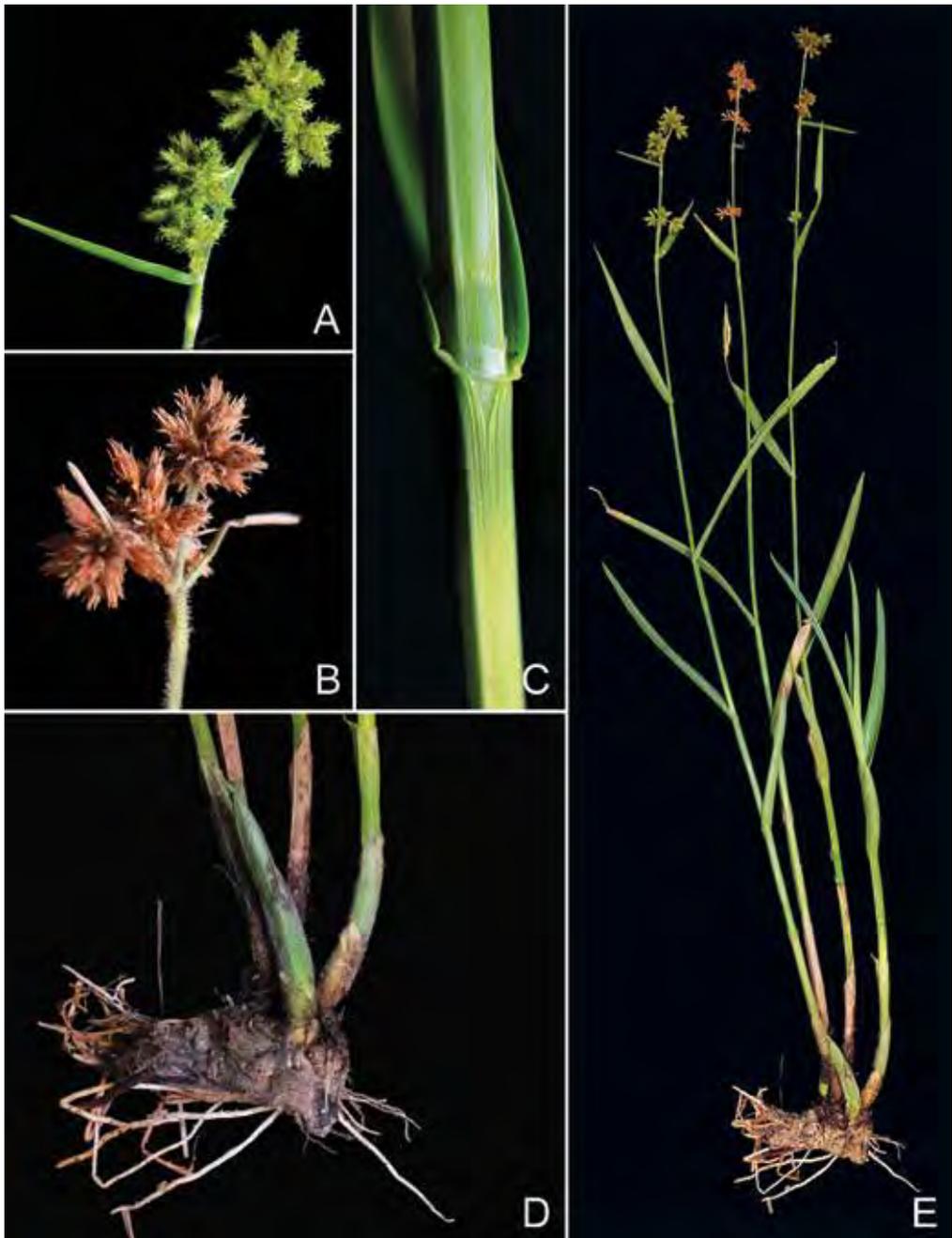


Figure 34. *Fuirena umbellata* Rottb. **A, B.** Partial inflorescences. **C.** Leaf sheath apex. **D.** Base of plant. **E.** Whole plant. (From Singapore, Tampines, *Niissalo SING2019-188*. Photos: J. Leong-Škorničková).

9. GAHNIA J.R.Forst. & G.Forst.

(Henric Gahn, 1747–1816, Swedish botanist)

Char. Gen. Pl., ed. 2 (1776) 26; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 676; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 98; Ridley, Fl. Malay Penins. 5 (1925) 168; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1041; Kern, Fl. Males., ser. 1, 7(3) (1974) 703; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 179; Simpson & Koyama, Fl. Thailand 6(4) (1998) 424; Liang et al., Fl. China 23 (2010) 257. **Type:** *Gahnia procera* J.R.Forst. & G.Forst.

Lamprocarya R.Br., Prodr. Fl. Nov. Holland. (1810) 238. **Type:** *Lamprocarya aspera* R.Br., lectotype designated here (= *Gahnia aspera* (R.Br.) Spreng.).

Robust perennials. **Rhizome** short, woody. **Culms** central. **Leaves** basal and cauline; blade linear; ligule present. **Involucral bracts** leaf-like. **Inflorescence** a spike-like panicle, with several to many partial inflorescences, each bearing many spikelets. **Spikelets** solitary or clustered, 1–2-flowered. **Glumes** several, spirally arranged, upper 2–3 smaller than lower ones, the upper 1–2 bearing flowers. **Flowers** 1–2, the upper bisexual, the lower (when present) male or sterile. **Perianth segments** usually 0. **Stamens** (2–)3–6; filaments often elongated and persistent at base of nutlet. **Stigmas** (2–)3; style continuous with ovary. **Nutlets** trigonous, 4angular or terete.

Distribution. A genus of 41 species, the highest number in eastern Australia and New Zealand, with several species in Malesia and 2 species in eastern Asia. In Singapore 1 native species.

Ecology. Occurs in swampy places in low-lying places and in mountains. Also, in drier heaths and on mountain ridges.

Taxonomy. *Gahnia* is a genus of robust plants in tribe Schoeneae. Its closest relatives include *Machaerina*. *Cladium* P.Browne (not in Singapore) was also considered to be a relative (Kern, Fl. Males., ser. 1, 7(3) (1974) 703) but this is now in a separate tribe, Cladieae (Semmour et al., Bot. Rev. (Lancaster) 85 (2019) 1–39). *Gahnia* has several different mechanisms of fruit dispersal which were described by Benl (Flora 131 (1937) 369–386) and formed the basis of a sectional delimitation proposed by Kükenthal (Feddes Repert. Spec. Nov. Regni Veg. 52 (1943) 56). It places the Singapore species in *Gahnia* J.R.Forst. & G.Forst. sect. *Lamprocarya* (R.Br.) Benth.

Gahnia tristis Nees

(Latin, *tristis* = dull-coloured; application uncertain
but probably referring to the dull, dark-coloured glumes)

in Hooker & Arnott, Bot. Beechey Voy., fasc. 5 (1837) 228; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 98; Ridley, Fl. Malay Penins. 5 (1925) 168; Henderson, Malay. Wild Fls., Monocot. (1954) 285; Kern, Fl. Males., ser. 1, 7(3) (1974) 710; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 132, fig. 240; Simpson & Koyama, Fl. Thailand 6(4) (1998) 426; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 44, 125, 228; Liang et al., Fl. China 23 (2010) 258. **Type:** *Vachell* 39/C, China, Macao, 1830 (lectotype CGE, designated here; isolectotypes E [E00386513], K [K000960178]). **Fig. 35.**

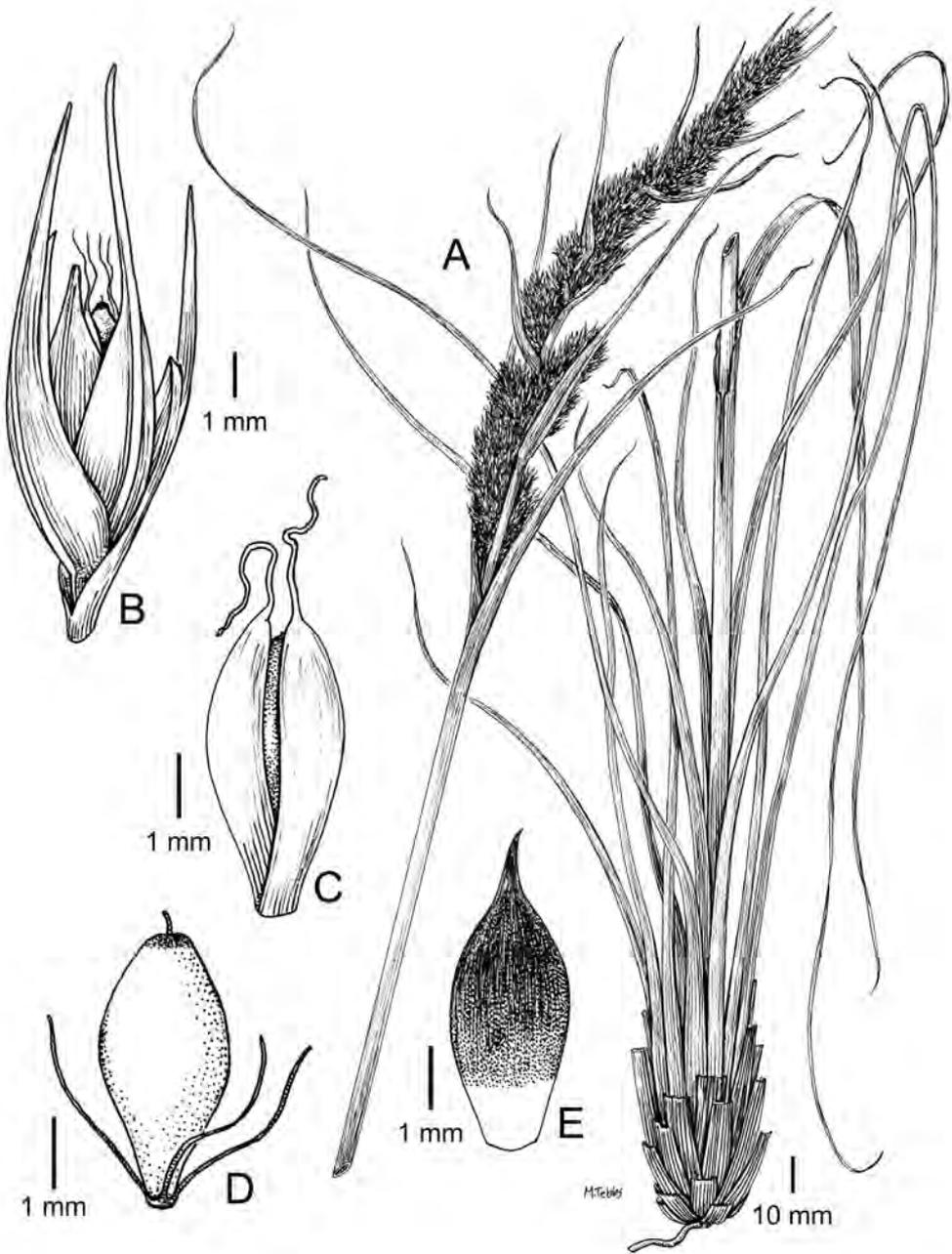


Figure 35. *Gahnia tristis* Nees. **A.** Base of plant. **B.** Inflorescence. **C.** Spikelet. **D.** Glumes surrounding nutlet. **E.** Glume, abaxial surface. **F.** Nutlet with persistent filaments. (From Peninsular Malaysia, *Samsuri SA281*. Drawn by M. Tebbs).

Perennial. **Culms** densely tufted, 50–100 long, 2–5 mm wide, subterete to trigonous, smooth. **Leaves** basal and cauline; blade rigid, up to 50 cm long, 3–7 mm wide, apex caudate-acuminate, coriaceous, margins strongly inrolled; cauline sheaths 7–15 cm long, yellowish-brown, basal sheaths up to 30 cm long, dark or chestnut brown. **Involucral bracts** several, leaf-like, the lowest up to 30 cm long; sheath up to 3 cm long. **Inflorescence** a spike-like panicle, ± cylindrical to linear-oblong, 15–50 × 3–7 cm with 10–28 ± sessile partial inflorescences each 1–5 × 1.2–1.7 mm. **Spikelets** numerous, densely clustered, oblong, becoming turbinate in nutlet, 7–10 mm long, 6–8-glumed, 1-flowered. **Glumes** ovate-lanceolate, 10–12 mm long, apex long-acuminate, sides chartaceous, dull dark brown, upper 2–3 glumes broadly ovate, much shorter, ciliolate, apex obtuse to rounded. **Perianth segments** 0. **Stamens** 3–4; anthers 3–4 mm long, filaments persistent. **Stigmas** 3. **Nutlets** ellipsoid, trigonous, c. 4.5 × 2 mm, conical, dark brown to shiny black, smooth.

Distribution. Southern China to Japan, Thailand, Vietnam and western Malaysia. Native in Singapore and recorded from Kent Ridge (*Samsuri et al. KRI*, 1 Oct 2002, SING [SING0041385]), Pulau Sarimbun (*Koh SING2012-306*, 10 Jul 2012, SING [SING0179444]) and the Western Catchment (*Samsuri WC16*, 30 Mar 2004, SING [SING0053918, SING0053919]). Previously also recorded from Bukit Timah Expressway (*Lai et al. LJ 55*, 28 Sep 1966, SING [SING0058251]), Bukit Timah, Lazarus Island, Pasir Panjang, Pulau Tekong, Sentosa (*Ridley s.n.*, 22 Jan 1887, SING [SING0058255]), Singapore Island Country Club, St. John's Island and Sungei Murai.

Ecology. Dry places near coast and on river or stream banks.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Erect gahnia* (English).

10. HYPOLYTRUM Pers.

(Greek, *hypo-* = under, *-lythron* = gore; application uncertain but possibly alluding to the reddish or brownish coloration of the leaf sheaths)

Syn. Pl. 1 (1805) 70; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 677Ridley, Mat. Fl. Malay. Penins. 3 (1907) 100; Ridley, Fl. Malay Penins. 5 (1925) 169; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1218; Kern, Fl. Males., ser. 1, 7(3) (1974) 489; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 160; Simpson & Koyama, Fl. Thailand 6(4) (1998) 264; Dai et al., Fl. China 23 (2010) 168. **Type:** *Hypolytrum latifolium* Rich., lectotype designated by Koyama, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 8 (1961) 68.

Moderately robust to robust, stoloniferous or rhizomatous perennials; rhizome woody; roots coarse. **Culms** central (in Singapore species) or lateral, the latter with cataphylls at base. **Leaves** 3-ranked, basal or cauline; blade coriaceous, glabrous; pseudopetiole present or 0; ligule 0. **Involucral bracts** leaf-like, basal bract usually longest. **Inflorescence** usually an open compound panicle, more rarely capitate with 1–many spikes. **Spikes** comprising many

spirally imbricate glume-like bracts (spicoid bracts) each subtending a partial inflorescence (spicoid) with a much-reduced axis. **Spicoid** comprising a naked, terminal female flower and 2(–3) scale-like floral bracts, all subtending a monandrous male flower, the lowest 2 floral bracts opposite, keeled. **Stigmas** 2. **Nutlets** sculptured, often with spongy conical apex.

Distribution. A genus of 61 species, Pantropical. In Singapore 1 species with 2 varieties, both native.

Ecology. Generally found in evergreen forest and forest margins. In the Neotropics they may also be found in savannahs and open woodland.

Taxonomy. *Hypolytrum* has the characteristic spicoid structure in the inflorescence, which is a key feature of subfamily Mapanioideae. It is closely related to *Mapania* in tribe *Hypolytreae* and is primarily separated on the basis of 2–3 floral bracts per spicoid compared to 4–6 in *Mapania*. Molecular phylogenetics have hinted towards *Hypolytrum* and *Mapania* being congeneric but further research is needed.

***Hypolytrum nemorum* (Vahl) Spreng.**

(Latin, *nemorum* = of woods, sylvan; referring to the habitat)

Syst. Veg. 1 (1824 [‘1825’]) 233; Kern, Blumea 9(1) (1958) 218; Kern, Fl. Males., ser. 1, 7(3) (1974) 490; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 133, fig. 241; Simpson & Koyama, Fl. Thailand 6(4) (1998) 265; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 50, 125, 228; Dai et al., Fl. China 23 (2010) 168. **Basionym:** *Schoenus nemorum* Vahl, Symb. Bot., pt 3 (1794) 8; Vahl, Enum. Pl. 2 (1805) 227. **Synonym:** *Hypaelyptum nemorum* (Vahl) P.Beauv., Fl. Oware 2, fasc. 12 (1810) 13. **Type:** *Collector unknown s.n.*, locality unknown (lectotype C [C10010485], designated by Dey & Prasanna, J. Jap. Bot. 88 (2013) 212). **Fig. 36.**

Hypolytrum latifolium Rich. in Persoon, Syn. Pl. 1 (1805) 70; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 678; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 100; Ridley, Fl. Malay Penins. 5 (1925) 170; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 1218; Henderson, Malay. Wild Fls., Monocot. (1954) 253. **Type:** *Herb. Richard s.n.*, India (holotype P [P00075668]).

Slender to robust, rhizomatous. **Culms** central, 20–90 cm long, 1–4 mm wide, trigonous, smooth to scabrid. **Leaves** mostly basal, 1–2 cauline; blade linear, 6–130 cm long, 3–23 mm wide, apex and base gradually narrowed, 3-nerved; pseudopetiole absent; basal sheaths 2–15 cm long, reddish-brown to purple, cauline sheaths light purple or cinnamon brown. **Involucral bracts** 2–3, leaf-like, 5–40 cm long. **Inflorescence** an open to contracted panicle, hemispherical or broadly ovoid, 2–7 × 0.5–10 cm, comprising up to 10 primary peduncles each subtending up to 6 secondary peduncles terminating in 1–3 sessile or shortly stalked spikes. **Spikes** ± elliptic-globose, 3–7 × 2.5–6 mm, whitish to mid-brown. **Spicoid bracts** ovate-orbicular to elliptic 1.3–2.5 × 1.2–2 mm, apex rounded, margins entire, brown. **Spicoid**

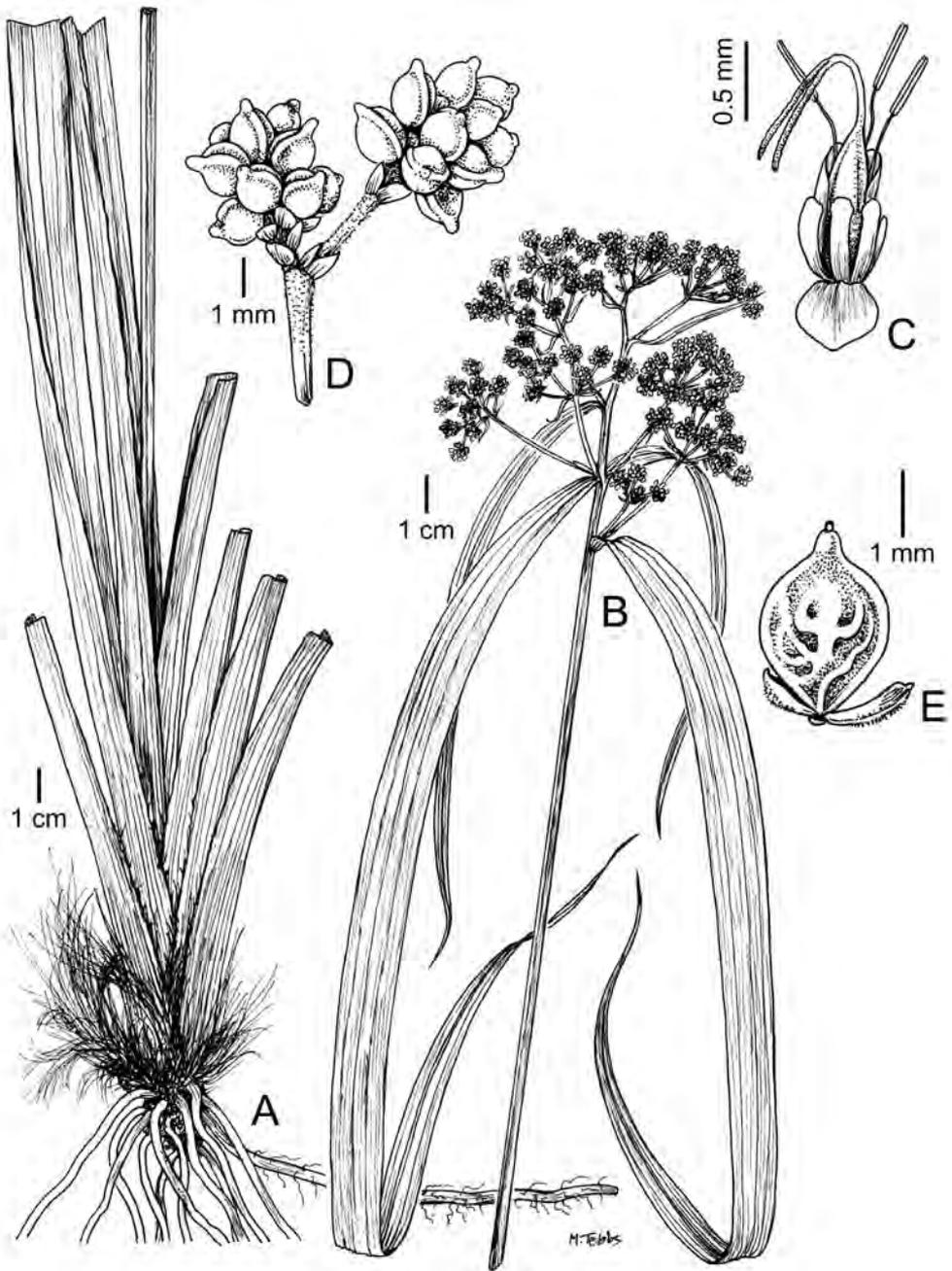


Figure 36. *Hypolytrum nemorum* (Vahl) Spreng. var. *nemorum*. **A.** Base of plant. **B.** Culm and inflorescence. **C.** Spicoid. **D.** Spikes with mature nutlets. **E.** Nutlet. (From Peninsular Malaysia, Simpson 89/31. Drawn by M. Tebbs).

± equalling the spicoid bracts. **Floral bracts** 2, free or ± connate on abaxial side, 1.2–1.8 mm long, keel ciliate. **Stamens** 2; anthers oblong 0.5–0.75 mm long. **Stigmas** 2. **Nutlets** broadly ovoid, 1.8–3 × 1.3–1.5 mm, apex conical, irregularly 2–5-ridged.

Key to varieties of *Hypolytrum nemorum*

1. Plants large, robust; spikes brown; spicoid bracts with entire, brown margins **a. var. nemorum**
Plants smallish, slender; spikes whitish; spicoid bracts with broad, whitish, scarious, lacerate margins **b. var. proliferum**

a. var. nemorum

Robust, rhizomatous. **Culms** central, 35–90 cm long, 1–3 mm wide, trigonous, smooth to scabrid. **Leaves** up to 130 cm long, 10–23 mm wide. **Inflorescence** an open panicle, 2–7 × 3–10 cm. **Spikes** usually more than 10, light to mid-brown. **Spicoid bracts** with margins narrow, brown, entire.

Distribution. Tropical and subtropical Asia to western Pacific islands. Native in Singapore and recorded from Upper Peirce (*Leong et al. SING2008-539*, 25 Nov 2008, SING [SING0116894]), Upper Seletar, Holland Woods (*Hassan SING2010-824*, 17 Aug 2010, SING [SING0153564]), Nee Soon, Pulau Tekong (*Samsuri et al. PT277*, 3 Jan 2002, SING [SING0039948]), Pulau Ubin (*Teo SING2011-457*, Nov 2011, SING [SING0171395]), Sarimbun and Singapore Botanic Gardens. Previously also recorded from Bukit Mandai, Bukit Timah, Lower Peirce, Chan Chu Kang Forest Reserve, Jurong, Nee Soon, Seletar (*Ridley s.n.*, 23 Apr 1889, SING [SING0005025]) and Serangoon.

Ecology. Wet evergreen forest and forest margins.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Notes. Superficially similar to *Mapania bancana* (Miq.) Ridl. but the latter has 6–8 floral bracts in a spicoid and nutlets with lateral furrows rather than ribs.

b. var. proliferum (Boeckeler) J.Kern

(Latin, *prolifer* = bearing progeny as offshoots)

Fl. Males., ser. 1, 7(3) (1974) 492; Turner, Gard. Bull. Singapore 45 (1993) 66; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 526; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 133.

Basionym: *Hypolytrum proliferum* Boeckeler, Linnaea 37 (1871) 126; Ridley, J. Straits Branch Roy.

Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 101; Ridley, Fl. Malay Penins. 5 (1925) 170; Henderson, Malay. Wild Fls., Monocot. (1954) 254. **Type:** *Ridley s.n.*, Singapore, Tanglin, 6 January 1915 (neotype K [K00626714], designated here). **Fig. 37.**

Slender, rhizomatous. **Culms** 20–60 cm long, 1–4 mm wide. **Leaves** up to 25 cm (rarely more) long, 3–20 mm wide. **Inflorescence** usually a contracted panicle (rarely open), 2–5 × 0.5–1 cm (rarely more). **Spikes** up to 10 (rarely more), whitish. **Spicoid bracts** with margins broad, whitish scarious, becoming lacerate.

Distribution. Vietnam, Malay Peninsula, Sumatra and Borneo. Native in Singapore recorded from Bukit Kalang (*Duistermaat S102*, 9 Aug 2002, SING [SING0059181]), Nee Soon (*Chen et al. SING2017-687*, 28 Nov 2017, SING [SING0267185]; *Chen SING2017-784*, 19 Dec 2017, SING [SING0266859]) and Upper Seletar (*Duistermaat et al. S171*, 2 Sep 2003, SING [SING0059182]). Previously also recorded from Choa Chu Kang, Serangoon Road, Singapore Botanic Gardens and Tanglin (*Ridley s.n.*, 6 Jan 1915, K [K00626714]).

Ecology. Damp forest and forest margins, lake and stream margins.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Notes. The epithet *proliferum* is misleading as the inflorescence of this taxon does not, in fact, proliferate.

11. LEPIRONIA Pers.

(Greek, *lepiro-* = scaly; presumably referring to scale-like appearance of the spicoid bracts)

in Persoon, Syn. Pl. 1 (1805) 70.; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 684; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 107; Ridley, Fl. Malay Penins. 5 (1925) 175; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1331; Kern, Fl. Males., ser. 1, 7(3) (1974) 460; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 161; Simpson & Koyama, Fl. Thailand 6(4) (1998) 266; Dai et al., Fl. China 23 (2010) 170. **Type:** *Lepironia mucronata* Rich. (= *Lepironia articulata* (Retz.) Domin).

Robust, rhizomatous perennials. **Culms** terete, transversely septate. **Leaves** reduced to bladeless sheaths. Inflorescence bract 1, erect, continuous with the culm. **Inflorescence** pseudolateral, comprising a single spike. **Spikes** comprising many spirally imbricate glume-like bracts (spicoid bracts), each subtending a partial inflorescence (spicoid) with a much-reduced axis. **Spicoids** comprising a single naked female flower, and numerous scale-like **floral bracts**, the 3 or 4 immediately below the female flower empty, the remainder subtending a monandrous male flower, the lowest 2 opposite and keeled. **Stigmas** 2–3. **Nutlets** dorsiventrally flattened, ± smooth to longitudinally ribbed.

Distribution. A genus of 1 species; Madagascar, tropical and subtropical Asia to western Pacific islands, including Singapore.

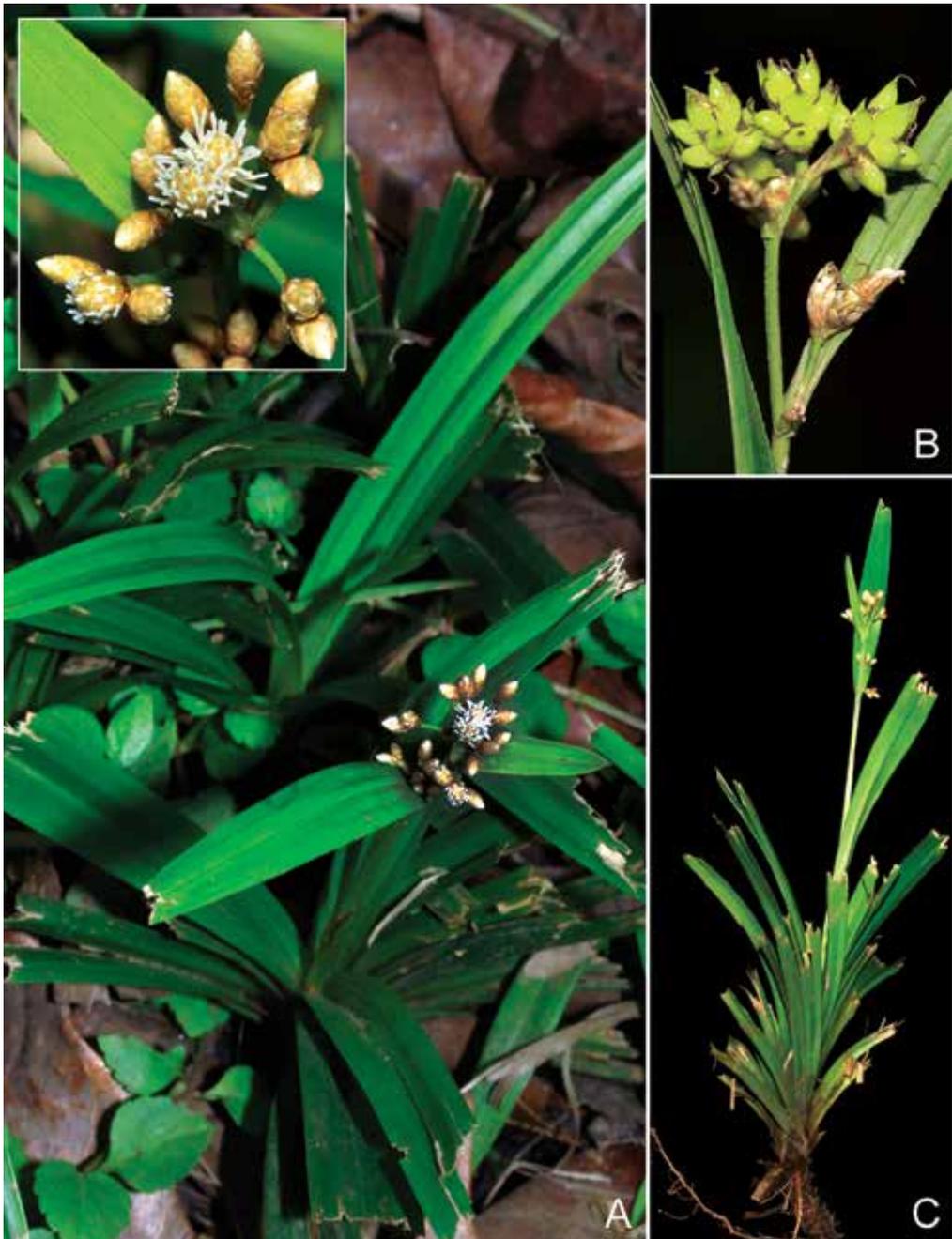


Figure 37. *Hypolytrum nemorum* (Vahl) Spreng. var. *proliferum* (Boeckeler) J.Kern. (From Singapore, Nee Soon, *Chen SING2017-784*. Photos: L.M.J. Chen).

Ecology. Coastal and inland swamp and swamp forest, ponds and streamsides.

Taxonomy. *Lepironia* is placed in subfamily Mapanoideae, having a characteristic spicoid-type inflorescence. Its placement in tribe *Chrysitricheae* is based on pollen type (pseudomonad), which differs from the specialised *Mapania*-type pollen in tribe Hypolytreae (Simpson et al., Amer. J. Bot. 90 (2003) 1071–1087). Kern (Fl. Males., ser. 1, 7(3) (1974) 462) suggested that *Lepironia* may be congeneric with the Australian genus *Chorizandra* R.Br. A sister group relationship is borne out by molecular phylogenetics but differences in nutlet structure warrant continued separation.

***Lepironia articulata* (Retz.) Domin**

(Latin, *articulatus* = articulated, jointed; referring to the transversely septate structure of the culms)

Biblioth. Bot. 20 (Heft 85) (1915) 486; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1331; Henderson, Malay. Wild Fls., Monocot. (1954) 249; Kern, Fl. Males., ser. 1, 7(3) (1974) 462; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 134, fig. 242; Simpson & Koyama, Fl. Thailand 6(4) (1998) 266; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 54, 125, 194; Dai et al., Fl. China 23 (2010) 171. **Basionym:** *Restio articulatus* Retz., Observ. Bot. 4 (1786–1787) 14. **Type:** *König s.n.*, India, Tranquebar (lectotype LD [LD1278478], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 70). **Fig. 38.**

Lepironia mucronata Rich. in Persoon, Syn. Pl. 1 (1805) 70; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 684; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 107; Ridley, Fl. Malay Penins. 5 (1925) 175. **Type:** *Richard*, ‘Habitat in Madagascar’ (not traced).

Perennial. **Rhizome** with greyish-brown scales at least distally. **Culms** crowded in a row along rhizome, stiff, 10–120 cm long, 2–7 mm diam., terete, smooth. **Leaf sheaths** open, the uppermost 12–26 cm long, apex obliquely truncate. **Involucral bract** subulate, terete, 2.2–6 cm long. **Inflorescence** comprising 1 spike. **Spike** elliptic or oblong, terete, 10–35 × 3–7 mm, green to chestnut brown or purplish-brown. **Spicoid bracts** oval, ovate-orbicular, 3.2–6.7 × 3–6.2 mm, apex rounded and often weakly recurved, easily detaching when mature. **Spicoids** ± equalling spicoid bracts. Floral bracts up to 15, lowest 2 linear-lanceolate, 4–6 mm long, keel ciliate. **Nutlets** ovate or obovate to broadly obovate, biconvex, 3–4 × 2–2.8 mm (excluding 0.5 mm long beak), hard, brown, ± smooth to indistinctly longitudinally nerved, often spinulose at apex.

Distribution. Madagascar, tropical and subtropical Asia to western Pacific islands. In Singapore recorded from Chinese Garden (*Phan NTP15002*, 10 Jan 2015, SING [SING0207019]). Previously also recorded from Jurong (*Ridley 54*, 10 Jan 1889, SING [SING0004029]; *Ridley s.n.*, Feb 1900, SING [SING0005031]), Singapore Botanic Gardens (*Furtado 24/199*, 16 Mar 1956, SING [SING00240012]) and Teban (*Ridley s.n.*, 1892, SING [SING0005031]).

Ecology. Coastal and inland swamp and swamp forest, pond and streamsides.

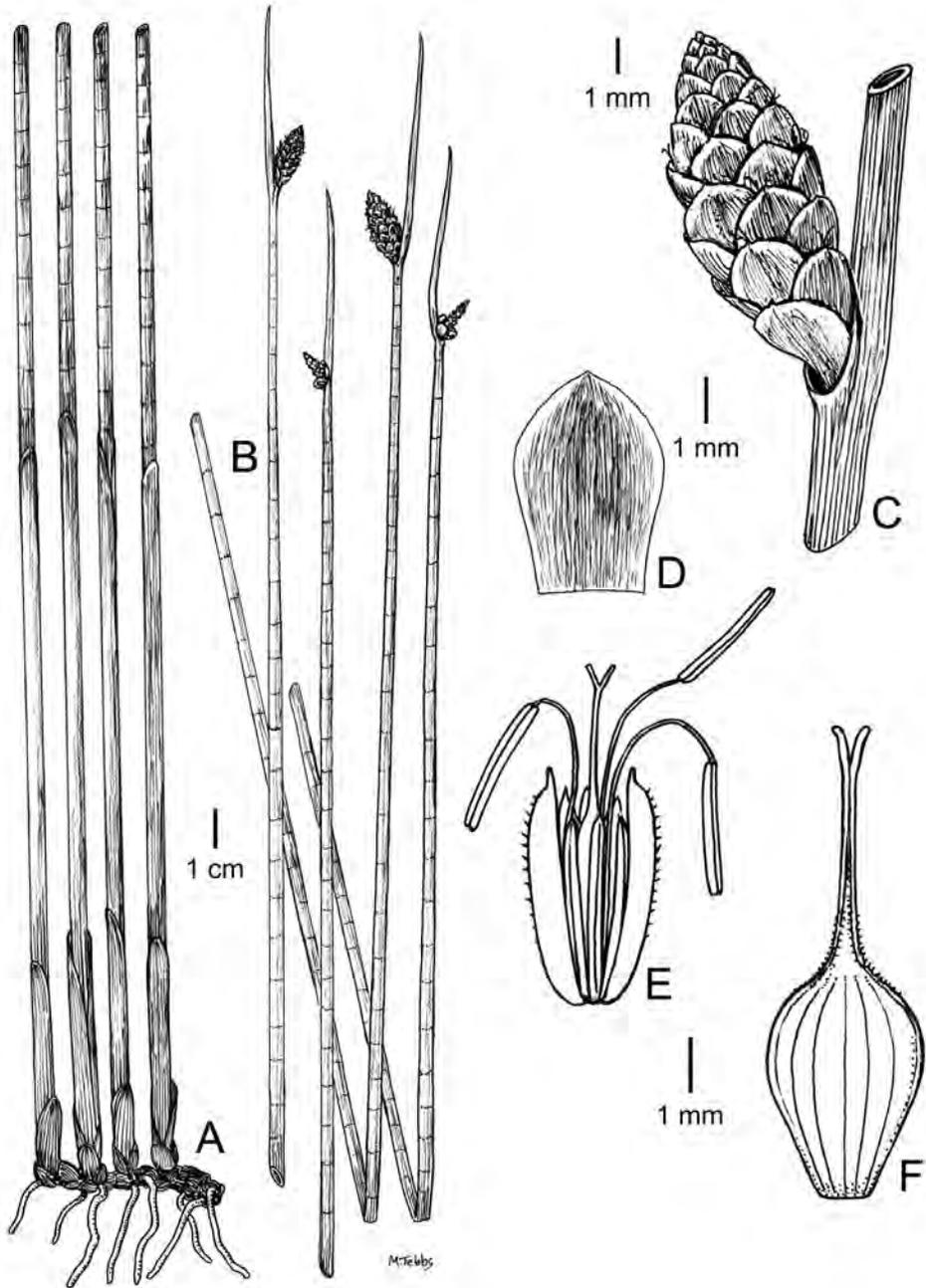


Figure 38. *Lepironia articulata* (Retz.) Domin. **A.** Rhizome and lower part of culms. **B.** Upper part of culms and spikes. **C.** Single spike. **D.** Spicoid bract. **E.** Fruit externally and in longitudinal dissection. (A, B from Peninsular Malaysia, Yao *et al.* FRI53090; C–F from Singapore, Jurong Road, Burkill *s.n.* Drawn by M. Tebbs).

Provisional conservation assessment. Globally Vulnerable (VU). Assessed here as Critically Endangered (CR/D) in Singapore.

Uses. In Madagascar and some parts of tropical Asia the culms are used for mat and basket making. It is sometimes cultivated.

Vernacular names. *Tube sedge* (English), *purun* (Malay).

12. MACHAERINA Vahl

(Greek, *machaira* = a large knife; alluding to the shape of the unifacial leaves)

Enum. Pl. 2 (1805) 238; Kern, Fl. Males., ser. 1, 7(3) (1974) 690; Liang et al., Fl. China 23 (2010) 259. **Type:** *Schoenus restioides* Sw. (= *Machaerina restioides* (Sw.) Vahl).

Baumea Gaudich., Voy. Uranie, fasc. 10 (1829) 416. **Type:** *Baumea glomerata* Gaudich., lectotype designated by Blake, Contr. Queensland Herb. 8 (1969) 23 (= *Machaerina glomerata* (Gaudich.) T.Koyama).

Perennials; rhizome often long, scaly. **Culms** tufted, erect, flattened, angular, or terete, usually smooth, rarely rough. **Leaves** distichous; blade unifacial, compressed or terete, sometimes reduced to a bladeless sheath; sheaths brown to purplish; ligule 0. **Involucral bracts** sheathing and with a short blade. **Inflorescences** paniculate, consisting of few to several partial panicles, main axis often sinuous. **Spikelets** often clustered, rarely solitary, ovoid to narrowly ovoid, compressed. **Glumes** distichous, basal 1–2 flowers bisexual, apical flower(s) male. **Perianth segments** 0. **Stamens** 3. **Stigmas** 3; style-base distinctly thickened, conical or pyramidal, persistent on nutlet. **Nutlet** stipitate or sessile, ovoid, oblong, or oblong-ellipsoid, apex beaked, ± terete or 3-sided, smooth or rugulose,

Distribution. A genus of 53 species, primarily in Australia but also in Tanzania, western Indian Ocean islands, Malesia, Pacific islands and tropical America. In Singapore 1 native species.

Ecology. Swamps and lake margins.

Taxonomy. *Machaerina* is in tribe Schoeneae and comprises taxa that have variously been placed in other genera including *Baumea* and *Cladium*. *Baumea* is now treated as wholly synonymous with *Machaerina* while *Cladium* maintains separate generic status in tribe Cladieae to accommodate three species (none in Singapore).

Machaerina rubiginosa (Biehler) T.Koyama

(Latin, *rubiginosus* = rusty red, brownish-red; referring to the colour of the inflorescence)

Bot. Mag. (Tokyo) 69 (1956) 65; Kern, Fl. Males., ser. 1, 7(3) (1974) 700; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Keng et al., Concise Fl. Singapore,

vol. 2, Monocot. (1998) 135; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 58, 125, 194; Liang et al., Fl. China 23 (2010) 259. **Basionym:** *Fuirena rubiginosa* Biehler, Pl. Nov. Herb. Spreng. (1807) 3. **Synonym:** *Schoenus rubiginosus* Sol. ex G.Forst., Fl. Ins. Austr. (1786) 89, nom. nud. **Type:** *Forster s.n.*, New Zealand [lectotype K [K000883942], designated by Garnock-Jones, Taxon 35 (1986) 125]. **Fig. 39.**

Cladium glomeratum R.Br., Prodr. Fl. Nov. Holland. (1810) 237; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 675; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 85; Ridley, Fl. Malay Penins. 5 (1925) 166. **Type:** *Brown s.n.* [Iter Austral. 6045], Australia, Port Jackson [Sydney], 1802 (lectotype BM [BM000797591], designated here by K.L. Wilson).

Rhizomes long, horizontal, scaly. **Culms** tufted, 100–180 cm long, 2–6 mm wide, compressed to subterete, smooth. **Basal leaves** shorter than to equalling culm; blade erect, 100–130 cm long, (2–)4–7 mm wide, apex acute, biconvex with obtuse edges to subterete, smooth. **Cauline leaves** long sheathing with short blades. **Inflorescence** paniculate, erect, narrow, dense or interrupted, (10–)20–50 cm, 3–7-noded. **Spikelets** in oblong to globose clusters, 4–7 × 2–2.5 mm, narrowly ovoid maturing to ovoid, 2–3-flowered, bearing 1 or 2 nutlets. **Glumes** 5, ovate to lanceolate, 4.5–6.5 mm, apex acuminate margins long-ciliate. **Perianth segments** 0. **Stamens** 3; anthers 1.5–2 mm long; connective prominently apiculate. **Nutlet** orange to reddish-brown, sessile, ellipsoid to oblong-ellipsoid, 3–5 × 1.5–2 mm, trigonous, smooth, shiny; style-base depressed to shortly pyramidal, densely hairy.

Distribution. Tropical Asia to southern China and New Zealand. Native in Singapore but no recent records. Previously recorded from Bukit Timah (*Mat s.n.*, 10 Sep 1894, SING [SING0005052]), Changi (*Ridley 5790*, 1893, K [K000626715], SING [SING0000050]) and Tampines (*Ridley s.n.*, Nov 1890, K [K000626712]).

Ecology. Swamps and lake margins.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

13. MAPANIA Aubl.

(from a West African vernacular name)

Hist. Pl. Guiane 1 (1775) 47; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 680; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 103; Ridley, Fl. Malay Penins. 5 (1925) 171; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1422; Kern, Fl. Males., ser. 1, 7(3) (1974) 466; Simpson, Rev. Gen. Mapania (1992) 34; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 160; Simpson & Koyama, Fl. Thailand 6(4) (1998) 258; Dai et al., Fl. China 23 (2010) 169. **Type:** *Mapania sylvatica* Aubl.

Pandanophyllum Hassk., Tijdschr. Natuurl. Gesch. Physiol. 10 (1843) 118. **Type:** *Pandanophyllum palustre* Hassk. ex Steud. (= *Mapania palustris* (Hassk. ex Steud.) Fern.-Vill. & Naves).

Robust, stoloniferous or rhizomatous perennials; rhizome woody, roots coarse. **Culms** central or lateral (arising from lower leaf axils or below the leaves), the latter with cataphylls at base.

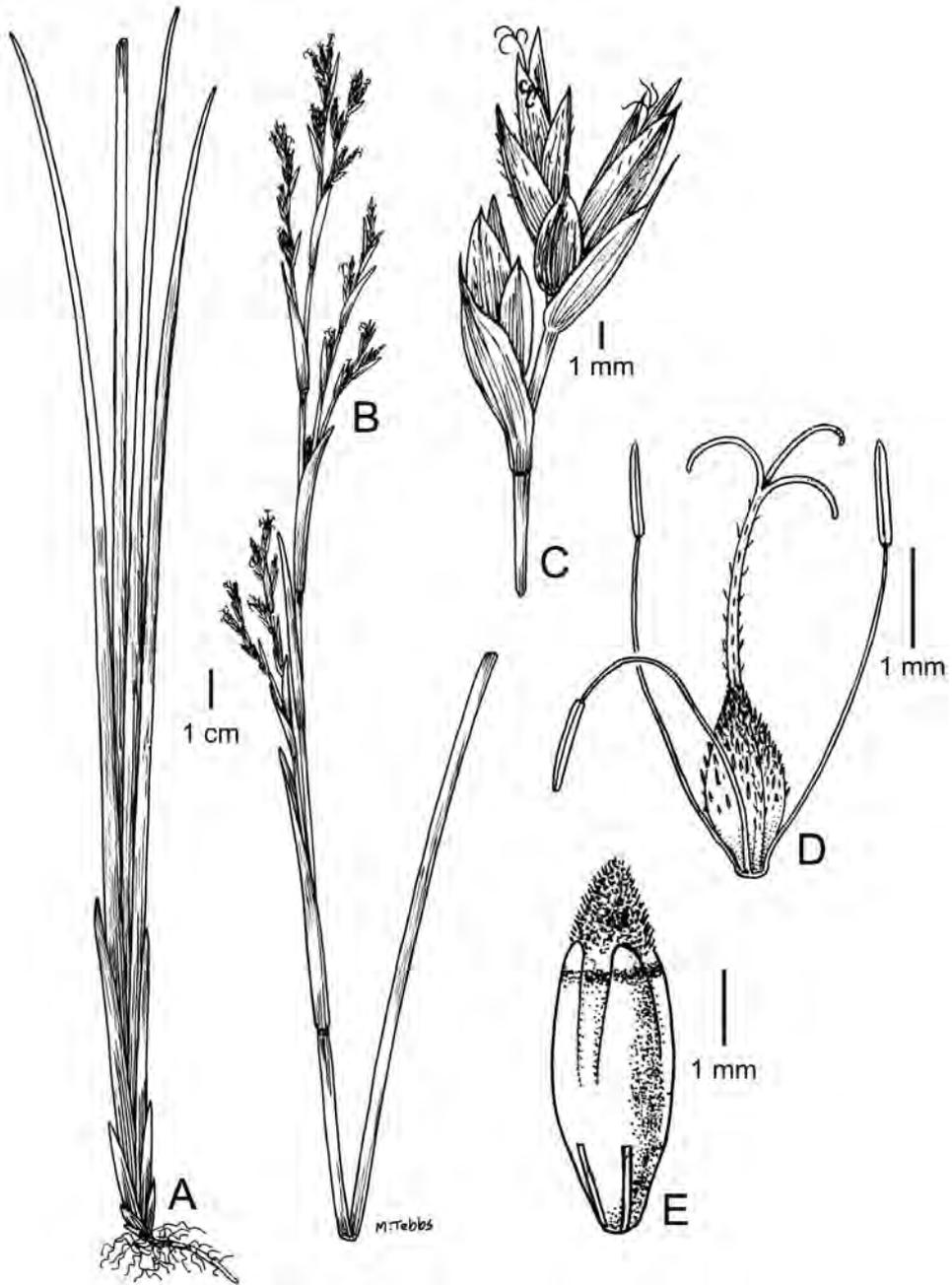


Figure 39. *Machaerina rubiginosa* (Spreng.) T.Koyama. **A.** Base of plant. **B.** Inflorescence. **C.** Spikelets. **D.** Flower. **E.** Nutlet. (A from Sumatra, *Whitehead & Flenley JW113*; B–E from Singapore, Changi, *Ridley 5790*. Drawn by M. Tebbs).

Leaves 3-ranked, basal or cauline; blade linear to oblong, coriaceous; pseudopetiole present or 0; ligule 0. **Involucral bracts** leaf-like in capitate and centrally culmed species, otherwise glume-like. **Inflorescence** paniculate, capitate with few to many spikes or a single spike only. **Spikes** comprising few–many, spirally imbricate glume-like bracts (spicoid bracts), each subtending a partial inflorescence with a much-reduced axis (spicoid). **Spicoid** comprising a naked, terminal female flower and 6 scale-like floral bracts, the lowest 2 opposite, keeled, the lowest 3 subtending a monandrous male flower, the remainder empty. **Stigmas** 2–3 (always 3 in Singapore species). **Nutlets** with a hard or succulent exocarp, smooth or sculptured, costae or furrows 0 or 2–3.

Distribution. A genus of 100 species, throughout the tropics. In Singapore 9 species, one of which is doubtfully native.

Ecology. Most species occur in the herb layer of rain forests, with high soil and air moisture levels. A few occur in more open, swampy areas. There is evidence from the inflorescence structure and pollen type to suggest that many species are animal pollinated (Simpson, Rev. Gen. *Mapania* (1992) 49; Simpson et al., Amer. J. Bot. 90 (2003) 1071–1087).

Taxonomy. *Mapania* is placed in subfamily Mapanioideae, tribe Hypolytreae based on the spicoid-type partial inflorescence and specialised *Mapania*-type pollen. It is closely related to *Hypolytrum* and *Scirpodendron*. Four sections are recognised, of which sects *Pandanophyllum* (Hassk.) Benth & Hook.f. and *Thoracostachyum* (Kurz) T.Koyama (*Mapania bancana* only) include the Singapore species.

Key to *Mapania* species

1. Inflorescence paniculate; exocarp thick in cross-section, persistent **1. M. bancana**
 Inflorescence capitate or with solitary spike; exocarp thin in cross-section, becoming detached from endocarp and disintegrating 2
2. Leaves with a distinct pseudopetiole between leaf-blade and sheath **2. M. cuspidata**
 Leaves without a distinct pseudopetiole, the leaf-blade gradually narrowed into sheath ..
 3
3. Inflorescence comprising 1–many spikes, if 1 spike present then at least some of the
 inflorescences on the same plant with 2 or more spikes 4
 All inflorescences comprising 1 spike only 8
4. Nutlets lageniform (flask-shaped) **3. M. enodis**
 Nutlets not lageniform 5
5. Inflorescence comprising 3–6 closely compressed spikes, almost completely enclosed by
 involucral bracts, even at maturity; spicoid bracts membranous, 18–21 mm long; lowest 2
 floral bracts 20–21 mm long **5. M. longiflora**

- Inflorescence comprising (1–)2–many spikes, partially or not enclosed by involucrel bracts; spicoid bracts subcoriaceous to coriaceous, up to 18 mm long; lowest 2 floral bracts up to 18 mm long 6
6. Spicoid and floral bracts (13–)14–18 cm long; anthers 5–8 mm long **8. M. squamata**
Spicoid and floral bracts 6–14.5 mm long; anthers up to 4 mm long 7
7. Spicoid bracts ovate, dark brown or dark reddish-brown; keel on lowest 2 floral bracts narrowly winged **4. M. kurzii**
Spicoid bracts oblong to lanceolate, light to mid-brown; keel on lowest 2 floral bracts wingless **7. M. palustris**
8. Spicoid bracts and lowest 2 floral bracts usually up to 9 mm long, if more than nutlet lageniform **6. M. lorea**
Spicoid bracts and lowest 2 floral bracts 10 mm more long 9
9. Leaf-blade 2.4–4.5 cm wide; involucrel bracts 0.8–1.2 cm wide **8. M. squamata**
Leaf-blade 0.6–2.3 cm wide; involucrel bracts 0.4–0.8 cm wide **9. M. wallichii**

1. *Mapania bancana* (Miq.) Ridl.

(from Pulau Banca, Sumatra)

J. Straits Branch Roy. Asiat. Soc. 30 (1897) 258; Simpson, Rev. Gen. *Mapania* (1992) 49; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Simpson & Koyama, Fl. Thailand 6(4) (1998) 259; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 125, 208. **Basionym:** *Lepironia bancana* Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 604. **Synonym:** *Thoracostachyum bancanum* (Miq.) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 38 (1869) 76; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 680; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 102; Ridley, Fl. Malay Penins. 5 (1925) 171; Uittien, Recueil Trav. Bot. Néerl. 33 (1936) 136; Henderson, Malay. Wild Fls., Monocot. (1954) 251; Kern, Fl. Males., ser. 1, 7(3) (1974) 465; Turner, Gard. Bull. Singapore 45 (1993) 67; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 144, fig. 251. **Type:** *Amand s.n.*, [Indonesia], Bangka [Pulau Bangka] (lectotype K [K000291111], designated here).

Mapania bancana (Miq.) Ridl. var. *longispica* C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 680. **Type:** *Griffith 6357*, [Malaysia] (lectotype K [K000291100], designated by Simpson, Rev. Gen. *Mapania* (1992) 49; isolectotype K [K000960205]).

Stoloniferous. **Culms** central, 30–73 cm long, 1–3 mm wide, trigonous to subtriquetrous; cataphylls absent. **Leaves** mostly basal, 1 cauline; blade linear, 41–105 cm long, 8–18 mm wide, apex and base gradually narrowed, 3-nerved, margins serrulate; pseudopetiole absent; basal sheath lanceolate, 47 cm long, light to mid-green or brown. **Involucrel bracts** leaf-like, basal bract longest, up to 37 cm long. **Inflorescence** paniculate, 2.8–7 cm diam., with up to 8 primary peduncles, each subtending 1–6 sessile or shortly stalked spikes. **Spikes** elliptic to ± half-globose, 0.3–0.4 × 0.2–0.3 cm, whitish, greenish to mid-brown. **Spicoid bracts** widely ovate to oblong-ovate, 2.1–2.5 × 1.6–2 mm, apex rounded. **Spicoids** ± equalling spicoid bracts.

Floral bracts 6–8, lowest 2 bracts 1.6–2.5 mm long, keel hispid. **Stamens** 3 per spicoid; anthers oblong, 0.9–1 mm long. **Stigmas** 3. **Nutlets** ellipsoid to ovoid, 2.8–3.5 × 1.5–1.6 mm, hard, smooth, with 2–3 lateral furrows.

Distribution. Southern Thailand and Vietnam to New Guinea. Native in Singapore but no recent records. Previously recorded from Ang Mo Kio, Bukit Panjang (*Ridley s.n.*, 1906, SING [SING0010034]), Changi, Choa Chu Kang (*Ridley s.n.*, 1894, SING [SING0010036]), Jurong (*Burkill 704*, 27 Jan 1915, SING [SING0010043]), Kranji, National University of Singapore (Bukit Timah Campus), Nee Soon, Pulau Ubin, Singapore Botanic Gardens (*Mhd Noor s.n.*, 19 Aug 1918, SING [SING0240015]) and Seletar (*Ridley s.n.*, Mar 1887, SING [SING0010038]).

Ecology. Swampy places in wet forest, swamp forest, open wet places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Used as a medicinal plant in Sabah although its precise application is unknown.

Vernacular names. *Black sedge* (English), *rumpit senderayan* (Malay).

Notes. The only species of *Mapania* occurring in Singapore with a paniculate inflorescence. It could be confused with *Hypolytrum nemorum*. However, the latter species has two stigma branches and ridges on the surface of the nutlet.

2. *Mapania cuspidata* (Miq.) Uittien

(Latin, *cuspidatus* = cuspidate; referring to the cuspidate leaf apex)

J. Arnold Arbor. 20 (1939) 213; Kern, Fl. Males., ser. 1, 7(3) (1974) 473; Simpson, Rev. Gen. *Mapania* (1992) 111; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Simpson & Koyama, Fl. Thailand 6(4) (1998) 263; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 125, 222.

Basionym: *Lepironia cuspidata* Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 603. **Type:** *Korthals s.n.*, [Indonesia], Sumatra (lectotype L [L0042677]), designated by Simpson, Rev. Gen. *Mapania* (1992) 111). **Fig. 40, 41.**

Mapania petiolata C.B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8 (1908) 54. **Synonyms:** *Mapania humilis* (Hassk. ex Steud.) Fern.-Vill. var. *petiolata* (C.B. Clarke) Ridl., Fl. Malay Penins. 5 (1925) 174. – *Mapania cuspidata* (Miq.) Uittien var. *petiolata* (C.B. Clarke) Uittien, J. Arnold Arbor. 20 (1939) 213; Kern, Fl. Males., ser. 1, 7(3) (1974) 474; Simpson, Rev. Gen. *Mapania* (1992) 113; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 135. **Type:** *Ridley s.n.*, [Malaysia], Sarawak, Matang (lectotype K [K000291134]), designated by Simpson, Rev. Gen. *Mapania* (1992) 113).

Mapania triquetra Ridl., J. Straits Branch Roy. Asiatic Soc. 41 (1904) 51; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 106; Ridley, Fl. Malay Penins. 5 (1925) 174. **Type:** *Ridley s.n.*, [Malaysia], Perak, Manjung, Dinding, Lumut (lectotype SING [SING0064520]), designated here).

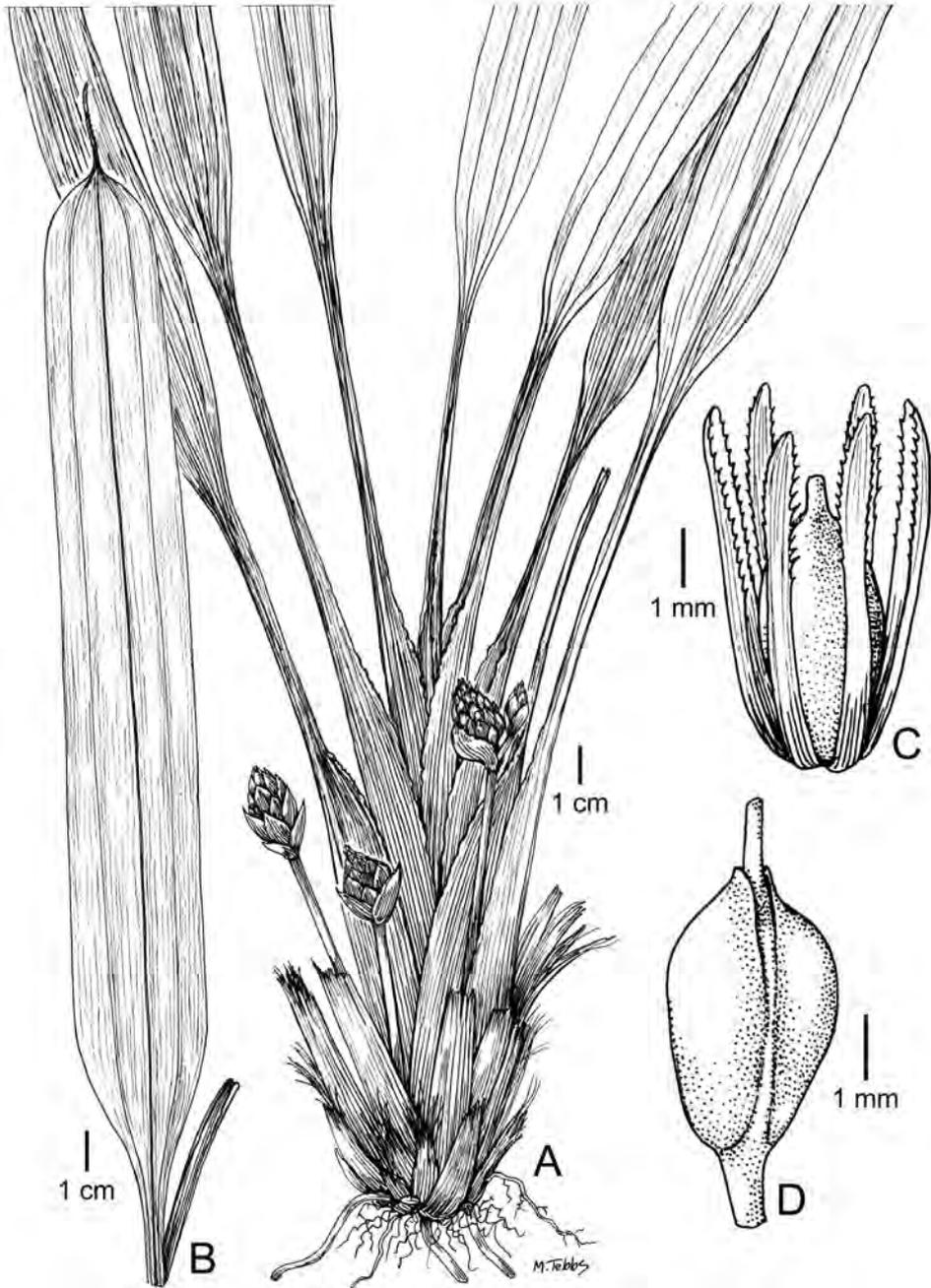


Figure 40. *Mapania cuspidata* (Miq.) Uittien. **A.** Habit showing spikes. **B.** Leaf blade. **C.** Spicoid. **D.** Nutlet. (From Peninsular Malaysia, *Boyce 697*. Drawn by M. Tebbs).



Figure 41. *Mapania cuspidata* (Miq.) Uittien. **A.** Habit and detail of leaf. **B, C.** Inflorescences with maturing nutlets. **D.** Base of plant. (From Singapore, MacRitchie. Photos: J. Leong-Škorničková).

Rhizomatous. **Culms** lateral, 1.5–29 cm long, 0.7–3 mm diam., terete; cataphylls ovate to lanceolate, 0.4–5 cm long, 2–5 mm wide, acute to obtuse. **Leaves** basal; blade ± oblong, 16–100 cm long, 35–65 mm wide, apex abruptly narrowed, long-cuspidate, base abruptly narrowed, 3-nerved, margins entire to scabrid near apex, young leaves salmon-pink to pinkish-red on underside; pseudopetiole 9.5–39 cm long; sheath broadly ovate to oblong-lanceolate, 4.5–15 cm long, green, reddish or reddish-brown. **Involucral bracts** glume-like, ovate, 0.6–1.4 cm long. **Inflorescence** comprising 1(–3) spikes. **Spikes** elliptic to half-globose, 1.5–4 × 0.5–2.5 cm, mid-brown. **Spicoid bracts** ovate to lanceolate-ovate, 7.2–12 × 4.5–5.5 mm, apex obtuse. **Spicoids** ± equalling or slightly longer than spicoid bracts. **Floral bracts** 6, lowest 2 bracts linear, 7.6–11.5 mm long, keel moderately hispid. **Stamens** 3 per spicoid; anthers linear, 4 mm long. **Stigmas** 3. **Nutlets** ellipsoid to obovoid-ellipsoid, 4–7.6 × 2.5–4 mm, succulent, ± smooth, lateral costae/furrows 0.

Distribution. Andaman and Nicobar Islands, Thailand to New Guinea. Native in Singapore and relatively recently recorded from Bukit Timah (*Duistermaat HDS332*, 21 Apr 2005, SING [SING0010038]) and Nee Soon (*Leong et al. SING2016-077*, 6 Apr 2016, SING [SING0236450]; *Ali Ibrahim et al. SING2013-238*, 1 Sep 2013, SING [SING0200467]). Previously also recorded from Bukit Mandai, Chan Chu Kang Forest Reserve, Choa Chu Kang, Kranji (*Ridley 1713*, 7 Dec 1889, SING [SING0005045]), MacRitchie (*Mhd Nur & Chew NK141*, 11 Aug 1994, SING [SING0005043]), Singapore Botanic Gardens and Tuas Forest Reserve.

Ecology. Evergreen forest.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

Uses. Used in Peninsular Malaysia as a remedy for fever.

Notes. This species is distinguished by broad leaf blades which are abruptly narrowed at the base into a petiole-like structure (pseudopetiole), an unusual feature in Cyperaceae. Simpson (Rev. Gen. *Mapania* (1992) 111) recognised three varieties in *Mapania cuspidata*, of which the Singapore material was assigned to var. *petiolata*. However, in subsequent work it has been suggested that intermediates occur between the varieties (Simpson & Koyama, Fl. Thailand 6(4) (1998) 263). Therefore, they are not recognised here.

3. *Mapania enodis* (Miq.) C.B. Clarke

(Latin, *enodis* = without nodes; application uncertain)

Bull. Misc. Inform. Kew, Addit. Ser. 8 (1908) 53; Uittien, Recueil Trav. Bot. Néerl. 33 (1936) 149; Kern, Reinwardtia 6(1) (1961) 30; Kern, Fl. Males., ser. 1, 7(3) (1974) 480; Simpson, Rev. Gen. *Mapania* (1992) 81; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 527; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 136; Simpson & Koyama, Fl. Thailand 6(4) (1998) 261; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong

et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 125, 208. **Basionym:** *Lepironia enodis* Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 603. **Type:** *Teysmann 3685*, [Indonesia], Sumatra, Palembang, Danau-tjalok moeri, Rompot-salingsing (lectotype U [U0103950], designated by Simpson, Rev. Gen. Mapania (1992) 81).

Mapania longa Ridl. ex C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1893) 683; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 105; Ridley, Fl. Malay Penins. 5 (1925) 173. **Type:** *Ridley 169*, Singapore (lectotype SING [SING0064511] designated by Simpson, Rev. Gen. Mapania (1992) 81; isolectotype K [K000291106]).

Mapania tumida Uittien, Gard. Bull. Straits Settle. 10 (1939) 182. **Type:** *Corner 29736*, [Malaysia], Johore, 3 August 1935 (holotype BO; isotype SING [SING0064509]).

Rhizomatous. **Culms** lateral, 20–87 cm long, 1–3 mm diam., terete, glabrous; cataphylls widely ovate to lanceolate, 0.7–9 cm long, 4–11 mm wide, broadly obtuse to acute. **Leaves** basal; blade narrowly linear, 66–98 cm long, 10–22 mm wide, apex and base very gradually narrowed, 1(–3)-nerved, margins entire to serrulate; pseudopetiole absent; sheath 5–13 cm long, dark green to brownish. **Involucral bracts** glume-like, ovate-lanceolate to lanceolate, 0.7–1.5 cm long. **Inflorescence** comprising 1(–5) spikes. **Spike(s)** elliptic to conical, 2–3.5 × 0.6–1.3 cm, greenish to dark brown. **Spicoid bracts** lanceolate to oblong-lanceolate, 7.3–10 × 2.5–3.5 mm, apex obtuse. **Spicoids** ± equalling spicoid bracts. **Floral bracts** 6, lowest 2 bracts 7–10 mm long, keel hispid. **Stamens** 3 per spicoid; anthers linear, c. 8 mm long. **Stigmas** 3. **Nutlets** lageniform, (5–)6–9 × 2.5–4 mm, base constricted between stipe and body of nutlet, succulent, ± smooth, costae/furrows 0.

Distribution. Southern Thailand and Vietnam to western Malesia. Native in Singapore but no recent records. Previously recorded from Seletar (*Ridley 169*, Mar 1889, SING [SING0064511]; *Ridley 6254*, 1894, SING [SING0005045]).

Ecology. Stream margins in evergreen forests.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

4. *Mapania kurzii* C.B. Clarke

(Wilhelm Sulpiz Kurz, 1834–1878, German botanist)

in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 681; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 104; Ridley, Fl. Malay Penins. 5 (1925) 172; Uittien, Recueil Trav. Bot. Néerl. 33 (1936) 288; Kern, Fl. Males., ser. 1, 7(3) (1974) 478; Simpson, Rev. Gen. Mapania (1992) 73; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 528; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 136; Simpson & Koyama, Fl. Thailand 6(4) (1998) 260; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 125, 217. **Type:** *Griffith 6356*, [Malaysia], Malacca (lectotype K [K000291103], designated by Simpson, Rev. Gen. Mapania (1992) 73).

Mapania longispica Ridl., J. Straits Branch Roy. Asiat. Soc. 44 (1905) 205; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 104; Ridley, Fl. Malay Penins. 5 (1925) 172. **Type:** *Ridley 11424*, [Malaysia], Perak, Taiping Hills (holotype K [K000291102]; isotype SING [SING0064512]).

Mapania valida Ridl., J. Straits Branch Roy. Asiat. Soc. 44 (1905) 205; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 104; Ridley, Fl. Malay Penins. 5 (1925) 172. **Type:** *Ridley 5793* (cited as 5798), Singapore, Changi, 1890 (lectotype SING [SING0005147], designated here).

Rhizomatous. **Culms** lateral, 28–63 cm long, 1–4 mm wide, ± terete to trigonous, glabrous; cataphylls ovate to lanceolate, 1–8.5 cm long, 6–10 mm wide, acute. **Leaves** basal; blade narrowly linear, 73–140 cm long, 11–35 mm wide, apex and base very gradually narrowed, 1(–3)-nerved, leathery, margins coarsely serrulate; pseudopetiole absent; sheath 4–9 cm long, mid- to dark reddish-brown, somewhat shiny. **Involucral bracts** glume-like, ovate, 0.7–1.4 cm long. **Inflorescence** capitate, ± half-globose to globose, 1.5–5.5 × 1.9–4 cm, composed of 2–11 spikes. **Spikes** elliptic, 1.2–5.5 × 0.5–1 cm, dark reddish-brown. **Spicoid bracts** ovate, 5.5–9 × 3.7–4.6 mm, apex obtuse to rounded. **Spicoids** equalling or slightly longer than spicoid bracts. **Floral bracts** 6, lowest 2 bracts 6–8.7 mm long, obtuse, keel densely minutely hispid. **Stamens** 3 per spicoid; anthers 3.5–3.7 mm long. **Stigmas** 3. **Nutlets** ellipsoid, 3.1–4.5 × 1.9–2.7 mm, succulent, ± smooth, lateral costae/furrows 0.

Distribution. Andaman Islands, Peninsular Thailand and Malaysia to Sumatra. Native in Singapore and recorded from Bukit Timah (*Duistermaat HDS330*, 21 Apr 2005, SING [SING0076919]) and Upper Peirce (*Dahlan et al. SING 2005-178*, May 2005, SING [SING0072510]). Previously also recorded from Changi (*Ridley 5793*, 1890, SING [SING0005147]), Pulau Ubin (*Ridley 1715*, 9 Oct 1890, SING [SING0005150]) and Singapore Botanic Gardens (*Holtum s.n.*, 30 Oct 1925, SING [SING0240016]).

Ecology. Evergreen forest.

Provisional conservation assessment. Globally Vulnerable (VU). Assessed here as Endangered (EN/D) in Singapore.

Notes. This species is distinguished from *Mapania palustris* (Hassk. ex Steud.) Fern.-Vill. & Naves by its leathery, 1-nerved leaves and dark reddish-brown spikes.

5. *Mapania longiflora* C.B. Clarke

(Latin, *longi-* = long, *-flora* = flower; referring to the relatively large size of spikes and spicoids)

Bull. Misc. Inform. Kew, Addit. Ser. 8 (1908) 54; Kern, Fl. Males., ser. 1, 7(3) (1974) 475; Simpson, Rev. Gen. *Mapania* (1992) 70; Turner, Gard. Bull. Singapore 45 (1993) 67; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 136; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 126, 194. **Type:** *Motley 1192*, [Indonesia, Kalimantan, Kalimantan Selatan], Banjarmasin (holotype K [K000291118]).

Robust, rhizomatous. **Culms** several, erect, lateral, 3.5–24 cm long, 1.4–3.5 mm wide, terete to subtrigonus, glabrous, greenish; cataphylls ovate to lanceolate, 0.6–6.5 cm long, 5–16 mm wide, acute. **Leaves** basal; blade linear, 60–115 cm long, 15–23 mm wide, apex very gradually narrowed, base gradually narrowed, 3-nerved, margins coarsely serrulate; pseudopetiole absent; sheath lanceolate, 8–10.5 cm long, greenish to mid-brown. **Involucral bracts** glume-like, ovate to lanceolate, 2–4 cm long. **Inflorescence** terminal, elliptic, 2.4–3.2 × 1.4–3 cm, composed of up to 3–6 spikes. **Spikes** obscured by involucral bracts even at maturity and only distinct when involucral bracts removed, linear, 2–2.5 × 0.8–1 cm, whitish or light brown. **Spicoid bracts** lanceolate, 18–21 × c. 7 mm, apex acute. **Spicoids** ± equalling spicoid bracts. **Floral bracts** 6, free, lowest 2 bracts narrowly linear, 20–21 mm long, keel wingless, sparsely hispid. **Anthers** linear, 4.5–5 mm long. **Stigma branches** 3. **Nutlets** ellipsoid, 5–7 × 2.2–2.5 mm, succulent, smooth, dull dark brown, costae/furrows 0.

Distribution. Borneo. In Singapore probably not native and recorded only once from Bukit Timah (*Corner s.n.*, 10 Jul 1941, SING [SING0005154]).

Ecology. Swampy lowland forest.

Provisional conservation assessment. Globally Least Concern (LC). Doubtfully native in Singapore.

Notes. *Mapania longiflora* is a Bornean species with one outlying record from Singapore. It is possible that the plant was introduced to Bukit Timah in the 1930s or 1940s as there is some evidence that other taxa were introduced here during this period. See Leong-Škorničková & Boyce (Gard. Bull. Singapore 67(1) (2015) 22–23) for a discussion of this.

6. *Mapania lorea* Uittien

(Latin, *lorum* = leather strap; alluding to the strap-shaped appearance of the leaves)

Recueil Trav. Bot. Néerl. 33 (1936) 150; Kern, Fl. Males., ser. 1, 7(3) (1974) 480; Simpson, Rev. Gen. Mapania (1992) 84; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 528; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 136; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 126, 194. **Type:** *Bruinier 17*, [Indonesia], Sumatra, Roepat Island (holotype BO; isotype L [L0042682]).

Mapania tenuiscapa auct. non C.B. Clarke; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 105; Ridley, Fl. Malay Penins. 5 (1925) 173.

Robust, rhizomatous. **Culms** lateral, 7–26(–30) cm long, 0.8–1.8 mm diam., ± terete; cataphylls widely ovate to lanceolate, 0.4–4 × 0.4–0.5 cm, broadly obtuse to acute. **Leaves** basal; blade narrowly linear, 55–91 cm long, 10–18 mm wide, apex very gradually narrowed, acuminate, base very gradually narrowed, 1-nerved, the secondary nerves indistinct, margins densely serrulate; pseudopetiole absent; sheath narrowly lanceolate, 6–7 cm long, dark green becoming dark, somewhat shiny brown towards base. **Involucral bracts** glume-like, ovate,

0.7–1 × 0.3–0.5 cm. **Inflorescence** comprising 1 spike. **Spike** elliptic to subglobose, 1.5–1.9 × 0.7–1.4 cm, dark reddish-brown. **Spicoid bracts** lanceolate to oblong-lanceolate, 7–9 × 3–5 mm, apex rounded. **Spicoids** slightly shorter or equalling spicoid bracts. **Floral bracts** 6, lowest 2 bracts 7–8 mm, apex long-acute, keel densely denticulate-hispid near apex. **Stamens** 3 per spicoid; anthers linear, 4 mm long. **Stigmas** 3. **Nutlets** ellipsoid to obovoid, 4.7–6 × 2.5–3.8 mm, succulent, smooth, lateral costae/furrows 0.

Distribution. Peninsular Malaysia, Sumatra and Borneo. Native in Singapore and recorded from Bukit Timah (*Niissalo et al. SING2019-455*, 15 May 2019, SING [SING0267379]). Previously also recorded from Jurong (*Burkill 6438*, 30 Jul 1902, SING [SING0005153]).

Ecology. Swampy forest, often by streams.

Provisional conservation assessment. Globally Vulnerable (VU). In Singapore Critically Endangered (CR/D).

7. *Mapania palustris* (Hassk. ex Steud.) Fern.-Vill. & Naves

(Latin, *palustris* = of swampy ground; referring to the habitat)

Nov. App. (1882) 309; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 681; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 103; Ridley, Fl. Malay Penins. 5 (1925) 172; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1423; Uittien, Recueil Trav. Bot. Néerl. 33 (1936) 285; Henderson, Malay. Wild Fls., Monocot. (1954) 250; Kern, Fl. Males., ser. 1, 7(3) (1974) 477; Simpson, Rev. Gen. *Mapania* (1992) 66; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 528; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 137, fig. 244; Simpson & Koyama, Fl. Thailand 6(4) (1998) 259; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 126, 217. **Basionym:** *Pandanophyllum palustre* Hassk. ex Steud., Syn. Pl. Glumac. 2, fasc. 8–9 (1855) 134. **Type:** *Zollinger 929*, [Indonesia], Java (lectotype P [P00584100], designated by Simpson, Rev. Gen. *Mapania* (1992) 66; isoelectotypes BR [BR0000006728021], FI [FI012218, FI012904], G [G00191793, G00191794], L [L0042685], P [P00584101, P00584102].

Mapania albescens C.B.Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8 (1908) 54; Ridley, Fl. Malay Penins. 5 (1925) 172. **Type:** *Ridley 7258*, [Malaysia], Perak (holotype K [K000291101]; isotype SING [SING0064506]).

Rhizomatous. **Culms** lateral, 7–37 cm long, 2–6 mm wide, terete to trigonous, glabrous to densely hispid; cataphylls ovate to lanceolate, 1–16 cm long, 6–28 mm wide, apex acute to obtuse. **Leaves** basal; blade linear, 68–206 cm long, 15–47 mm wide, apex and base gradually narrowed, 3-nerved, margins entire to serrulate; pseudopetiole absent; sheath 9–22 cm long, reddish-brown to dark chestnut brown, often shiny. **Involucral bracts** glume-like, ovate, ovate-lanceolate or oblong, 0.7–3.4 cm long. **Inflorescence** capitate, globose, 1.7–5 × 1.7–5 cm, comprising 7–20 or more, often densely packed spikes. **Spikes** elliptic, 1–3 × 0.5–1 cm, light to mid-brown. **Spicoid bracts** lanceolate, 6–14.5 × 1.6–2.2 mm, apex subobtuse to obtuse. **Spicoids** ± equalling spicoid bracts. **Floral bracts** 6, lowest 2 bracts 6–14 mm long, keel densely hispid. **Stamens** 3 per spicoid; anthers linear, 2.8–4 mm long. **Stigmas** 3. **Nutlets** ellipsoid to obovoid, 3.5–5 × 2.3–3.5 mm, succulent, ± smooth, lateral costae/furrows 0.

Distribution. Andaman Islands, Thailand, through Malesia to Vanuatu. Native in Singapore but no recent records. Previously recorded from Bukit Timah (*Corner s.n.*, 10 Jul 1943 SING [SING0005155]; *Maxwell 81-99*, 21 May 1981, SING [SING0005160]; *Ridley s.n.*, 1898, SING [SING0005157]), Chan Chu Kang Forest Reserve (*Ridley 1712*, 30 Oct 1889, SING [SING0005156]) and Singapore Botanic Gardens (*Ridley 11960*, Jun 1894, SING [SING0005158]).

Ecology. Damp or swampy, shaded areas in primary and secondary forest.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Used for basketry and matting in Peninsular Malayasia.

8. *Mapania squamata* (Kurz) C.B. Clarke

(Latin, *squamatus* = with small scale-like leaves or bracts; referring to the cataphylls at the base of the culm which appear to cover all of the shorter culms)

Bull. Misc. Inform. Kew, Addit. Ser. 8 (1908) 53; Kern, Fl. Males., ser. 1, 7(3) (1974) 479; Simpson, Rev. Gen. *Mapania* (1992) 76; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 528; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 137; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 220; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 126, 194. **Basionym:** *Pandanophyllum squamatum* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 38 (1869) 80. **Synonym:** *Lepironia squamata* (Kurz) Miq., Ill. Fl. Archip. Ind. (1870) 64. **Type:** *Zippelius s.n.*, [Indonesia], Java (holotype BO). **Fig. 42.**

Mapania heterocephala Merr., J. Straits Branch Roy. Asiat. Soc. 85 (1922) 158. **Type:** *Ramos 1854*, [Malaysia, Sabah], Sandakan and vicinity, 2 December 1920 (lectotype US [US00028299], designated here).

Mapania wallichii auct. non C.B. Clarke: Ridley, Mat. Fl. Malay. Penins. 3 (1907) 105; Ridley, Fl. Malay Penins. 5 (1925) 173.

Robust to very robust, rhizomatous. **Culms** lateral, 1–10(–14) cm long, 2–3.5 mm wide, terete, glabrous; cataphylls ovate to lanceolate, 0.8–5 cm long, 6–8 mm wide, acute. **Leaves** basal, up to 150 cm long; blade linear, 103–144 cm long, 24–45 mm wide, apex narrowed or gradually narrowed, base very gradually narrowed, 3-nerved, margins serrulate; pseudopetiole absent; sheath lanceolate, 5.5–10 cm long, dark green. **Involucral bracts** glume-like, ovate to ovate-lanceolate, 1.3–2.1 × 0.8–1.2 mm. **Inflorescence** comprising 1(–5) spikes. **Spikes** narrowly elliptic to elliptic, 2.5–3.2 × 0.7–2.4 cm, greenish at first, becoming dark brown, distinct when more than one. **Spicoid bracts** lanceolate to oblong-lanceolate, 13.5–18 × 5.5–6.5 mm, apex obtuse. **Spicoids** ± equalling spicoid bracts. **Floral bracts** 6, free, lowest 2 bracts 13.5–17 mm long, keel narrowly winged, sparsely denticulate-hispid towards apex. **Stamens** 3 per spicoid; anthers linear, 5–6 mm long. **Stigmas** 3. **Nutlets** ellipsoid to obovoid, 5–7 × 2.5–4 mm, succulent, smooth, costae/furrows 0 or sometimes indistinctly 3-costate.



Figure 42. *Mapania squamata* (Kurz) C.B.Clarke. **A.** Habit. **B.** Detail of leaf (lower side) and apex (upper side). **C.** Inflorescence and infructescences. **D.** Inflorescence arising from the base of the plant. **E.** Old infructescence. **F.** Young infructescence. (From Singapore, Upper Pierce, *Leong-Škorničková et al. SING2017-468*. Photos: J. Leong-Škorničková).

Distribution. Western Malesia. Native in Singapore and recorded from Upper Peirce (*Leong-Škorničková et al. SING2017-468*, 14 Sep 2017, SING [SING0239582]). Previously also recorded from Bukit Panjang (*Ridley s.n.*, 1903, SING [SING0005162]) and Bukit Timah (*Ridley s.n.*, 1894, SING [SING0005164]).

Ecology. Lowland dipterocarp forest.

Provisional conservation assessment. Globally Vulnerable (VU). Assessed here as Critically Endangered (CR/D) in Singapore.

9. *Mapania wallichii* C.B. Clarke

(Nathaniel Wallich, 1786–1854, Superintendent of the Calcutta Botanic Gardens)

in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 682; Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8 (1908) 130, as '*wallichiana*'; Kern, Fl. Males., ser. 1, 7(3) (1974) 479; Simpson, Rev. Gen. *Mapania* (1992) 78; Turner, Gard. Bull. Singapore 45 (1993) 67; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 528; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 137; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 221; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 59, 126, 194; Dai et al., Fl. China 23 (2010) 170. **Type:** *Wallich s.n.* [EIC 3541], Singapore (lectotype K [K000291105], designated by Simpson, Rev. Gen. *Mapania* (1992) 78).

Pandanophyllum palustre auct. non Hassk. ex Steud.: Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 38 (1869) 79.

Robust, rhizomatous. **Culms** lateral, 8–28 cm long, 1.3–2.2(–3) mm diam., terete, glabrous; cataphylls ovate to broadly lanceolate, 1–3 cm long, 8–9 mm wide, obtuse to acute. **Leaves** basal; blade narrowly linear, 72–160 cm long, 13–22 mm wide, apex and base very gradually narrowed 3-nerved, margins serrulate; pseudopetiole absent; sheath 7–12 cm long, dark green. **Involucral bracts** glume-like, ovate to ovate-lanceolate, 1–1.5 cm long, 0.4–0.7 mm wide. **Inflorescence** comprising 1 spike. **Spike** elliptic to broadly elliptic, 2.5–4.2 × 1.2–1.6 cm, dark brown. **Spicoids** ± equalling spicoid bracts. **Spicoid bracts** lanceolate, 15–16 × 4–8 mm, apex obtuse. **Floral bracts** 6, free, lowest 2 bracts 15–16 mm long, keel wingless, hispid towards apex. **Stamens** 3 per spicoid; anthers linear, 8 mm long. **Nutlets** broadly ellipsoid, 4.3–5.5 × 3.2–3.5 mm, succulent, smooth, costae/furrows 0.

Distribution. South-eastern China to Hainan, Western Malesia. Native in Singapore but no recent records. Previously recorded from Bukit Timah (*Ridley s.n.*, Feb 1900, SING [SING0005166]; *Ridley s.n.*, 1903, SING [SING0005165]; *Corner s.n.*, 10 Jul 1943, SING [SING0005167]).

Ecology. Forest, often on sand.

Provisional conservation assessment. Globally Vulnerable (VU). In Singapore presumed Nationally Extinct.

Notes. Kern (Fl. Males., ser. 1, 7(3) (1974) 479) doubted whether *Mapania wallichii* and *M. squamata* were distinct species. However, Simpson (Rev. Gen. *Mapania* (1992) 76, 78) upheld them as separate, citing leaf width, involucre bract width and anther length as distinguishing characters.

14. RHYNCHOSPORA Vahl

(Greek, *ryncho-* = beaked, *-spora* = seed;

referring to the presence of a prominent style-base on the nutlet)

Beak-rush (English)

Enum. Pl. 2 (1805) 229, as '*Rynchospora*', nom. cons.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 668; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 82; Ridley, Fl. Malay Penins. 5 (1925) 164; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1906; Kern, Fl. Males., ser. 1, 7(3) (1974) 710; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 174; Simpson & Koyama, Fl. Thailand 6(4) (1998) 410; Liang & Simpson, Fl. China 23 (2010) 253. **Type:** *Schoenus albus* L. (= *Rynchospora alba* (L.) Vahl).

Annuals or perennials. **Culms** central. **Leaves** basal and/or cauline; blades linear to lanceolate; sheaths closed; ligule 0. **Inflorescence** of terminal and lateral umbel-like partial inflorescences, or paniculate or capitate. **Spikelets** lanceolate, ovate to elliptic, flattened to terete. **Glumes** 5–9 (rarely more), distichous or spirally imbricate, membranous to chartaceous, 1-nerved, the basal 2–3 glumes, empty and small, the remainder of the glumes gradually larger with a single flower, the uppermost glume often empty. **Flowers** either all bisexual, the upper ones not producing a mature nutlet, or lower 1–few bisexual and upper ones staminate, or unisexual with the lowest pistillate and upper one(s) staminate. **Perianth segments** 0–6, rarely more, bristle-like, upwardly or retrorsely scabrous, rarely smooth. **Stamens** (1–)2–3. **Stigmas** 2 or **style** undivided. **Nutlets** biconvex, smooth, cancellate, rugose or sometimes spinose; style base persistent, variously-shaped.

Distribution. A genus of 359 species in tropical to temperate regions, with the greatest concentration of species in tropical and subtropical South America. In Singapore 4 native species.

Ecology. Open swamps, muddy river banks, margins of rice fields, wet to semi-dry grasslands and hillsides, sometimes grassy waysides.

Taxonomy. *Rynchospora* sits within tribe Rhynchosporeae, a natural grouping that is well supported by molecular phylogenetics.

Key to *Rynchospora* species

- | | |
|---|--------------------|
| 1. Inflorescence capitate | 3. R. rubra |
| Inflorescence panicle-like or spicate | 2 |

2. Inflorescence spicate with globose partial inflorescences **2. R. malasica**
 Inflorescence panicle-like with corymbose partial inflorescences 3
3. Culms 3 mm or more wide; style ± undivided **1. R. corymbosa**
 Culms up to 3 mm wide; style with 2 distinct stigmas **4. R. rugosa**

1. *Rhynchospora corymbosa* (L.) Britton

(Latin, *corymbosus* = with flowers arranged in corymbs;
 referring to the structure of the inflorescence)

Trans. New York Acad. Sci. 11 (1892) 84; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1906; Kükenthal, Bot. Jahrb. Syst. 74 (1949) 410; Henderson, Malay. Wild Fls., Monocot. (1954) 282; Kern, Fl. Males., ser. 1, 7(3) (1974) 713; Turner, Gard. Bull. Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 529; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 138; Simpson & Koyama, Fl. Thailand 6(4) (1998) 411; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 75, 126, 273; Liang & Simpson, Fl. China 23 (2010) 253. **Basionym:** *Scirpus corymbosus* L., Cent. Pl. 2 (1756) 7. **Type:** *Collector unknown s.n.*, India (lectotype LINN [Herb. Linn. no. 71.48], designated by Gordon-Gray, *Strelitzia* 2 (1995) 150). **Fig. 43, 44.**

Rhynchospora aurea Vahl, Enum. Pl. 2 (1805) 229, nom. illeg. superfl.; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 670; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 83; Ridley, Fl. Malay Penins. 5 (1925) 164. **Type:** *König s.n.*, India (lectotype C [C10010571], designated here).

Rhizomatous perennial. **Culms** 1–few, 80–120(–150) cm long, 3–10 mm wide, trigonous, smooth to scabrid above. **Leaves** basal and 2–3 cauline; blade broadly linear, 20–70 cm long, 0.8–1.6 mm wide, apex long-acuminate, flattish, glabrous; basal sheaths up to 20 cm long, pale brown, cauline sheaths 5–8 cm long, greenish. **Involucral bracts** leaf-like, the longest 10–30 cm long. **Inflorescence** panicle-like, open, 20–40 cm long, comprising 2–5, rather distant, corymbose partial inflorescences, 10–15 × 10–15 cm, simple to compound, with primary rays (8–)12–many, up to 12 cm long. **Spikelets** in clusters of 2–10, lanceolate or elliptic, subterete, 6–9 mm long. **Glumes** 5–7, subdistichous, ovate to oblong-ovate, 2.5–6 mm long, apex acute to mucronulate, sides membranous, reddish-brown. **Perianth segments** in bisexual flower 6, ± equalling nutlet. **Stamens** 3; anthers 2–3 mm long. **Style** ± undivided. **Nutlets** obdeltoid-obovate, compressed, 2.5–3.5 × 2 mm, apex without short neck, glabrous, dull yellowish-brown to mid-brown, finely transversely wrinkled to rugose; style-base elongate-conical, 4–5 mm long.

Distribution. Pantropical. Native in Singapore and recorded from Upper Seletar, Nee Soon (*Samsuri SAI400*, 9 Feb 2011, SING [SING0059979]), Pulau Tekong, Tampines (*Ali Ibrahim SING2013-264*, 27 Oct 2013, SING [SING0201458]), Tampines Avenue 8 (*Duistermaat et al. HDS363*, 10 May 2005, SING [SING0080181]) and the Western Catchment (*Lee et al. SING2007-205*, 27 Feb 2007, SING [SING0093623]). Previously also recorded from Jurong Road, MacRitchie, Singapore Botanic Gardens and Ulu Berih (*Burkill s.n.*, 16 Jun 1913, SING [SING0005170]).



Figure 43. *Rhynchospora corymbosa* (L.) Britton. **A.** Base of plant. **B.** Inflorescence. **C.** Spikelet. **D.** Nutlet. (From Peninsular Malaysia, *Henderson SFN38233*. Drawn by M. Tebbs).



Figure 44. *Rhynchospora corymbosa* (L.) Britton. **A.** Whole plant. **B.** Inflorescence. **C.** Spikelets. **D.** Base of plant. (From Singapore, Tampines, *Niissalo SING2019-189*. Photos: J. Leong-Škorničková).

Ecology. Open swamps and waterlogged areas, elsewhere on muddy river banks and the margins of rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Golden beak sedge* (English).

2. *Rhynchospora malasica* C.B. Clarke (of Malaya)

in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 670; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, J. Straits Branch Roy. Asiat. Soc. 46 (1906) 225; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 83; Ridley, Fl. Malay Penins. 5 (1925) 164; Henderson, Malay. Wild Fls., Monocot. (1954) 281; Kern, Fl. Males., ser. 1, 7(3) (1974) 715; Turner, Gard. Bull. Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 529; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 138; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 221; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 75, 126, 197; Liang & Simpson, Fl. China 23 (2010) 253. **Type:** *Griffith 6358*, [Malaysia], Malacca (lectotype K [K000291040], designated here).

Rhizomatous perennial. **Culms** 60–100 cm tall, rigid, with several nodes, smooth, basally trigonous apically triquetrous. **Leaves** basal and 2–3 cauline; blade broadly linear, up to 50 cm long, 4–9 mm wide, flattish to inrolled, apex long-acuminate to acute; sheath elongated, tightly surrounding culm; ligule short, membranous; **Involucral bracts** leaf-like, the longest up to 20 cm long. **Inflorescence** spicate, 3–20 cm long, with 2–7 heads; heads sessile, globose, 1–1.5 cm diam. **Spikelets** narrowly ovoid, weakly laterally compressed, 6–7 mm long. **Glumes** 5–6; basal 3–4 ovate, much smaller than others, apex acute, sides membranous; apical 2 glumes lanceolate-ovate. **Perianth segments** 6, twice as long as nutlet. **Stamens** 3; anthers c. 2 mm long. **Stigmas** 2. **Nutlets** obovoid to broadly obovoid, 2–2.3 × 1.5–1.7 mm, maturing dark brown, indistinctly transversely wrinkled, shiny, base attenuate; style-base narrowly conical-subulate.

Distribution. Warm-temperate eastern Asia to western Malesia. Native in Singapore but no recent records. Previously recorded from Bedok (*Ridley 5792*, 1892, SING [SING0005174]) and Bukit Mandai (*Ridley 80*, Apr 1889, K [K000291041], SING [SING0005173]).

Ecology. Swampy areas.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

3. *Rhynchospora rubra* (Lour.) Makino

(Latin, *ruber* = red; referring to the coloration of the inflorescence)

Bot. Mag. (Tokyo) 17 (1903) 180; Kükenthal, Bot. Jahrb. Syst. 74 (1949) 491; Kern, Fl. Males., ser. 1, 7(3) (1974) 715; Turner, Gard. Bull. Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 529; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 138, fig. 245; Simpson & Koyama, Fl. Thailand 6(4) (1998) 417; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 75, 126, 273; Liang & Simpson, Fl. China 23 (2010) 255. **Basionym:** *Schoenus ruber* Lour., Fl. Cochinch. 1 (1790) 41. **Type:** Dey 9923, India, Meghalaya, Khasia, Cherrapunji, August 2006 (neotype CAL [CAL0000022241], designated by Dey & Prasanna, Candollea 67 (2012) 47; isoneotype ASSAM).

Morisia wallichii Nees, Edinburgh New Philos. J. 1834 (1834) 265. **Synonym:** *Rhynchospora wallichiana* (Nees) Kunth, Enum. Pl. 2 (1837) 289; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 668; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 82; Ridley, Fl. Malay Penins. 5 (1925) 164; Henderson, Malay. Wild Fls., Monocot. (1954) 281. **Type:** Wallich s.n. [EIC 3422A], Nepal, 26 August 1821 (lectotype K-W [K001119351], designated here).

Annual or short-lived perennial. **Culms** tufted, 20–70(–100) cm long, 1–2 mm wide, trigonous below, triquetrous above. **Leaves** basal; blade narrowly linear, up to 42 cm long, 1.5–3(–4) mm wide, apex subacute, flattish to folded or canaliculate; sheath 1–7 cm long, yellowish-brown. **Involucral bracts** 4–8, leaf-like, eventually reflexed, the longest up to 8 cm long, base dilated, margins ciliate. **Inflorescence** capitate, subglobose, to globose, 10–17 mm wide. **Spikelets** many, ovate-lanceolate, somewhat flattened, 6–8 × 1.5–2 mm. **Glumes** 6–8, ovate to lanceolate, up to 6.5 mm long, apex acute, sides thinly chartaceous, pale to mid-brown. **Perianth segments** 3–6, up to half the length of nutlet. **Style** ± undivided. **Nutlets** obovate to broadly obovate, bilaterally compressed, 1.3–1.8 × 1–1.5 mm, scabrid-hispid along margins, maturing somewhat shiny mid-brown, smooth to indistinctly minutely papillose; style-base depressed-conical.

Distribution. Old World tropics and subtropics. Native in Singapore and recorded from Tampines (*Vermeulen & Ang 2216*, 29 Dec 2001, SING [SING0043691]) and Tampines Avenue 8 (*Duistermaat et al. HDS 366*, 10 May 2005, SING [SING0080183]). Previously also recorded from MacRitchie (*Samsuri SA1330*, 16 Dec 1976, SING [SING0005217]), Jurong (*Ridley s.n.*, 11 Jun 1889, SING [SING0005176]), Pasir Ris, Pulau Damar, Seletar (*Burkill HMB78*, 27 Feb 1955, SING [SING0005215]) and Sungei Murai.

Ecology. Open, wet or semi-dry grasslands, sometimes grassy waysides.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Vulnerable (VU/D) in Singapore.

4. *Rhynchospora rugosa* (Vahl) Gale

(Latin, *rugosus* = wrinkled; referring to the appearance of the nutlet)

Rhodora 46 (1944) 275; Kern, Fl. Males., ser. 1, 7(3) (1974) 720; Turner, Gard. Bull. Singapore 45 (1993) 68; Liang & Simpson, Fl. China 23 (2010) 254. **Basionym:** *Schoenus rugosus* Vahl, Eclog.

Amer. 2 (1798) 5. **Synonym:** *Rhynchospora glauca* Vahl, Enum. Pl. 2 (1805) 233, nom. illeg. superfl.; Henderson, Malay. Wild Fls., Monocot. (1954) 283. **Type:** *Rohr* 27, South America, 'Boia chica' (holotype C [C10010607]).

Distribution. Tropics and subtropics worldwide.

Notes. *Rhynchospora rugosa* is a widespread and variable species. Four subspecies are currently recognised, one of which is in Asia.

subsp. brownii (Roem. & Schult.) T.Koyama
(Robert Brown, 1773–1858, Scottish botanist and pioneering cell biologist)

in Hara et al., Enum. Fl. Pl. Nepal 1 (1978) 118; Simpson & Koyama, Fl. Thailand 6(4) (1998) 412; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 75, 126, 230; Liang & Simpson, Fl. China 23 (2010) 254. **Basionym:** *Rhynchospora brownii* Roem. & Schult., Syst. Veg., ed. 15 bis, 2 (1817) 86; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 529; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 138. **Type:** *Banks & Solander s.n.*, Australia, Queensland, Endeavour River, 1770 (lectotype BM, designated by Laren et al., S. African J. Bot. 55 (1989) 501, 503).

Rhynchospora glauca Vahl var. *chinensis* C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 672; Ridley, J. Straits Branch Roy. Asiatic Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 84; Ridley, Fl. Malay Penins. 5 (1925) 165. **Type:** *Griffith 6302*, 'Birma and Malay Peninsula' (lectotype K [K000357821], designated here).

Rhizomatous perennial. **Culms** loosely tufted, 30–70 cm long, 1–1.7 mm wide, trigonous, smooth to scabrid above. **Leaves** basal and 2–3 cauline; blade narrowly linear, up to 55 cm long, 1.5–3 mm wide, apex gradually acute, flattish to canaliculate; basal sheath up to 8 cm long, greyish-brown, cauline sheath up to 5 cm long, greenish. **Involucral bracts** leaf-like, the longest up to 20 cm long. **Inflorescence** narrow, panicle-like, 10–30 cm long, with 2–3(–4) distant nodes each subtending 1–3 pedunculate spikelet clusters, the clusters rarely with primary and secondary rays. **Spikelets** 2–40 per cluster, ovate-lanceolate to ovate-elliptic, subterete, 3–4.5 mm long. **Glumes** 5–7, ovate to broadly ovate, 1–3.5 mm long, apex acute, mucronate, sides thinly chartaceous, dark brown. **Perianth segments** 6(–7), shorter or slightly longer than nutlet. **Stamens** (1–)2–3; anthers 1–1.5 mm long. **Stigmas** 2. **Nutlets** broadly obovate, biconvex, 1.5–1.8 × 1–1.5 mm, maturing light brown, weakly transversely wrinkled and lineolate with longitudinally oblong epidermal cells; style-base conical, ± as broad as nutlets abruptly widening below.

Distribution. Pantropical. Native in Singapore but no recent records. Previously recorded from Balestier (*Ridley 9144*, SING [SING0005218]), Changi (*Ridley s.n.*, Oct 1890, SING [SING0005221]; *Ridley s.n.*, 1892, SING [SING0005220]) and Sentosa (*Ridley 5791*, 1892, SING [SING0005219]).

Ecology. Wet or marshy grasslands and boggy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

15. SCHOENOPLECTIELLA Lye

(Greek, *schoeno-* = rush, reed, rope, *-plecti-* = plait, *-ella* = diminutive form;
referring to some members of the genus having been used for plaiting)
Bulrush (English)

Lidia 6 (2003) 20. **Type:** *Scirpus articulatus* L. (= *Schoenoplectiella articulata* (L.) Lye).

Annuals or perennials, sometimes with decumbent creeping rhizomes. **Culms** 3-sided or terete. **Leaves** mostly reduced to bladeless sheaths, rarely leaf blade present; ligule 0. **Involucral** bracts culm-like, lowest bract erect, remainder usually indistinct. **Inflorescence** pseudolateral, capitate; small, secondary inflorescence sometimes present within lowermost leaf sheath at culm base. **Spikelets** mostly ovoid or ellipsoid, rarely flattened, with many glumes. **Glumes** spirally imbricate, rarely distichous, usually membranous, all fertile. **Flowers** bisexual in main inflorescence, female in secondary inflorescence. **Perianth segments** 0–6, needle-like, spinulose-scabrous, rarely broader and fimbriate. **Stamens** 1–3. **Stigmas** 2–3; style continuous with ovary. **Nutlets** biconvex or trigonous, smooth to transversely wrinkled, maturing brown or black.

Distribution. A genus of 52 species, almost cosmopolitan. In Singapore 1 native species.

Ecology. Swamps, ditches, rice fields and other open wet places.

Taxonomy. *Schoenoplectiella* was split from *Schoenoplectus* (not in Singapore) by Lye (Lidia 6 (2003) 20), mainly based on phylogenetic data presented in Muasya et al. (Pl. Syst. Evol. 211(3) (1998) 257–271). Kern (Fl. Males., ser. 1, 7(3) (1974) 494–516) placed taxa now assigned to *Schoenoplectiella* within a broadly circumscribed genus *Scirpus* sensu lato. However, most of the species are now placed in separate genera and *Scirpus* sensu stricto comprises 47 species (none in Singapore).

Schoenoplectiella mucronata (L.) J.Jung & H.K.Choi

(Latin, *mucronatus* = mucronate; referring to the structure of the glume apex)

J. Pl. Biol. 53 (2010) 230. **Basionym:** *Scirpus mucronatus* L., Sp. Pl. 1 (1753) 50; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 657; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 182; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 79; Ridley, Fl. Malay Penins. 5 (1925) 161; Henderson, Malay. Wild Fls., Monocot. (1954) 255; Kern, Fl. Males., ser. 1, 7(3) (1974) 494–516) 510; Turner, Gard. Bull. Singapore 45 (1993) 68; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 140, fig. 247. **Synonym:** *Schoenoplectus mucronatus* (L.) Palla, Bot. Jahrb. Syst. 10 (1889) 299; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1981; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 530; Simpson & Koyama, Fl. Thailand 6(4) (1998) 276; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 273; Dai et al., Fl. China 23 (2010) 185. **Type:** *Collector unknown s.n.*, ‘Habitat in Angliae, Italiae, Helvetiae, Virginiae stagnis maritimis’ (lectotype LINN [Herb. Linn. no. 71.31], designated by Kukkonen, Taxon 53 (2004) 181). **Fig. 45.**

Scirpus triangulatus Roxb., Fl. Ind. 1 (1820) 219. **Synonyms:** *Schoenoplectus triangulatus* (Roxb.) Soják, Cas. Nár. Mus., Odd. Prír. 141 (1972) 62. – *Schoenoplectiella triangulata* (Roxb.) J.Jung &

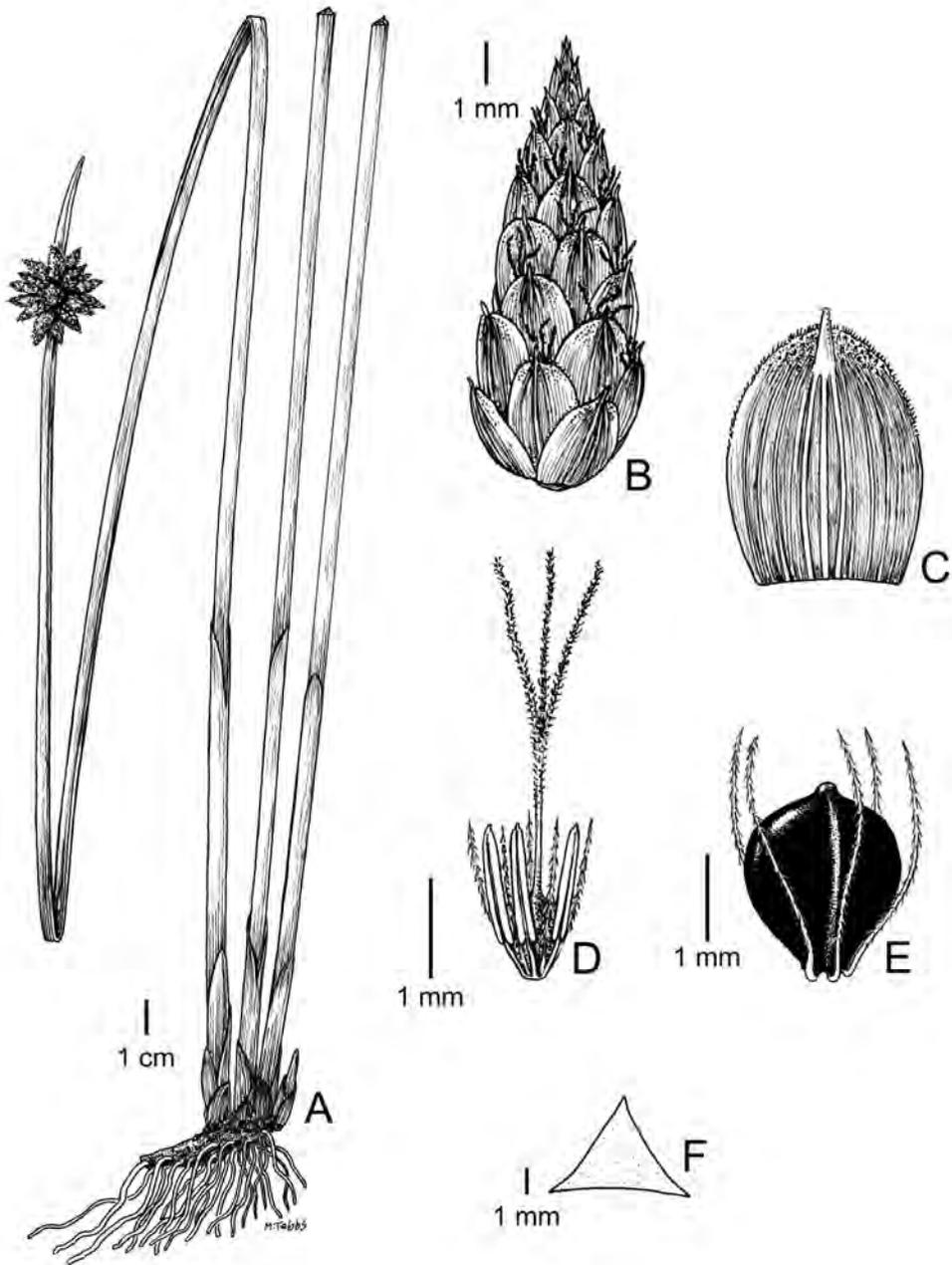


Figure 45. *Schoenoplectiella mucronata* (L.) J. Jung & H.K. Choi. **A.** Habit. **B.** Spikelet. **C.** Glume. **D.** Flower. **E.** Nutlet. **F.** Cross-section of culm. (From Peninsular Malaysia, *Simpson 89/43*. Drawn by M. Tebbs).

H.K.Choi, J. Pl. Biol. 53 (2010) 230. **Type:** *Wallich s.n.* [EIC 3467], Bangladesh, Chittagong (lectotype CAL designated by Jung & Choi, J. Pl. Biol. 53 (2010) 230).

Scirpus mucronatus L. var. *robustus* Miq., Ann. Mus. Bot. Lugduno-Batavi 2, fasc. 5 (1865) 143. **Synonyms:** *Scirpus mucronatus* L. subsp. *robustus* (Miq.) T.Koyama, Quart. J. Taiwan Mus. 14 (1961) 194. – *Schoenoplectus mucronatus* (L.) Palla var. *robustus* (Miq.) T.Koyama, Makinoa, new ser., 7 (2008 [‘2007’]) 59. **Type:** *Ito s.n.*, Japan (lectotype L [L0104658], designated here).

Perennial. **Rhizome** short, horizontal, sometimes slightly elongate with culms arranged in a row. **Culms** erect, 25–100 cm long, 4–9 mm wide, triquetrous, smooth, sides concave. **Leaf sheaths** 7–20 cm long, acute or rounded, mucronate, septate-nodulose below. **Involucral bract** 1, erect or patent, later deflexed, triquetrous, 2.5–6 cm long, blunt-pointed. **Inflorescence** pseudolateral, capitate, with (1–)2–10 spikelets. **Spikelets** sessile, ovate or oblong, 6–20 × 3–6 mm, terete or obscurely angular, pale yellowish-brown. **Glumes** oval or ovate-orbicular, 2.8–4 × 2–3 mm, apex obtuse, subulate-mucronulate, minutely ciliolate along upper margin, many-nerved, pale brown or reddish-brown. **Perianth segments** 6, needle-like, slightly shorter or equalling nutlet. **Stamens** 3. **Stigmas** 3. **Nutlets** broadly ovate, compressed-triangular, 1.8–2.2 × 1.5–1.8 mm, shiny black-brown, transversely wrinkled.

Distribution. Eastern and southern Europe to Australia. Native in Singapore but no recent records. Previously recorded from Ang Mo Kio (*Ridley s.n.*, 1889, SING [SING0005232]), MacRitchie, Rochor (*Ridley 1210*, 5 May 1890, SING [SING0005231]), Sungei Buloh and Thomson Road (*Murton 127*, Dec 1877, SING [SING0005233]; *Hullett 239*, Dec 1886, SING [SING0005234]).

Ecology. Across its range in swamps, ditches, rice fields and other open wet places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Used in parts of Southeast Asia for weaving and production of cord and string. Occasionally cultivated.

Vernacular name. *Bog bulrush* (English).

16. SCHOENUS L.

(Greek, *schoinos* = rush, reed, rope; referring to the rush-like appearance)

Bog-rush (English)

Sp. Pl. 1 (1753) 42; Clarke in Hooker, Fl. Brit. India 6, fasc. 19 (1893) 672; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 85; Ridley, Fl. Malay Penins. 5 (1925) 165; Kern, Fl. Males., ser. 1, 7(3) (1974) 672; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 175; Simpson & Koyama, Fl. Thailand 6(4) (1998) 420; Liang et al., Fl. China 23 (2010) 256. **Type:** *Schoenus nigricans* L.

Annuals or perennials. **Rhizome** sometimes creeping or woody. **Culms** erect or with ascending base rooting at nodes. **Leaves** basal and cauline, rarely reduced to bladeless sheaths; ligule

0. **Involucral** bracts leaf-like or glume-like. **Inflorescence** panicle-like, rarely capitate or reduced to a single spikelet. **Spikelets** usually lanceolate to oblong-lanceolate, flattened (in Singapore species), several-glumed, few-flowered. **Glumes** distichous, caducous, 1-nerved, keel acute, lower several glumes empty. **Flowers** usually bisexual, the uppermost one often not producing mature nutlets or male. **Perianth segments** 0–6. **Stamens** (1–)3(–6). **Stigmas** (2–)3; style continuous with ovary. **Nutlets** trigonous.

Distribution. A genus of 133 species, mostly in Australia and Southeast Asia with a few species in Europe and the Americas. In Singapore 1 native species.

Ecology. Grasslands and savannah forest, often in seasonally dry habitats.

Taxonomy. *Schoenus* is fairly well characterised as a genus by having distichous glumes and the presence of perianth segments (absent in *Cyperus* which also has distichous glumes).

***Schoenus calostachyus* (R.Br.) Poir.**

(Greek, *calo-* = beautiful, *-stachyus* = spike; referring to the appearance of the inflorescence)

in Lamarck, Encycl., Suppl. 2, fasc. 1 (1811) 251; Roemer & Schultes, Syst. Veg., ed. 15 bis 2: (1817) 77; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 673; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 85; Ridley, Fl. Malay Penins. 5 (1925) 166; Kern, Fl. Males., ser. 1, 7(3) (1974) 675; Turner, Gard. Bull. Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 530; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 138, fig. 246; Simpson & Koyama, Fl. Thailand 6(4) (1998) 420; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 273; Liang et al., Fl. China 23 (2010) 256. **Basionym:** *Chaetospora calostachya* R.Br., Prodr. Fl. Nov. Holland. (1810) 233. **Type:** *Banks & Solander s.n.*, Australia, Queensland, Endeavour River, 1770 (lectotype BM [BM000900960], designated here by K.L. Wilson). **Fig. 46.**

Perennial. **Rhizome** short, woody. **Culms** 30–80 cm long, 1–2 mm diam., subterete, smooth, glabrous. **Leaves** mostly basal, distichous, 1–3-cauline; blade narrowly linear, up to 30 cm long, 1.5–2 mm wide, apex abruptly acute, folded, glaucous; basal sheath up to 6 mm long, reddish to dark purple brown, cauline sheath up to 3 cm long. **Involucral bracts** several, leaf-like, lowest bract 1–4 cm long. **Inflorescence** panicle-like 20–50 cm long, with 2–5 nodes, each subtending 1–2(–3) pedunculate spikelets; peduncles 2–12 cm long. **Spikelets** lanceolate or oblong-lanceolate, 20–25 × 3–5 mm, apex acute, 9–14-glumed, 3–5-flowered. **Glumes** lanceolate, 1.5–2 cm long, 3–4 mm wide, apex acute, sides chartaceous, mid-brown, keel acute, the lower 4–9 glumes empty, becoming shorter. **Perianth segments** 4–6, shorter than nutlet. **Stamens** 3; anthers 7–8 mm long. **Stigmas** 3. **Nutlets** broadly ovoid to ovoid, trigonous, 3–3.5 × 1.5 mm, maturing blackish-brown, irregularly transversely wrinkled.

Distribution. Southeastern China to Thailand, Vietnam and eastern Australia. Native in Singapore but no recent records. Previously recorded only once from an unknown locality (*Ridley 1724*, Oct 1890, SING [SING0005223]).

Ecology. Grasslands and savannah forest, growing on podsolic sands and in heath forest.

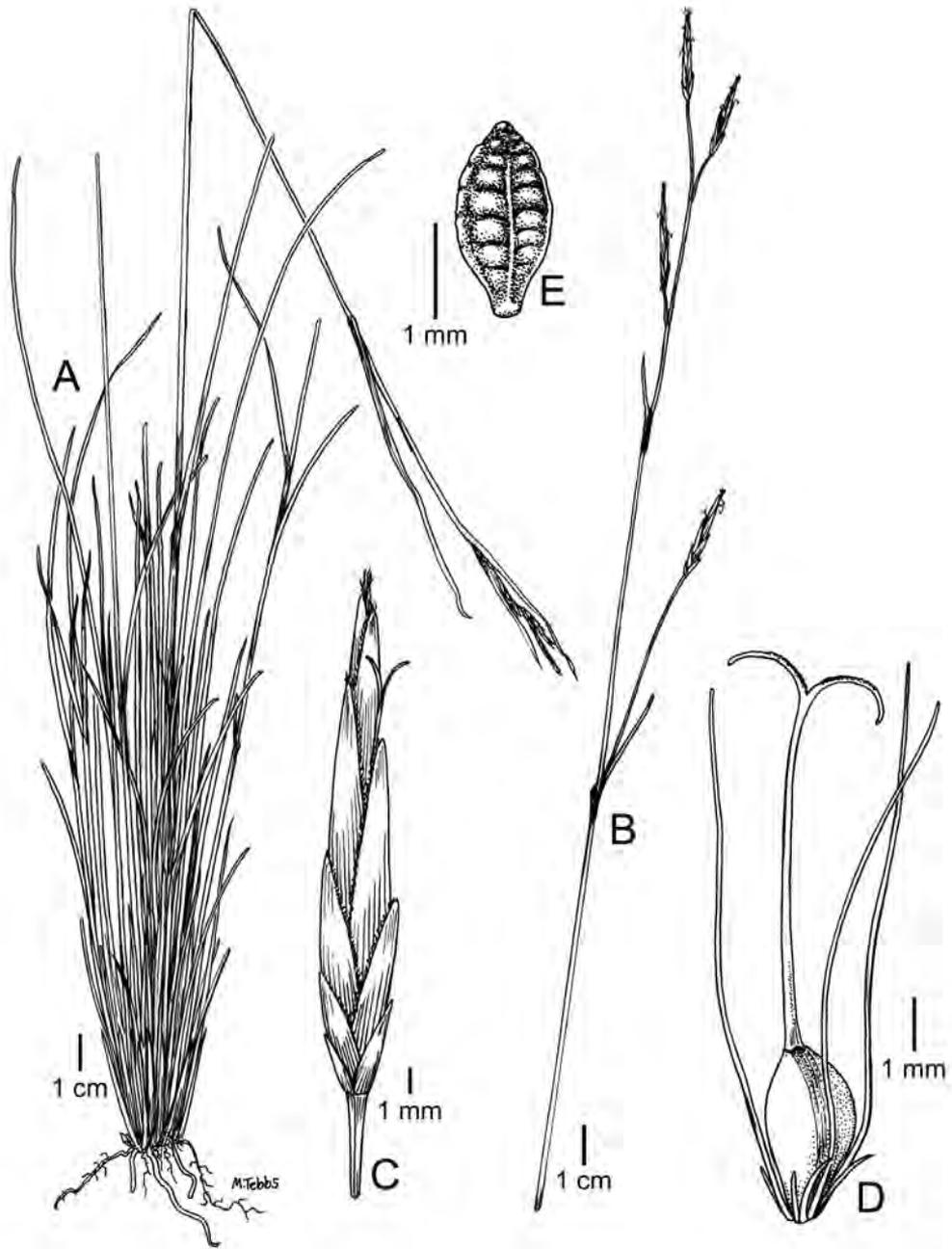


Figure 46. *Schoenus calostachyus* (R.Br.) Poir. **A.** Base of plant and leaves. **B.** Inflorescence. **C.** Spikelet. **D.** Flower. **E.** Nutlet. (A from Thailand, *Larsen et al.* 32437; B–E from Thailand, *Pooma et al.* 5578. Drawn by M. Tebbis).

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

17. SCIRPODENDRON Zipp. ex Kurz

(Greek, *scirpo-* = rush-like plant, *-dendron* = tree;
referring to the robust habit and woody rhizome)

J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 38 (1869) 84; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 684; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 106; Ridley, Fl. Malay Penins. 5 (1925) 174; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1980; Kern, Fl. Males., ser. 1, 7(3) (1974) 456; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 159; Simpson & Koyama, Fl. Thailand 6(4) (1998) 256. **Type:** *Scirpodendron costatum* Kurz. (= *Scirpodendron ghaeri* (Gaertn.) Merr.).

Robust to very robust, rhizomatous perennials; rhizome woody, roots coarse. **Culms** solitary, central. **Leaves** basal, 3-ranked; blade linear; ligule 0. **Involucral bracts** leaf-like at base of inflorescence, shorter ovate-lanceolate above. **Inflorescence** a terminal, narrow, compound panicle, more or less branched below, spike-like above. **Spikes** densely packed, comprising many spirally imbricate glume-like bracts (**spicoid bracts**) each subtending a partial inflorescence with a much-reduced axis (**spicoid**). **Spicoid** comprising a naked, terminal female flower and (2–)8–12, hyaline, scale-like floral bracts, each subtending a monandrous male flower, the lowest pair of floral bracts keeled and opposite. **Stigmas** 3. **Nutlets** rhombic-ovoid, fleshy at first, later corky.

Distribution. A genus of 2 species, Sri Lanka to Australia and Polynesia. In Singapore 1 native species.

Ecology. Coastal swamp forest, in freshwater areas or in transitional forest behind mangroves.

Uses. Has various uses throughout its range, including basketry, matting and thatching. In Samoa, the nutlets are sometimes eaten.

Taxonomy. *Scirpodendron* is nested in subfamily Mapanioideae, tribe Hypolytreae and is closely related to *Hypolytrum* and *Mapania*. It has the largest nutlets of any member of Cyperaceae. Some authors (e.g. Holttum, Bot. Rev. (Lancaster) 14 (1948) 525–541) considered it to be the most ‘archaic’ extant member of Cyperaceae. However, molecular phylogenetics suggest this not the case, as it has *Mapania*-type pollen that is thought to have evolved late in the evolutionary history of Mapanioideae (Simpson et al., Amer. J. Bot. 90 (2003) 1071–1087).

Scirpodendron ghaeri (Gaertn.) Merr.

(origin uncertain but possibly derived from a Sri Lankan vernacular name)

Philipp. J. Sci., C 9 (1914) 268; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1980; Henderson, Malay. Wild Fls., Monocot. (1954) 248; Kern, Fl. Males., ser. 1, 7(3) (1974) 456; Turner, Gard. Bull.

Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 530; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 139; Simpson & Koyama, Fl. Thailand 6(4) (1998) 256; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 221; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 198. **Basionym:** *Chionanthus ghaeri* Gaertn., Fruct. Sem. Pl. 1 (1788) 190, t. 39. **Type:** [Published illustration] *Chionanthus ghaeri* Gaertn., Fruct. Sem. Pl. 1 (1788) t. 39 (lectotype designated here). **Fig. 47.**

Hypolytrum costatum Thwaites, Enum. Pl. Zeyl., fasc. 5 (1864) 346, nom. illeg. non Hochst. ex Steud. (1855). **Synonym:** *Scirpodendron costatum* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 38 (1869) 85, nom. illeg.; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 684; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 106; Ridley, Fl. Malay Penins. 5 (1925) 175. **Type:** *Thwaites CP3222*, Sri Lanka, Central Province (holotype PDA, n.v.).

Rhizomatous. **Rhizome** horizontal to obliquely ascending. **Culm** 25–300 cm long, 20–40 mm wide, trigonous, glabrous. **Leaves** basal; blade linear, 110–230 cm long, 20–50 mm wide, apex gradually narrowed, 3-nerved, margins serrulate-scabrous; sheath 8–18 cm long, tinged with yellow or dark brown. **Involucral bracts** linear to ovate-lanceolate, basal bract longest, up to 90 cm long. **Inflorescence** densely paniculate, ovoid to ovoid-cylindric, becoming ellipsoid in nutlet, 6.5–14 × 3–5 cm. **Spikes** ovoid to ellipsoid, 1–2 cm long, 5–9 mm wide, greenish to mid-brown. **Spicoid bracts** ovate, 6–8 × 3–4 mm, acute. **Spicoids** ± equalling the spicoid bracts. **Floral bracts** 10, lowest 2 keeled, c. 10 mm long, keel hispidulous. **Nutlets** 8–16 × 6–11 mm, apex conical, base obtuse, fleshy to corky, with 6–10 deep longitudinal ridges.

Distribution. Sri Lanka and India to northern Australia and western Pacific islands. Native in Singapore but no recent records. Previously recorded from Bukit Mandai (*Ridley s.n.*, 1890, SING [SING0005227]), Changi (*Ridley 3939*, 1890, SING [SING0005226]), Seletar (*Ridley s.n.*, 1894, SING [SING0005228]) and Sungei Perupok (*Sinclair SFN39242*, 19 May 1951, SING [SING0005224]).

Ecology. Coastal swamp forest, in freshwater areas or in transitional forest behind mangroves.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Used in various parts of Southeast Asia for thatching and weaving.

Vernacular names. *Giant sedge* (English), *selinsing* (Malay).

18. SCLERIA P.J.Bergius

(Greek, *scleros* = hard; referring to the hard, bony pericarp of the nutlet)

Kongl. Vetensk. Acad. Handl. 26 (1765) 142; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 685; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 107; Ridley, Fl. Malay Penins. 5 (1925) 175; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1981; Kern, Blumea 11(1) (1961) 150; Kern, Fl. Males., ser. 1, 7(3) (1974) 722; Goetghebeur in Kubitzki et al. (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 184; Simpson & Koyama, Fl. Thailand 6(4) (1998) 426; Zhang et al., Fl. China 23 (2010) 260. **Type:** *Scleria flagellum-nigrorum* P.J.Bergius, lectotype designated by Britton, Bull. Dept. Agric. Jamaica 5, Suppl. 1 (1907) 17.

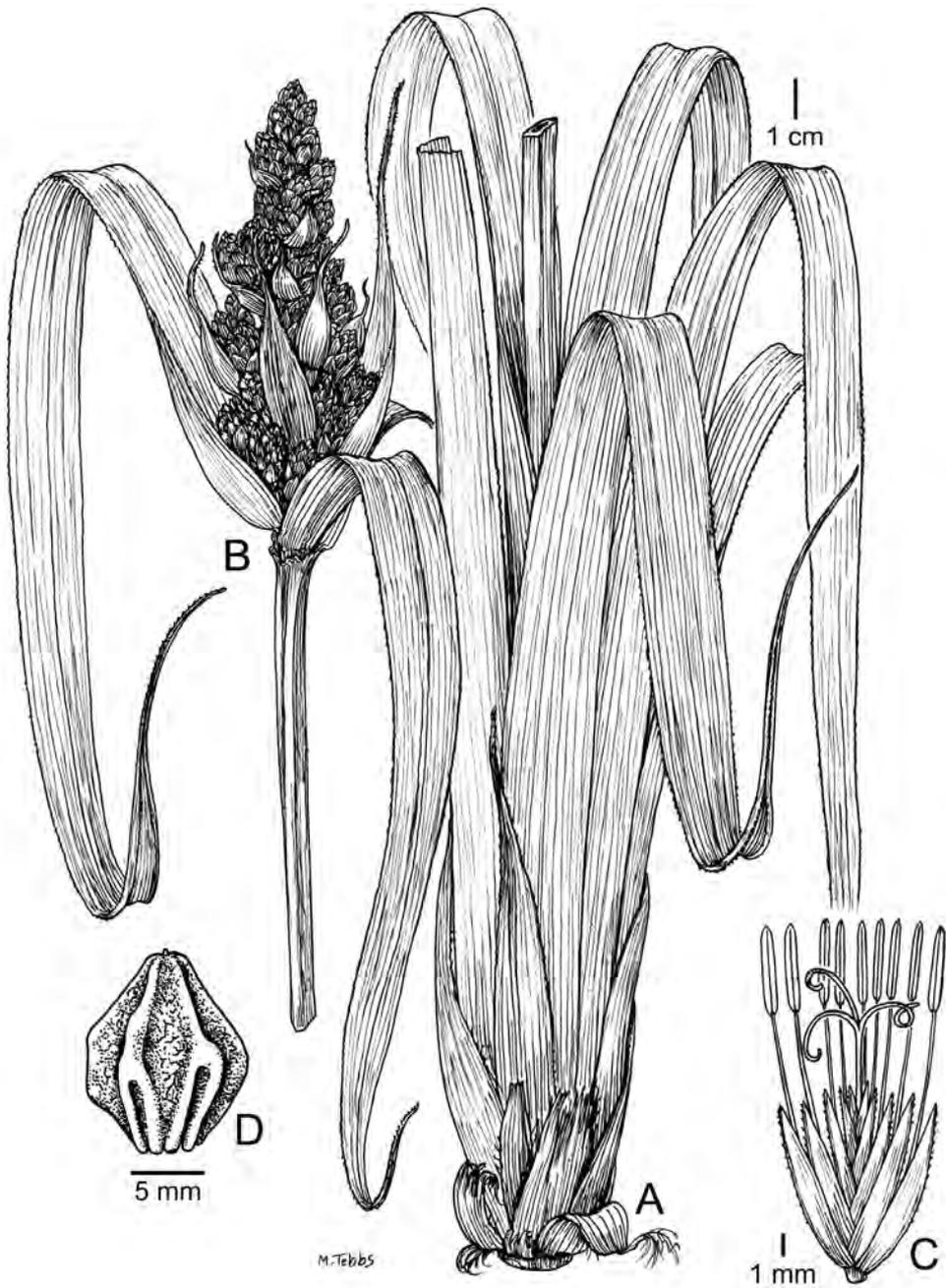


Figure 47. *Scirpodendron ghaeri* (Gaertn.) Merr. **A.** Base of plant and leaves. **B.** Inflorescence. **C.** Spicoid. **D.** Nutlet. (A–C from Papua New Guinea, *Stevens & Lelean LAE58624*; D from Indonesia, Kalimantan, *Kostermans 21667*. Drawn by M. Tebbs).

Hypoporum Nees, Edinburgh New Phil. J. 17 (1834) 266. **Type:** *Hypoporum pergracile* Nees, lectotype designated by Kern, Blumea 11(1) (1961) 196 (= *Scleria pergracilis* (Nees) Kunth).

Annuals or perennials. **Rhizome** usually woody, knotted. **Culms** solitary or tufted, usually erect, sometimes climbing or scrambling. **Leaves** basal and/or cauline, the latter sometimes apparently in whorls; blade mostly linear; sheath closed, often 3-winged; ligule 0; contraligule usually present. **Inflorescence** usually paniculate, bearing a terminal and 0–several lateral partial inflorescences, occasionally reduced and spike-like or capitate. **Spikelets** unisexual or bisexual; bisexual spikelets with terminal female flower and 1–several lateral male ones; female spikelets with a single female flower and 1–several lateral glumes (reduced male flowers); male spikelets with several to many glumes. **Glumes** spirally arranged or distichous. **Flowers** unisexual. **Perianth segments** 0. **Stamens** 1–3 per male flower. **Stigmas** 3; style continuous with the ovary, caducous. **Nutlets** terete or subtrigonal, mostly globose, ovoid or subpyramidal, with bony pericarp and a stipe-like, 3-lobed or cup-like, rarely indistinct disk attached at the base.

Distribution. A genus of 252 species in tropical and subtropical regions of both hemispheres, with the highest number of species in tropical America. In Singapore 10 native species.

Ecology. Occurs in a wide variety of damp or wet habitats, mostly at low altitudes.

Taxonomy. *Scleria* is well circumscribed by having nutlets with a hard, bony pericarp and a lobed, cup-like or indistinct disk at the base of the nutlet. It forms a monophyletic group circumscribed as tribe Sclerieae, the sister to Bisboeckelereae which includes *Diplacrum*.

Key to *Scleria* species

Note: Nutlets are essential for accurate identification.

1. Nutlet-bearing spikelets bisexual; disk at base of nutlets not well developed, indistinct ..
..... **3. *S. corymbosa***
Nutlet-bearing spikelets usually female; disk at base of nutlet well developed, lobed or
cup-like 2
2. Annuals, underground rhizomes absent 3
Perennials, underground rhizomes present 4
3. Nutlets up to 1.8 mm long; disk at base of nutlet shallowly lobed **8. *S. rugosa***
Nutlets over 1.8 mm long; disk at base of nutlet deeply lobed **1. *S. biflora***
4. Leaves on mid-section of culm apparently in whorls of 2–5 5
Leaves never in whorls 6
5. Disk at base of nutlet cup-like, often bright red, completely covering lower half of nutlet
..... **9. *S. sumatrensis***
Disk at base of nutlet 3-lobed **7. *S. purpurascens***

6. Lowest involucre bract setaceous, less than 3 cm long; spikelets rather distant, all solitary **6. *S. poiformis***
 Lowest involucre bract leaf-like, 3 cm or more long; spikelets crowded, at least some in clusters of 2–3 7
7. Disk-lobes acute at apex **4. *S. levis***
 Disk-lobes obtuse, rounded to ± emarginate at apex 8
8. Widest leaves mostly up to 6 mm wide; at least some nutlets distinctly flattened at apex ...
 **5. *S. oblata***
 Widest leaves mostly over 6 mm wide; nutlets rounded at apex 9
9. Contraligule oblong-lanceolate, 10 mm or more long; bracteoles prominent, stiff
 **2. *S. ciliaris***
 Contraligule crescent-shaped or depressed-rounded, less than 10 mm long; bracteoles indistinct **10. *S. terrestris***

1. *Scleria biflora* Roxb.

(Latin, *bi-* = two, *-flora* = flowers; referring to the spikelets often occurring in pairs)

Fl. Ind., ed. 2, 3 (1832) 573; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 687; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 114; Ridley, Fl. Malay Penins. 5 (1925) 180; Kern, Fl. Males., ser. 1, 7(3) (1974) 743; Turner, Gard. Bull. Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 530; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 140; Simpson & Koyama, Fl. Thailand 6(4) (1998) 443; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 273; Zhang et al., Fl. China 23 (2010) 264. **Type:** *Roxburgh s.n.*, India (lectotype BM [BM000884995], designated by Dey & Prasanna, Candollea 62(1) (2007) 54.

Scleria ferruginea Ohwi, Acta Phytotax. Geobot. 7 (1938) 37. **Synonym:** *Scleria biflora* Roxb. subsp. *ferruginea* (Ohwi) J. Kern, Reinwardtia 6(1) (1961) 76; Kern, Blumea 11(1) (1961) 199; Kern, Fl. Males., ser. 1, 7(3) (1974) 744. **Type:** *Koidzumi s.n.*, Japan, Riu Kiu Islands, Iriomote (holotype KYO).

Annual. **Culms** loosely tufted, 25–60 cm long, 1–2 mm wide, triquetrous, smooth. **Leaves** cauline; blade linear, 4–23 cm long, 3–5(–8) mm wide, apex ± obtuse, flattish; sheath 3–5 cm long, narrowly winged; contraligule depressed-rounded, margin ciliate. **Lowest involucre bract** leaf-like, up to 15 cm long. **Inflorescence** paniculate, up to 20 cm long; nodes 2–4, distant, each subtending 1–2 partial inflorescences; partial inflorescences sessile to pedunculate, ± simple, oblong-elliptic, 2–4 cm long; bracteoles setaceous, rather prominent. **Spikelets** unisexual, solitary or in pairs; female spikelets broadly obovoid, 4–4.5 mm long; male spikelets lanceolate, 2–4 mm long, peduncle 1–2 mm long. **Glumes** ovate, 3–4 mm long, apex acute, sides membranous, pale green to rusty brown, keel green. **Stamens** 2–3. **Nutlets** globose or somewhat depressed-globose, 1.8–2 × 1.8–2 mm, apex rounded to shortly beaked, white, finely trabeculate with regular longitudinal rows of square pits, pubescent on ridges between pit rows, beak dark brown or purplish-brown; disk deeply 3-lobed; lobes ovate-lanceolate, up to 1/2 as long as nutlet, with deep pit at sinus between lobes.

Distribution. Tropical and subtropical Asia. Native in Singapore but no recent records. Previously recorded from Bukit Timah (*Ridley s.n.*, 1891, SING [SING0010007]; *Ridley 8452*, 1897, SING [SING0010006]), Changi (*Ridley s.n.*, Nov 1890, SING [SING0005881]) and Singapore Botanic Gardens (*Ridley s.n.*, Feb 1889, SING [SING0005882]).

Ecology. Open, wet grasslands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Young shoots eaten as a vegetable in Java.

2. *Scleria ciliaris* Nees

(Latin, *ciliaris* = ciliate; referring to the ciliate hairs on the margins of the bracteoles)

in Wight, Contr. Bot. India (1834) 117; Kern, Blumea 11(1) (1961) 174; Kern, Fl. Males., ser. 1, 7(3) (1974) 734; Turner, Gard. Bull. Singapore 45 (1993) 68; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 530; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 141, fig. 249; Simpson & Koyama, Fl. Thailand 6(4) (1998) 435; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 230; Zhang et al., Fl. China 23 (2010) 265. **Synonym:** *Scleria chinensis* Kunth, Enum. Pl. 2 (1837) 357, nom. illeg. superfl.; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 690; Ridley, Fl. Malay Penins. 5 (1925) 180. **Type:** *Vachell s.n.*, China, Macao (lectotype CGE, designated here; isolectotype K [K000960237]). **Fig. 48, 49.**

Scleria bancana Miq., Fl. Ned. Ind., Eerste Bijv., fasc. 3 (1861) 602; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 112; Ridley, Fl. Malay Penins. 5 (1925) 178; Henderson, Malay. Wild Fls., Monocot. (1954) 289. **Type:** *Kurz s.n.*, [Indonesia], Sumatra, Bangka, circa Muntok (lectotype U [U0001560], designated by Kern, Blumea 11(1) (1961) 173).

Scleria bancana Miq. var. *nana* Ridl., J. Straits Branch Roy. Asiat. Soc. 59 (1911) 225; Ridley, Fl. Malay Penins. 5 (1925) 178. **Type:** *Ridley 14804*, Thailand, Setul (Satun), March 1910 (lectotype SING [SING0064530]; isolectotype K [K000291155], designated here).

Rhizomatous perennial. **Culms** (40–)70–130(–200) cm long, 2.5–6 mm wide, triquetrous, smooth to scabrid. **Leaves** cauline; blade linear, up to 42 cm long, (6–)7–15 mm wide, apex subobtuse, flattish; sheath 4–8 cm long, narrowly to broadly winged; contraligule oblong-lanceolate, 10–15 mm long. **Lowest involucre bract** leaf-like, up to 20 cm long. **Inflorescence** paniculate but often appearing spike-like, 7–60 × 3–13 cm; nodes 2–3, close or rarely distant, each subtending a single partial inflorescence; partial inflorescence shortly pedunculate, ovoid-lanceolate, compound, 5–15 cm long; bracteoles prominent, stiff, with ciliate hairs on margins. **Spikelets** unisexual, in clusters of 2–3; female spikelets ovoid, 4–5 mm long; male spikelets lanceolate, 3.5–4 mm long. **Glumes** ovate to lanceolate, 3–5 mm long, apex acuminate, sides membranous, pale brown to mid-reddish-brown. **Stamens** 3. **Nutlets** ovoid-globose to ± depressed-ovoid, obscurely trigonous, 2–2.3 × 2.3–2.5 mm, apex rounded, shiny white or slightly purplish-grey, reticulate or undulate-rugose, usually glabrous; disk 3-lobed, lobes acute, obtuse.

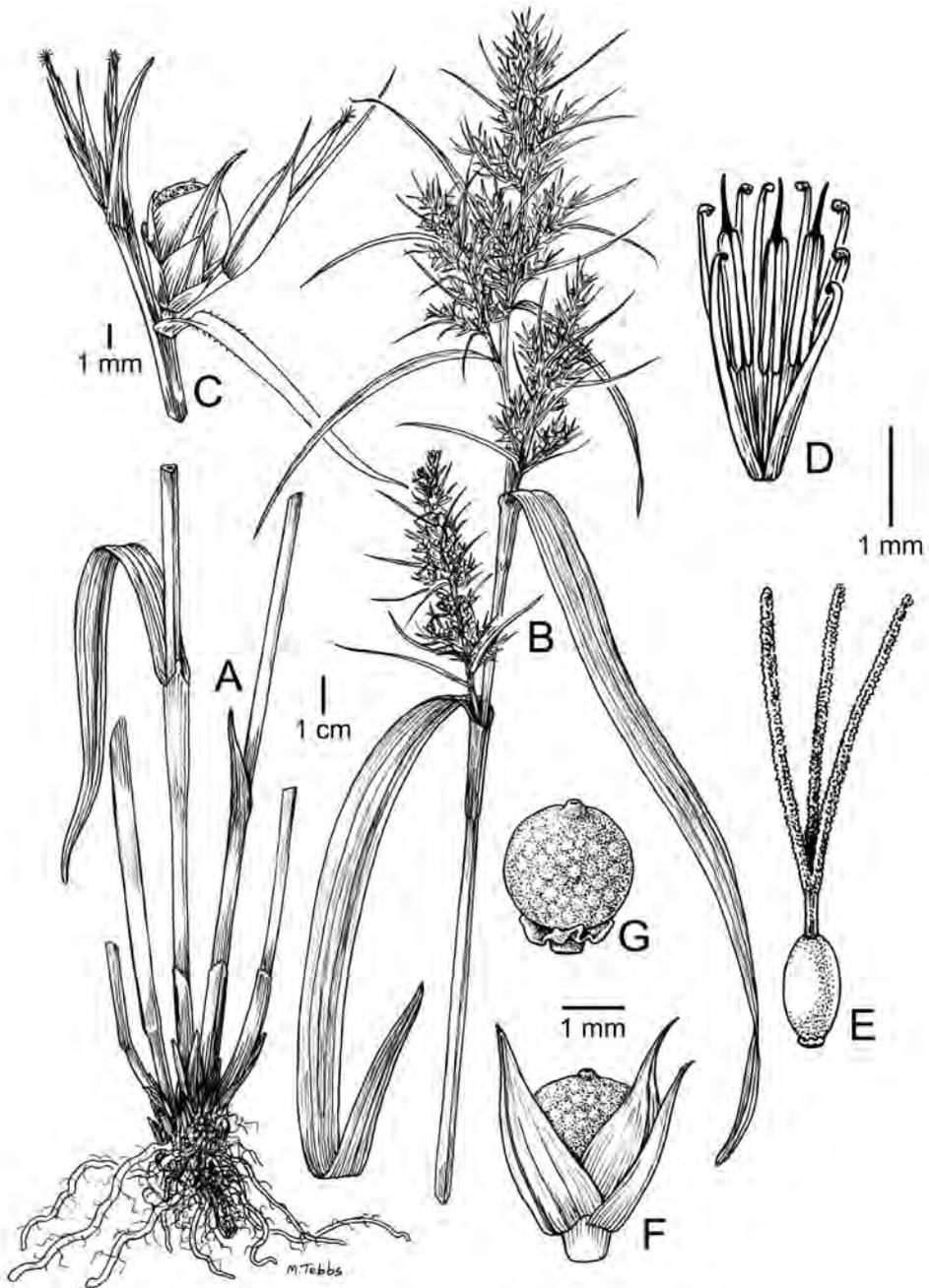


Figure 48. *Scleria ciliaris* Nees. **A.** Base of plant. **B.** Inflorescence. **C.** Spikelets. **D.** Male flower. **E.** Female flower. **F.** Female spikelet with maturing nutlet. **G.** Nutlet. (A–E from Peninsular Malaysia, Simpson 89/2; F, G from Peninsular Malaysia, Poore 322. Drawn by M. Tebbis).



Figure 49. *Scleria ciliaris* Nees. **A.** Inflorescence. **B.** Detail of inflorescence showing spikelets. **C.** Apex of leaf sheaths showing contraligule. (From Singapore, Nee Soon, *Ho et al. SING2017-686*. Photos: L.M.J. Chen).

Distribution. Tropical and subtropical Asia to the Caroline Islands. Native in Singapore and recorded from Nee Soon, Pasir Laba Camp (*Gwee et al. SING2007-456*, 14 Aug 2007, SING [SING0093682]), Pulau Tekong, Pulau Ubin (*Teo SING2012-206*, 18 Apr 2012, SING [SING0174124]), Sarimbun (*Gwee SING2007-595*, 23 Oct 2007, SING [SING0097209]), Tampines Avenue 8 (*Duistermaat et al. HDS365*, 10 May 2005, SING [SING0080182]), the Western Catchment and other localities. Previously also recorded from Bukit Timah, Bukit Mandai, Holland Road (*Ridley s.n.*, 1899, SING [SING0059720]), Lazarus Island, St. John's Island and other localities.

Ecology. Forest floors and savannah grasslands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

3. *Scleria corymbosa* Roxb.

(Latin, *corymbosus* = with flowers arranged in corymbs;
referring to the corymbiform partial inflorescences)

Fl. Ind., ed. 2, 3 (1832) 574; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 686; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 109; Ridley, Fl. Malay Penins. 5 (1925) 176; Kern, Blumea 11(1) (1961) 189; Kern, Fl. Males., ser. 1, 7(3) (1974) 740; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 530; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 142; Simpson & Koyama, Fl. Thailand 6(4) (1998) 430; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 221; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 198; Zhang et al., Fl. China 23 (2010) 263. **Type:** *Roxburgh s.n.* [sp. no. 179], India (lectotype BM [BM000833637], designated here).

Scleria ridleyi C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 686; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 109; Ridley, Fl. Malay Penins. 5 (1925) 177. **Type:** *Ridley 1641*, ‘Singapore’ [but presumably Indonesia], Pulau Buru, May 1890 (holotype K [K000291160]; isotype SING [SING0064537]).

Rhizomatous perennial; rhizome woody, horizontal. **Culm** solitary, 90–200 cm long, 5–20 mm wide, triquetrous, smooth. **Leaves** cauline; blade broadly linear, 30–70 cm long, 6–25 mm wide, apex abruptly acute to subobtuse, flat; sheath 6–15 cm long, green to brown; contraligule depressed-deltoid, brown. **Involucral bracts** leaf-like, the longest up to 47 cm long. **Inflorescence** paniculate, 35–80 cm long; nodes 3–5, each subtending 2–3 long-pedunculate, corymbiform partial inflorescences. **Spikelets** bisexual and male, intermingled, solitary or in groups of 2–5; bisexual spikelets ovoid, 4–5 mm long, with a male spikelet in axil of the uppermost glume; male spikelets ovate-lanceolate, 4–4.5 mm long. **Glumes** broadly ovate, 3.5–4 mm long, apex acute, mucronate, sides dark chestnut brown, glabrous. **Stamens** 3. **Nutlets** ovoid, trigonous, 3–3.5 × 2–2.5 mm, apex ± acute, base with 3 shallow depressions, shiny white, smooth, glabrous; disk triangular, adnate to base of nutlet.

Distribution. Southern China to tropical Asia. Native in Singapore but no recent records. Previously recorded from Bukit Timah (*Mhd Nur s.n.*, 24 Aug 1932, SING [SING0010012]),

Changi (*Ridley 2131*, 28 May 1891, SING [SING0010009]; *Ridley 2131*, 1894, SING [SING0010011]) and Pulau Ubin.

Ecology. Wet or swampy forest floors, less frequently in open wet grassy places.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

4. *Scleria levis* Retz.

(Latin, *levis* = smooth; referring to the smoothish nutlet pericarp)

Observ. Bot. 4 (1786–1787) 13; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1982, as '*laevis*'; Kern, Blumea 11(1) (1961) 164; Kern, Fl. Males., ser. 1, 7(3) (1974) 732; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 531; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 142, fig. 250; Simpson & Koyama, Fl. Thailand 6(4) (1998) 433; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 273; Zhang et al., Fl. China 23 (2010) 266. **Type:** *Retzius s.n.*, India (holotype LD [LD1277738]). **Fig. 50.**

Scleria hebecarpa Nees in Wight, Contr. Bot. India (1834) 117; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 689; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 113; Ridley, Fl. Malay Penins. 5 (1925) 179. **Type:** *Macrae s.n.*, Sri Lanka (lectotype CGE, designated here).

Rhizomatous perennial; rhizome woody, creeping. **Culms** 30–90 cm long, 1–3 mm wide, triquetrous, glabrous to puberulent. **Leaves** cauline; blade linear, 18–35 cm long, 2–8(–12) mm wide, apex gradually narrowed, acute, flat; sheath 5–8 cm long, winged, green to reddish or purplish-brown; contraligule shallowly rounded, pubescent. **Lowest involucreal bract** leaf-like, up to 13 cm long, upper bracts and bracteoles prominent, setaceous. **Inflorescence** paniculate, open to compact, sometimes appearing head-like, 5–13 × 1.5–2.5 cm; nodes 3–4, each subtending a single partial inflorescence; partial inflorescence sessile or shortly pedunculate, ovate-lanceolate, 2–8 cm long. **Spikelets** female and male in groups of 2–4; female spikelets sessile, obovoid, 4–6 mm long; male spikelets pedunculate, oblong-lanceolate, 3–4 mm long. **Glumes** ovate, 2–4 cm long, apex acuminate, sides membranous, mid-brown to chestnut brown. **Stamens** 3. **Nutlets** globose, ± terete, 1.7–2.5 × 1.7–2.5 mm, apex rounded, white, smoothish, pubescent to glabrous; disk 3-lobed, the lobes lanceolate, acute, minutely toothed at apex.

Distribution. Tropical and subtropical Asia to western Pacific islands. Native in Singapore and recorded from MacRitchie (*Leong MR 2014-058*, 14 Oct 2014, SING [SING0213821]), Kent Ridge, Lim Chu Kang, Nee Soon (*Chen SING2017-786*, 19 Dec 2017, SING [SING0266860]), Pulau Ubin, Pulau Tekong, Simpang and other localities. Previously also recorded from Bukit Timah (*Ridley s.n.*, 1901, SING [SING0059972]), Changi (*Ridley 5011*, 1892, SING [SING0059973]), Pulau Ubin (*Ridley s.n.*, 1892, SING [SING0059969]), Singapore Botanic Gardens, Sungei Buloh, Tanglin, Yio Chu Kang (*Ridley s.n.*, 1902, SING [SING0059974]) and other localities.

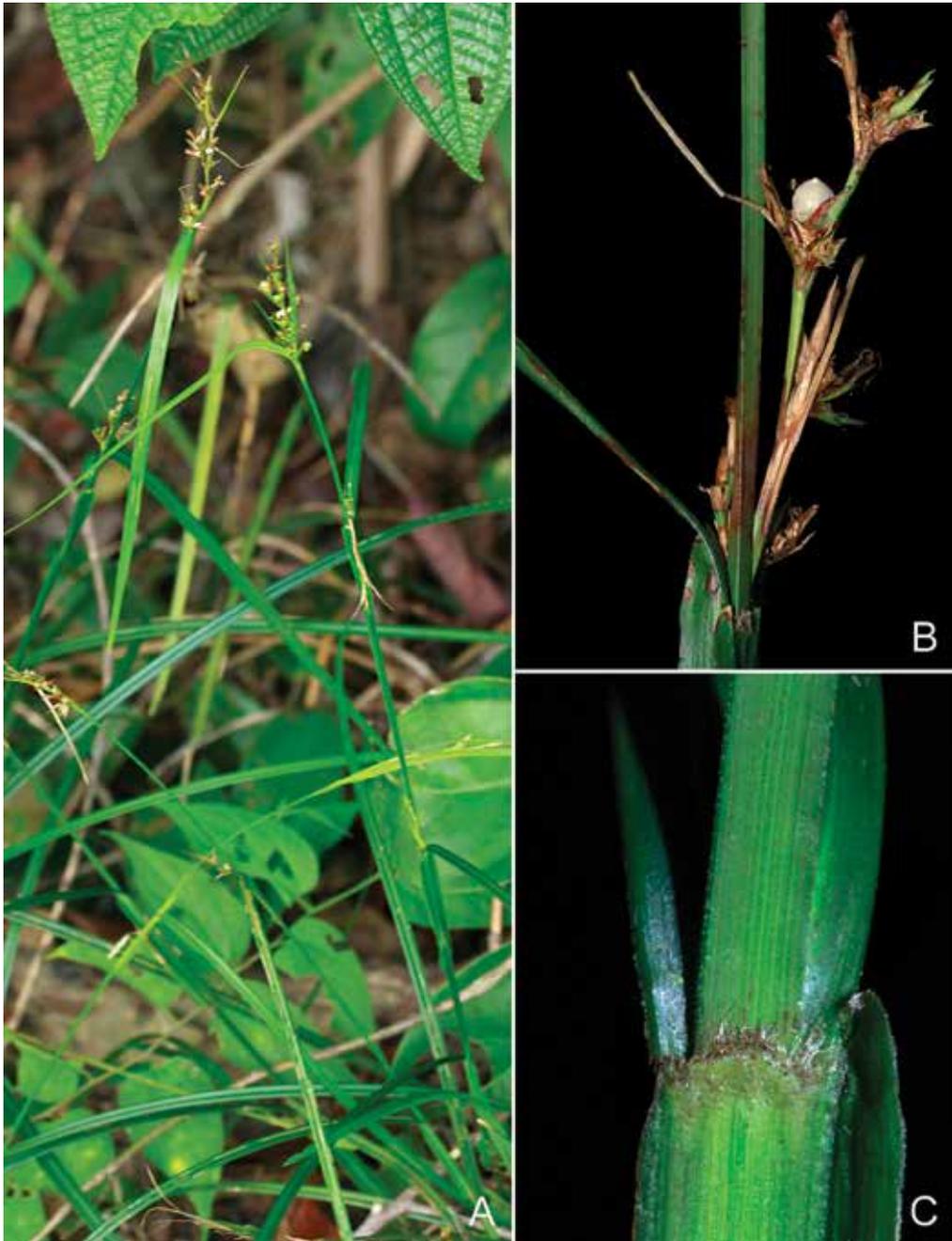


Figure 50. *Scleria levis* Retz. **A.** Habit. **B.** Part of inflorescence showing nutlet. **C.** Apex of leaf sheath. (From Singapore, Nee Soon, *Chen SING2017-786*. Photos: L.M.J. Chen).

Ecology. Savannah grasslands, floors of open forests, and elsewhere at the margins of rice fields.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

5. *Scleria oblata* S.T.Blake ex J.Kern

(Latin, *oblatus* = somewhat flattened at the ends; referring to the shape of the nutlet)

Reinwardtia 6(1) (1961) 73; Kern, Blumea 11(1) (1961) 169; Kern, Fl. Males., ser. 1, 7(3) (1974) 733; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 531; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 142; Simpson & Koyama, Fl. Thailand 6(4) (1998) 435; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 273; Zhang et al., Fl. China 23 (2010) 267. **Type:** *Elbert 3078*, [Indonesia], Sulawesi, Sulawesi Tenggara, Rumbia (holotype L [L0042778]). **Fig. 51.**

Scleria levis auct. non Retz.: Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 694; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 111; Ridley, Fl. Malay Penins. 5 (1925) 177; Henderson, Malay. Wild Fls., Monocot. (1954) 289, as ‘*laevis*’.

Rhizomatous perennial. **Culms** 60–120 cm long, 2–3 mm wide, triquetrous, smooth. **Leaves** cauline; blade linear, up to 60 cm long, 4–9 mm wide, apex long-acute, flattish to recurved; sheath 2–7 cm long, wingless, reddish-brown; conraligule depressed-deltoid, ciliate or 0. **Lowest involucreal bract** leaf-like, up to 25 cm long. **Inflorescence** paniculate, 10–22 cm long; nodes 2–5, close or distant, each subtending 1(–2) partial inflorescences; partial inflorescences sessile to shortly pedunculate, lanceolate to ovate, simple to compound, 2–5 cm long, upper ones often overlapping. **Spikelets** unisexual, in groups of 2–3; female spikelets ovoid, 4–4.5 mm long; male spikelets shortly pedunculate, oblong-ovate or oblong-lanceolate, 3.5–4 mm long. **Glumes** ovate-orbicular, 4 mm long, apex acuminate, sides membranous, brown or reddish-brown. **Stamens** 3. **Nutlets** globose or depressed-globose, 2–2.3 × 2.5–2.8 mm, usually rather flattened at apex, shiny dirty white, glabrous, smooth; disk deeply 3-lobed, lobes oval to broadly ovate, obtuse to rounded.

Distribution. Southern China to tropical Asia. Native in Singapore and recorded from Pulau Tekong (*Samsuri PT196*, 6 Dec 2001, SING [SING0039872]), St. John’s Island (*Koh SING2013-106*, 3 Jun 2013, SING [SING0200424]), Sungei Serangoon, Tampines (*Ali Ibrahim SING2013-262*, 27 Oct 2013, SING [SING0201456]) and Tampines Avenue 8 (*Duistermaat et al. HDS368*, 10 May 2005, SING [SING0080184]). Previously also recorded from Changi (*Ridley 5809*, 1892, SING [SING0010014]), MacRitchie and Pulau Ubin.

Ecology. Open wet grasslands, open forests and thickets.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

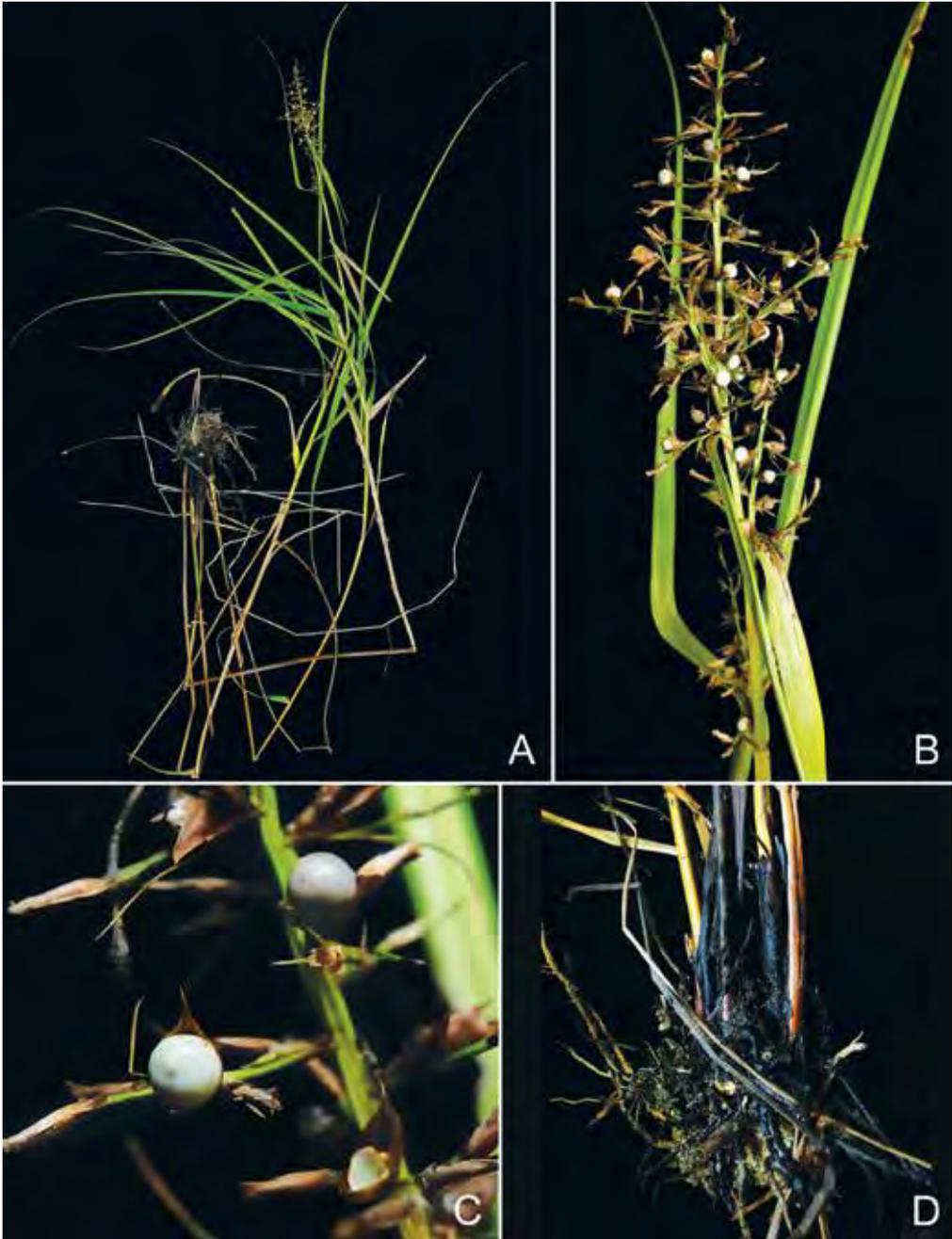


Figure 51. *Scleria oblata* S.T.Blake ex J.Kern. **A.** Whole plant. **B.** Inflorescence. **C.** Detail of inflorescence showing nutlet. **D.** Base of plant. (From Singapore, Tampines, *Niissalo SING2019-193*. Photos: J. Leong-Škorničková).

6. *Scleria poiformis* Retz.

(Latin, *poi-* = pertaining to *Poa* L., *-formis* = form, shape; referring to the overall grass-like appearance of the plant)

Observ. Bot. 4 (1786–1787) 13; Kern, Blumea 11(1) (1961) 178, as '*poaeformis*' Kern, Fl. Males., ser. 1, 7(3) (1974) 736, as '*poaeformis*'; Turner, Gard. Bull. Singapore 45 (1993) 69, as '*poaeformis*'; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 531, as '*poaeformis*'; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 143, as '*poaeformis*'; Simpson & Koyama, Fl. Thailand 6(4) (1998) 439, as '*poaeformis*'; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 230; Zhang et al., Fl. China 23 (2010) 267. **Type:** *König s.n.*, 'India orientalis' (lectotype LD [LD1277678], designated by Fischer, Bull. Misc. Inform. Kew 1932 (1932) 70).

Scleria oryzoides J.Presl & C.Presl in C.Presl, Reliq. Haenk. 1, fasc. 3 (1828) 201; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 691; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 110; Ridley, Fl. Malay Penins. 5 (1925) 177; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1982. **Type:** *Haenke s.n.*, Philippines, Luzon (lectotype PRC [PRC450374], designated here).

Rhizomatous perennial; rhizome woody, creeping. **Culms** solitary 90–180 cm long, 4–6(–13) mm wide, triquetrous, sides slightly concave, smooth. **Leaves** mostly basal, 1–3 cauline; blade linear, up to 120 cm long, 8–25 mm wide, apex subobtuse to acute, flattish or weakly conduplicate; sheath up to 15 cm long, wingless, green to purplish; contraligule 0. **Lowest involucre bracts** setaceous, up to 1.5 cm long. **Inflorescence** paniculate, broadly elliptic to ovate, 8–20 cm long, comprising a dense, often slightly nodding head of several partial inflorescences. **Spikelets** bisexual and unisexual, solitary; bisexual and female spikelets borne towards base of partial inflorescence branches, obovoid, 4–6 mm long; male spikelets many, ovate 4–4.8 mm long. **Glumes** broadly ovate, 4–5 mm long, apex acute, sides membranous, brown. **Stamens** 3. **Nutlets** broadly ovoid to ovoid, indistinctly trigonous to terete, 3–3.2 × 2.5–3 mm, apex rounded, minutely apiculate, shiny white, smooth, glabrous; disk obtusely triangular, emarginate on one side.

Distribution. Tanzania to South Africa, Madagascar, tropical and subtropical Asia to northern Australia. Native in Singapore but recorded only once from Changi (*Ridley* 5888, 1892, SING [SING010018]).

Ecology. Open freshwater swamps and forest swamps, frequently growing in large communities.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore presumed Nationally Extinct.

Uses. Used for weaving and for roofing in some areas of Southeast Asia.

Vernacular name. *Rumput siku dana* (Malay).

7. *Scleria purpurascens* Steud.

(Latin, *purpurascens* = becoming purple; referring to the colour of the nutlet)

Syn. Pl. Glumac. 2, fasc. 8–9 (1855) 169; Kern, Blumea 11(1) (1961) 187; Kern, Fl. Males., ser. 1, 7(3) (1974) 739; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 531; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 143; Simpson & Koyama, Fl. Thailand 6(4) (1998) 440; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 230; Zhang et al., Fl. China 23 (2010) 266. **Type:** *Göring 167*, [Indonesia], Java, 1851 (lectotype P [P00492815], designated here). **Fig. 52.**

Scleria multifoliata Boeckeler, Linnaea 38 (1874) 510; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 693; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 112; Ridley, Fl. Malay Penins. 5 (1925) 178. **Type:** *Helper 6132*, Myanmar (lectotype P [P00079881], designated here; isolectotypes C [C10010682, C10010683, C10010684], L [L0042786], NY [NY00051792]).

Scleria multifoliata Boeckeler var. *pilosula* C.B. Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 693; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 112; Ridley, Fl. Malay Penins. 5 (1925) 179. **Type:** *King’s Collector 1656*, [Malaysia], Penang, April 1881 (lectotype K [K000291158], designated here; isolectotype L, n.v.).

Rhizomatous perennial; rhizome thick, woody. **Culms** 100–200 cm long, 3–7 mm wide, triquetrous, glabrous or pubescent, smooth or scabrous. **Leaves** cauline, appearing to be in whorls of 2–5 at middle of culm; blade linear to broadly linear, 30–60 cm long, 3–15 mm wide, apex long-acuminate, flat; sheaths 3–8 cm, wingless, tinged reddish-purple; contraligule depressed-semicircular, 1.5–2.5 mm high, hirsute-ciliate. **Inflorescence** paniculate, 20–50 cm long; nodes 3–5 each subtending 1–4 partial inflorescences; partial inflorescences pedunculate, ± simple to compound, lanceolate to ovoid-pyramidal, 4–10 cm long. **Spikelets** unisexual, rarely bisexual, in groups of 2–3; female spikelets on basal part of branches, obovoid, 3.5–4 mm long; male spikelets pedunculate, lanceolate, 3–3.5 mm long. **Glumes** ovate or broadly ovate, 2–4 mm long, apex acuminate, sides chartaceous, mid-brown to purplish. **Stamens** 3. **Nutlets** ovoid, ellipsoid or obovoid, 2–2.5 × 1.7–2 mm, apex rounded, whitish- to mid-brown or dark purple, deeply cancellate, pubescent at apex and on ridges; disk deeply 3-lobed, lobes narrowly triangular.

Distribution. Southern China, Myanmar, Thailand and Vietnam to Malesia. Native in Singapore but the only recent record is from Tampines (*Leong-Škorničková SING2019-187*, 7 May 2018, SING [SING0267380]). Previously recorded from Bukit Timah (*Ridley 6113*, 1894, SING [SING0010433]), Jurong (*Burkill 6439*, 30 Jul 1921, SING [SING0010436]), Rochor (*Ridley s.n.*, May 1890, SING [SING0010432]) and Singapore Botanic Gardens (*Ridley s.n.*, 1892, SING [SING0010434]).

Ecology. Secondary forest and thicket, swampy grasslands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore it is only known from one recent collection from an area that is scheduled for development. Consequently, it is assessed here as Critically Endangered (CR/D).

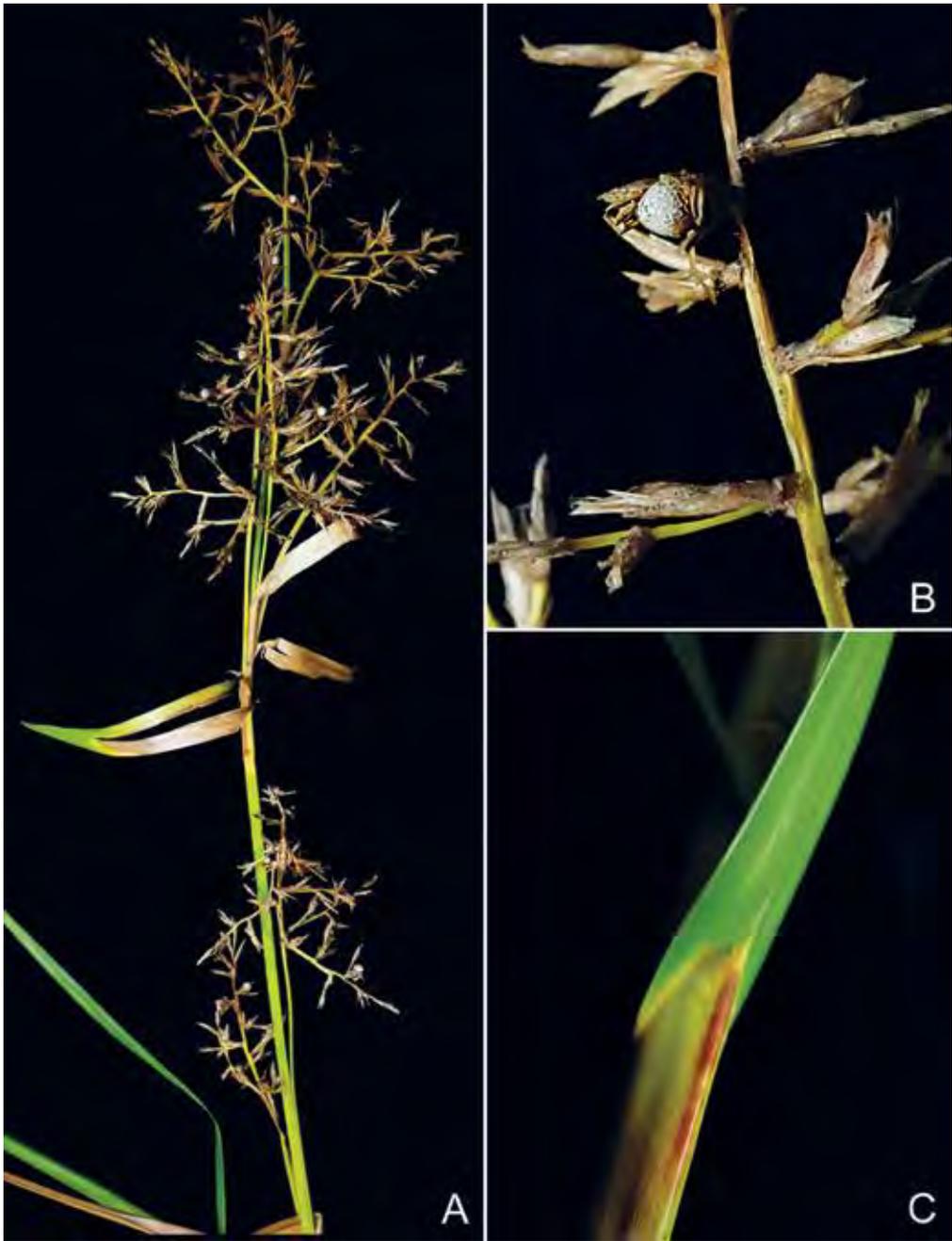


Figure 52. *Scleria purpurascens* Steud. **A.** Inflorescence. **B.** Detail of inflorescence showing nutlet. **C.** Apex of leaf sheath. (From Singapore, Tampines, *Niissalo* SING2019-187. Photos: J. Leong-Škorničková).

8. *Scleria rugosa* R.Br.

(Latin, *rugosus* = wrinkled; referring to the appearance of the nutlet)

Prodr. Fl. Nov. Holland. (1810) 240; Kern, Blumea 11(1) (1961) 206; Kern, Fl. Males., ser. 1, 7(3) (1974) 749; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 531; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 143; Simpson & Koyama, Fl. Thailand 6(4) (1998) 444; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 273; Zhang et al., Fl. China 23 (2010) 263. **Type:** *Banks & Solander s.n.*, Australia, Queensland, Endeavour River, 1770 (lectotype BM [BM000833641], designated here; isolectotypes BM [BM000833642], BRI [BRI-AQ0433557], NSW [NSW269611, NSW269602]).

Scleria lateriflora Boeckeler, Linnaea 38 (1874) 455; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184. **Type:** *Thwaites CP3796*, Sri Lanka (lectotype L [L0042790], designated here; isolectotypes BO, CAL, P [P00079902]).

Scleria zeylanica auct. non Poir.: Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 687; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 110; Ridley, Fl. Malay Penins. 5 (1925) 177.

Annual. **Culms** densely tufted, 8–35 cm long, 0.7–1.5 mm wide, triquetrous, pubescent. **Leaves** cauline; blade narrowly linear, 5–15 cm long, 2–4 mm wide, apex ± obtuse, folded, pubescent; sheath 1.5–3.5 cm long, narrowly winged or wingless, pale to mid-brown; contraligule rounded-deltoid to suborbicular, ciliate. **Lowest involucre bract** leaf-like, up to 14 cm long. **Inflorescence** paniculate, 9–20 cm long; nodes 2–3, distant, each subtending 1(–2) partial inflorescences; partial inflorescences sessile to shortly pedunculate, simple, 1–2 cm long, with few spikelets. **Spikelets** unisexual, solitary or in pairs; female spikelets broadly obovate, 3–4 mm long; male spikelets shortly pedunculate, lanceolate, 2–2.5 mm long. **Glumes** ovate, 2.5–4 mm long, apex acute, sides membranous, pale green sometimes tinged with reddish-brown, keel green. **Stamen** 1. **Nutlets** globose or broadly obovoid-globose, terete, 1.2–1.8 × 1.2–1.8 mm, apex rounded, apiculate, white, usually smooth or transversely wrinkled above, rarely trabeculate, glabrous; disk shallowly 3-lobed, lobes suborbicular, densely glandular.

Distribution. Tropical and subtropical Asia to northern Australia. Native in Singapore and recorded from Tampines (*Vermeulen & Ang 2212*, 29 Dec 2001, SING [SING0043687]). Previously also recorded from MacRitchie (*Corner s.n.*, 11 Aug 1941, SING [SING0010021]), Changi (*Ridley s.n.*, 16 Feb 1889, SING [SING0010019]), Kallang (*Ridley s.n.*, 1899, SING [SING0010020]) and National University of Singapore (Bukit Timah Campus) (*Kassim 374*, 8 Nov 1956, SINU).

Ecology. Open, wet grasslands and rice fields.

Provisional conservation assessment. Globally Least Concern (LC). Assessed here as Critically Endangered (CR/D) in Singapore.

9. *Scleria sumatrensis* Retz.

(of Sumatra)

Observ. Bot. 5 (1788 [‘1789’]) 19; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 693; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 184; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 113; Ridley, Fl. Malay Penins. 5 (1925) 179; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1982; Henderson, Malay. Wild Fls., Monocot. (1954) 289; Kern, Blumea 11(1) (1961) 182; Kern, Fl. Males., ser. 1, 7(3) (1974) 736; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 531; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 143; Simpson & Koyama, Fl. Thailand 6(4) (1998) 441; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 221; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 224; Zhang et al., Fl. China 23 (2010) 268. **Type:** *Wennerberg s.n.*, locality unknown (holotype LD [LD1277798]). **Fig. 53.**

Rhizomatous perennial; rhizome woody. **Culms** erect or climbing, 100–400 cm long, 6–8 mm wide, trigonous to subtriquetrous, smooth or scabrid on angles. **Leaves** cauline, appearing to be in whorls of 3–5 at middle of culm; blade linear, 20–40 cm long, 7–13 mm wide, apex long-acuminate, flattish; sheath 5–7 cm long, winged or wingless, brown-tinged toward the base; contraligule depressed-rounded, densely ciliate. **Lowest involucreal bract** leaf-like, up to 25 cm long. **Inflorescence** paniculate, up to 30 cm long; nodes 2–4, distant, each subtending 1–4 partial inflorescences; partial inflorescences pedunculate, compound to decompound, oblong to ellipsoid, 15–30 cm long. **Spikelets** unisexual, solitary or in clusters of 2–3; female spikelets broadly ovoid, 3.5–4 mm long; male spikelets sessile or shortly pedunculate, lanceolate, 3.5–4.3 mm long, yellowish- or reddish-brown. **Glumes** broadly ovate, 3.5–4 mm long, apex acute, sides chartaceous, pale to mid-brown or purplish-tinged. **Stamens** 3. **Nutlets** globose or depressed-globose, 2–2.3 × 2–3 mm, apex rounded, dark greyish to brownish, scrobiculate, sparsely puberulent; disk cup-like, half as long to ± covering the nutlet, yellowish to bright shiny red, 3-lobed, lobes obtuse, toothed.

Distribution. Seychelles, China (Hainan) to tropical Asia and northern Australia. Native in Singapore and recorded from Mandai (*Gwee & Samsuri SING2007-600*, 15 Nov 2007, SING [SING0098829]), Pasir Laba Camp (*Gwee & Salfuddin SING2007-273*, 23 Apr 2007, SING [SING0092731]), Sungei Buloh (*Duistermaat et al. S75*, 19 Mar 2002, SING [SING0059784]), Singapore Zoological Gardens and Tampines (*Vermeulen & Ang 2205*, 29 Dec 2001, SING [SING0043680]). Previously also recorded from Bukit Timah (*Ridley s.n.*, Jan 1889, SING [SING0010029]), Chasseriau Estate, Choa Chu Kang, Singapore Botanic Gardens, Sungei Tengah and Upper Seletar.

Ecology. In thickets and forests, forest openings, sometimes in swampy grasslands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Least Concern (LC).

Vernacular name. *Sendayan* (Malay).

Notes. A characteristic species easily identifiable by having leaves appearing to be in whorls and nutlets which are almost completely surrounded by the reddish, cup-like disk.

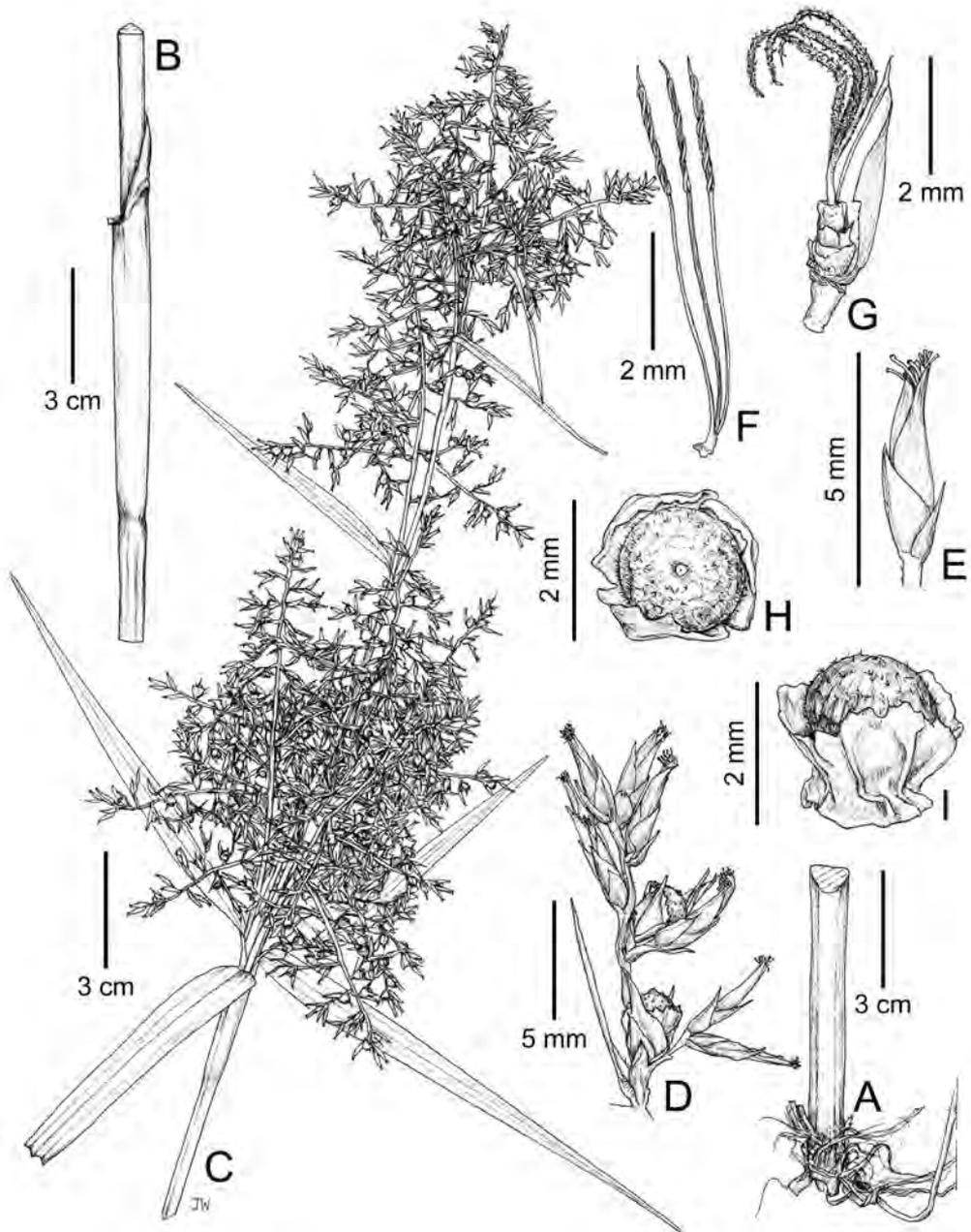


Figure 53. *Scleria sumatrensis* Retz. **A.** Base of plant. **B.** Leaf sheath. **C.** Inflorescence. **D.** Detail of inflorescence. **E.** Spikelet. **F.** Male flower. **G.** Female flower. **H.** Nutlet, top view. **J.** Nutlet, side view. (A, B from Peninsular Malaysia, *Corner SFN 38177*; C–J from Peninsular Malaysia, *Hardial 554*. Drawn by J. Williamson, reproduced with the kind permission of the Director and the Board of Trustees, Royal Botanic Gardens, Kew).

10. *Scleria terrestris* (L.) Fassett

(Latin, *terrestris* = growing on the ground; referring to the habit of the plant)

Rhodora 26 (1924) 159; Kern, Blumea 11(1) (1961) 170; Kern, Fl. Males., ser. 1, 7(3) (1974) 733; Turner, Gard. Bull. Singapore 45 (1993) 69; Turner, Gard. Bull. Singapore 47 (1997 [‘1995’]) 531; Keng et al., Concise Fl. Singapore, vol. 2, Monocot. (1998) 144; Simpson & Koyama, Fl. Thailand 6(4) (1998) 437; Tan et al. in Davison et al. (ed.), Singapore Red Data Book, ed. 2 (2008) 221; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 78, 126, 218; Zhang et al., Fl. China 23 (2010) 265. **Basionym:** *Zizania terrestris* L., Sp. Pl. 2 (1753) 991. **Type:** [Published illustration] ‘Katou-tsjolam’ in Rheede, Hort. Malab. 12 (1693 [‘1703’]) 113, t. 60, 1693 (lectotype designated by Majumdar & Bakshi, Taxon 28 (1979) 354).

Scleria radula Hance, Ann. Sci. Nat., Bot., sér. 4, 18 (1862) 232; Clarke in Hooker, Fl. Brit. India 6, fasc. 20 (1894) 691; Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 183; Ridley, Mat. Fl. Malay. Penins. 3 (1907) 111; Ridley, Fl. Malay Penins. 5 (1925) 178. **Type:** *Harland* 730 [Herb. Hance 1157], China, Hong Kong (holotype BM [BM000833636]; isotype K [K000960235]).

Rhizomatous perennial. **Culms** sometimes climbing, (60–)100–400 cm long, 3–6 mm wide, triquetrous, scabrid. **Leaves** cauline, often closely spaced; blade linear, 15–40(–60) cm long, (5–) 7–20 mm wide, apex long-acute, flattish; sheath 6–15 cm long, triquetrous, winged or wingless, reddish or purplish-brown; contraligule crescent-shaped or depressed-rounded, 2–4 mm long, ciliate or glabrescent. **Lowest involucre bract** leaf-like, up to 40 cm long. **Inflorescence** paniculate, 25–50 × 5–10 cm; nodes 2–4, rather distant, each subtending a single partial inflorescence; partial inflorescence long-pedunculate, ovate-pyramidal to broadly ovoid, compound, 4–14 cm long; bracteoles indistinct. **Spikelets** solitary or in groups of 2–3; female spikelets sessile, broadly ovoid, 3.7–5 mm long; male spikelets lanceolate or oblong-lanceolate, 3–4 mm long. **Glumes** broadly ovate, 3.5–4 mm long, apex abruptly acute, sides membranous, dark reddish-brown. **Stamens** 3. **Nutlets** ovoid-globose to ± globose, terete or trigonous, 2.5–3 × 2.5–2.8 mm, apex rounded, shiny white to dark purplish, smooth or indistinctly scrobiculate, puberulent to glabrous; disk shallowly 3-lobed, lobes broadly triangular, obtuse to rounded or ± emarginate.

Distribution. Tropical and subtropical Asia to northern Australia. In Singapore recorded from the Central Catchment (*Duistermaat* S97, 9 Aug 2002, SING [SING0059785]) and Lazarus Island (*Samsuri et al.* LZ10, 13 May 2003, SING [SING0045137]). Previously also recorded from Bedok (*Ridley s.n.*, 1892, SING [SING010031]) and Bukit Timah (*Ridley s.n.*, Jan 1889, SING [SING0010032]; *Ridley* 10851, 1900, SING [SING0010030]).

Ecology. Forest floors, thickets and in wet grasslands.

Provisional conservation assessment. Globally Least Concern (LC). In Singapore Endangered (EN/D).

Excluded species

Cyperus exaltatus Retz. was reported for Singapore by Kern (Fl. Males., ser. 1, 7(3) (1974) 498), Turner (Gard. Bull. Singapore 45 (1993) 63), Turner et al. (in Ng & Wee (ed.), Singapore Red Data Book (1994) 281), Keng et al. (Concise Fl. Singapore, vol. 2, Monocot. (1998) 120) and Chong et al. (Checkl. Vasc. Pl. Fl. Singapore (2009) 31, 124, 270) but no material has been found. It occurs in Peninsular Malaysia and it would not be surprising if it were to be found in Singapore.

Cyperus melanospermus (Nees) Valck.Sur. was reported for Singapore by Ridley (J. Straits Branch Roy. Asiat. Soc. 33 (1900) 180; Mat. Fl. Malay. Penins. 3 (1907) 59; Fl. Malay Penins. 5 (1925) 138 – all under *Kyllinga melanosperma* Nees), Kern (Fl. Males., ser. 1, 7(3) (1974) 655), Turner (Gard. Bull. Singapore 45 (1993) 63), Turner et al. (in Ng & Wee (ed.), Singapore Red Data Book (1994) 281), Keng et al. (Concise Fl. Singapore, vol. 2, Monocot. (1998) 122) and Chong et al. (Checkl. Vasc. Pl. Fl. Singapore (2009) 53, 125, 271, under *Kyllinga melanosperma*) but no material has been found. It occurs in Peninsular Malaysia and it would not be surprising if it were to be found in Singapore.

Eleocharis acutangula (Roxb.) Schult. was reported for Singapore by Ridley (J. Straits Branch Roy. Asiat. Soc. 33 (1900) 181, under the synonym *Eleocharis fistulosa* Schult.), Kern (Fl. Males., ser. 1, 7(3) (1974) 525), Turner (Gard. Bull. Singapore 45 (1993) 64), Turner et al. (in Ng & Wee (ed.), Singapore Red Data Book (1994) 281), Keng et al. (Concise Fl. Singapore, vol. 2, Monocot. (1998) 126) and Chong et al. (Checkl. Vasc. Pl. Fl. Singapore (2009) 38, 125, 270) but no material has been found. It occurs in Peninsular Malaysia and it would not be surprising if it were to be found in Singapore.

Fimbristylis quinquangularis (Vahl) Kunth. There are three early twentieth century collections of *F. quinquangularis* from Singapore Botanic Gardens but it seems likely that these were introductions in cultivation and not wild or naturalised plants. There are no records from outside the Gardens or in Peninsular Malaysia.

