The genera of Cyperaceae of Madagascar

Fitiavana Rasaminirina¹,², Isabel Larridon³,⁴

¹ University of Antananarivo, Antananarivo, Madagascar
² Kew Madagascar Conservation Centre, Antananarivo, Madagascar
³ Royal Botanic Gardens, Kew, Richmond, UK
⁴ Ghent University, Department of Biology, Systematic and Evolutionary Botany Lab, Gent, Belgium

Corresponding author: Isabel Larridon (i.larridon@kew.org)

Abstract

Background and aims – The rise of DNA sequencing in systematics has brought more understanding of the Cyperaceae family worldwide. Through these studies, it has been possible to delineate major clades and classify its species into subfamilies, tribes, and genera. Today, we have a good understanding of the species diversity and geographic distribution of the genera. However, in the case of Madagascar, the only complete taxonomic treatment of Cyperaceae dates from 1937. Although recent monographs exist for some genera in Madagascar, the taxonomic treatment of the Cyperaceae of Madagascar has not been updated until now. Hence, the present work aims to produce an updated treatment at the generic level including descriptions and an identification key of all Cyperaceae genera in Madagascar.

Material and methods – Books and scientific articles containing descriptions of the genera of Cyperaceae of Madagascar, and information on their ecology and distribution were consulted, as well as herbarium specimens, collections, and data available from online herbaria and aggregator portals.

Key results – Madagascar is very rich in Cyperaceae. The species of the Cyperaceae family on the island are distributed in 24 genera, including one endemic genus, i.e. Trichoschoenus. Ten genera are monotypic on the island. Sixteen of the 29 genera described in the Flore de Madagascar remain accepted but the others are now either synonyms of Cyperus, or no longer apply because they are absent from Madagascar, such as Scirpus. Regarding their habitat and ecology, some genera are specific to a particular habitat, like Costularia, while others that are very broadly distributed, like Cyperus and Scleria.

Conclusion – Our study provides an updated overview of the genera of Cyperaceae of Madagascar, including an identification key, descriptions, and illustrations.

Keywords

Cyperaceae, genera, identification, Madagascar, taxonomy

INTRODUCTION

Madagascar, with its area of 592,000 km², is home to ca 310 species of the Cyperaceae family (Larridon et al. 2021a). These 310 species are classified into two subfamilies, i.e. Cyperoideae and Mapanioideae, each of which includes several tribes and genera (Larridon et al. 2021b). The evolution of technology in systematics has brought much more understanding for the Cyperaceae family worldwide. Through these studies, major groups such as the two subfamilies (Cyperoideae and Mapanioideae) and different tribes and genera have been delineated (Larridon 2022a). Although much taxonomic work remains at the species level, we have a good understanding of species diversity per genus and the geographic distribution of species (Jung et al. 2016; Semmouri et al. 2019; Muasya and Larridon 2021; Larridon 2022a). However, in the case of Madagascar, the only taxonomic treatment of the family, Chermezon's Flore de Madagascar, dates from 1937, although research has been done since then on a few genera (Díaz et al. 2019; Larridon et al. 2019), the taxonomic treatment of the Cyperaceae of Madagascar...
Table 1. Overview of the genera occurring in Madagascar and their subfamily and tribal placement following Larridon et al. (2021b), and ordered according to Larridon (2022a).

<table>
<thead>
<tr>
<th>Subfamily</th>
<th>Tribe</th>
<th>Subtribe</th>
<th>Genus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapanioideae</td>
<td>Chrysitricheae</td>
<td></td>
<td>Lepironia Pers.</td>
</tr>
<tr>
<td></td>
<td>Hypolytrumae</td>
<td></td>
<td>Hypolytrum Pers.</td>
</tr>
<tr>
<td>Trilepideae</td>
<td>Cladiacae</td>
<td>Coleochloa Gilly</td>
<td></td>
</tr>
<tr>
<td>Bisboeckelaceae</td>
<td></td>
<td>Cladium P.Browne</td>
<td></td>
</tr>
<tr>
<td>Scleriacae</td>
<td></td>
<td>Scleria P.J.Bergius</td>
<td></td>
</tr>
<tr>
<td>Carpheae</td>
<td></td>
<td>Carpha Banks &amp; Sol. ex R.Br.</td>
<td></td>
</tr>
<tr>
<td>Schoeneae</td>
<td></td>
<td>Oreobolinae</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lepidopermatinae</td>
<td></td>
</tr>
<tr>
<td>Rhynchosporeae</td>
<td></td>
<td>Machaerina Vahl</td>
<td></td>
</tr>
<tr>
<td>Cariceae</td>
<td></td>
<td>Carex L.</td>
<td></td>
</tr>
<tr>
<td>Eleocharideae</td>
<td></td>
<td>Eleocharis R.Br.</td>
<td></td>
</tr>
<tr>
<td>Cyperoideae</td>
<td></td>
<td>Balbosstylis Kunth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abildgaardiae</td>
<td>Trichoschoenus J.Raynal</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actinoschoenus Benth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abildgaardia Vahl</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fimbristyris Vahl</td>
<td></td>
</tr>
<tr>
<td>Bolboschoeneae</td>
<td></td>
<td>Bolboschoenus (Asch.) Palla</td>
<td></td>
</tr>
<tr>
<td>Fiurenaceae</td>
<td></td>
<td>Fiurenra Rottb.</td>
<td></td>
</tr>
<tr>
<td>Schoenoplectaceae</td>
<td></td>
<td>Schoenoplectus (Rchb.) Palla</td>
<td></td>
</tr>
<tr>
<td>Pseudoschoeneae</td>
<td></td>
<td>Schoenoplectiella Lye</td>
<td></td>
</tr>
<tr>
<td>Cypereae</td>
<td>Ficiniinae</td>
<td>Isolepis R.Br.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ficinia Schrad.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyperinae</td>
<td>Cyperus L.</td>
<td></td>
</tr>
</tbody>
</table>

The information contained in the Flore de Madagascar (Chermezon 1937) is still very useful, but it needs to be reformulated to adapt it to the results of the recent work done on the family. Hence, the present work aims to produce an updated overview of the genera of Cyperaceae of Madagascar, including an identification key, descriptions, and illustrations.

**MATERIAL AND METHODS**

Numerous scientific works documenting each genus of Cyperaceae occurring in Madagascar have been studied. These include Sedges Genera of Africa and Madagascar by Browning and Goetghheu (2017), Flora of Tropical East Africa by Hoenselaar et al. (2010), Flora Zambesiaca by Browning et al. (2020), Flore de Madagascar by Chermezon (1937), Flore du Gabon by Lyte and Thery (2012), Flore d’Afrique centrale by Larridon and Reynolds 2020; Larridon 2022; Larridon et al. 2022), and the online Flora of North America and Flora of China (http://www.efloras.org), and the Catalogue of the Vascular Plants of Madagascar (2023).

In addition, available recent scientific literature (e.g. Diaz et al. 2019; Larridon et al. 2019, 2021b) and protologues of the genera of Cyperaceae in Madagascar were consulted (e.g. Raynal 1968). To find the type species of each genus, synonyms, etc., we consulted the protologues and online sources such as POWO (2022) and Tropicos.org (2022).

To verify the described characteristics, herbarium specimens were consulted in the following herbaria: TAN, TEF, and the herbarium of the University of Antananarivo in Madagascar including recent collections collected by the first author and Cyperaceae recently collected by the Kew Madagascar Conservation Centre (KMCC) team in different localities of Madagascar. In addition, collections available from online herbaria (e.g. Kew Herbarium Catalogue of the Royal Botanic Gardens, Kew (K), Missouri Botanical Gardens’ Tropicos.org (MO), and the Vascular plants catalogue of the Muséum national d’Histoire naturelle (P), and aggregator portals such as Plants of the World Online and JSTOR Global Plants were also consulted. For studies of the ecology and distribution of each genus, online platforms such as POWO (2022), GeoCAT (Bachman et al. 2011), which provides information from GBIF (2022) and iNaturalist, were consulted.
The identification key to subfamilies, tribes, subtribes, and genera follows the classification of Larridon et al. (2021b), and the order of the taxa in the taxonomic treatment follows the linear classification of Larridon (2022a). Only commonly used synonyms are provided when they are relevant to Madagascar.

RESULTS AND DISCUSSION

Twenty-four genera of Cyperaceae currently exist in Madagascar including one endemic genus, i.e. *Trichoschoenus* J.Raynal. Ten genera are monospecific on the island, i.e. *Actinoschoenus* Benth., *Bolboschoenus* (Asch.) Palla, *Carpha* Banks & Sol. ex R.Br., *Cladium* P. Browne, *Coleochloa* Gilly, *Diplacrum* R.Br., *Ficinia* Schrad., *Hypolytrum* Pers., *Lepironia* Pers., and *Trichoschoenus*. Table 1 provides an overview of the genera occurring in Madagascar and their subfamily, tribal, and subtribal placement following Larridon et al. (2021b).

Sixteen of the 29 genera described in the Flore de Madagascar are still accepted and found on the island, i.e. *Actinoschoenus*, *Bulbostylis* Kunth, *Carex* L., *Carpha*, *Cladium*, *Costularia* C.B.Clarke, *Cyperus* L., *Eleocharis* R.Br., *Ficinia*, *Fimbristylis* Vahl, *Fuirena* Rottb., *Hypolytrum*, *Lepironia*, *Rhynchospora* Vahl, and *Scleria* P.J.Bergius. Others are now either synonyms of the genus *Cyperus*, such as *Ascolepis* Nees ex Steud., *Lipocarpha* R.Br., *Mariscus* Gaertn., *Pycreus* P. Beauv., *Queenslandiella* Domin, *Remirea* Aubl., and *Torulinium* Desv. With respect to their habitat and ecology, there are those that are specific to one habitat, such as the genus *Costularia*, and others that are very widely distributed, such as the genera *Cyperus* and *Scleria*. Our study provides an updated overview of the genera of Cyperaceae of Madagascar, including an identification key, descriptions, and illustrations.

Table 2. Comparison of the accepted genera in Madagascar according to Chermezon (1937) and Larridon et al. (2021b).

<table>
<thead>
<tr>
<th>Chermezon (1937)</th>
<th>Larridon et al. (2021b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Actinoschoenus</em> Benth.</td>
<td><em>Actinoschoenus</em> Benth.</td>
</tr>
<tr>
<td><em>Bulbostylis</em> Kunth</td>
<td><em>Bulbostylis</em> Kunth</td>
</tr>
<tr>
<td><em>Carex</em> L.</td>
<td><em>Carex</em> L.</td>
</tr>
<tr>
<td><em>Schoenoxiphium</em> Nees</td>
<td><em>Abildgaardia</em> Vahl</td>
</tr>
<tr>
<td><em>Carpha</em> Banks &amp; Sol. ex R.Br.</td>
<td><em>Carpha</em> Banks &amp; Sol. ex R.Br.</td>
</tr>
<tr>
<td><em>Cladium</em> P.Browne p.p.</td>
<td><em>Cladium</em> P.Browne</td>
</tr>
<tr>
<td><em>Eriospora</em> Hochst. ex A.Rich.</td>
<td><em>Coleochloa</em> Gilly</td>
</tr>
<tr>
<td><em>Costularia</em> C.B.Clarke</td>
<td><em>Costularia</em> C.B.Clarke</td>
</tr>
<tr>
<td><em>Ascolepis</em> Nees ex Steud.</td>
<td><em>Ascolepis</em> Nees ex Steud.</td>
</tr>
<tr>
<td><em>Courtoisia</em> Nees (as <em>Courtoisia</em>)</td>
<td><em>Courtoisia</em> Nees (as <em>Courtoisia</em>)</td>
</tr>
<tr>
<td><em>Cyperus</em> L.</td>
<td><em>Cyperus</em> L.</td>
</tr>
<tr>
<td><em>Kylinga</em> Rottb. (as <em>Kylinga</em>)</td>
<td><em>Kylinga</em> Rottb. (as <em>Kylinga</em>)</td>
</tr>
<tr>
<td><em>Queenslandiella</em> Domin</td>
<td><em>Queenslandiella</em> Domin</td>
</tr>
<tr>
<td><em>Diplacrum</em> R.Br.</td>
<td><em>Diplacrum</em> R.Br.</td>
</tr>
<tr>
<td><em>Eleocharis</em> R.Br. (as <em>Heleocharis</em>)</td>
<td><em>Eleocharis</em> R.Br.</td>
</tr>
<tr>
<td><em>Ficinia</em> Schrad.</td>
<td><em>Ficinia</em> Schrad.</td>
</tr>
<tr>
<td><em>Isolepis</em> R.Br.</td>
<td><em>Isolepis</em> R.Br.</td>
</tr>
<tr>
<td><em>Rhynchospora</em> Vahl</td>
<td><em>Rhynchospora</em> Vahl</td>
</tr>
<tr>
<td><em>Schoenoplectus</em> (Rchb.) Palla</td>
<td><em>Schoenoplectus</em> (Rchb.) Palla</td>
</tr>
<tr>
<td><em>Scirpus</em> L. p.p.</td>
<td><em>Schoenoplectus</em> (Rchb.) Palla</td>
</tr>
<tr>
<td><em>Scleria</em> P.J.Bergius</td>
<td><em>Scleria</em> P.J.Bergius</td>
</tr>
</tbody>
</table>
### TAXONOMIC TREATMENT

**Identification key to subfamilies, tribes, subtribes, and genera of Cyperaceae of Madagascar**

1. Basic inflorescence unit (= spike) usually comprising 2, strongly keeled and opposite basal bracts (rarely 1 and unkeeled), with a further (0–)1–13(–100) scale-like bracts, the bracts subtending 1 stamen, the whole unit with a terminal pistil...
   - Basic inflorescence unit (= spikelet) consisting of a rachilla bearing few to many glumes that may or may not subtend a flower....
   - (Cyperoideae)
2. Leaf blade absent; inflorescence always a single spike; predominantly in temperate and subtemperate heathlands and swaps
   - Leaf blade present, inflorescence variable, relatively broad with 3 prominent veins; usually forest plants
   - Chrysitriceae (*Lepironia*)
3. All florets unisexual
   - At least some florets bisexual
   - At least some florets unisexual
   - Cariceae (*Carex*)
4. Female (or more rarely bisexual) spikelet enclosed in a sac-like prophyll (thus forming the utricle or perigynium), usually clustering to form a spike or part of a bisexual spike
   - Female spikelet not enclosed in a sac-like prophyll or perigynium
   - Trilieae (*Dipsilacrum*)
5. Inflorescence paniculate, densely spiked with many spindly spikelets and with 1 or 2 florets; nutlet fusiform with long beak, surrounded at the base by 3 small long fimbriate scales opposite the sides of the nutlet; plant of granitic rocks
   - Inflorescence variable, but not as above; nutlet not surrounded at base by 3 small long fimbriate scales opposite the sides of the nutlet
   - Bisboeckelereae (*Bisboeckia*)
6. Inflorescence a group of sessile to short-stalked spikelets developing in leaf axils (except the lowest 1 or 2 leaves); all spikelets unisexual, the female spikelet 1-flowered, with no evidence of the other sex, the top of the rachilla completely reduced; male flower usually 1-stamened; contraligule usually undeveloped; nutlet surrounded by two subterminal and opposite glumes
   - Inflorescence variable, often paniculate or spike-like on upper part of stem; spikelet bisexual with 1 female floret; if all spikelets unisexual, then female spikelets with reduced male flowers, or with reduced rachilla apex; male flower usually with 3 stamens; contraligule usually well developed; nutlet usually large, well distinct at maturity, smooth or ornamented, egg-shaped, pale and often white, with hypogynium (hardened gynophore) at base sometimes cupuliform (sometimes reduced) .....Sclereae (*Scleria*)
7. Robust perennial; leaf with very scabrous and sharp margins; inflorescence terminal, paniculate or briefly corymbiform
   - Plants of variable size, if robust the leaf sometimes scabrous but not sharp; inflorescence terminal or pseudolateral, anthelate or capitate
   - Cladiaceae (*Cladium*)
8. Style base distinct, often thickened and/or distinctly fimbriate
   - Style base neither distinct nor thickened and non-fimbriate
   - Rhynchosporaceae (*Rhynchospora*)
9. All leaves reduced to bladeless sheaths; inflorescence always reduced to a terminal spikelet without involucral bracts; flower without adaxial and bifid hypogynous scale
   - At least a few leaves or involucral bracts with well-developed leaf blades; inflorescence variable, usually composed of several spikelets, if inflorescence reduced to a terminal spikelet then at least 1 involucral bract larger than the glumes or flower with 1 hypogynous scale, adaxial, flattened, more or less obovate, bifid at apex
   - Eleeocharideae (*Eleeocharis*)
10. Inflorescence paniculate or corymbiform, rarely capitate and then the spikelet with several empty basal glumes and only the upper glumes fertile; perianth present or absent, formed of 6 hairs
   - Inflorescence anthelate or capitate; spikelets usually with all glumes fertile; if some basal glumes empty, spikelets with many flowers; perianth absent or flower subtended by a bifid scale
   - Rhynchosporaceae (*Rhynchospora*)
11. Leaf ligulate; glumes distichous and glabrous
   - Leaf ligulate or reduced to sheath; if ligulate, glumes spirally arranged and hairy
   - Oreobolinae (*Costularia*)
12. Culms terete, elliptical or partially flattened
   - Culms highly variable, commonly biconvex, but ranging from flat to terete or quadrangular or occasionally biconvex
   - Lepidospermatinae (*Lepironia*)
13. Glumes and spikelets persistent on the plant
   - Glumes deciduous or the spikelet deciduous as a whole or in pieces
   - Lepidospermatinae (*Lepironia*)
14. Inflorescence a reduced panicle; glumes distinctly arranged; perianth present
   - Inflorescence anthelate, often reduced to a single spikelet; glumes spirally arranged; perianth absent
   - Carpeae (*Carpha*)
15. Leaf sheath apex with long white hairs; style base mostly enlarged and persistent; style glabrous
   - Leaf sheath apex without long white hairs, an adaxial ligule of minute hairs present or absent; style base enlarged and mostly deciduous; style fimbriate, hispidulous, rarely glabrous
   - Bulbosytis
16. Fertile flowers per spikelet more than 2. ................................. 17
- Fertile flowers spikelet 1–2. .......................................................... 18
17. Lowermost involucral bract glume-like, inflorescence of 1–3 spikelets; nutlets 2–3.4 mm long (always trigonous, stipitate) .................. 18
- Lowermost involucral bract not glume-like, inflorescence of 1–many spikelets; nutlets 0.5–1.8 mm (rarely up to 2.2 mm) long (many species trigonous some biconvex, stipitate or not) .................................................. 18
18. Style base persistent, spreading over apex of nutlet; leaves, stem and glumes with many long erect hairs .................. 18
- Style base deciduous with rest of style, slightly enlarged .......................................................... 19
19. Perianth absent; glumes usually distichous or reduced to 1 per spikelet (and then spikelet bract larger or smaller than glume), rarely spirally arranged; ligule always absent; if glumes spirally arranged and primary involucral bract erect, then stem capillary, not compressible and less than 1 mm wide. .............................................................................................................. 20 (Cyperaceae)
- Perianth present or absent, glumes always spirally arranged; ligule present or, if absent, the inflorescence always with erect primary involucral bract and cylindrical, compressible stem, more than 1 mm wide .............................................................................................................. 23
20. Glumes usually spirally arranged; anatomy C3 or C4. If distichously arranged, then 2 or more parallel veins prominently visible on glume and/or nutlet bearing a distinct gynophore. .................................................................................................................. 21 (Ficiinaceae)
- Glumes usually distichously arranged; anatomy C3 or C4. If spirally arranged, then either with elongated anther filaments, usually pale or white head-like inflorescences or parallel veins not strongly visible on glume and no gynophore ............. Cyperinae (Cyperus)
21. Leaf blades and inflorescence bracts scabrid, nutlets with gynophore .................................................................................. 22
- Leaf blades and inflorescence bracts smooth, nutlets without gynophore .......................................................... 22
22. Glumes cartilaginous .................................................................................................................................................................. 23
- Glumes chartaceous to hyaline .................................................................................................................................................. 24
23. Culm with more than 3 nodes ................................................................................................................................................. 25
- Culm nodeless or with less than 1–3 nodes above the base ....................................................................................................... 25
24. Glumes puberulent, apex entire to emarginate or deeply 2-fid, awned or mucronate .................. Bolbochoeneae (Bolbochoenus)
- Glumes often pubescent, apex entire and mucronate to awned .................................................................................. Fuirena (Fuirena)
25. Inflorescence bracts often large, erect, stem-like, rarely leaf-like, and patent to reflexed .......... Schoenoplectaeae (Schoenoplectus)
- Inflorescence bracts culm-like, erect, or patent while fruiting, rarely short, rigid and sheathing .......................................................... Pseudoschoenoeae (Schoenoplectiella)

Subfamily Mapanioidae

Tribe Chrysisitricheae

Lepironia Pers. (Persoon 1805: 70)

Type species. Lepironia mucronata Rich. [= Lepironia articulata (Retz.) Domin]

Description of the genus. Medium-sized to tall perennials; rhizomes woody, creeping with thick roots. Culms scapose, erect, terete, with transverse septa. Basal leaves, reduced to a sheath, open in front, the margins overlapping, elagulate. Involucral bracts 1, large, subulate, cylindrical, erect, culm-like. Inflorescence a single spike, pseudolateral, with many spirally arranged imbricate glume-like bracts; basal glume-like bracts empty, most subtending spicoids. Spicoids with 2 outer strongly keeled glumes and many non-keeled glumes, most subtending 1 stamen and a solitary apparently terminal female flower; rachilla thick and spongy. Florets unisexual; perianth absent. Stamina 1; anthers linear, apiculate; filaments highly accrescent. Style deeply 2-fid, long, slender; base not distinct, slightly thickened, persistent. Nutlets obovoid, dorsiventrally compressed, plano-convex, ± winged along the margins, beaked.

Distribution and ecology. Lepironia occurs in Madagascar, and in tropical and subtropical Asia to the Western Pacific (POWO 2022). It grows in freshwater wetlands near sea level. In Madagascar, the single species of Lepironia, i.e. Lepironia articulata (Fig. 1), occurs along the east coast.

Tribe Hypolytreae

Hypolytrum Pers. (Persoon 1805: 70)

Type species. Hypolytrum latifolium Rich. ex Pers. [= Hypolytrum nemorum (Vahl) Spreng.]

Description of the genus. Perennials, moderately robust to robust; rhizomatous or stoloniferous; rhizomes often woody, roots coarse. Culms trigonous or cylindrical, either laterally scapose and bearing reduced leaves at the base (cataphylls), or central with 1–several nodes and bearing well-developed leaves. Leaves elagulate, 3-ranked, sometimes pseudopteolate; leaf sheath of basal leaves open adaxially; leaf sheath of cauline leaves tubular; blade linear to oblong-lanceolate or reduced (often in basal leaves), with 3, well-developed principal veins, margin entire or many small teeth, gradually or abruptly narrowed at apex. Involucral bracts small, scale-like, or large and leaf-like, not sheathing, patent to reflexed. Inflorescence terminal, paniculate, corymbose or capitate, the ultimate branches subtending small clusters of spikes. Spicoids composed of 2–3 floral bracts, each subtending 1 stamen (male flowers), often connate to varying degrees, the lower two followed by a bare pistil (female flower). Florets unisexual; perianth absent. Stamina 1; anthers oblong to linear, latr尔斯ely decident, without extended winged along the margins, beaked.
connective tip; filaments filiform, exceeding spicoid bract. **Style** 2-fid, exserted; base distinct or not, thickened or not, more or less persistent. **Nutlets** obovoid to ellipsoid, dorsiventrally biconvex, smooth, costate, wrinkled, tuberculate or spongious.

**Distribution and ecology.** *Hypolytrum* is widely distributed in the tropics (POWO 2022). It grows in humid forests, on the edges of wetlands including mangroves, and in rocky areas near sea level. A single species of the genus, i.e. *Hypolytrum nudicaule* Juss. ex Cherm. (Fig. 2), occurs in eastern and northern Madagascar.

---

**Figure 1.** *Lepironia articulata*. **A.** Habit. **B.** Inflorescences. All photos taken in Vatomasina Vohipeno, Vohipeno District, Fitovinany Region by Botovao Auguste Ramandrisoa, reproduced with permission from the photographer.
Subfamily Cyperoideae

Tribe Trilepideae

Coleochloa Gilly (Gilly 1943: 12)

Type species. Coleochloa abyssinica (Hochst. ex A.Rich.) Gilly

Description of the genus. Tufted or cushion-forming perennials; rhizomes extensively branched, infrequently forming a small caudex. Culms scapose or nearly so, compressed below, sometimes subcylindrical; erect or slightly wanting, basal part of culms covered by remains of old leaf sheaths. Leaves only distichous; leaf sheath open on ventral side; ligule a line of fine hairs; contraligule not developed; blade flat or inrolled, deciduous. Involucral bracts more or less leaf-like; sheaths partly closed. Inflorescence terminal, paniculate, with few to many spikelet-like spikes; spikes bisexual, with numerous lateral spikelets subtended by small, densely spirally arranged glume-like bracts. Spikelet unisexual (male) or bisexual; lateral spikelets with an irregularly shaped prophyll. Glumes distichous, persistent, the larger 1–2 each subtending a flower, enclosed by the wings of the next glume. Basal spikelets with 1–2 male florets, apical spikelets mostly with 1 male and 1 female floret, more rarely completely female. Perianth surrounding the style base by 3 small, long fimbriate hypogynous scales, deciduous with the fruit. Stamens 2–3. Style 3-fid; base not distinct, tapering, persistent. Nutlets fusiform, trigonous, long beaked, surface smooth.

Distribution and ecology. Coleochloa occurs in tropical and southern Africa and Madagascar (POWO 2022). It grows on inselbergs, between 600 to 2000 m in elevation. A single species of the genus, i.e. Coleochloa setifera (Ridl.) Gilly (Figs 3, 4A), occurs in northern and southeastern Madagascar and in the Central Highlands.

Tribe Cladieae

Cladium P.Browne (Browne 1756: 114)

Type species. Cladium jamaicense Crantz [= Cladium mariscus subsp. jamaicense Kük.]

Description of the genus. Robust perennials, up to several meters tall; rhizomatous, sometimes with swollen stolons. Culms with few-noded, internodes hollow. Leaves basal and cauline, V-shaped to flat, midribs and margins scabrid, eligulate. Involucral bracts leaf-like, sheathing. Inflorescence terminal or some lateral, paniculate; partial inflorescences anthelate. Spikelets numerous, short stalked or sessile. Glumes few to many, spirally arranged, persistent, increasing in length, with 2–3 upper glumes fertile. Lower floret mostly functionally male, upper florets bisexual. Perianth absent. Stamens 2–3. Style 2–3-fid, with a thickened persistent base. Nutlets ovoid, with

Figure 2. Hypolytrum nudicaule. A. Habit. B. Inflorescence. C. Plant base. All photos taken on Nosy Boraha Island by Justine Faure (https://www.inaturalist.org/observations/132556611), reproduced with permission from the photographer.
a thick corky beak, surface smooth to wrinkled. **Embryo** small and poorly developed, broadly obovate in outline, with a basal, poorly developed root cap and without a leaf primordium.

**Distribution and ecology.** *Cladium* is a cosmopolitan genus (POWO 2022). It grows in estuaries, freshwater wetlands, and lake margins up to 1500 m in elevation. In Madagascar, it is only known from the north where a single taxon, i.e. *Cladium mariscus* subsp. *jamaicense* (Fig. 5), has been recorded in the Sava region of Antsiranana province.

**Tribe Bisboeckelereae**

*Diplacrum* R.Br. (Brown 1810: 241)

**Type species.** *Diplacrum caricinum* R.Br.

**Description of the genus.** Small to medium-sized annuals or tufted, rarely stoloniferous perennials. Culms
scapose or leafy, often short. Leaves elgulate; blade linear or lanceolate, alternate, simple, often reddish purple abaxially. Primary bracts leaf-like, sheathing. Inflorescence paniculate or capitate; partial inflorescences anihilate or capitately contracted. Spikelets many, lateral spikelets usually male, terminal spikelets usually female. Glumes male spikelets with few distichous, persistent glumes, each subtending a male floret; female spikelet with 2 distichous, persistent glumes, sometimes deciduous with the fruit, surrounding a pseudo-terminal female floret. Florets unisexual. Bristles absent. Stamens 1–3, anthers sightly oblongs. Pistil seated on a basal trilobed disc, lobes opposite the 3 main ribs; style 3-fid; base not distinct, not thickened, deciduous. Nutlets subglobe to ovoid, inconspicuously 3-ribbed, beak short, surface smooth, ribbed, or reticulate.

**Distribution and ecology.** Diplacrum is widely distributed in the tropics and tubertops (POWO 2022). It grows in damp soils and freshwater wetlands including rice fields, usually near sea level. A single species of Diplacrum, i.e. Diplacrum africanum (Benth.) C.B.Clarke (Fig. 6), is known from northwestern and east central Madagascar, and from the southeast along the mountain range.

**Tribe Sclerieae**

Scleria P.J.Bergius (Bergius 1765: 142)

**Type species.** Scleria flagellum-nigrorum P.J.Bergius

**Description of the genus.** Habit variable, from tiny annuals with fibrous roots to perennial climbers more than 10 meters tall; stoloniferous rhizome or tubers; aerial adventitious roots at stem nodes (adaptation to flooded habitats). Culms trigonous or triquetrous, noded bearing leaves often without ligules, sometimes with a contraligule. Leaves alternate, tristichously arranged, often persistent at the base, and finely serrate at least along the distal third of the margins, rarely smooth: sometimes abruptly narrowed down or pseudopraemorse; sheaths sometimes winged, usually topped by a contraligule, opposite to the blade. Inflorescence bracts leaf-like and sheathing, setaceous, or glume-like; spikelet bract usually setaceous, rarely glume-like. Inflorescence variable, usually paniculate, but with often contracted partial inflorescences. Spikelets bearing flowers of one or both sexes, the bisexual ones with one basal female and one to few male flowers above; female spikelet similar but upper part reduced to 1–2 empty scales or wanting; male spikelet lacking basal female flower and with more male flowers. Glumes in androgynous or bisexual spikelets the lower part is female with distichously arranged glumes (a few may be empty), upper part male with few to many spirally arranged glumes. Florets always unisexual, enclosed by at least three glumes. Bristles absent. Stamens 1–3, anthers often linear, more or less apiculate. Style 3-fid; ovary surrounded at the base by a variously shaped (sometimes reduced) lobed hypogynium, which is shed with the fruit. Nutlets globose to ovoid, variously sculptured and ornamented, usually white, sometimes beaked, subtended by a cupule, frequently surrounded by a hypogynium. **Distribution and ecology.** Scleria is widely distributed in the tropics and subtropics up to North America (POWO 2022). It grows in seasonally damp or permanently wet habitats, woodland, forests stream sides, and grasslands (Browning and Goetghebeur 2017). Scleria occurs throughout Madagascar. The 25 previously known species, including e.g. Scleria bulbifera Hochst. ex A.Rich. (Fig. 7) and Scleria distans Poir. (Fig. 8A), were recently monographed (Diaz et al. 2019), and a new species has been recently discovered from northern Madagascar (Larridon et al. unpubl. data).

**Tribe Carphaeae**

Carpha Banks & Sol. ex R.Br. (Brown 1810: 230)

**Type species.** Carpha alpina R.Br.

**Description of the genus.** Perennials, small to medium-sized (rarely tall), tufted, mat-forming; rhizomatous or rarely stoloniferous. Culms erect, trigonous to more or less cylindrical, scapose or with a few nodes. Leaves basal and cauline, elgulate. Lower primary bracts more or less leaf-like, sheathing. Inflorescence open to condensed paniculate with (sub)capitate partial; inflorescences with few to many spikelets. Spikelets with 3–6 distichous, persistent glumes of increasing length. Lower glumes empty, larger 1–2(--3) glume(s) each subtending a floret, enclosed by the wings of the next glume. Floret bisexual, sometimes upper or lower floret male. Bristles 6, ciliate to partly fimbriate or plumose, shorter than to much longer than the fruit, deciduous with the fruit. Stamens 2–3, anthers conspicuously greenish yellow. Style 3-fid, base not distinct, slightly thickened, persistent, often scabrid. Nutlets narrowly (ob)vooib to oblong, trigonous, often with a long beak, surface smooth or finely reticulate.

**Distribution and ecology.** Carpha occurs from Uganda to South Africa, Western Indian Ocean, South Japan, New Guinea to New Zealand and South America. It grows along streams, on marshy ground, and on rocks, from 1800 to 2500 m in elevation. In Madagascar, a single species of Carpha, i.e. Carpha perrieri Cherm., is known from Fianarantsoa province Matsiatra Ambony region and Toliara provinces Anosy region.

**Tribe Schoenoeae**

1. **Subtribe Oreobolinae**

Costularia C.B.Clarke (Clarke 1898: 274)

**Type species.** Costularia natalensis C.B.Clarke

**Description of the genus.** Perennials, small to tall, tufted or more rarely shortly rhizomatous, caudex sometimes present. Culms scapose or with few nodes. Leaves usually basal and cauline; basal leaves with poorly defined sheaths; cauline leaves enveloping up to 1/2 internode length;
spirodistichous, eliagulate; blade sometimes deciduous, margins scabrid. Involucral bracts more or less leaf-like, sheathing. Inflorescence terminal, contracted paniculate. Spikelets few to numerous. Glumes several, distichous, deciduous, of increasing length, the upper (1–)2 glumes each subtending a floret, enclosed by the wings of the next

Figure 5. Cladium mariscus subsp. jamaicense. A. Habit. B. Inflorescence. C. Plant base, longitudinal section. D. Detail of leaf. E. Nutlet and upper unisexual floret with 2 filaments and rudimentary gynoecium. F. Spikelet. All from Ward 9082. Scale bars: A = 25 cm; B, C = 5 cm; D = 1 cm; E, F = 2 mm. Drawn by Jane Browning, reproduced with permission from the artist, originally published in Gordon-Gray (1995).
**Figure 7. Scleria bulbifera.** A. Habit showing rhizome. B. Junction of lamina and sheath. C. Androgy nous spikelet with lower prophyll and one glume removed; remainder displaced to show lower female floret and upper male florets. D. Glomerule of three spikelets. E. Nutlet. A–D from Hilliard & Burtt 13394; E from Hilliard & Burtt 18036. Scale bars: A = 40 mm; B–E = 2 mm. Drawn by Jane Browning, reproduced with permission from the artist, originally published in Gordon-Gray (1995).
glume. Lower floret functionally male rarely bisexual or absent, upper floret bisexual or functionally female rarely functionally male. Bristles 6, fimbriate to ciliate, mostly longer than the nutlet and deciduous with it. Stamens 3; anthers long linear, briefly apiculate or not. Style 3-fid; base often distinct (at anthesis), thickened, persistent, often scabrid. Nutlets ovoid or oblong, rounded trigonous, often 3-ribbed, more or less stipitate, beaked, surface smooth or rugulose.

**Distribution and ecology.** Costularia occurs in southeastern Africa, Madagascar, the Mascarenes, and Seychelles. It grows on rocky ground in forest, grassland, or ericoid vegetation, sometimes along streams or in swamps, usually at higher elevations. In Madagascar, Costularia is known from north to south along the mountain ridge and high elevation areas, including the Central Highlands. The genus was recently monographed (Larridon et al. 2019), and 11 species are native to Madagascar, including e.g.

---

**Figure 8.** A. *Scleria distans*. B. *Bulbostylis iremoensis*. C. *Fuirena pubescens* (pale green) and *Schoenoplectiella corymbosa* (dark green). All photos by Fitiaavana Rasaminirina.
Costularia itremoensis Larridon (Fig. 4B) and Costularia pantopoda C.B.Clarke (Fig. 9).

2. Subtribe Lepidospermatinae

Machaerina Vahl (Vahl 1805: 238)

Type species. Schoenus restioides Sw. [= Machaerina restioides Vahl]

Description of the genus. Medium-sized to tall creeping rhizomatous or stoloniferous perennials. Culms scapose or with few nodes, flattened, angular, compressed or (sub)terete, sometimes septate. Leaves distichous, elongate, blade ensiform to (sub)terete, sometimes septate, rarely reduced to a sheath. Primary bracts often leaf-like, sheathing. Inflorescence sometimes more or less pseudolateral, paniculate, main axis often sinuous, partial inflorescences sometimes capitately contracted. Spikelets many. Glumes 2–10 distichous, long-persistent, of increasing length, with (1–)2–4(–5) florets subtended by the larger glumes and enclosed by the wings of the next glume. Lower 1–2 floret(s) usually bisexual, upper floret(s) usually functionally male. Bristles absent or poorly developed, or up to 6, delicate, shorter than, to as long as the fruit, deciduous with the fruit. Stamens 3; filaments distinct, anthers linear. Style 2–3-fid, exserted, base not distinct, thickened, persistent, sometimes scabrid. Nutlets ovoid to oblong, terete to triquertous, more or less 3-ribbed to winged, stipitate or sessile, beaked, smooth to rugose.

Distribution and ecology. Machaerina occurs in western India, the Caribbean, and eastern Africa. It grows in forest, shrubland, or grassland, along streams, in marshy areas or on rocks. Machaerina occurs in northern, northeastern, and southeastern Madagascar; four species are known including e.g. Machaerina flexuosa (Boeckeler) J.Kern (Fig. 10).

Tribe Rhynchosporae

Rhynchospora Vahl (Vahl 1805: 229), nom. cons.

Type species. Rhynchospora alba (L.) Vahl

Description of the genus. Usually small to medium-sized perennials, rarely annuals; rhizomatous or with a poorly developed root system. Culms scapose or with 1-many nodes, rounded to trigonous. Leaves radical or radical and caudine; sheaths closed, ligule minute or absent. Involucral bracts leaf-like or reduced. Inflorescence very variable, paniculate, corymbose, anhelate or capitate, rarely pseudolateral. Glumes spirally arranged (rarely distichous), of increasing length to subequal, larger (1–)2-few glume(s) subtending a floret, enclosed by the wings of the next glume. Florets bisexual, the lowest few sterile and/or upper staminate (variable with species). Perianth bristles usually 3–6, or absent. Stamens 1–3, inconspicuous. Style 2–3-fid, with base persistent (tubercle).

Nutlets usually lenticular to globose. Embryo top-shaped in frontal view, root cap developed in a (sub)basal position, and first leaf primordium developed in a lateral position (Carex-type embryo).

Distribution and ecology. Rhynchospora is a cosmopolitan genus (POWO 2022). It grows in seasonally wet to permanently flooded grassland, laterite outcrops, lake shores, stream sides, swamps, rice fields (Browning and Goetghebeur 2017). Rhynchospora occurs throughout Madagascar; ten species are known including e.g. Rhynchospora holoschoenoides (Rich.) Herter (Fig. 11) and Rhynchospora angolensis Turrill (Fig. 12A).

Tribe Cariceae

Carex L. (Linnaeus 1753: 972)

Schoenoxiphium Nees (Nees von Esenbeck 1832: 531)

Type species. Carex hirta L.

Description of the genus. Generally perennials, rarely annuals, caespitose or rhizomatous, sometimes forming a compact tussock. Culms central or lateral, mostly scapose, rarely with nodes, simple, smooth or scabrid. Leaves generally present, glabrous or rarely hairy, sheath often surrounding culm, ligule or sometimes contraligule present at the junction of the sheath and the blade. Primary bracts leaf-like or not, sheathing or not. Partial inflorescences spike-like, unisexual or bisexual, with few to many spirally arranged bracts (or glumes), either subtending a female spikelet or a male floret. Inflorescence terminal, rarely pseudolateral, paniculate, often partly or completely contracted, rarely corymbose or anhelate with few to numerous spikes, less frequently reduced to a single spike, cladophylls sometimes swollen at the base, utriculiform and subtending a female floret; inflorescence mostly bisexual, rarely unisexual or florets dioecious. Spikes male, female, or bisexual, and then mostly male florets apically, rarely basally, or intermingled; female spikelet reduced to the rachilla and a utriculiform, flower-bearing prophyll, completely enclosing the rachilla. Glumes 0 or 1. Floret unisexual; staminate flowers without scales; pistillate flowers with 1 scale with fused margins (perigynium) enclosing flower, open only at apex. Bristles absent. Stamens 1–3, filaments distinct, anthers linear. Style 2–3-fid, exserted, base not distinct, rarely thickened, persistent. Nutlets often obvoid, trigonous, or dorsiventrally compressed, sometimes remarkably malformed.

Distribution and ecology. Carex is a cosmopolitan genus (POWO 2022). It grows in humid forest, wet grassland, in freshwater wetlands, on sand or rocks, usually at higher elevation. Carex (Fig. 12B) occurs throughout Madagascar; 30 species are known.
Figure 11. *Rhynchospora holoschoenoides*. A–B. Habit. C. Leaf sheath. D. Leaf apex. E. Inflorescence. F. Head of spikelets. G–H. Spikelet, complete and opened to show florets. I. Glume, lateral view. J. Nutlet. A–D from Robinson 6123; E, G, I from Robinson 1048; F from Robinson 1456; J from Renvoize 5598. Scale bars: A = 250 mm; B, E = 40 mm; C, F = 5 mm; G–I = 2 mm; D, J = 1 mm. Drawn by Jane Browning, reproduced with permission from the artist, originally published in Browning et al. (2020).
Tribe Eleocharideae

Eleocharis R.Br. (Brown 1810: 224)
Websteria S.H.Wright (Wright 1887: 135)

Type species. Scirpus palustris L. [= Eleocharis palustris (L.) Roem. & Schult.]

Description of the genus. Very small to medium-sized tufted annuals or large rhizomatous, stoloniferous perennials; rhizome often strong, horizontal, often producing stolons. Culms scapose, 3–4 angular, ridged or terete, occasionally septate, ancipitous or bulbously thickened at base. Leaves reduced to inconspicuous basal sheaths, rarely with a short blade, eligulate. Primary bracts absent, rarely proximal scale of spikelet resembling short bract. Inflorescence solitary terminal spikelet, usually quite short and ebracteate. Spikelets with 2–many spirally arranged, rarely subdistichous, deciduous imbricate glumes, each subtending a floret. Lowermost glume often empty or with a vegetative bud, rarely flower-bearing. Floret bisexual. Bristles barbellate, (0–)3–6(–10), or reduced to a narrow rim underlying nutlet, shorter or longer than nutlet and shed with it. Stamens 1–3; anthers linear. Style 2–3-fid, upper portion deciduous, base enlarged persistent as a conical or flattened appendage on nutlet. Nutlets obovoid, lenticular or trigonous, beaked smooth or variously ornamented with pits in longitudinal rows.

Distribution and ecology. Eleocharis is a cosmopolitan genus (POWO 2022). It grows in forest, wet grasslands, freshwater wetlands, along rivers, lake margins, and rice fields, and in rocky areas. Eleocharis occurs throughout Madagascar; 12 species are known including e.g. Eleocharis acutangula (Roxb.) Schult. (Fig. 4C) and Eleocharis dulcis (Burm.f.) Trin. ex Hensch. (Fig. 13).

Tribe Abildgaardieae

1. Bulbostylis Kunth (Kunth 1837: 205), nom. cons.

Type species. Scirpus capillaris L. [= Bulbostylis capillaris (L.) Kunth ex C.B.Clarke]

Description of the genus. Small to medium-sized annuals or tufted perennials, rarely with an elongated rhizome, rarely forming a caudex; rhizome woody, variable, usually compact with swollen confluent shoot bases, occasionally elongate in uniseriate or multiseriate rows, less often of uniform thickness throughout. Culms scapose, terete, ridged and furrowed, glabrous to pilose or densely velutinous apically. Leaves eligulate (rarely ligulate), but with two lateral tufts of long white hairs at the sheath mouth, rarely reduced to a sheath. Primary bracts short, not sheathing, rarely the lowest bract leaf-like and erect. Inflorescence terminal, rarely pseudolateral, anthelate or capitulate. Spikelets few to many, or reduced to a single spikelet, often with many densely

Figure 12. A. Rhynchospora angolensis; photo taken in the Itremo Massif Protected Area by Fitiavana. Rasaminirina. B. Carex sp.; photo taken in the Mantadia National Park by Vida. Svahnstrom.
Figure 13. Eleocharis dulcis. A. Habit (× 1/3). B. Inflorescence (× 1.5). C. Floret (× 10). D. Nutlet (× 12). A from Kirika et al. NMK 778; B from Vesey-Fitzgerald 401; C from Milne-Redhead & Taylor 9164; D from Faden et al. 96/468. Drawn by Juliet Beentje, reproduced with permission from the artist, originally published in Hoenselaar et al. (2010).
spirally arranged (rarely distichous), deciduous glumes, each subtending a floret. Florets bisexual. Perianth bristles absent. **Stamens** 1–3, anthers generally oblong or linear, often acute, rarely setiferous. **Style** (2–)3-fid, base distinct, thickened, persistent, rarely only slightly thickened or deciduous. **Nutlets** obovoid to obpyriform, rounded trigonous, rarely dorsiventrally lenticular, surface with various ornamentations, rarely smooth.

**Distribution and ecology.** *Bulbostylis* is widely distributed in the tropics and subtropics to Central Asia (POWO 2022). It grows in grasslands and woodlands, along roadsides and among rocks. In Madagascar, *Bulbostylis* is known from the northwest, the Central Highlands, and the southwest. This genus is currently being monographed (Rasaminirina et al. unpubl. data), and ca 25 species are currently known to occur in Madagascar including *e.g.* *Bulbostylis iteremoensis* Lye ex Rasam. (Fig. 8B) and *Bulbostylis hispidula* (Vahl) R.W.Haines (Fig. 14).

2. *Trichoschoenus* J.Raynal (Raynal 1968: 223)

**Type species.** *Trichoschoenus bosseri* J.Raynal

**Description of the genus.** Small to medium-sized tufted *perennials*; thick roots. **Culms** scapose, densely hairy, flattened, tufted. **Leaves** reduced to a sheath, leaf sheath of increasing length, blade sometime present as a short micro, eliogulate. **Primary bracts** mostly as long as or shorter than spikelet, not sheathing. **Inflorescence** capitate. **Spikelets** many. **Glumes** 3, distichous, deciduous, of increasing length, the second subtending a floret, enclosed by the wings of the next. **Florets** bisexual. **Perianth bristles** absent. **Stamens** 3. **Style** deeply 3-fid, style base distinct, thickened, deciduous. **Nutlets** obovoid, trigonous, more or less 3-ribbed, surface smooth to slightly tuberculate.

**Distribution and ecology.** *Actinoschoenus* occurs from West-Central Tropical Africa to Zambia, Western Indian Ocean, Sri Lanka to southern China and Australia (POWO 2022). It grows in open woodland on dry sandy areas (Browning and Goetghebeur 2017), wetlands, swamps, sands and wet rocks, water’s edge, forest, to 800 m elevation (Chermezon 1937). A single species of *Actinoschoenus*, i.e. *Actinoschoenus aphyllus* (Vahl) Larridon (Fig. 15), occurs throughout Madagascar.

4. *Abildgaardia* Vahl (Vahl 1805: 296)

**Type species.** *Cyperus monostachyos* L. [= *Abildgaardia ovata* (L.) Vahl]

**Description of the genus.** Small to medium-sized annuals or tufted *perennials*; short woody rhizome. **Culms** scapose, rounded, generally glabrescent, rarely scabrid. **Leaves** eliogulate, sometimes reduced to a sheath, basal polystichous, sheaths distally open, loose, ribbed; blades mostly filiform, compressed or lunate to semicircular in cross section, margins strongly involute. **Primary bracts** short, not sheathing, inconspicuous. **Inflorescence** terminal, depauperate anthelate or capitate. **Spikelets** few or reduced to one single spikelet. **Glumes** many densely (spiro) distichous, deciduous, each subtending a floret. **Floret** bisexual, protandrous. **Perianth bristles** absent. **Stamens** 2–3. **Style** deeply 3-fid, base distinct, thickened, deciduous. **Nutlets** mostly obovoid, stipitate, rounded trigonous, rarely winged, surface often tuberculate.

**Distribution and ecology.** *Abildgaardia* is widely distributed in the tropics and subtropics (POWO 2022). It grows in grasslands, woodlands, freshwater wetlands, and brackish marshes. *Abildgaardia* occurs throughout Madagascar; two species are known including *e.g.* *Abildgaardia triflora* (L.) Abeyw. (Fig. 16).


**Type species.** *Scirpus dichotomus* L. [= *Fimbristylis dichotoma* (L.) Vahl]

**Description of the genus.** Annuals tufted or *perennials* with rhizomes. **Culms** scapose or subscapose, terete or 3–4–5-angular or acipinartous, variously pubescent to glabrous. **Leaves** spirally or distichously arranged, or reduced to a sheath, ligulate or eliogulate; blade linear, filiform, or rarely ensiform, usually dorsiventrally compressed and canaliculate, often adaxially cellular-reticulate. **Primary bracts** short, not sheathing. **Inflorescence** variable usually capitate or anthelate. **Spikelets** few to numerous, or reduced to a single spikelet, mostly cylindrical. **Glumes** usually spirally arranged, rarely distichous, deciduous, each subtending a bisexual floret. **Perianth bristles** absent. **Stamens** 1–3. **Style** 2–3-fid, often penultimate larger glume, enclosed by the wings of the next glume, bisexual. **Perianth bristles** absent. **Stamens** 3. **Style** deeply 3-fid, style base distinct, thickened, deciduous. **Nutlets** obovoid, trigonous, more or less 3-ribbed, surface smooth to slightly tuberculate.
Figure 14. Bulbostylis hispidula. A. Habit. B. Glume. C. Nutlet. D. Spikelet. E. Mouth of leaf sheath. F. Young nutlet with style. All from Ward 610. Scale bars: A = 40 mm; B, C = 5 mm; D–F = 0.5 mm. Drawn by Jane Browning, reproduced with permission from the artist, originally published in Gordon-Gray (1995).
flattened with fimbriate margins when 2-fid; base distinct, thickened, deciduous. Nutlets obovoid, trigonous or biconvex and often variously ornamented, trigonous when style 3-fid, lenticular when style 2-fid, smooth, tuberculate or longitudinally ribbed, not transversely wrinkled.

**Distribution and ecology.** *Fimbristylis* is a cosmopolitan genus (POWO 2022). It grows on seasonally wet or damp sandy soils in grassland, woodland, riverbeds, and rice fields, also on rocks in shallow soil (Browning and Goetghebeur 2017). *Fimbristylis* occurs throughout Madagascar; 17 species are known including e.g. *Fimbristylis dichotoma* (Fig. 17).

**Tribe Bolboschoeneae**

**Bolboschoenus** (Asch.) Palla (Palla 1905: 2531)

**Type species.** *Bolboschoenus maritimus* (L.) Palla

**Description of the genus.** Perennials with long rhizomes often forming hard ovoid tubers at tips. Culms many-noded, sharply trigonous, thickened at tips. Leaves basal and cauline, elliptic; blade often reduced in lower leaves. Involucral bracts leaf-like, patent, lowermost often suberect. Inflorescence terminal (in reduced inflorescences, bract may be erect, but clearly leaf-like), a (compound) corymb-like anthela or capitate with

**Figure 15.** *Actinoschoenus aphyllus*. All photos taken in Andrainjato, Taolagnaro District, Anosy Region by Andriambolantsoa Rasolohery (https://www.inaturalist.org/observations/14549565), reproduced with permission from the photographer.
Figure 17. *Fimbristylis dichotoma*. A, B. Habit. C. Leaf sheath apex. D. Leaf apex. E. Spikelet. F, G. Glume, abaxial and lateral view. H. Floret. I. Nutlet. All from *Brummitt 9546*. Scale bars: A = 250 mm; B = 40 mm; C, E = 5 mm; D = 2 mm; F–I = 1 mm. Drawn by Jane Browning, reproduced with permission from the artist, originally published in Browning et al. (2020).
awned or mucronate. Floret bisexual. Perianth present, puberulent, the apex entire to emarginate or deeply 2-fid, deciduous glumes, each subtending a flower. Glumes many, spirally arranged, deciduous with fruit. Stamens 3. Style 2–3-fid; base persistent, barely thickened. Nutlets obovate, dorsiventrally lenticular or trigonous. Pericarp with the three highly differentiated layers, exocarp cells often enlarged and hollow; surface smooth, epidermal cells roughly isodiametric. Embryo fungiform with three primordial leaves.

**Distribution and ecology.** Bolboschoenus is a cosmopolitan genus (POWO 2022). It grows in saline, brackish, or freshwater wetlands. In Madagascar, Bolboschoenus is known from the north and west, occurring in the Diana Region of Antsiranana province, Boeny region of Mahajanga province, and Atsimo Andrefana region of Toliara province. Only a single species occurs in Madagascar, i.e. Bolboschoenus glaucus (Lam.) S.G.Sm. (Fig. 18).

**Tribe Fuireneae**

*Fuirena* Rottb. (Rottboll 1773: 70)

**Type species.** *Fuirena umbellata* Rottb.

**Description of the genus.** Annuals or rhizomatous perennials. Culms many-noded, rarely scapose, 3–5-sided, sometimes thickened at base. Leaves usually well developed, basal and cauline, ligule tubular, membranous, with blade often reduced in lower leaves (rarely all leaf blades reduced). Involucral bracts leaf-like, usually sheathing, lowermost bract sometimes erect. Inflorescence terminal (in reduced inflorescences, bract may be erect, but clearly leaf-like), paniculate to capitulate with few to many spikelets. Glumes many, spirally arranged or rarely pentaschistously arranged, deciduous, each subtending a flower, often pubescent, the apex entire and mucronate to awned. Floret bisexual. Perianth present, as long or shorter than nutlet, formed by 3 parts, or when 6 in 2 whorls, the inner parts scale-like, the outer parts bristle-like, rarely all parts reduced or absent or only 1 scale developed, deciduous with the fruit. Stamens 1–3. Style 3-fid, base persistent, barely thickened, if at all. Nutlets obovate, triquetrous to trigonous, frequently stipitate, smooth or variously ornamented. Embryo turbinate to weakly fungiform with a horizontally broadened scutellum, first leaf primordium not strongly outgrown, the second leaf primordium either absent or poorly developed.

**Distribution and ecology.** *Fuirena* is a cosmopolitan genus (POWO 2022). It grows in seasonally wet grasslands, freshwater wetlands, on sand or in rocky areas. *Fuirena* occurs throughout Madagascar; seven species are known including e.g. *Fuirena pubescens* (Poir.) Kunth (Figs 8C, 19).

**Tribe Schoenoplectieae**

*Schoenoplectus* (Rchb.) Palla (Palla 1888: 49), nom. cons.

**Type species.** *Schoenoplectus lacustris* (L.) Palla

**Description of the genus.** Perennials with long rhizomes sometimes ending in tubers at tips. Culms scapose, trigonous to terete, thickened at base. Leaves scapose, trigonous, or dorsiventrally lenticular, yellow to dark brown when mature; fruit epidermal cells isodiametric to narrowly oblong. Embryo fungiform, scutellum turbinate to rhomboid in shape, root cap lateral, first well developed and second embryonic leaves basal.

**Schoenoplectiella** Lye (Lye 2003: 20)

**Type species.** *Scirpus articulatus* L. [= *Schoenoplectiella articulata* (L.) Lye]

**Description of the genus.** Annuals or perennials, tufted or with firm, short to creeping rhizomes. Culms nodeless and scapose or 1(–3)-noded above the base, trigonous, terete or rarely 7-sided. Leaves reduced to a sheath, rarely well developed. Involucral bracts leaf-like, erect, or sometimes plumose, longer or shorter than nutlet, deciduous with fruit. Stamens 2–3. Style 2–3-fid, base not thickened, persistent. Nutlets smooth, obovate, trigonous, or dorsiventrally lenticular, yellow to dark brown when mature; fruit epidermal cells isodiametric to narrowly oblong. Embryo fungiform, scutellum turbinate to rhomboid in shape, root cap lateral, first well developed and second embryonic leaves basal.

**Schoenoplectiella** Lye (Lye 2003: 20)

**Type species.** *Scirpus articulatus* L. [= *Schoenoplectiella articulata* (L.) Lye]

**Description of the genus.** Annuals or perennials, tufted or with firm, short to creeping rhizomes. Culms nodeless and scapose or 1(–3)-noded above the base, trigonous, terete or rarely 7-sided. Leaves reduced to a sheath, rarely well developed. Involucral bracts leaf-like, erect, or sometimes plumose, longer or shorter than nutlet, deciduous with fruit. Stamens 2–3. Style 2–3-fid, base undifferentiated, rarely...
Figure 21. *Isolepis fluitans*. A. Habit. B. Leaf sheath. C. Spikelet. D. Rachilla, apical glume attached. E. Glume, lateral view. F. Floret. G, H. Nutlet, abaxial and apical view. All from Iversen & Martinsson 89195. Scale bars: A = 40 mm; B–H = 1 mm. Drawn by Jane Browning, reproduced with permission from the artist, originally published in Browning et al. (2020).
distinct and somewhat thickened, persistent. Nutlets smooth or transversely rugose to distinctly ridged, obovate, trigonous to planoconvex or biconvex, dark nearing black when mature, sometimes brown.

**Distribution and ecology.** *Schoenoplectiella* is a cosmopolitan genus (POWO 2022). It grows in freshwater wetlands, along stream banks, wet grasslands, and rocky areas. *Schoenoplectiella* is known from all parts of Madagascar; 13 species are known including e.g. *Schoenoplectiella corymbosa* (Roth ex Roem. & Schult.) J.R.Starr & Jim.Mejías (Figs 8C, 20).

**Tribe Cyperaeae**

1. **Subtribe Ficiniinae**

1. *Isolepis* R.Br. (Brown 1810: 221)

**Type species.** *Scirpus setaceus* L. [= *Isolepis setacea* (L.) R.Br.]

**Description of the genus.** Small to more rarely medium-sized tufted annuals or mat-forming perennials; rhizome more rarely creeping, rhizomatous or stoloniferous. Culms scapose or with few to many nodes. Leaves eligate, of a minute lobe or elongated to form a linear blade often much reduced. Primary bracts leaf-like or short, not sheathing, lowermost bract often erect. Inflorescence often pseudolateral, capitate, rarely anhelate. Spikelets few to many or reduced to a single spikelet. Glumes with few to many usually spirally arranged (rarely distichous), mostly deciduous glumes, each subtending a floret. Floret bisexual. Perianth bristles absent. Stamens 3; anthers linear, often apiculate or setiferous. Style deeply 3-fid, sometimes 2-fid, rarely almost undivided; base not distinct, not thickened, deciduous. Nutlets mostly obovoid, rounded trigonous, rarely biconvex, base mostly surrounded by a tightly enveloping cupular to 3-lobed disc (gynophore), surface usually smooth.

**Distribution and ecology.** *Ficinia* is a cosmopolitan genus (POWO 2022). It grows in wet or dry mountain grasslands (Browning and Goetghebeur 2017). In Madagascar, *Ficinia* is known from the Analamanga region of Antananarivo province. Only a single endemic species is known from Madagascar, i.e. *Ficinia ciliata* Boeckeler. No illustration is available of this species and the type material has not been located.

2. **Subtribe Cyperinae**

**Cyperus** L. (Linnaeus 1753: 44)

*Kyllinga* Rottb. (Rottboll 1773: 12), nom. cons.

*Remirea* Aubl. (Aublet 1775: 44)


*Pycreus* P.Beauv. (Palisot de Beauvois 1807 publ. 1816: 48)

*Ascolepis* Nees (Nees von Esenbeck 1842: 90)

*Queenslandiella* Domin (Domin 1915: 415)

*Courtoisina* Soják (Soják 1979 publ. 1980: 193)

**Type species.** *Cyperus esculentus* L.

**Description of the genus.** Small to large annuals, or tufted, rhizomatous, stoloniferous or bulbiferous perennials. Culms mostly scapose, triangular to subterete, rarely winged, compressed or septate. Leaves eligate (more rarely ligulate), sometimes reduced to a sheath; sheaths sometimes semisucculent; blade linear or rarely oblong or pseudopetiolate. Primary bracts often large and leaf-like, not sheathing, lowermost bract rarely erect. Inflorescence of few to many spikelets, in clusters called spikes, terminal, rarely pseudolateral, anhelate to capitate, rarely spicate or reduced to a single spikelet; partial inflorescences spike-like with spicately or digitately-arranged spikelets, or densely capitate. Spikelets with few to many, 2-ranked (very rarely spirally arranged) glumes, spikelet bract and prophyll more or less glume-like, each glume subtending a floret. Glumes deciduous or persistent; rachilla internodes elongated. Floret bisexual, very rarely unisexual or even dioecious. Bristles absent, lacking a gynophore. Stamens 1–3. Style (2–)3-fid, more rarely (sub)entire; base mostly not distinct, not thickened, persistent or deciduous. Nutlets most often 3-sided, with scattered along a profusely branched stem. Spikelets 1–many. Glumes with few to many spirally arranged or more rarely distichous, usually long-persistent glumes, each with a floret, or a few lower glumes empty. Floret bisexual.
Figure 22. *Cyperus pectinatus*. A. Habit (× 2/3). B. Inflorescence (× 1.5). C. Spikelet (× 3). D. Glume (× 10). E. Flower (× 10). F. Nutlet (×10). A from Peter 8794; B–D, F from Greenway & Kanuri 12298; E from Richards 24601. Drawn by Juliet Beentje, reproduced with permission from the artist, originally published in Hoenselaar et al. (2010).
Figure 23. Diversity in the genus *Cyperus*. A. *Cyperus cf. cyperoides*. B. *Cyperus obtusiflorus*. C. *Cyperus assimilis*. All photos taken in the Itremo Massif Protected Area by Fitiavana Rasaminirina.
the flat side pressed against the spikelet rachilla, often obovoid or ellipsoid, rarely dorsiventrally compressed, rarely stipitate, beaked or not, surface smooth or with various ornamentations, rarely thickened, coryn.

**Distribution and ecology.** *Cyperus* is a cosmopolitan genus who can be found everywhere. *Cyperus* occurs throughout Madagascar; ca 145 species are known including e.g. *Cyperus pectinatus* Vahl (Figs 22, 23).

**ACKNOWLEDGEMENTS**

We are grateful to an anonymous member of the International Sedge Society for sponsoring a 4-month research placement for the first author in preparation of starting a PhD at University of Antananarivo in collaboration with Royal Botanic Gardens, Kew. This study was supported by the Today’s Flora for Tomorrow project funded by a generous donor through Kew Foundation. We would like to thank Benoît Loeuille and Jérémie Morel for improving the language in the French version of this paper.

**REFERENCES**


