

## 28. CAREX

LINNÉ, Gen. Pl. ed. 5 (1754) 420; Sp. Pl. (1753) 972; ENDL. Gen. (1836) 110; KUNTH, En. 2 (1837) 368; STEUD. Syn. 2 (1855) 182; MIQ. Fl. Ind. Bat. 3 (1856) 346; BOOTT, Illustr. Genus Carex I–IV (1858–67); BOECK. Linnaea 39 (1875) 14; *ibid.* 40 (1876) 327; *ibid.* 41 (1877) 145; B. & H. Gen. Pl. 3 (1883) 1073; PAX in E. & P. Nat. Pfl. Fam. 2, 2 (1887) 122; CLARKE, Fl. Br. Ind. 6 (1894) 699; J. Linn. Soc. Bot. 37 (1904) 1; Philip. J. Sc. 2 (1907) Bot. 107; KÜK. Pfl. R. Heft 38 (1909) 67; Philip. J. Sc. 6 (1911) Bot. 57; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 232; NELMES, Kew Bull. (1946) 5; Reinwardtia 1 (1951) 221; *ibid.* 2 (1954) 373; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 17; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 149; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 487. — Fig. 118–135.

Perennial herbs with tufted or creeping rhizome, monoecious, rarely dioecious. *Stems* arising centrally or laterally, erect or obliquely erect, mostly triquetrous or trigonous, rarely subterete, solid or sometimes hollow, often clothed at the base by persistent leaf-sheaths or their fibrous remains. *Leaves* tristichous, usually narrowly linear, sheathing at the base, with a ligule at the junction of blade and sheath, rarely lanceolate or elliptic with a more or less distinct petiole and eligulate, mostly basal and subbasal, 0–several higher on the stem, the lower ones often reduced to bladeless sheaths; sheaths of the stem-leaves and bracts closed. *Inflorescence* paniculiform, racemiform or spiciform, more rarely reduced to a single spikelet. *Spikelets* 1–very numerous, terete, sessile or peduncled, few- to many-flowered, wholly male, wholly female, or bisexual (androgynous when male flowers above, gynaeandrous when female flowers above). Bracts foliaceous or glume-like, often sheathing, sometimes wanting. Base of the branches of the inflorescence usually with a utriculiform or ocreiform bracteole (*cladoprophyllum*) surrounding it. *Flowers* unisexual, naked, solitary in the axils of the spirally arranged glumes; male flowers consisting of 3 free or rarely more or less connate stamens; anthers linear; female flowers consisting of a single pistil enclosed in a bottle-shaped prophyll (*utricle*, *perigynium*). *Style* either continuous with the ovary and persistent, or articulated with it and deciduous, straight or flexuous, often incrassate at the base; stigmas 2 or 3, protruding through the small terminal orifice of the utricle. Vestigial *rachilla* (see *Uncinia*) rarely present. *Utricles* membranous, chartaceous, or coriaceous, bicarinate, sometimes winged, sessile or stipitate, beakless to strongly beaked, nerveless, nerved, or ribbed, glabrous, or pubescent or hispid, papillose or punctulate or smooth, sometimes spongy at the base; beak truncate, obliquely cleft, bidentate, or bifurcate at the top. *Nut* trigonous (when stigmas 3), or lenticular (plano-convex or biconvex; when stigmas 2), enclosed within the utricle.

*Distr.* A large genus with 600 to 1000 *spp.*, the majority of them outside the tropics. However, the most primitive section, *Vigneastra* with a compound, paniculate inflorescence and androgynous spikelets, occurs mainly in the tropics of the Old World, from sea-level up to 3000 m. This section is represented in Malesia with 11 *spp.*, and is there by far the largest section.

*Subg. Carex* is, besides with the 11 *spp.* of *sect. Vigneastra*, represented in Malesia by 25 sections and 49 *spp.*, *subg. Vignea* with 6 sections and 6 *spp.*

(1) Continued from volume 7, part 3 (1974) p. 753.

Of the 66 *spp.* in all, 12 *spp.* are endemic and mostly confined to one island. Of the other 54 *spp.* the majority occur also in the northern hemisphere, either widely or only in SE. and/or E. Asia. Of these, 25 *spp.* extend without noticeable disjunctions into Malesia, either to its western part or further eastward. Another 4 of the E. Asian *spp.* occur in Formosa and in Malesia only in the Philippines (mostly only in Luzon), viz 12. *C. satzumensis*, 30. *C. rhynchachaenium*, 32. *C. dolichostachya*, and 33. *C. formosensis*.

Among the Asian *spp.* 4 show a distinct disjunction between SE. Asia and Java, viz 11. *C. vesiculosa*, 14. *C. helferi*, 63. *C. nubigena*, and 58. *C. longipes* (which is also once found in Celebes and once in New Guinea); all are mountain species.

A similar disjunction is found in the lowland species 10. *C. stramentitia* and 38. *C. tricephala*; this disjunction is understandable as both are bound to a distinct seasonal climate which shows a similar pattern (see VAN STEENIS, Reinwardtia 5, 1961, 420-429).

Still larger disjunctions are shown by 5 E. Asian *spp.* which are in Malesia almost only found in New Guinea, Formosa being mostly the nearest station, viz 46. *C. brachyathera*, 47. *C. finitima* (also in N. Sumatra), 48. *C. michauxiana*, 56. *C. bilateralis*, and 61. *C. duriuscula*; all are mountain plants.

Not a few *Carex spp.* occur in both the northern and southern hemisphere (Australia, often Tasmania and New Zealand) and are also found in the intervening tropical zone in Malesia. There are 11 of such species in all. Among these the following 7 are found in more than one island, viz 6. *C. indica*, 31. *C. breviculmis*, 39. *C. maculata*, 40. *C. capillacea*, 57. *C. brunnea*, 5. *C. horsfieldii*, and 64. *C. echinata*, although the latter two are very rare. Four others are also transtropical but are in Malesia only found in New Guinea, and thus show almost the same disjunction between Formosa and New Guinea as mentioned above; these are 43. *C. brownii*, 49. *C. pseudocyperus*, 55. *C. gaudichaudiana*, and 66. *C. curta*. They occur in Malesia only in bogs and marshes on (high) mountains.

The southern hemisphere has contributed very little to the Malesian *Carices*, as there is only one southern species from Australia, New Zealand, and New Caledonia, viz 62. *C. appressa*, which is found in Malesia, and then again only in New Guinea at very high altitude.

Summarizing, one cannot withdraw oneself from concluding that only the presence of mountain bogs, marshes and grasslands gives the opportunity for the maintenance of *Carex* in the Malesian tropics. This would explain why the big mountainous island of New Guinea — where this habitat is most abundantly represented, much more than in any other island — is so rich in species. It is then also understandable that this is the place where relict areas could maintain their last stand in the tropical mountains of Malesia.

Ecol. Most species prefer moist or wet localities, some are found in rain-forest, others in open habitats like in mountain marshes, grassland, heaths, etc. Only 22 *spp.* grow below 1000 m, 8 of them belonging to *sect. Vigneastra*, 13 are found below 500 m, 4 of them of *sect. Vigneastra*; 14 *spp.* occur exclusively above 2000 m. 57. *C. brunnea*, which is found from 80 m up to 3400 m, has the largest altitudinal range.

The majority of the *Carex spp.* is growing on more or less acid soils. Three species of the lowland tropics occupy a different habitat, and are bound to a seasonal climate, viz 10. *C. stramentitia*, 38. *C. tricephala*, and 37. *C. speciosa*. The first two occur only in Java or Madura I., amongst others with the teak-forest; the third of these drought species occurs also in some local dry spots in E. Sumatra and SE. Borneo, and is obviously adapted to a slightly less severe dry season.

Of the three mentioned species, *C. tricephala* and *C. speciosa* are confined to limestone, like one other species, 35. *C. malaccensis*, an endemic of N. Malaya (the Langkawi Is.).

One species, 59. *C. teinogyna*, seems in Malesia to be confined to banks of swift streams and occupies a rheophytic habitat.

Notes. The distinction of the sections is not always unanimously agreed on, and several species were put into different sections by different authors. Some sections are closely allied, the only difference being sometimes 2 versus 3 carpels. As this has great influence on the shape of the nut, it often is considered a very important character. In my opinion the difference is due to a minor genetic difference, and is taxonomically not very important. Besides, in some collections 2-carpelled and 3-carpelled fruits are found in the same inflorescence, e.g. in species of *sect.*

*Graciles*, which has normally 2 carpels, and of *sect. Oligostachyae (Decorae)* which has normally 3 carpels (NOOT.).

Acknowledgement. The manuscript of *Carex* was for the greater part elaborated by Dr. J. H. KERN before he died in 1974. The obstacle for finishing it in time was his worry about the status *cq.* evaluation of a number of names in *sect. Vigneastra*, which also prohibited the finishing of the practical key to the species. Dr. H. P. NOOTBOOM has done this evaluation and he made the final draft of the key, for which he is responsible. He is also responsible for the treatment offered here for several species, *viz* 3. *C. cruciata*, 18. *C. perakensis*, 19. *C. turrita*, 20. *C. verticillata*, and 31. *C. breviculmis*, and for some critical notes which have been marked "NOOT." between brackets. The division in subgenera and sections is largely from Dr. KERN. The revision of *Uncinia* is entirely by Dr. NOOTBOOM. (Ed.)

Explanation of some terms. The term 'stems' refers to the flower-bearing stems, except when stated otherwise, whereas 'inflorescence' means the entire flower-bearing stem including all the spikelets. The terms used for the inflorescence ('panicle', 'raceme') indicate the disposition of the spikelets, not of the individual flowers. 'Stems central' means that the leaves are arranged around the flower-bearing stem (usually towards the base). 'Stems lateral' means that the leaves are placed on a vegetative shoot, and that the flower-bearing stems arise separately from the rhizome and bear few short-bladed leaves. The flowering stems can also be situated in the axils of the leaves. This situation is sometimes difficult to distinguish from 'stems central', because the leaves are often crowded in a basal rosette.

The bracts are inserted on the stem and they are sheathing or not; they bear in their axils a spikelet or a partial inflorescence, the peduncles of which are often basally surrounded by a cladoprophyllum; this is a bracteole which is utriculiform or ocreiform. If the cladoprophyllum is ocreiform, it usually is hidden entirely in the sheath of the bract. Each flower is solitary in the axil of a glume; several flowers together form a spikelet which can be ♂, ♀, or bisexual; in the latter case the ♂ flowers are usually placed only at the base or at the apex of a spikelet. Gynaecandrous spikelets have ♀ flowers above, ♂ below, androgynous spikelets have ♂ flowers above and ♀ below.

The figures 118–123, depicting utricles and nuts of nearly all the species, and some glumes (fig. 132), are given to facilitate use of the keys.

#### KEY TO SUBGENERA AND SECTIONS

##### as represented in *Malesia*

1. Stigmas 3 and nut trigonous, or, when stigmas 2 and nut lenticular (plano-convex or biconvex) some or all of the spikelets peduncled or terminal spikelet ♂. Spikelets either dissimilar in appearance (the terminal one ♂ and some or all the lateral ones ♀), or similar in appearance (all bisexual). Base of the peduncles of the lateral spikelets or of the branches of the inflorescence surrounded by a utriculiform or ocreiform bracteole (*cladoprophyllum*); inflorescence sometimes reduced to a single terminal spikelet  
I. SUBG. CAREX
2. Stigmas 3; nut trigonous.
3. Inflorescence consisting of more than one spikelet.
4. Lateral spikelets arising from a gaping, utriculiform, fertile (*i.e.* nut-bearing) cladoprophyll. Spikelets androgynous, up to 15 mm long. Bracts not sheathing. Stems 3–20 cm tall. *Sp.* 12  
2. *Sect. Japonicae*
4. Lateral spikelets arising from a sterile cladoprophyll, or sessile without cladoprophyll.
5. Stems scapiform, surrounded at the base by spadiceous sheaths in place of leaves. Leaves wide, conduplicate-petioled below. Secondary panicles contracted, very dense. Utricles with very long linear beak and very oblique mouth. *Sp.* 14 . . . . . 4. *Sect. Mapaniifoliae*
5. Otherwise.
6. Spikelets peduncled, in fascicles in the axils of at least some of the sheathing bracts, all androgynous or some wholly ♂ or ♀. Utricles long-beaked. *Spp.* 17–20 . . . . . 6. *Sect. Oligostachyae*
6. The peduncled or sessile spikelets or secondary panicles single or binate in the axils of the bracts.
7. Spikelets similar in appearance, androgynous (upper flowers ♂, lower ones ♀).
8. Lower bracts not or only shortly (some millimeters) sheathing.
9. Apex of nut truncate,  $\frac{1}{2}$ – $\frac{3}{4}$  mm  $\varnothing$ , hollowed out. Style centred in the apical hollow of the nut. Utricles lageniform or rhomboid-lageniform. *Spp.* 27–30. . . 10. *Sect. Lageniformes*

9. Apex of nut not truncate. Style base pyramidally thickened, often broader than apex of nut. *Spp.* 35–38 . . . . . 12. *Sect. Radicales*
8. Lower bracts long sheathing.
10. Flowering stems arising from the axils of the leaves which are crowded on a short stem and much longer than the flowering stems. Style flexuous. Nut with irregularly excavated sides, seated on a spongy, disk-like stipe. *Sp.* 26 . . . . . 9. *Sect. Cryptostachyae*
10. Flowering stems arising either from the centre of the leaves, or from lateral shoots bearing a few short-bladed leaves.
11. Spikelets small, up to 15(–20) mm long.
12. Stems central. Spikelets numerous, ovoid or oblong-ovoid, arranged in often diffuse, compound panicles. Bracts long. *Spp.* 1–11 . . . . . 1. *Sect. Vigneastra*
12. Stems lateral. Spikelets few, globose-ovoid, in a simple panicle. Bracts shorter than 8 cm, the sheaths not included. *Sp.* 21 . . . . . 7. *Sect. Surculosae*
11. Spikelets longer.
13. Utricles densely many-nerved. Spikelets 1–8(–14).
14. Utricles ellipsoid, short-beaked, more or less ciliate on the margins, spongy-thickened at the base. Spikelets 1–3(–4). *Spp.* 35–38 . . . . . 12. *Sect. Radicales*
14. Utricles narrowly ellipsoid, long-beaked, more or less hispidulous on the faces, not spongy-thickened at the base. Spikelets 2–8(–14). *Spp.* 17–20 . . . . . 6. *Sect. Oligostachyae*
13. Utricles distinctly but not densely nerved. Leaves with reddish sheaths splitting into fibres. Spikelets 6–numerous. *Spp.* 15–16 . . . . . 5. *Sect. Polystachyae*
7. Spikelets dissimilar in appearance, unisexual (or rarely gynaeandrous), the terminal one or some upper ones ♂, the remainder ♀ (occasionally the ♀ spikelets may have a few ♂ flowers, and the ♂ spikelets a few ♀ flowers). Or most of the spikelets ♀, shortly cylindrical, the ♂ spikelets lateral, 1–5 just below some of the terminal ♀ spikelets.
15. Leaves not crowded in a basal rosette but inserted all over the stem, the upper ones merging into leafy bracts, the lower ones gradually decreasing in length and merging into bladeless sheaths.
16. Inflorescence a compound panicle consisting of 5–8 secondary panicles each containing numerous ♀ spikelets and 1–5 ♂ spikelets. Spikelets small, 4–8 mm long. Utricles glabrous, with short,  $\frac{1}{4}$  mm long beak. Leaves sparsely hairy beneath. *Sp.* 13 . . . . . 3. *Sect. Hypolytroides*
16. Inflorescence simple, racemose, consisting of 4–9 spikelets; terminal spikelet ♂ (sometimes a second, smaller one added), remaining spikelets ♀,  $1\frac{1}{2}$ –4 cm long. Utricles densely hispid, with distinct, *c.* 1 mm long beak. Leaves glabrous. *Sp.* 50. . . . . 21. *Sect. Occlusae*
15. Leaves crowded at the base of the stem, often also some higher on the stem.
17. Nut excavated in the middle, the apex abruptly narrowed into a conspicuous, hastiform, *i.e.* cylindrical,  $\frac{1}{2}$ – $\frac{1}{3}$  mm long beak expanding into the annulate apex. *Spp.* 22–25 . . . . . 8. *Sect. Rhomboidales*
17. Nut without hastiform beak.
18. Apex of nut truncate,  $\frac{3}{4}$ –1 mm wide, hollowed out. Style centred in the apical hollow of the nut. Utricles lageniform or rhomboid-lageniform. *Spp.* 27–30 . . . . . 10. *Sect. Lageniformes*
18. Apex of nut not truncate, at most  $\frac{1}{2}$  mm wide.
19. Nut mitrate, *i.e.* contracted at the apex and then expanded into a discoid annulus. Utricles ovoid or ellipsoid. *Spp.* 31–34 . . . . . 11. *Sect. Mitratae*
19. Nut not mitrate.
20. Utricles densely papillose, erostrate or but shortly beaked. *Sp.* 39 . . . . . 13. *Sect. Trachychlaenae*
20. Utricles not papillose, distinctly beaked.
21. ♀ Spikelets broadly ovoid or subglobose, with few narrowly lanceolate, *c.* 1 cm or more long utricles. Bracts sheathing. Rhizome short. *Sp.* 48 . . . . . 19. *Sect. Folliculatae*
21. ♀ Spikelets not broadly ovoid-subglobose. Utricles smaller.
22. Spikelets linear-cylindric, loosely flowered. Utricles nerveless (except for 2 submarginal nerves) or obscurely nerved, with long beak and oblique mouth. Bracts sheathing.
23. Utricles hispidulous, brownish. *Sp.* 46 . . . . . 17. *Sect. Ferrugineae*
23. Utricles glabrous, light green. *Sp.* 47 . . . . . 18. *Sect. Sylvaticae*
22. Spikelets oblong or cylindric. Utricles many-nerved.
24. Spikelets short-cylindric, few-flowered. Utricles fusiform-ellipsoid or rhomboid, at least towards the base many-nerved. Flowering stems lateral or central. *Spp.* 22–25 . . . . . 8. *Sect. Rhomboidales*
24. Spikelets cylindric, densely many-flowered.

- 25. Utricles firm, of thick texture, short-beaked. Rhizome emitting strong stolons. Leaves conspicuously septate-nodulose. Spikelets erect. Bracts not or scarcely sheathing. *Sp.* 60 . . . . . 26. *Sect.* Paludosae
- 25. Utricles membranous, with long beak (except in *C. brownii* ssp. *brownii*).
- 26. Spikelets erect. Utricles patulous, subinflated, many-nerved, with shortly bidentate beak. Style straight. Rhizome often creeping. *Spp.* 42–45 . . . . . 16. *Sect.* Anomalae
- 26. Lower spikelets cernuous. Utricles widely patent to reflexed, closely many-ribbed, with bifurcate beak. Style flexuous. Rhizome cespitose. *Sp.* 49  
20. *Sect.* Pseudocypereae
- 3. Inflorescence consisting of a single terminal spikelet.
- 27. Utricles with whitish pubescent margins or hispidulous, densely and strongly many-nerved, 4–10 mm long. *Spp.* 35–38 . . . . . 12. *Sect.* Radicales
- 27. Utricles glabrous, 1½–5 mm long.
- 28. Utricles rather large (4½–5 mm long), with slender, linear, bidentate beak. *Sp.* 41  
15. *Sect.* Rhizopodae
- 28. Utricles small (1½–4 mm long), with short, subentire or slightly emarginate beak. *Sp.* 40  
14. *Sect.* Capitellatae
- 2. Stigmas 2; nut lenticular (plano-convex or biconvex).
- 29. Bracts sheathing. Spikelets often in fascicles. Utricles often hispidulous, membranous, nerved, usually long-beaked. Stigmas often very long. *Spp.* 56–59 . . . . . 25. *Sect.* Graciles
- 29. Bracts not sheathing (or very shortly).
- 30. Lateral spikelets sessile or the lowest shortly peduncled, erect. Terminal spikelet ♂. Glumes muticous. *Sp.* 55 . . . . . 24. *Sect.* Carex
- 30. Spikelets peduncled, cernuous. Glumes often awned.
- 31. Spikelets 3–8, single at the nodes, cylindric, short peduncled. Terminal spikelet ♂, or (often with exception of basal spikelets) spikelets gynaeandrous. *Spp.* 52–54. . . . . 23. *Sect.* Praelongae
- 31. Spikelets 6–50, single or binate at the nodes, the lower ones long-peduncled, all androgynous or some ♂, linear-cylindric. *Sp.* 51 . . . . . 22. *Sect.* Longispicae
- 1. Stigmas 2 and nut lenticular. Spikelets similar in appearance, bisexual, sessile. Cladophylla usually absent . . . . . II. SUBG. VIGNEA
- 32. Spikelets androgynous (upper flowers ♂, lower ones ♀).
- 33. Rhizome long-creeping. Spikelets 4–7. Utricles coriaceous, plano-convex, sharp-edged but not winged. *Sp.* 61 . . . . . 27. *Sect.* Divisae
- 33. Rhizome short, forming dense tufts. Spikelets numerous or very numerous.
- 34. Utricles coriaceous, with rounded margins. Bracts inconspicuous. *Sp.* 62 . . . . . 28. *Sect.* Paniculatae
- 34. Utricles membranous, with acute or winged margins. Lower bracts foliaceous. *Sp.* 63  
29. *Sect.* Multiflorae
- 32. Spikelets gynaeandrous (upper flowers ♀, lower ones ♂). Utricles membranous.
- 35. Utricles with rounded margins, densely whitish-punctulate, beakless or very shortly beaked. Spikelets ebracteate (bracts glumiform). *Sp.* 66 . . . . . 32. *Sect.* Heleonastes
- 35. Utricles with acute or winged margins, not punctulate.
- 36. Utricles obliquely erect, also when mature. Spikelets more or less distinctly bracteate. *Sp.* 65.  
31. *Sect.* Elongatae
- 36. Utricles widely spreading or reflexed when mature. Spikelets not or inconspicuously bracteate (bracts glumiform). *Sp.* 64 . . . . . 30. *Sect.* Stellulatae

KEY TO THE SPECIES

Only complete specimens with nearly or fully mature utricles are identifiable. As the distribution of sexes is variable, especially in the species with a terminal male spikelet, it is advisable to examine several specimens if possible.

In the measurements of the length of the utricles the beak is included. Unless stated otherwise 'glumes' refers to the glumes subtending the female flowers.

- 1. Inflorescence consisting of a single (androgynous) spikelet terminating the stem. Stigmas 3; nut trigonous.
- 2. Utricles with whitish pubescent margins, or hispidulous, or winged and scabrid margined, 4–8 mm long. Glumes (many)-nerved. Style pyramidally thickened towards the base, persistent on the nut. Leaves (2–)3–10 mm wide.
- 3. Spikelets 2–8 cm long. Utricles with whitish pubescent margins . . . . . 37. *C. speciosa*
- 3. Spikelets 6–12 mm. Utricles hispidulous or glabrous with scabrid margins.

4. Utricles hispidulous in the upper  $\frac{2}{3}$ , 4–6 mm, with conic-cylindric, 1–2 $\frac{1}{2}$  mm long beak. 38. *C. tricephala*
4. Utricles glabrous with scabrid, distinctly winged margins, 6–8 mm, gradually narrowed into the 3 mm long beak . . . . . 36. *C. ramosii*
2. Utricles glabrous, membranous and otherwise different, 2–5 mm long. Glumes 3-nerved in the centre, otherwise nerveless. Style not or but slightly thickened towards the base. Leaves  $\frac{1}{2}$ –3 mm wide.
5. Utricles (1 $\frac{1}{2}$ –)2 $\frac{1}{2}$ –3 $\frac{1}{2}$ (–4) mm long, rather gradually tapering into a very short, subentire or slightly emarginate beak. Leaves  $\frac{1}{2}$ –2 mm wide. Glumes 1 $\frac{1}{2}$ –3 mm long . . . . . 40. *C. capillacea*
5. Utricles 4 $\frac{1}{2}$ –5 mm long, abruptly narrowed into a slender, linear, bidentate, c. 1 $\frac{1}{2}$  mm long beak. Leaves 2–3 mm wide. Glumes 3–4 mm long . . . . . 41. *C. eremostachya*
1. Inflorescence consisting of 2 or more spikelets.
6. Terminal and most of the other spikelets ♀, shortly cylindrical, the ♂ spikelets lateral, 1–5, just below some of the terminal ♀ spikelets. Inflorescence a compound panicle. Leaves all over the stem 13. *C. hypolytroides*
6. Terminal spikelet bisexual or wholly ♂.
7. Terminal spikelet wholly ♂ (exceptionally in some specimens with a few ♀ flowers), or when spikelets in fascicles, 1–2 spikelets of the upper fascicle wholly ♂.
8. Stigmas 3.
9. Leaves inserted all over the stem, the upper ones merging into leafy bracts, the lower ones gradually decreasing in length and merging into bladeless sheaths. Inflorescence simple, racemose, consisting of 4–9 spikelets. Spikelets 1 $\frac{1}{2}$ –4 cm long. Utricles densely hispid, with distinct, c. 1 mm long beak. Leaves glabrous. . . . . 50. *C. maubertiana*
9. Leaves basal and often also some higher on the stem.
10. Nut excavated in the middle, the apex abruptly narrowed into a conspicuous, cylindric,  $\frac{1}{2}$ –1 $\frac{1}{4}$  mm long beak expanding into the annular apex . . . . . 22. *C. anomocarya*
10. Nut different.
11. Apex of nut truncate,  $\frac{3}{4}$ –1 mm wide, hollowed out. Style centred in the apical hollow of the nut. Utricles lageniform or rhomboid-lageniform.
12. Utricles 5–7 mm long. Apex of nut contracted into a cylindric, truncate,  $\frac{2}{3}$ –1 mm long and wide neck.
13. Leaves 5–10 mm wide. Beak of utricles 1 $\frac{1}{2}$ –2 mm long. Stems arising from basal leaf axils 28. *C. gracilispica*
13. Leaves 1–3 mm wide. Beak of utricles  $\frac{3}{4}$ –1 mm long. Stems central 30. *C. rhynchachaenium*
12. Utricles 3 $\frac{1}{2}$ –4 $\frac{1}{2}$  mm long. Apex of nut hardly or not contracted into a cylindric neck 27. *C. breviscapa*
11. Apex of nut not truncate, at most  $\frac{1}{2}$  mm wide.
14. Utricles densely papillose, subabruptly contracted into a very short, up to  $\frac{1}{2}$  mm long beak 39. *C. maculata*
14. Utricles not papillose, nut either mitrate or distinctly beaked.
15. Nut mitrate, *i.e.* contracted at the apex and then expanded into a discoid annulus.
16. Glumes of ♂ spikelets cup-shaped, the margins more than halfway connate in front. Stamens monadelphous (not always so in the lowermost flowers). Utricles many-nerved 34. *C. tristachya*
16. Glumes of ♂ spikelets with free margins. Stamens free.
17. Nut rhomboid with deeply concave faces. . . . . 33. *C. formosensis*
17. Nut (long-)ellipsoid to ovoid or obovoid.
18. Leaves 3–10 mm wide. Stems arising from basal leaf-axils. Utricles strongly many-nerved 32. *C. dolichostachya*
18. Leaves 1–4(–6) mm wide. Stems central. Utricles nerveless to multinerved. 31. *C. breviculmis*
15. Nut not mitrate.
19. Spikelets in fascicles of 3–20 from the axils of at least one of the bracts.
20. Utricles narrowly ellipsoid, 4–6 $\frac{1}{2}$  mm long, gradually tapering below into a stipe-like,  $\frac{3}{4}$ –1 mm long base, above into a 1–3 mm long beak . . . . . 20. *C. verticillata*
20. Utricles ovoid or ellipsoid, 2 $\frac{1}{3}$ –3 $\frac{1}{2}$  mm long, scarcely stipitate; beak  $\frac{3}{4}$ –1 mm long. 17. *C. celebica*
19. Spikelets solitary (exceptionally binate) from the axils of the bracts, or crowded at the apex of the stem.
21. Utricles (8–)12–13 mm, many-nerved. ♀ Spikelets broadly ovoid to subglobose, 15–25 mm long and wide, with few, divergent, narrowly lanceolate utricles. Bracts long-sheathing 48. *C. michauxiana*

21. Utricles at most  $7\frac{1}{2}$  mm long. Other characters not so combined.
22. Broader leaves 1–2 cm wide. Spikelets  $5\frac{1}{2}$ –16 cm long. Glumes vinaceous to dark red with a green, central stripe. Stoloniferous . . . . . 45. *C. olivacea*
22. Broader leaves at most 10 mm wide. Spikelets usually much shorter.
23. Stems lateral. Lateral spikelets 6–12 by 4–7 mm, ♀ or androgynous. Utricles at least below many-nerved, 5–7 mm long. Glumes  $2\frac{1}{2}$ –4 mm. Nut 3–4 mm.
24. Leaves 3–7 mm wide. Glumes  $2\frac{1}{2}$ – $3\frac{1}{2}$  mm, with a  $1\frac{1}{2}$ –6 mm long awn. Lateral spikelets ♀. . . . . 24. *C. lateralis*
24. Leaves  $1\frac{1}{2}$ –3 mm wide. Glumes c. 4 mm long, mucicous or mucronulate. Lateral spikelets androgynous . . . . . 25. *C. loheri*
23. Stems central. Lateral spikelets more than 10 mm long, ♀ or rarely androgynous, when shorter than 12 mm nut  $2\frac{1}{2}$ –3 mm.
25. Utricles 5– $7\frac{1}{2}$  mm long; nut at least  $2\frac{1}{4}$  mm long.
26. Glumes 2– $2\frac{1}{2}$  mm, with an antrorsely scabrous, 2–4 mm long awn. Utricles with deeply furcate  $1\frac{1}{2}$ –2 mm long beak, strongly and densely many-nerved, when ripe widely spreading or reflexed. Lower bracts much overtopping the inflorescence, scarcely sheathing. . . . . 49. *C. pseudocyperus*
26. Glumes 3–6 mm long, whether or not awned.
27. Utricles nerveless or obscurely few-nerved, except for the 2 marginal veins, 5– $7\frac{1}{2}$  mm long. ♀ Spikelets linear-cylindric, lax-flowered, 2–9 cm by 3–7 mm. Glumes  $3\frac{1}{2}$ –6 mm, oblong to ovate, acute to very obtuse, translucent, with broad white margins and greenish midrib, the latter not reaching the apex, but sometimes excurrent into a short awn up to 1(–2) mm long . . . . . 47. *C. finitima*
27. Utricles (strongly) many-nerved.
28. Utricles  $5\frac{1}{2}$ – $7\frac{1}{2}$  mm, fusiform. Glumes oblong-ovate, acute, very thin, dirty white with 3-nerved greenish central stripe, 3– $5\frac{1}{2}$  mm long, mucicous or mucronulate, rarely with a short awn . . . . . 23. *C. jackiana*
28. Utricles 5– $5\frac{1}{2}$  mm. Glumes ovate, deeply emarginate at the top, pale with purplish margins, c. 3 mm long, the strong midrib excurrent into a firm, smooth or scabrid awn as long as the glume . . . . . 60. *C. sp.* (§ *Paludosae*)
25. Utricles 3–5(–7) mm long; nut at most  $2\frac{1}{2}$  mm long, but mostly shorter; if the utricles are longer than 5 mm, the nut is at most  $1\frac{2}{3}$  mm long.
29. Utricles sparsely to rather densely hispidulous, nerveless except for 2 submarginal nerves, 3– $4\frac{1}{2}$  mm long, with stout, 1– $1\frac{1}{2}$  mm long beak. ♀ Spikelets linear-cylindric,  $1\frac{1}{2}$ –6 cm by  $2\frac{1}{2}$ – $3\frac{1}{2}$  mm. Glumes 3– $4\frac{1}{2}$  mm, with an hispidulous awn up to 1 mm long . . . . . 46. *C. brachyathera*
29. Utricles glabrous, many-nerved or -ribbed.
30. Utricles 4–5(–7) mm long, strongly many-nerved. Glumes 2– $2\frac{1}{2}$  mm, with a 2–4 mm long awn. ♀ Spikelets  $2\frac{1}{2}$ –5 cm by 7–15 mm. Leaves 6–10 mm wide. . . . . 49. *C. pseudocyperus*
30. Utricles 3–4 mm (up to 6 mm in *C. brownii* ssp. *transversa*), strongly many-ribbed or plurinerved. Glumes  $1\frac{1}{2}$ – $2\frac{1}{2}$  mm, excurrent into a  $\frac{1}{2}$ – $3\frac{1}{2}$  mm long awn. ♀ Spikelets  $1\frac{1}{2}$ –12 cm by 4–6 mm. Leaves 2–10 mm wide.
31. Utricles strongly many-ribbed. ♀ Spikelets short-cylindric to cylindric,  $1\frac{1}{2}$ –3 cm by 5–6 mm. Glumes 1–2 mm with a  $\frac{1}{2}$ – $3\frac{1}{2}$  mm long awn. Nut  $2\frac{1}{4}$ – $2\frac{1}{2}$  mm. Leaves 3–4 mm wide . . . . . 43. *C. brownii*
31. Utricles plurinerved. ♀ Spikelets (narrowly) cylindric, ( $1\frac{1}{2}$ )– $2\frac{1}{2}$ –12 cm by 4–6 mm. Nut  $1\frac{1}{2}$ – $2\frac{1}{4}$  mm. Leaves 2–10 mm wide.
32. Plant densely cespitose, without stolons. Lower bracts long sheathing. Utricles olive-brown to fuscous. ♀ Spikelets  $2\frac{1}{2}$ –12 cm long . . . . . 44. *C. oedorrhampha*
32. Plant stoloniferous. Bracts not sheathing. Utricles pale greenish to stramineous. ♀ Spikelets ( $1\frac{1}{2}$ )–2–5 cm . . . . . 42. *C. alopecuroides*
8. Stigmas 2.
33. Utricles densely covered with raised glandular papillae, slenderly nerved or nerveless. At least the lower spikelets subcernuous to pendulous. Lowest bract much overtopping the inflorescence.
34. Glumes acute to obtusish, mucicous or only the lower ones excurrent in a short, up to 1 mm long awn. Utricles slenderly nerved, 3–4 mm long . . . . . 53. *C. pruinosa*
34. Glumes truncate or bilobed-emarginate, distinctly awned (awn  $\frac{1}{2}$ –2 mm long). Utricles mostly nerveless,  $2\frac{1}{4}$ – $3\frac{1}{2}$  mm . . . . . 52. *C. phacota*
33. Utricles not papillate, whether minutely punctulate or not.

35. Stems 3–40(–75) cm by 1–1½ mm. Utricles distinctly 8–14-nerved, 2–3½ mm. Spikelets erect or suberect, terminal ♂, remainder ♀ or with a few ♂ flowers at the top, 1–6 cm. Leaves 1½–4 mm wide . . . . . 55. *C. gaudichaudiana*
35. Stems 30–110 cm by up to 4 mm (below). Spikelets nodding, all lateral ones androgynous or 1(–2) at the base of the uppermost much smaller and wholly ♂, (3)–6–13 cm long. Leaves 3–12 mm wide. . . . . 51. *C. graeffeana*
7. Terminal spikelet always bisexual.
36. Terminal spikelet (often all the spikelets) gynaeandrous (*i.e.* ♀ flowers above, ♂ ones below); ♂ flowers often so few that the spikelets have an entirely ♀ appearance.
37. Stigmas 2. Nut lenticular (biconvex or planoconvex).
38. Spikelets all sessile, ½–1½ cm long.
39. Utricles distinctly winged on the margins. Lower bracts foliaceous, long, far exceeding the up to 15 cm long inflorescence . . . . . 65. *C. remota*
39. Utricles wingless. Bracts glumiform, the lowest exceptionally subulate to herbaceous, sometimes exceeding the 1½–3½(–6) cm long inflorescence.
40. Utricles (3)–4–5(–5½) mm long, when mature widely patent to reflexed, distinctly beaked, not whitish-punctulate . . . . . 64. *C. echinata*
40. Utricles 2–2½ mm long, suberect also when mature, scarcely beaked, densely whitish-punctulate . . . . . 66. *C. curta*
38. At least the lowest spikelet peduncled, cernuous, 3–6(–8) cm long . . . . . 54. *C. teres*
37. Stigmas 3. Nut trigonous.
41. Utricles hispidulous or sparsely pubescent. Nut mitrate (*i.e.* contracted at the apex and then expanded into a discoid annulus).
42. Utricles many-nerved. Glumes of ♂ flowers infundibuliform . . . . . 34. *C. tristachya*
42. Utricles obscurely nerved or nerveless. Glumes of ♂ flowers with free margins . . . . . 31. *C. breviculmis*
41. Utricles glabrous. Nut not mitrate.
43. Lower bracts sheathing. Plants caespitose.
44. Utricles broadly ellipsoid to subglobose, 3–4 mm long or ovoid-ellipsoid, 6 mm long . . . . . 43. *C. brownii*
44. Utricles fusiform or fusiform-ellipsoid, 5–7½ mm long.
45. Utricles strongly many-nerved . . . . . 23. *C. jackiana*
45. Utricles nerveless except 2 marginal nerves or obscurely few-nerved . . . . . 47. *C. finitima*
43. Bracts not sheathing. Plants stoloniferous . . . . . 42. *C. alopecuroides*
36. Terminal spikelet and all or most of the other spikelets androgynous (*i.e.* ♂ flowers above, ♀ ones below).
46. Stigmas 3.
47. Leaves pseudopetiolate, 1½–3½ cm wide, the base conduplicate. Stems central, erect, scapiform, the base surrounded by some brown, infundibuliform, up to 10 cm long leaf sheaths. Utricles very long beaked, the beak curved, bulbous at the base (to hold the thickened conical style-base), nearly linear towards the very oblique mouth, the whole beak 3–3½ mm long, the utricle including the beak 6–7 mm long. Inflorescence paniculate with head-like very dense partial inflorescences . . . . . 14. *C. helferi*
47. Leaves not pseudopetiolate (except in *C. commixta*). Other characters not so combined.
48. Spikelets peduncled, in fascicles from at least one of the sheathing bracts, sometimes compound.
49. Utricles densely many-nerved, 5–9½ by 1–2⅓ mm. Spikelets 3–8 mm thick. Nut 3–4 mm long . . . . . 18. *C. perakensis*
49. Utricles nerveless or slenderly few-nerved, 3–6 by ⅔–1 mm. Spikelets 2–3½ mm thick. Nut 1½–3½ mm long . . . . . 19. *C. turrita*
48. Inflorescence racemose or spicate and spikelets peduncled or sessile, single or binate at the nodes or inflorescence a panicle and the secondary panicles single or binate at the nodes. Bracts sheathing or not.
50. Flowering stems arising from the axils of the basal leaves, which are crowded on a short stem and much longer than the flowering stems. Inflorescence racemiform or paniculiform; spikelets 6–30, 8–30 mm long. Bracts usually shorter than the spikelets, with funnel-shaped sheaths and short blade. Nut irregularly rhomboid-ellipsoid or rhomboid-obovoid with faces excavated at base and apex; style flexuous . . . . . 26. *C. cryptostachys*
50. Flowering stems not arising from the axils of the basal leaves.

51. Flowering stems developing from lateral shoots. Inflorescence a narrow, simple panicle, consisting of 6–12 head-like or racemose partial inflorescences each containing 1–8 spikelets 4–10 mm long. Utricles strongly many-nerved,  $2\frac{1}{2}$ –4 mm long. . . . 21. *C. oligostachya*
51. Flowering stems central.
52. Nut with a stout, cylindrical,  $\frac{1}{2}$ – $\frac{3}{4}$  mm wide neck. Style centred in the apical hollow of the nut.
53. Inflorescence spiciform, with 2–10 sessile spikelets. Utricles rhomboid-lageniform,  $4\frac{1}{2}$ –5 mm long . . . . . 29. *C. palawanensis*
53. Inflorescence a slender compound panicle with numerous spikelets. Utricles ellipsoid-rhomboid, c. 4 mm long . . . . . 1. *C. cirrhulosa*
52. Nut without stout cylindrical neck. Style not centred in an apical hollow.
54. Lower bracts not or only very shortly sheathing.
55. Inflorescence with 12 to numerous spikelets, spiciform, the lateral spikelets arising from a utriculiform, gibbous prophyll containing a ♀ flower or a nut. Stems 3–20(–30) cm tall . . . . . 12. *C. satzumensis*
55. Inflorescence with 1–4 spikelets, or 1–4 heads, each consisting of 1–4 crowded sessile spikelets. The lateral spikelets not arising from a fertile prophyll.
56. Utricles densely hispidulous in the upper  $\frac{2}{3}$ . Glumes densely setulose. Lateral spikelets of the inflorescence sessile, ovoid or subglobose (sometimes absent) 38. *C. tricephala*
56. Utricles at most scabrous at the margins towards the apex, the rest glabrous.
57. Utricles 6–8 mm long, with a c. 3 mm long beak. Glumes  $3$ – $4\frac{1}{2}$  mm long, with a  $1$ – $1\frac{3}{4}$  mm long awn . . . . . 36. *C. ramosii*
57. Utricles  $4$ – $6\frac{1}{4}$  mm long, with a 1–2 mm long beak. Glumes  $2\frac{1}{2}$ –3 mm long, with a  $\frac{1}{2}$ –1 mm long awn . . . . . 35. *C. malaccensis*
54. Lower bracts long-sheathing.
58. The longer spikelets at least 20 mm.
59. Spikelets many. Utricles  $3$ – $4\frac{1}{2}$  mm. Nut 2–3 mm.
60. Beak of utricles straight. Utricles not inflated, ellipsoid or ellipsoid-obovoid, trigonous, pale to castaneous, slenderly nerved, sparsely to subdensely hispidulous, at least towards the apex. Leaves 2–10 mm broad . . . . . 16. *C. myosurus*
60. Beak of utricles curved. Utricles inflated, obscurely trigonous, ovoid to subglobose, strongly nerved, glabrous except the hispidulous margins towards the apex, at first yellowish green, ultimately red and more or less succulent. Leaves 5–18 mm broad . . . . . 15. *C. baccans*
59. Spikelets 1–many. Utricles  $4$ – $9\frac{1}{2}$  mm (if utricles less than 5 mm, spikelets few). Nut 3–4 mm.
61. Spikelets 2–many, branched (or when not branched the beak of the utricle 2–3 mm). Utricles  $5$ – $9\frac{1}{2}$  mm long, the beak  $1\frac{1}{2}$ –3 mm. Style-base slightly thickened . . . . . 18. *C. perakensis*
61. Spikelets not branched, 1–3(–4), 5–20 cm distant. Utricles 4–7 mm, the beak shorter. Style-base pyramidically thickened . . . . . 37. *C. speciosa*
58. Spikelets never becoming longer than 20 mm.
62. Leaves inserted all over the stem. . . . . 13. *C. hypolytroides*
62. Leaves (sub)basal, often 1–3 higher on the stem.
63. Utricles densely pale to golden hispidulous, 5–6(–8) mm long. Spikelets at least 8 mm long . . . . . 18. *C. perakensis*
63. Utricles different,  $2\frac{1}{4}$ –6 mm long.
64. Nut narrowly discoid-annulate at the apex. Utricles whitish setulose, not inflated. Secondary panicles mostly spiciform . . . . . 8. *C. nodiflora*
64. Nut not narrowly discoid-annulate at the apex, or utricles glabrous, inflated.
65. Leaves often pseudopetiolate, the broader leaves more than 15 mm wide. Spikelets ± patent, rather few-flowered, 5–10 mm long. Glumes ovate or oblong-ovate, obtuse or slightly emarginate, 2–3 mm long, the awn  $\frac{1}{2}$ –2 mm. Utricles distinctly trigonous, ellipsoid, with prominent angles and flattish faces, membranous, c. 5-nerved on each face, 4–5(–6, *extra-Mal.*) by  $1\frac{1}{2}$ – $1\frac{3}{4}$  mm, subabruptly beaked, the beak  $1\frac{1}{2}$ –2(–3, *extra-Mal.*) mm long, straight, bidentulate on the ventral side with very oblique mouth . . . . . 2. *C. commixta*
65. Leaves not pseudopetiolate, rarely more than 15 mm wide.
66. Utricles glabrous, whether inflated or not, shiny and conspicuously 2–4-nerved on each face and then glumes mucicous or mucronulate, or dull, 3–5-spongy-ribbed or strongly 5–10-nerved on each face, with oblique, often scabrid beak.

67. Utricles shiny, triquetrous, not inflated, conspicuously few-(c. 2-4)-nerved on each face, olivaceous to reddish-castaneous,  $2\frac{1}{4}$ -5 by  $\frac{1}{2}$ -1 mm, with slender, subulate or scarcely tapering beak which is about as long as the body or slightly longer (1- $2\frac{1}{2}$  mm long). Glumes  $1\frac{1}{2}$ - $2\frac{1}{2}$ (- $4\frac{1}{2}$ ) mm, about as long as the body of the utricle, muticous or rarely mucronulate . . . . . 4. *C. flicina*
67. Utricles rather dull, inflated or subinflated, or at least not triquetrous, strongly spongy 3-5-ribbed on each face or strongly 5-10-nerved. (If different proceed under 66 second lead.)
68. Utricles spongy 3-5-ribbed on each face, stramineous or brown, 2-4 by  $1(-1\frac{1}{2})$  mm, abruptly beaked, the beak usually straight, with oblique mouth often becoming bifid,  $\frac{3}{4}$ - $1\frac{1}{2}$  mm long . . . . . 3. *C. cruciata*
68. Utricles strongly many-nerved (5-7 or c. 10 nerves on each face),  $3\frac{1}{2}$ -5 by  $1-2\frac{1}{3}$  mm.
69. Utricles distinctly inflated, obscurely trigonous, c. 10 nerves on each face. The rather compact ♂ part of the spikelets as long as to usually much longer than the ♀ part, rarely shorter. Glumes 2- $3\frac{1}{2}$  mm, with an awn to  $3\frac{1}{2}$  mm. Nut often rostrate . . . . . 6. *C. indica*
69. Utricles rhomboid, trigonous, 5-7 nerves on each face. Nut erostrate.
70. The (often plumose) ♂ part of the spikelets shorter than to about as long as the ♀ part. Glumes  $1\frac{1}{2}$ -2 mm, with an awn of 1-3 mm . . . . . 5. *C. horsfieldii*
70. The ♂ part longer than the ♀ part of the spikelets. Glumes 2- $2\frac{3}{4}$  mm, with an awn of  $\frac{3}{4}$ -2 mm . . . . . 10. *C. stramentitia*
66. Utricles glabrous, or hairy, not inflated, obscurely to conspicuously nerved or spongy-ribbed, the beak bidentate or bidentulate.
71. Glumes distinctly awned, broadly ovate. At least in the lowest glumes of a large part of the spikelets the awn longer than the glume. Utricles with (3-)-4-6 strong nerves on each face, glabrous and smooth (glossy), or hispidulous on the margins in the upper part, light green to stramineous, ( $2\frac{1}{2}$ -)3-4 by  $1-1\frac{1}{4}$  mm, the beak compressed, shorter to about as long as the body of the utricle,  $1-1\frac{1}{2}$  mm long. (If the utricles are hispidulous, see 3. *C. cruciata*.) . . . . . 7. *C. lamprochlamys*
71. Glumes whether awned or not, awn never longer than glume.
72. Glumes muticous or mucronulate, rarely awned. Utricles obscurely nerved, only 2 nerves more prominent, glabrous at the base, otherwise densely scabrid-pubescent, blackish fuscous or greenish,  $2\frac{3}{4}$ - $4\frac{1}{2}$  by c. 1 mm; the beak straight, compressed, deeply bidentate, but often originally oblique, blackish fuscous, the mouth with whitish hyaline margins . . . . . 9. *C. sarawaketensis*
72. Glumes often awned. Beak of utricles not blackish fuscous, or utricles not scabrid-pubescent except at the base, or characters otherwise combined.
73. Glumes ovate or broadly ovate, acutish or obtuse. Utricles obtusely trigonous, strongly spongy 3-5-ribbed on each face, glabrous, except sometimes on the margins . . . . . 3. *C. cruciata*
73. Glumes ovate or narrowly ovate, acute. Utricles distinctly trigonous or triquetrous, more or less distinctly several-nerved to obscurely nerved, glabrous or hairy.
74. The ♂ and ♀ part of the spikelets of same length. Glumes  $1\frac{1}{2}$ - $2\frac{1}{2}$  mm . . . . . 3. *C. cruciata*
74. In the longer spikelets the ♂ part much longer than the few-flowered ♀ part. Glumes  $2\frac{1}{2}$ - $4\frac{1}{2}$  mm . . . . . 11. *C. vesiculosa*
46. Stigmas 2.
75. Rhizome long-creeping, slender. Leaves canaliculate or convolute, c. 1 mm wide. Spikelets approximate, forming an oblong,  $1-1\frac{1}{2}$  cm long head. Utricles nerveless, glabrous . . . . . 61. *C. duriuscula*
75. Rhizome short, plant forming dense tufts. Leaves usually wider than 1 mm.
76. Spikelets very numerous, forming a slender, 5-25 cm long, oblong-cylindric, contracted, spike-like 1-2 cm broad panicle. Leaves with very scabrous margins, 3-10 mm wide. Utricles coriaceous . . . . . 62. *C. appressa*
76. Spikelets 4-10(-25), forming a head-like or spike-like 1-3(-5) cm long inflorescence, or spikelets up to 50, in a lax raceme or in (2-)-4-8 fascicles of 2-7 spikelets each and inflorescence up to 50 cm. Utricles membranous.

77. Spikelets all sessile. Cladophylls (see below) absent. Utricles ovate or ovate-lanceolate, not cordate at the base, winged on the margin,  $3\frac{1}{2}$ – $4\frac{1}{2}$  mm long. Glumes mucronate  
63. *C. nubigena*
77. At least the lower spikelets distinctly peduncled. Peduncles of the lateral spikelets at the base surrounded by an ocreiform or utriculiform bracteole (cladophyllum) which is often hidden in the sheath of the bract subtending the spikelet.
78. Bracts not sheathing. Spikelets linear-cylindric, very densely flowered, (2)–6–13 cm long.
79. Utricles densely beset with ferruginous papillae . . . . . 52. *C. phacota*
79. Utricles epapillate . . . . . 51. *C. graeffeana*
78. Bracts sheathing. Spikelets loosely or somewhat densely flowered, up to  $4\frac{1}{2}$  cm long.
80. Inflorescence very lax, only 1 spikelet at each node. Glumes with a stoutish, up to 5 mm long awn. Utricles glabrous except for the sparsely hispid beak (rarely the margin setulose)  
58. *C. longipes*
80. Spikelets often in fascicles at the nodes. Glumes mucicous or minutely apiculate (rarely an awn up to 2 mm present). Utricles setulose at least on the margins.
81. Lower bract setaceous, suddenly widening into a spatheaceous, reddish brown base clasping the base of the spikelets. Glumes 4–6 mm . . . . . 56. *C. bilateralis*
81. Lower bracts foliaceous.
82. Glumes distinctly shorter than to about as long as the utricule, 2–4 mm, rarely some of them to 5 mm. Stigmas shorter than to about as long as the utricles, up to c. 5 mm  
57. *C. brunnea*
82. Glumes about as long as the utricles,  $3\frac{1}{2}$ –5 mm. Stigmas very long (7–12 mm), always much longer than the utricles . . . . . 59. *C. teinogyna*

### I. Subgenus *Carex*

*Carex* subg. *Indocarex* BAILL. Hist. Pl. 12 (1893) 345. — *Primocarex* KÜK. Verh. Bot. Ver. Brandenb. 47 (1905) 204. — *Carex* subg. *Primocarex* KÜK. Pfl. R. Heft 38 (1909) 68.

Type species: *Carex acuta* L.

#### 1. Section *Vigneastra*

TUCKERM. En. Meth. (1843) 10. — *Sect. Vigneastra* [grex] *Indicae* [TUCKERM. *l.c.*, *nomen*]; ex BAILEY, Proc. Am. Ac. 22 (1886) 98. — *Sect. Indicae* CLARKE, Fl. Br. Ind. 6 (1894) 713; KÜK. Pfl. R. Heft 38 (1909) 260; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 20, 38; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 491, *in nota*. — *Sect. Polystacheae* CLARKE [ser.] *Stramentitiae*, *Cruciatae* & *Filicinae* CLARKE, J. Linn. Soc. Bot. 37 (1904) 4. — *Sect. Stramentitiae* (CLARKE) NELMES, Reinwardtia 1 (1951) 250, *p.p.* — *Sect. Cruciatæ* (CLARKE) NELMES, *l.c.* 275. — *Sect. Filicinae* (CLARKE) NELMES, *l.c.* 286; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 20, 48. — *Sect. Indicae subsect. Indicae* KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 151.

Type species: *Carex indica* L. (lectotype).

1. *Carex cirrhulosa* NEES in Hook. J. Bot. Kew Misc. 6 (1854) 29; NELMES, Reinwardtia 1 (1951) 262. — ? *C. densiflora* PRESL, Rel. Haenk. 1 (1828) 204; F.-VILL. Nov. App. (1882) 310. — *C. fuirenooides* (non GAUDICH.?) F.-VILL. Nov. App. (1882) 310; CLARKE, J. Linn. Soc. Bot. 37 (1904) 11, *p.p.*; Philip. J. Sc. 2 (1907) Bot. 107, *p.p.* — *C. fibrata* BOOTT *ex* VIDAL, Phan. Cuming. (1885) 156; Rev. Pl. Vasc. Filip. (1886) 286, *nomen*.

— *C. fuirenooides* GAUDICH. *var. cirrhulosa* KÜK. Pfl. R. Heft 38 (1909) 287; Philip. J. Sc. 6 (1911) Bot. 61; MERR. En. Philip. 1 (1923) 138, *p.p.* — Fig. 118.

*Inflorescence* a slender, compound panicle, continuous above, interrupted below, c. 18 cm long; secondary panicles 6, single at the nodes, erect, oblong, rather dense,  $1\frac{1}{2}$ – $3\frac{1}{2}$  cm long, their lower branches again branched into several sessile, patent,

crowded spikelets on trigonous, smooth or sparsely scabrid peduncles; rachis sparsely scabrid above. Lower bracts foliaceous, much exceeding the inflorescence, stiff, flat or with revolute margins, long-attenuate, long-sheathing, 5–8 mm wide, upper ones much reduced, shortly sheathing. *Spikelets* numerous, androgynous, oblong, ovoid, or subglobose, dense, 4–5 mm long, their ♂ part about as long as the ♀, their bracteoles glumiform, with hispid, often curved awns, c. 10 mm long. *Glumes* ovate or suborbicular, translucent, erose-ciliolate at the apex, otherwise glabrous,  $\frac{3}{4}$ –1 mm long, the midnerve excurrent in a stout, flat, sparsely hispid, straight or slightly curved,  $1\frac{1}{2}$ – $2\frac{1}{2}$  mm long awn. *Utricles* trigonous, ellipsoid-rhomboid, subcoriaceous, patent, strongly many-nerved, glabrous, smooth or very sparsely scabrid at the apex, usually slightly curved, somewhat spongy-thickened at the base, subabruptly narrowed into the beak, pale stramineous to brown, 4 by 1– $1\frac{1}{4}$  mm; beak scarcely tapering, compressed, sparsely scabrid, straight or slightly curved, bidenticulate, with straight mouth,  $1\frac{1}{2}$  mm long. *Nut* triquetrous, with prominent angles and concave faces, ellipsoid-rhomboid, stipitate, the apex narrowed into a short, thick neck expanding into a discoid ring c.  $\frac{1}{2}$  mm diam.,  $2\frac{1}{4}$  by 1– $1\frac{1}{4}$  mm. *Style-base* broadly pyramidal, persistent on the nut, centred in the apical hollow of the nut. Stigmas 3.

Distr. *Malesia*: Philippines (Cebu).

Note. Only known from the type collection (CUMING 1764, collected in 1841), which is represented in BM and K by very defect specimens (rhizome, leaves and parts of the inflorescence missing), so that it is difficult to ascertain its status. CLARKE considered it synonymous with *C. fuirenoides* GAUDICH. from the Marianas, which is *C. indica* L. NELMES supposed affinity with *C. cryptostachys* BRONGN. and the species of *sect. Lageniformes* (OHWI) NELMES, wrongly as I think.

2. *Carex commixta* STEUD. [in Zoll. Syst. Verz. 1 (1854) 60, *nomen*] Syn. 2 (1855) 207; MIQ. Fl. Ind. Bat. 3 (1856) 349; KERN, Blumea 15 (1967) 427, f. 1; in Back. & Bakh. f. Fl. Java 3 (1968) 491. — *C. horsfieldii* (*non* BOOTT) MIQ. Fl. Ind. Bat. 3 (1856) 349, p.p. (*quoad specim. Jungh.*); KÜK. Pfl. R. Heft 38 (1909) 273; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 67. — *C. spatiosa* BOOTT, Ill. 2 (1860) 86, t. 246; BOECK. Linnaea 40 (1876) 349; CLARKE, J. Linn. Soc. Bot. 37 (1904) 12, *incl. var. bogorensis* CLARKE; KÜK. Pfl. R. Heft 38 (1909) 265; CAMUS, Fl. Gén. I.-C. 7 (1912) 188; NELMES, Kew Bull. (1946) 21, 23; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 111; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 40. — *C. blepharolepis* NELMES, Kew Bull. (1946) 18, 23; Reinwardtia 1 (1951) 265. — *C. smitinandii* RAYM. Dansk Bot. Ark. 23 (1965) 255, f. 1. — Fig. 118.

Rhizome shortly creeping, stout, woody. *Stems*

loosely tufted, triquetrous, smooth, 40–100 cm by 2–3 mm, the base clothed with membranous, pale or fuscous bladeless sheaths or their fibrous remains. *Leaves* herbaceous, subbasal and a few higher on the stem, equalling to much longer than the stems, linear-lanceolate, long-attenuate, tapering below (often into a pseudo-petiole), flat, light green, scabrid on the margins,  $1\frac{1}{2}$ –3 cm wide. *Inflorescence* a pale, compound, erect, much interrupted, 15–40 cm long panicle; secondary panicles 2–6, single at the nodes, erect, pyramidal, loose, 3– $7\frac{1}{2}$  by  $1\frac{1}{2}$ –5 cm, upper continuous, lower (when more than 2) distant, on exerted, hispidulous peduncles; rachis densely whitish hispid. Lower bracts foliaceous, exceeding the inflorescence, long-sheathing, upper reduced. *Spikelets* androgynous, subsessile, patulous, rather few-flowered, 5–10 mm long, ♂ and ♀ parts about equal in length. *Glumes* ovate or oblong-ovate, thinly membranous, obtuse or slightly emarginate, slenderly nerved, ciliolate at least at the top, otherwise glabrous or minutely adpressed-hispidulous, pale stramineous to light brown, 2–3 mm long, the midnerve excurrent in an antorse scabrid,  $\frac{1}{2}$ –2 mm long awn. *Utricles* distinctly trigonous, ellipsoid with prominent angles and flattish faces, membranous, not inflated, patulous, many-nerved (nerves c. 5 on each face), glabrous or very sparsely hispidulous, rounded at the base, straight or slightly recurved, subabruptly beaked, 4–5(–6) by  $1\frac{1}{2}$ – $1\frac{3}{4}$  mm; beak sparsely scabrid on the margins, or smooth,  $1\frac{1}{2}$ –2(–3) mm long, bidenticulate on the ventral side, with very oblique mouth. *Nut* triquetrous, ellipsoid-rhomboid, not cuneate at the base, erostrate, dark brown with yellowish angles,  $2\frac{1}{2}$ – $2\frac{3}{4}$  by  $1\frac{1}{2}$ – $1\frac{4}{5}$  mm. *Style-base* pyramidally thickened, subsistent on the nut. Stigmas 3.

Distr. Burma, N. Thailand, Tonkin, Annam, Hainan; in *Malesia*: Sumatra (Bencoolen, Lampongs), West and Central Java.

Ecol. Moist places in primary and, less frequently, secondary forests, 800–1500 m, along water-courses sometimes descending to 300 m.

Vern. Java: *ilat harashas*, S.

Note. The type of *C. spatiosa* is from Annam (GAUDICHAUD 67). According to CLARKE, *l.c.*, the Malesian plants should differ by the ovoid utricles with a scabrid beak  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the body, and according to NELMES (1946, *l.c.*) by the shorter, glabrous glumes and the shorter utricles. On the whole the Indochinese specimens have longer utricles (up to 6 mm) because of the slenderer beak, but some of them are indistinguishable from the Malesian plants, which were described as *C. spatiosa* var. *bogorensis* CLARKE and *C. blepharolepis* NELMES.

3. *Carex cruciata* WAHLENB. Vet. Akad. Handl. Stockh. 24 (1803) 149; CLARKE, Fl. Br. Ind. 6 (1894) 715; J. Linn. Soc. Bot. 37 (1904) 9; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 118; KÜK.

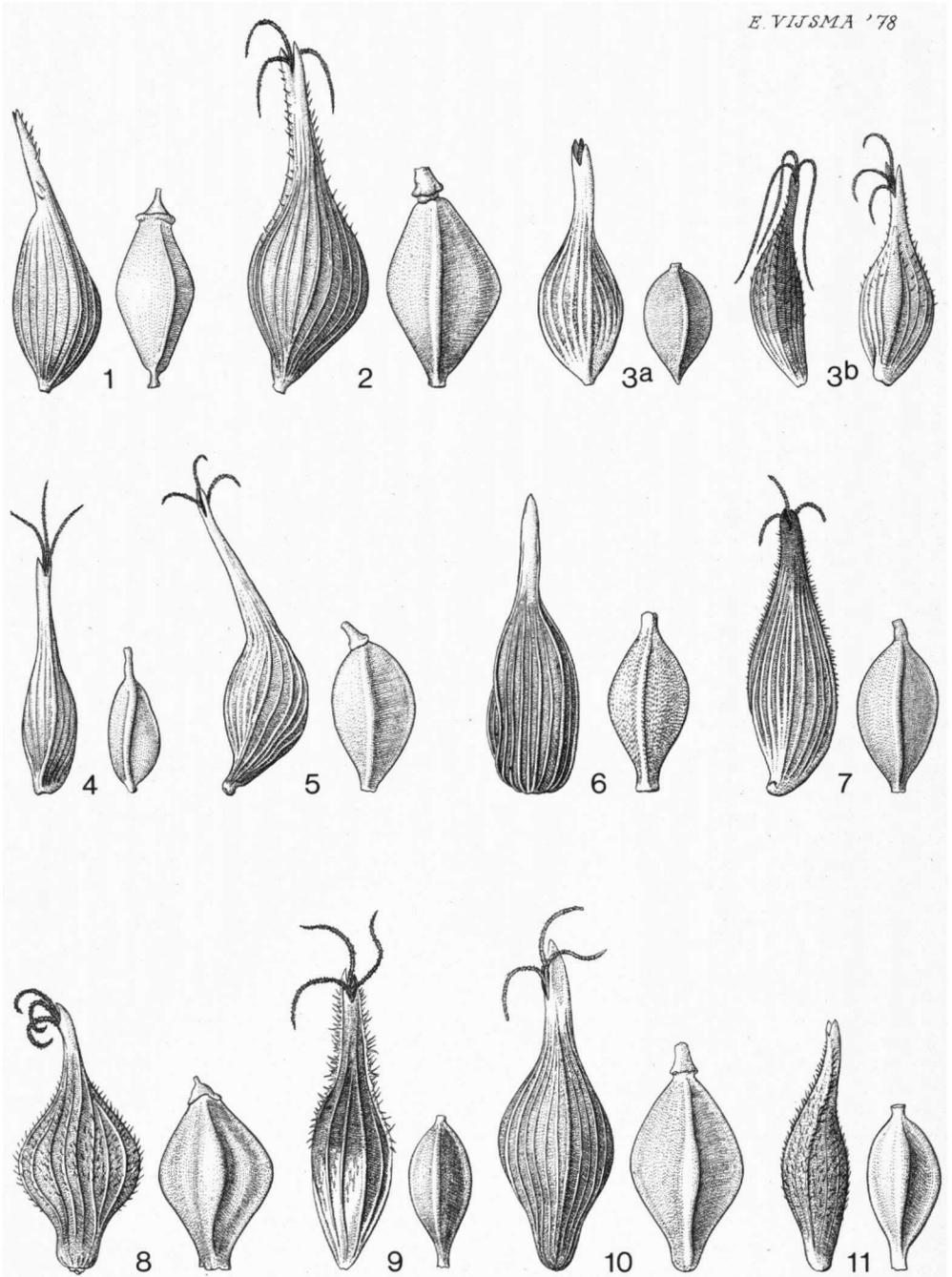


Fig. 118. Utricles and nuts of *Carex*. Species numbered as in the text (1 CUMING 1764, 2 JACOBS 8046, 3a CHEW, CORNER & STANTON 1706, 3b (left) VERHEIJEN 2585, 3b (right) VAN OOSTSTROOM 13154, 4 HARTLEY 11122, 5 NGF 21261, 6 RIDLEY 15721, 7 BRASS 24684, 8 B. F. HERNAY 652, 9 PULLEN 6106, 10 BAKHUIZEN VAN DEN BRINK 6565, 11 VAN STEENIS 4140). All  $\times 10$ .

Pfl. R. Heft 38 (1909) 265; CAMUS, Fl. Gén. I.-C. 7 (1912) 189, f. 27, 5-9; RIDL. Fl. Mal. Pen. 5 (1925) 185; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B 11 (1936) 460; KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 315; NELMES, Reinwardtia 1 (1951) 277; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 129; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 46; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 153; RAYM. Dansk Bot. Ark. 23 (1965) 254; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 492. — Fig. 118, 124a-d.

*Further synonyms under the varieties.*

Rhizome short or shortly creeping, stout, woody. *Stems* tufted, stout, trigonous, smooth, up to 200 cm by 2-5 mm, surrounded below the leaves by bladeless, dark reddish to blackish sheaths and their fibrous remains. *Leaves* (sub)coriaceous, mostly basal but 1-3 higher on the stem, much exceeding to shorter than the stems, linear, long-attenuate, flat or with revolute margins, scabrid on the margins and the nerves, (3-)5-14 mm wide. *Inflorescence* a slender, usually much elongated, interrupted, decomposed, ferruginous or stramineous panicle up to 70 cm long; secondary panicles 3-12, at 3-8 nodes, all or the middle ones binate at the nodes or all single, erect or suberect, oblong-linear or (broadly) oblong-lanceolate or ovoid-subpyramidal, loose to dense, 5-10 cm long, the upper approximate, the lower distant on unequal scabrid or smooth peduncles; rachis scabrid-hispid or hispidulous on the angles. Lower bracts foliaceous, equalling or exceeding the inflorescence, long-sheathing, upper much reduced; bracteoles excurrent in a slender, ciliolate-scabrid, often recurved awn. *Spikelets* (very) numerous, androgynous, obliquely patent or divaricate, 4-8 (-10) mm long, ovoid to oblong, the ♂ part as long as or somewhat longer than the ♀ part. *Glumes* broadly ovate, ovate or ovate-lanceolate, acute to very obtuse, membranous, (sub)translucent, glabrous or sparsely hispidulous, with reddish brown to dark brown streaks,  $1\frac{1}{4}$ -3 mm long, several-nerved, the midnerve of the lower ones acute or excurrent in a smooth or hispidulous, up to 1 mm long awn. *Utricles* distinctly or obtusely trigonous, not inflated or subinflated, (broadly) ellipsoid to ovoid, membranous or subcoriaceous, patulous or patent, straight or slightly recurved, often finally recurved, more or less distinctly several-(spongy)-nerved, glabrous or sparsely hispidulous, (sub)abruptly beaked, stramineous or brown with reddish brown streaks and spots, 2-4 by  $\frac{1}{2}$ -1(-1 $\frac{1}{2}$ ) mm; beak slender, smooth or scabrid on the margins, ( $\frac{3}{4}$ -)1-1 $\frac{1}{2}$  mm long, with oblique but soon bidenticulate to bifid mouth. *Nut* distinctly trigonous, with prominent angles and flat or concave sides, (ovoid-)ellipsoid, not or scarcely beaked, scarcely stipitate, stramineous to brown or blackish,  $1\frac{1}{2}$ -2 $\frac{1}{4}$  by  $\frac{3}{4}$ -1 mm. *Style-base* not or slightly thickened. Stigmas 3.

Distr. Widely spread, from India through SE.

Asia to S. China, Formosa and the Ryu Kyu Is.; throughout *Malesia*.

Note. Several collections from Sumatra: VAN BORSSUM WAALKES 2753, BÜNNEMEIJER 2530 (type of *C. buennemeijeri* NELMES), 3644, 3880, 4126, 4651, are intermediate between *var. cruciata* and *var. rafflesiana*.

KEY TO THE VARIETIES

1. Leaves usually much exceeding the stem. Inflorescence stramineous. Utricles strongly spongy 3-5-ribbed on each face

a. *var. cruciata*

1. Leaves usually as long as the stems or shorter. Inflorescence ferruginous. Utricles more or less distinctly 3-7-nerved on each face

b. *var. rafflesiana*

a. *var. cruciata*. — *C. cruciata* WAHLENB. Vet. Akad. Handl. Stockh. 24 (1803) 149; RIDL. Fl. Mal. Pen. 5 (1925) 185, *incl. var. condensata* RIDL. — *C. bengalensis* ROXB. Fl. Ind. ed. Carey 3 (1832) 572; BOOTT, Ill. 2 (1860) 85, t. 240-243; BOECK. Linnaea 40 (1876) 346, *excl. varieties*. — *C. condensata* NEES in Wight, Contr. (1834) 123; CLARKE, Fl. Br. Ind. 6 (1894) 716; BOOTT, Ill. 2 (1860) 86, t. 247-248. — *C. vacua* BOOTT *ex* BOECK. Linnaea 40 (1876) 343, *p.p. (excl. pl. jav.)*. — *C. valida* NEES in Wight, Contr. (1834) 123, *p.p.*; KUNTH, En. 2 (1837) 513, *p.p.* — *C. continua* CLARKE, Fl. Br. Ind. 6 (1894) 717. — ? *C. repanda* CLARKE *var. implumis* CLARKE, J. Linn. Soc. Bot. 37 (1904) 9. — *C. galactolepis* NELMES, Kew Bull. (1946) 20; Reinwardtia 1 (1951) 279. — *C. spongocrepis* NELMES, Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 128. — Fig. 118, 124a-b.

Rhizome shortly creeping. *Stems* 40-150 cm. *Leaves* coriaceous, usually much exceeding the stems. *Inflorescence* stramineous, continuous above, usually interrupted below, 15-60 cm long; secondary panicles 3-11, at 3-8 nodes, usually all single at the nodes, sometimes binate at the middle nodes, erect, broadly lanceolate or ovoid-subpyramidal, rather dense to dense, on stiff, smooth or scabrid peduncles long-exserted from the sheaths, up to 10 cm long; rachis hispidulous on the angles. Lower bracts slightly to much exceeding the inflorescence. *Spikelets* very numerous, divaricate, rather dense, 5-8(-10) mm long, the ♂ part as long as or somewhat longer than the ♀ part. *Glumes* ovate or broadly ovate, acutish to very obtuse, thinly membranous, translucent, several-nerved, glabrous, with ferruginous to dark brown streaks,  $1\frac{3}{4}$ -3 mm long. *Utricles* obtusely trigonous, subinflated, ovoid or broadly ellipsoid, membranous, patent, finally recurved, strongly spongy-ribbed (nerves 3-5 on each face), glabrous, rarely sparsely setulose at the apex, often with spongy-thickened base, abruptly beaked, stramineous or brown, purplish spotted,  $2\frac{1}{2}$ -3(-4) by

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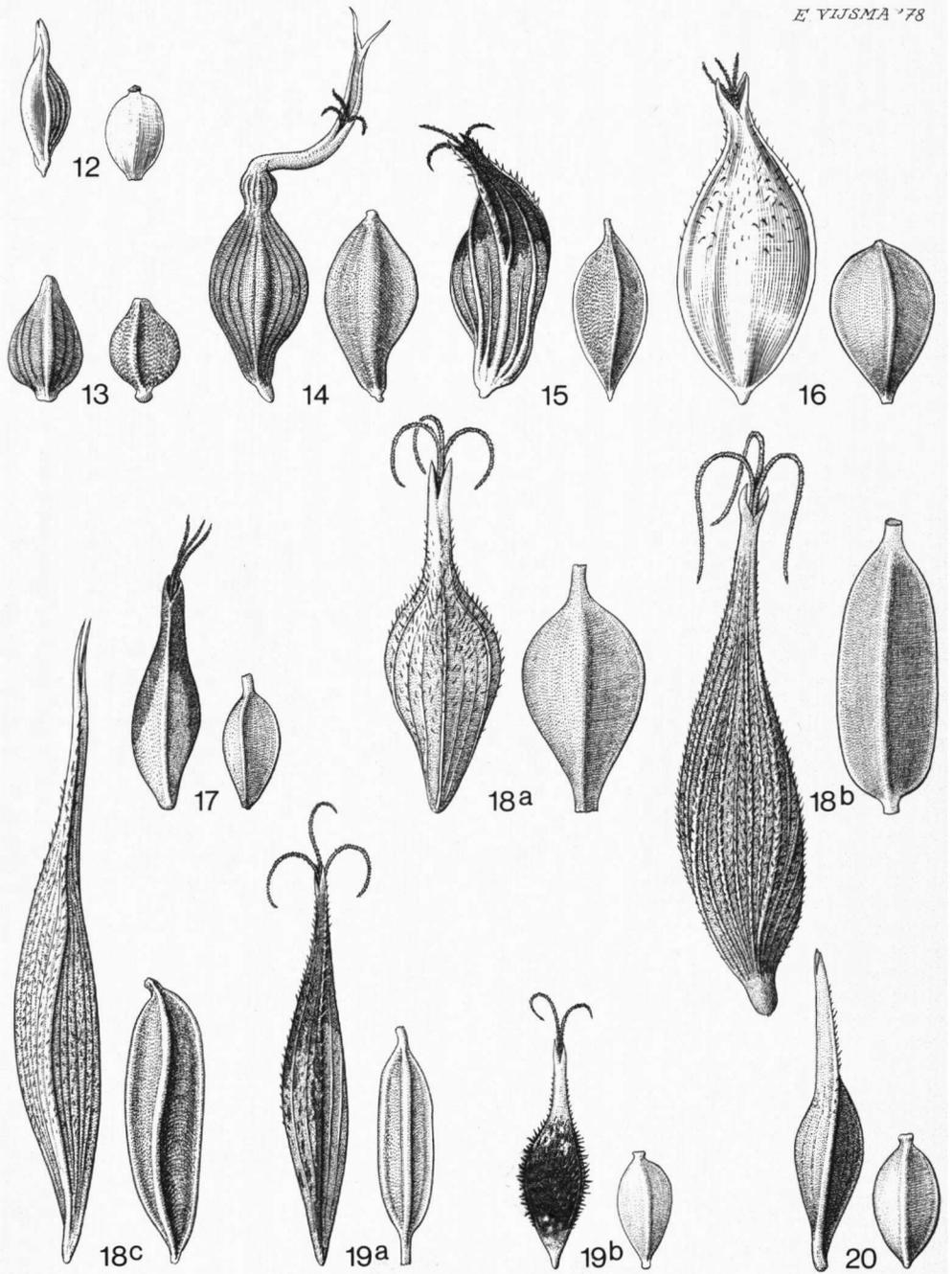


Fig. 119. Utricles and nuts of *Carex*. Species numbered as in the text (12 SANTOS 5776, 13 BÜNNEMEIJER 9820, 14 BACKER 22996, 15 ELBERT 62, 16 VAN OOSTSTROOM 13293, 17 NGF 39555, 18a VAN STEENIS 8277, 18b BROOKE 8561, 18c VAN STEENIS 8461, 19a ANU 15532, 19b SANTOS 5785, 20 MEIJER 6127). All  $\times 10$ .

1(-1½) mm; beak usually straight, smooth or sparsely scabrid on the margins, with oblique mouth often becoming bifid, (¾)-1-1½ mm long. *Nut* with flat or slightly concave sides, ovoid-ellipsoid, olive-brown to blackish, 2-2¼ by ⅑-1 mm. *Style-base* slightly thickened.

Distr. Widely spread, from India through SE. Asia to S. China, Formosa, the Ryu Kyu Is., and Queensland; in *Malesia*: Malay Peninsula, Sumatra, N. Borneo.

Ecol. In savannahs, open places in mountain forests, forest-borders, along river-banks, 1100-1500 m.

Vern. *Rija-rija*.

Note. Very variable; sometimes hard or impossible to distinguish from *var. rafflesiana*, especially in Sumatra. The type specimens of *C. galactolepis* (KING's coll. 106) and *C. repanda var. implumis* (WRAY 1982) are too poor to be certain of their affinity.

b. *var. rafflesiana* (BOOTT) NOOT., *stat. nov.* — *C. rafflesiana* BOOTT, Trans. Linn. Soc. 20 (1846) 132; Ill. 1 (1858) 12, t. 33; CLARKE, J. Linn. Soc. Bot. 37 (1904) 10, *incl. var. tenuior* CLARKE; KÜK. Pfl. R. Heft 38 (1909) 282, *incl. var. macrothyrsa* KÜK. *et var. scaberrima* KÜK.; Philip. J. Sc. 6 (1911) Bot. 59, *incl. var. scaberrima* KÜK. *et var. continua* KÜK.; MERR. En. Philip. 1 (1923) 140, *incl. var. scaberrima* KÜK. *et var. continua* KÜK.; KÜK. in Hochr. Candollea 6 (1936) 430, *incl. var. minor* KÜK.; NELMES, Reinwardtia 1 (1951) 290, *incl. var. macrothyrsa* KÜK. *et var. virgata* NELMES; *ibid.* 2 (1954) 376; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 153, *incl. var.*; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 492. — *C. macrothyrsa* MIQ. Fl. Ind. Bat. 3 (1856) 351. — *C. virgata* MIQ. *l.c.*, *non SOL.* ex BOOTT, 1853. — *C. pentacarpa* BOECK. Flora 58 (1875) 265. — *C. vacua* BOOTT ex BOECK. Linnaea 40 (1876) 343, *p.p. (pl. jav.)*. — *C. bengalensis var. virgata* BOECK. *et var. scaberrima* BOECK. *l.c.* 347. — *C. continua* [non CLARKE, Fl. Br. Ind. 6 (1894) 717] CLARKE, J. Linn. Soc. Bot. 37 (1904) 11; Philip. J. Sc. 2 (1907) Bot. 107; KÜK. Pfl. R. Heft 38 (1909) 282, *p.p.*; NELMES, Reinwardtia 1 (1951) 299; *ibid.* 2 (1954) 376. — *C. gembolensis* CLARKE *var. timorensis* CLARKE, J. Linn. Soc. Bot. 37 (1904) 10. — *C. scaberrima* CLARKE, *l.c.* 10; Philip. J. Sc. 2 (1907) Bot. 107; Kew Bull. add. ser. 8 (1908) 72. — *C. clarkeana* KÜK. Bull. Herb. Boiss. II, 4 (1904) 52, *ex descr.*; Pfl. R. Heft 38 (1909) 282; RIDL. Fl. Mal. Pen. 5 (1925) 183; NELMES, Reinwardtia 1 (1951) 288. — *C. pycnothyrsos* KÜK. Philip. J. Sc. 6 (1911) Bot. 60; MERR. En. Philip. 1 (1923) 140; NELMES, Reinwardtia 1 (1951) 282; *ibid.* 2 (1954) 374, *descr.* — *C. semiglomerata* KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 315; in Fedde, Rep. 53 (1944) 106; NELMES, Reinwardtia 1 (1951) 285; *ibid.* 2 (1954) 376. — *C. sarawaketensis* KÜK. *var. brevirostris* KÜK. Bot. Jahrb. 70 (1940) 464. — *C. timorensis* (CLARKE)

NELMES, Kew Bull. (1946) 24; Reinwardtia 1 (1951) 242, 287. — *C. spongoneura* NELMES, Kew Bull. (1946) 18; Reinwardtia 1 (1951) 281. — *C. xestogyne* NELMES, Kew Bull. (1946) 16; Reinwardtia 1 (1951) 311. — *C. buennemeijeri* NELMES, Kew Bull. (1950) 191; Reinwardtia 1 (1951) 283; *ibid.* 2 (1954) 376. — *C. oblonga* NELMES, Kew Bull. (1950) 192; Reinwardtia 1 (1951) 297. — *C. ceramica* NELMES, Kew Bull. (1950) 193; Reinwardtia 1 (1951) 319; *ibid.* 2 (1954) 376. — Fig. 118, 124c-d.

Rhizome short. *Stems* up to 200 cm. *Leaves* subcoriaceous, mostly as long as or shorter than the stems. *Inflorescence* ferruginous, interrupted, up to 70 cm long; secondary panicles 8-12, at 4-6 nodes, all or the middle ones binate at the nodes, or single in depauperate specimens, erect or suberect, oblong-linear or oblong-lanceolate, loose or rather dense, 5-10 cm long, the lower on unequally exerted scabrid peduncles; rachis scabrid-hispid on the angles. Lower bracts equaling or exceeding the inflorescence. *Spikelets* numerous, obliquely patent, 4-7 mm long, the ♂ and ♀ part about equal in length. *Glumes* ovate or ovate-lanceolate, acute, membranous, subtranslucent, glabrous or sparsely hispidulous, with ferruginous streaks, 1½-2½ mm long. *Utricles* distinctly trigonous, not inflated, ellipsoid or ovoid-ellipsoid, membranous or subcoriaceous, patulous, straight or slightly recurved, more or less distinctly 3-7-nerved, glabrous or sparsely hispidulous, subabruptly beaked, stramineous with reddish brown streaks and spots, 2-4 by ⅔-1 mm; beak slender, scabrid on the margins, 1-1½ mm long, with oblique but soon bidenticulate mouth. *Nut* with concave sides, ellipsoid, stramineous to brown, 1½-2 by ¾-1 mm. *Style-base* not or scarcely thickened.

Distr. Thailand, Formosa (Kotosho Is.), Queensland; throughout *Malesia*.

Ecol. Primary forests, forest edges, grassy slopes, sometimes in dry sunny places, 500-2400 m.

Vern. Java: *ilateun*, S; Philippines: *chidak*, Ig., *ikidsan*, Klg., *talayid*, *tamalang*, Bag.

4. *Carex filicina* NEES in Wight, Contr. (1834) 123; KUNTH, En. 2 (1837) 510; BOOTT, Ill. 3 (1862) 105, t. 311-318; BOECK. Linnaea 40 (1876) 352; O. K. Rev. Gen. Pl. 2 (1891) 748, *incl. var. laevis* O. K. *et var. ciliata* O. K.; CLARKE, Fl. Br. Ind. 6 (1894) 717; J. Linn. Soc. Bot. 37 (1904) 11; KÜK. Pfl. R. Heft 38 (1909) 274, *incl. var. saturata* (CLARKE) KÜK.; CAMUS, Fl. Gén. I.-C. 7 (1912) 191; MERR. En. Philip. 1 (1923) 137; NELMES, Reinwardtia 1 (1951) 304, *incl. var. angustifolia* NELMES *et var. zipelii* NELMES; *ibid.* 2 (1954) 376; AKIYAMA, Car. Far East Reg. Asia (1955) 138, t. 124; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 48; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 152. — *C. nilagirica* STEUD. Syn. 2 (1855) 207. — *C. neoguineensis* CLARKE, J. Linn. Soc. Bot. 37

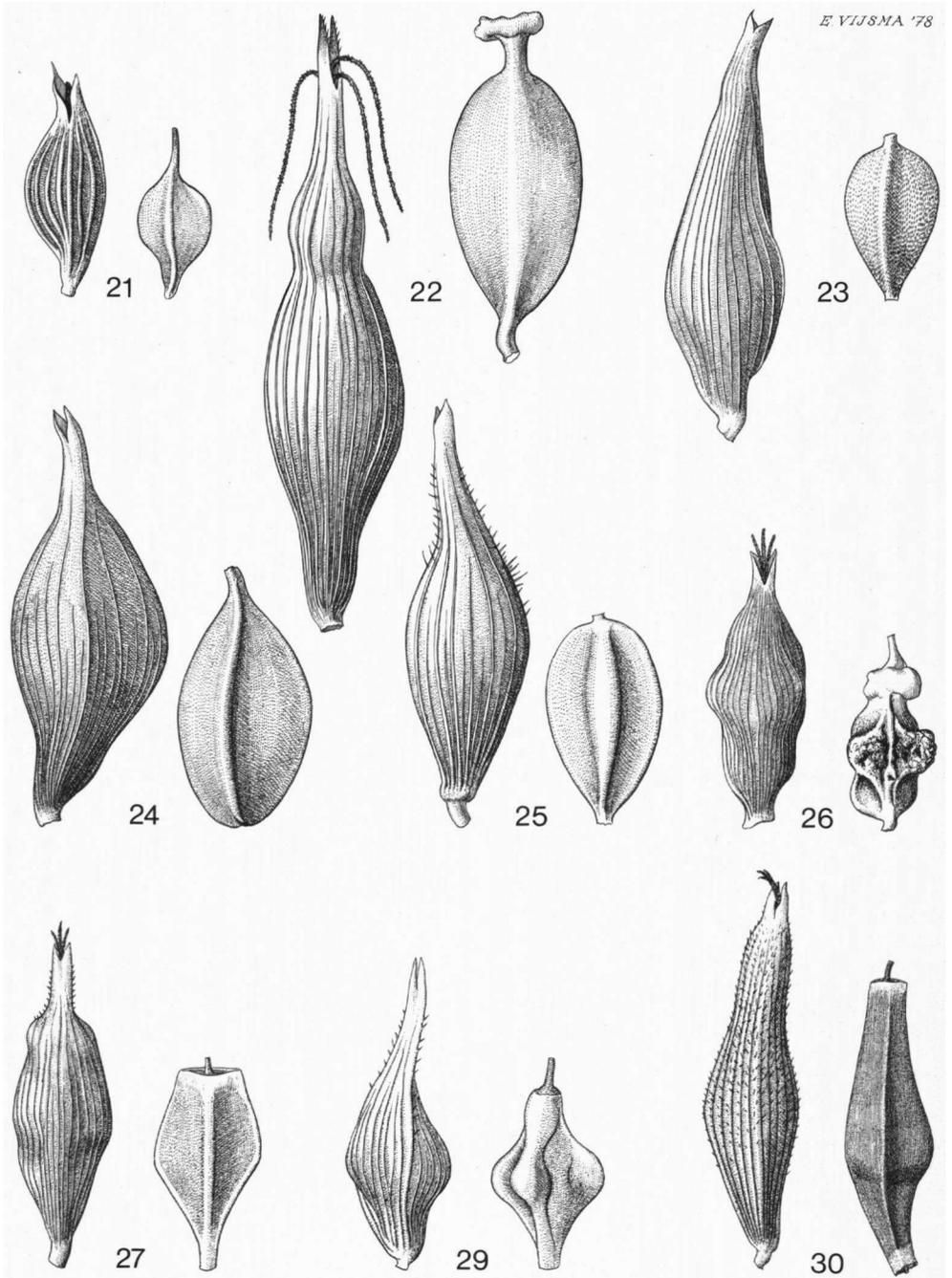


Fig. 120. Utricles and nuts of *Carex*. Species numbered as in the text (21 VANOVERBERGH 323, 22 DE WILDE c.s. 13535, 23 VAN STEENIS 4579, 24 KAUDERN 333, 25 BS 45002, 26 MEIJER 688, 27 LÖRZING 6678, 29 ELMER 13146, 30 MERRILL 512). All  $\times 10$ .

(1904) 12; KÜK. Pfl. R. Heft 38 (1909) 280; S. T. BLAKE, J. Arn. Arb. 28 (1947) 105; NELMES, Reinwardtia 1 (1951) 308; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 492. — *C. saturata* CLARKE, J. Linn. Soc. Bot. 37 (1904) 12; NELMES, Reinwardtia 1 (1951) 302. — *C. filicina* NEES f. *saturata* KÜK. Philip. J. Sc. 6 (1911) Bot. 59. — *C. sclerioides* RIDL. Trans. Linn. Soc. Bot. II, 9 (1916) 247; NELMES, Reinwardtia 1 (1951) 307. — *C. ceylanica* BOECK. var. *saturata* KÜK. in Hochr. Candollea 6 (1936) 431. — *C. sarawaketensis* KÜK. var. *glabrinux* KÜK. Bot. Jahrb. 70 (1940) 464. — Fig. 118.

Rhizome short, stout, woody. *Stems* loosely tufted, slender to stout, trigonous, smooth, up to 150 cm by 6 mm near the base, surrounded below the leaves by bladeless, reddish or blackish sheaths. *Leaves* herbaceous to subcoriaceous, mostly basal but some spaced on the stem, as long as or shorter than the stems, linear, long-attenuate, flat or with revolute margins, scabrid on the margins, (2-)7-20 mm wide. *Inflorescence* a slender, interrupted or continuous, decoupled, fuscous panicle up to 60 cm long; partial panicles 5-13, at 4-8 nodes, single and (middle ones) binate, oblong-lanceolate or pyramidal, erect, rather loose to very dense, up to 12 by 2-5 cm, the upper approximate, the lower usually distant on smooth or scabrid, unequally exerted peduncles; rachis smooth towards the base, hispidulous above. Lower bracts foliaceous, shorter than to slightly exceeding the inflorescence, long-sheathing, the upper much reduced; bracteoles excurrent into a hispidulous awn. *Spikelets* very numerous, androgynous, oblong, rather loose, 4-15(-20) mm long, the ♂ part shorter than to about as long as the ♀ part. *Glumes* ovate-lanceolate, acuminate, mucicous, rarely minutely mucronulate, membranous, subtranslucent, glabrous or the lower ones hispidulous, finely nerved, ferruginous, often darker streaked,  $1\frac{1}{2}$ -2 $\frac{1}{2}$ (-4 $\frac{1}{2}$ ) mm long (about as long as the body of the utricle). *Utricles* triquetrous, not inflated, ellipsoid, membranous, patent, eventually arcuately recurved, conspicuously 2-4-nerved on each face, glabrous, smooth, often shiny, subabruptly beaked, olivaceous to reddish-castaneous, (2 $\frac{1}{4}$ -)3-5 by  $\frac{1}{2}$ -1 mm; beak slender, subulate (scarcely tapering), smooth, or very sparsely scabrid on the margins, (1-) $1\frac{1}{2}$ -2(-2 $\frac{1}{2}$ ) mm long (about as long as the body or slightly longer); mouth very oblique (the base  $\frac{1}{2}$ - $\frac{3}{4}$  mm from the apex). *Nut* trigonous, ellipsoid, beaked, closely filling the utricle,  $1\frac{1}{4}$ -1 $\frac{3}{4}$  by  $\frac{1}{2}$ -1 mm. *Style-base* slightly thickened. Stigmas 3.

Distr. Ceylon and India to S. China, Formosa, Tonkin, Laos and Annam; probably throughout Malesia, in the Lesser Sunda Is. only known from Lombok and in the Malay Peninsula from Pahang. Ecol. Wet openings in primary forests, in subalpine shrub vegetation, on grassy slopes, along river-banks, 1350-3750 m.

Vern. Philippines: *silak*, *táan*, Ig., *taláyig*, Bag.

Notes. In the circumscription here accepted very variable in all its parts. Numerous segregates have been described, but typical *C. filicina* from India and the aberrant forms from New Guinea are connected by all sorts of intermediates. Typical *C. neoguineensis* is characterized by its dense, often darker inflorescence, and the utricles more scabrid on the beak (usually smooth or almost so in typical *C. filicina*).

The high variability of *C. filicina* also in India is amply discussed and excellently figured by BOOTT, l.c.

The few specimens on which *C. sarawaketensis* var. *glabrinux* KÜK. was based are more or less transitional to 9. *C. sarawaketensis*.

5. *Carex horsfieldii* BOOTT, Proc. Linn. Soc. Lond. 1 (1845) 257; Ill. 1 (1858) 11, t. 32; Miq. Fl. Ind. Bat. 3 (1856) 349, p.p. (*quoad specim. Horsf.*); CLARKE, J. Linn. Soc. Bot. 37 (1904) 11; NELMES, Reinwardtia 1 (1951) 269 (*incl. var. major* NELMES?); *ibid.* 2 (1954) 374; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 44; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 492. — *C. fleckeri* NELMES, Kew Bull. (1939) 313, *vide* NELMES 1951. — Fig. 118, 124e-g.

Rhizome very short, stout, woody. *Stems* loosely tufted, obtusely trigonous, smooth, 50-100 cm by 2-4 mm, the base clothed with fuscous, bladeless sheaths and comose by their fibrous, fuscous to blackish remains. *Leaves* herbaceous, subbasal and a few higher on the stem, exceeding the stems, linear, long-attenuate, flat or with revolute margins, greyish-glaucous, scabrid on the margins in the upper part, 5-15 mm wide. *Inflorescence* a pale, decoupled, erect, much interrupted, 20-40 cm long panicle; secondary panicles 5-8, single at the nodes, erect, oblong-ovoid, loose, distant, up to 10 cm long; peduncles smooth below, scabrid above, the lower much exerted from the sheaths, upper shortly; rachis hispid on the angles. *Spikelets* androgynous, widely patent, finally almost squarrose, sessile, 5-15 mm long, the ♂ part shorter than to about as long as the ♀ part. *Glumes* ovate, obtuse (the lower ones truncate to emarginate), membranous, glabrous or sparsely hispidulous, not ciliate, slenderly nerved, whitish,  $1\frac{1}{2}$ -2 by 1-1 $\frac{1}{2}$  mm, the midnerve excurrent in an antorsely scabrid, curved, 1-3 mm long awn. *Utricles* distinctly trigonous, rhomboid, with prominent angles and flat faces, membranous, not inflated, strongly many-nerved (nerves c. 5-7 on each face), glabrous, patent, arcuately recurved, gradually tapering to the base, suddenly narrowed above into the beak, olive-brown,  $3\frac{1}{2}$ -4 $\frac{1}{2}$  by 1-1 $\frac{1}{4}$  mm; beak strongly recurved, smooth or very sparsely scabrid,  $1\frac{1}{2}$ -2 mm long; mouth dorsally very oblique, not bidentate. *Nut* trigonous, rhomboid-ellipsoid, erostrate, dark brown with prominent pale angles,

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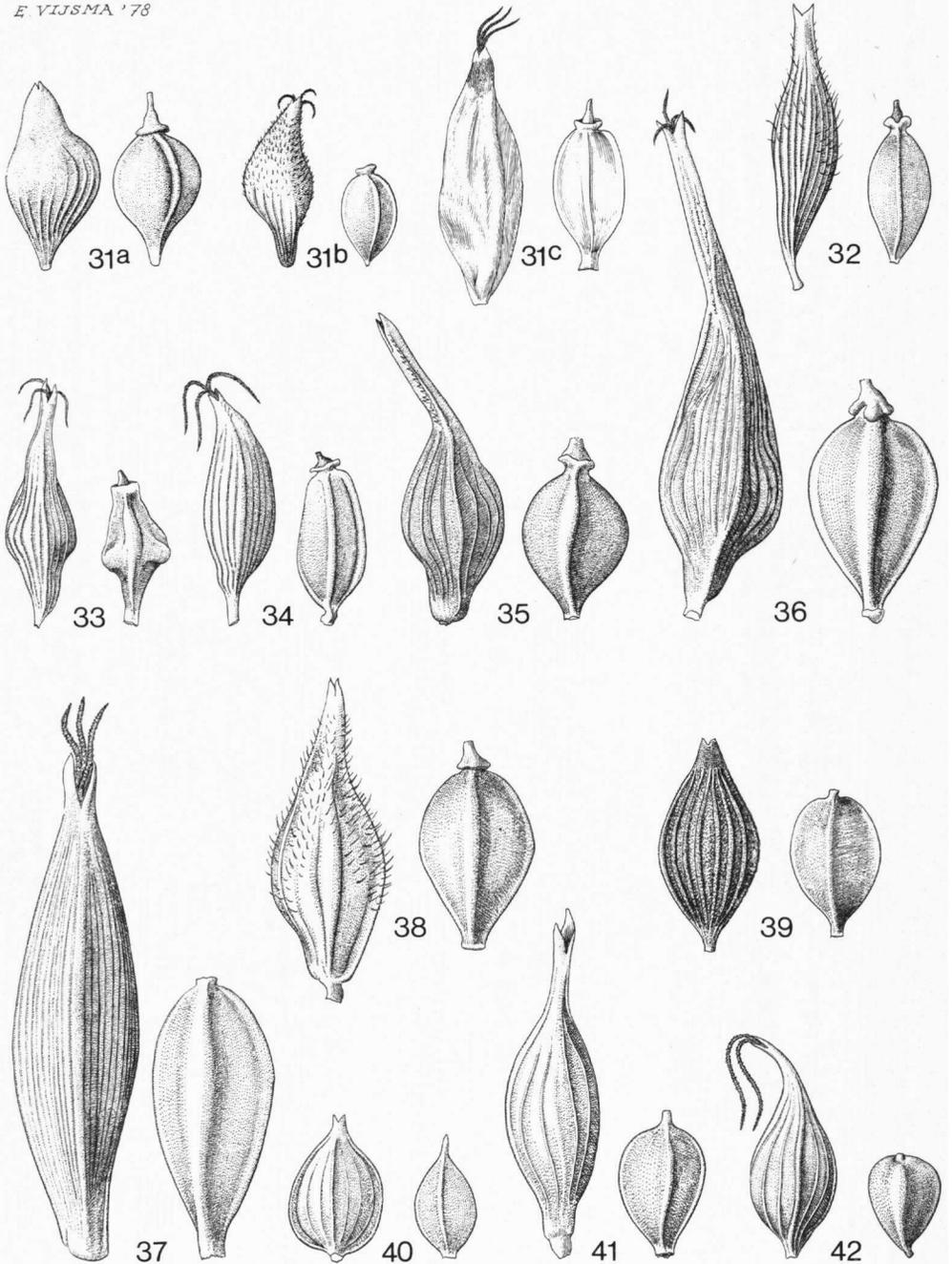


Fig. 121. Utricles and nuts of *Carex*. Species numbered as in the text (31a BRASS 4697, 31b EYMA 864, 31c BRASS 9032, 32 SANTOS 5394, 33 EDAÑO 17857, 34 ROBBINS *s.n.*, 35 ROBINSON 6186, 36 RAMOS 20990, 37 LÖRZING 16274, 38 BACKER 20462, 39 DE WILDE *c.s.* 13325, 40 KALKMAN 5213, 41 BRASS 10255, 42 JERMY 4274). All  $\times 10$ .

2-2 $\frac{1}{4}$  by 1-1 $\frac{1}{2}$  mm. *Style-base* pyramidally thickened at the base. Stigmas 3.

Distr. Burma, Thailand, Annam (*var. annamica* RAYM.), Queensland (*C. fleckeri* NELMES); in Malasia: West to East Java, Moluccas, New Guinea.

Ecol. Primary and secondary forests, 100-1100 m.

Vern. Java: *irissan*, J; New Guinea: *homuma*, Garaina.

Notes. *C. horsfieldii* *var. major* NELMES, from Tanimbar Is., P. Jamdena ("utricles 5.2-5.8 mm long, straight or slightly recurved, beak 2.5-2.8 mm long"), was based on a young, very poor collection.

KÜENTHAL and others misapplied the name *C. horsfieldii* to the Javan plants of *C. commixta* STEUD., while *C. horsfieldii* itself has often been misidentified as *C. indica* L., from which species it chiefly differs in the shorter ♂ part of the spikelets, and the strongly recurved, distinctly trigonous, not inflated, less densely nerved utricles.

6. *Carex indica* LINNÉ, Mant. 2 (1771) 574; MIQ. Fl. Ind. Bat. 3 (1856) 350; BOOTT, Ill. 2 (1860) 87, t. 250-254; BOECK. Linnaea 40 (1876) 347; CLARKE, Fl. Br. Ind. 6 (1894) 714, *incl. var. ? laetebrunnea* CLARKE *et var. milnei* BOOTT *ex* CLARKE; J. Linn. Soc. Bot. 37 (1904) 8; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 117; KÜK. Pfl. R. Heft 38 (1909) 262, f. 40, *incl. var. fissilis* (BOOTT) KÜK., *saltem quoad specim. males.*; CAMUS, Fl. Gén. 1.-C. 7 (1912) 187; MERR. En. Philip. 1 (1923) 138; RIDL. Fl. Mal. Pen. 5 (1925) 185; NELMES, Reinwardtia 1 (1951) 271; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 42; Dansk Bot. Ark. 23 (1965) 253; KERN in BACK. & Bakh. f. Fl. Java 3 (1968) 492. — *C. fuirenoides* GAUDICH. Freyc. Voy. Bot. (1826) 412. — *C. moritzii* STEUD. [in Zoll. Syst. Verz. 1 (1854) 60, *nomen*] Syn. 2 (1855) 207; MIQ. Fl. Ind. Bat. 3 (1856) 350; BOECK. Linnaea 40 (1876) 350. — *C. dietrichiae* BOECK. Flora 58 (1875) 122; CLARKE, J. Linn. Soc. Bot. 37 (1904) 8; S. T. BLAKE, J. Arn. Arb. 28 (1947) 102; NELMES, Reinwardtia 1 (1951) 273; Kew Bull. 2 (1955) 303. — *C. fuirenoides* (*non* GAUDICH.?) CLARKE, J. Linn. Soc. Bot. 37 (1904) 11; Philip. J. Sc. 2 (1907) Bot. 107, *p.p.*; KÜK. Pfl. R. Heft 38 (1909) 287, *p.p.*; MERR. En. Philip. 1 (1923) 138, *p.p.* — Fig. 118, 124j-k, 125.

Rhizome shortly creeping, woody. *Stems* loosely tufted, triquetrous, smooth, (15-)60-100 cm by 1-3 mm, surrounded below the leaves by bladeless, brownish to blackish sheaths and their fibrous remains. *Leaves* subcoriaceous, mostly basal but some higher on the stem, as long as or longer than the stems, linear, long-attenuate, flat or with slightly revolute margins, scabrid on the margins and the nerves above, 5-15 mm wide; sheaths blackish-nerved. *Inflorescence* a decompound, erect, interrupted panicle occupying the upper half of the stem; secondary panicles 3-8, single at the

nodes, erect, oblong-pyramidal, rather loose to dense, the upper approximate, the lower distant on long-exserted peduncles, up to 10 cm long; rachis sparsely hispidulous on the angles. Lower bracts foliaceous, exceeding the inflorescence, long-sheathing, their sheaths glabrous, or hispidulous at the mouth; upper bracts much reduced; bracteoles with a filiform, usually long and recurved awn. *Spikelets* divaricate, androgynous, rather dense, (5-)10-20 mm long, the ♂ part as long as to (usually) much longer than the ♀ part. *Glumes* thinly membranous, ovate or ovate-lanceolate, acute or obtuse, sometimes slightly emarginate, nerved, glabrous, stramineous to brownish, 2-3 $\frac{1}{2}$  mm long, the midnerve excurrent into an antrorsely scabrid, recurved, up to 3 $\frac{1}{2}$  mm long awn. *Utricles* inflated, obsoletely trigonous, broadly ellipsoid to subglobose, patent, straight or almost so, subcoriaceous, strongly many-nerved (nerves c. 10 on each face), glabrous, scarcely stipitate, abruptly beaked, olive-brown, 3 $\frac{1}{2}$ -5 by 1 $\frac{2}{3}$ -2 $\frac{1}{3}$  mm; beak straight or slightly bent, 1 $\frac{1}{2}$ -2 mm long; mouth oblique, not bidentate. *Nut* triquetrous, with very prominent angles and concave faces, broadly ellipsoid-obovoid to subglobose, pyriform, or rhomboid, scarcely stipitate, sometimes slightly discoid-annulate at the apex, often with a curved or straight, dark brown to blackish rostrum, 2-3 by 1 $\frac{1}{2}$ -2 mm. *Style-base* pyramidally thickened, subpersistent on the nut. Stigmas 3.

Distr. Widely distributed, from Ceylon and India through Burma, Thailand, Indo-China and S. China to Queensland, New Caledonia, Carolines, Solomon and Fiji Is.; in Malasia: Malay Peninsula, W. Java (only once collected near Tjikoya by ZOLLINGER), Borneo, SE. & N. Celebes (2 collections), Philippines (Luzon, Samar, Palawan), New Guinea.

Ecol. Moist places in forests, along streams, at low and medium altitudes, up to 1000 m.

Vern. *Bundung*, *sesayak*, M.

Notes. Very variable, especially in the length of the awns on bracteoles and glumes. When KOYAMA, Micronesica 1 (1964) 108-109, says that in *C. indica* the glumes gradually taper to the cuspidate apex without any conspicuous awn, in contradistinction to the Micronesian *C. fuirenoides* GAUDICH. with truncate or shallowly emarginate glumes with a long, scabrous awn, he cannot have had true *C. indica* before him.

Segregation of *C. dietrichiae* (= *C. indica* *var. laetebrunnea*) on account of the darker glumes appears to be impossible. See RAYMOND 1959, *l.c.*, who is in all probability right in supposing that in general NELMES referred young plants to *C. indica*, and those with mature fruits, in which the glumes have often become darker, to *C. dietrichiae*.

7. *Carex lamprochlamys* S. T. BLAKE, J. Arn. Arb. 28 (1947) 104, f. 2A; NELMES, Kew Bull. (1949)

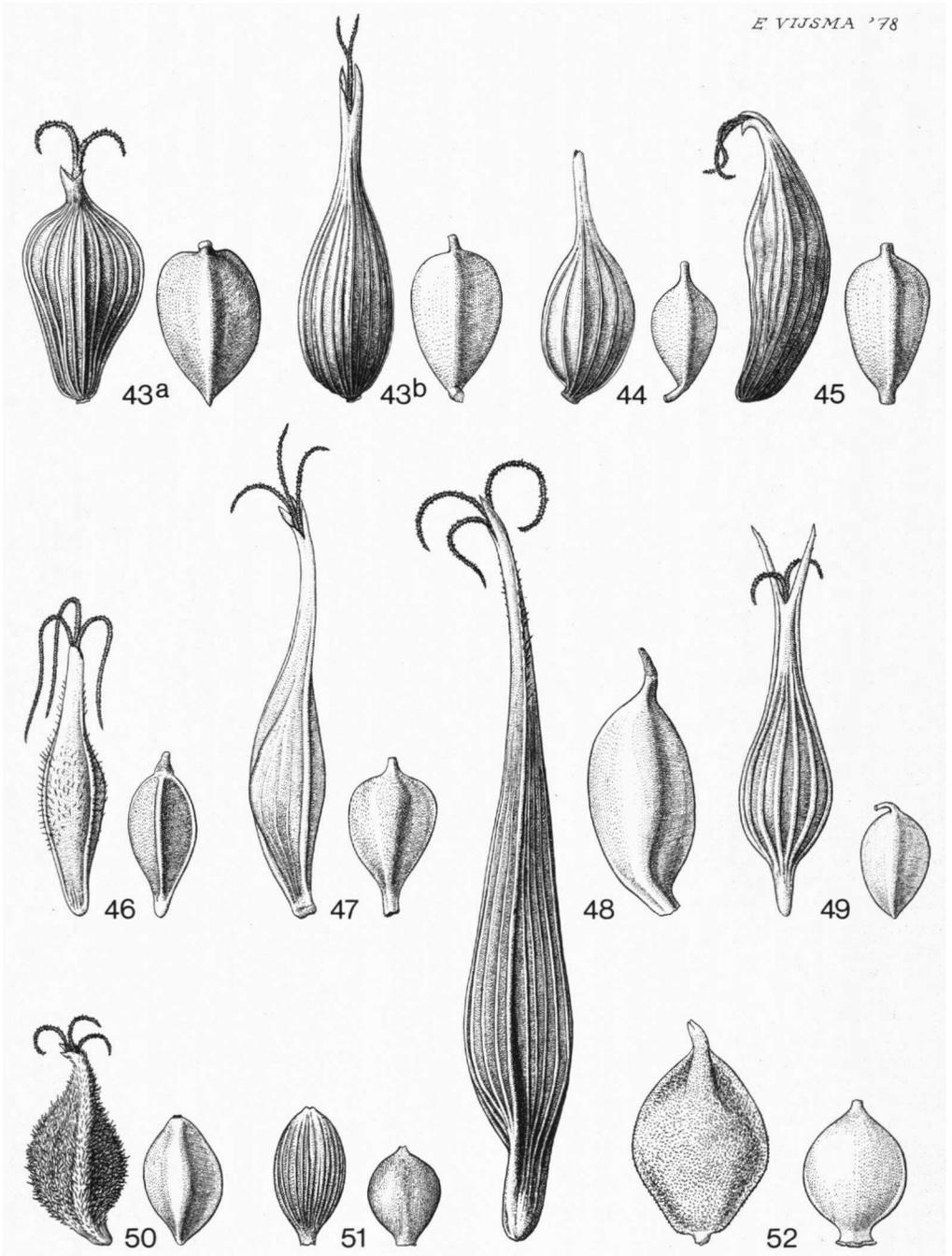


Fig. 122. Utricles and nuts of *Carex*. Species numbered as in the text (43a WOMERSLEY 5122, 43b ANU 614, 44 BRASS 4867, 45 MEIJER 6656, 46 BRASS 9803, 47 LAE 61655, 48 SCHODDE 1992, 49 EYMA 4709, 50 KOSTERMANS 14005, 51 SINCLAIR 9797, 52 JERMY 4634). All  $\times 10$ .

379, incl. var. *diplocolea* NELMES. — *C. rafflesiana* var. *continua* [non (CLARKE) KÜK.] KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 315. — *C. continua* (non CLARKE) S. T. BLAKE, J. Arn. Arb. 28 (1947) 104, p. p. — *C. papuana* NELMES, Kew Bull. (1949) 379; Reinwardtia 1 (1951) 314. — *C. tytholepis* NELMES, Kew Bull. (1949) 388; Reinwardtia 1 (1951) 320. — Fig. 118, 124h–i.

Rhizome short. *Stems* tufted, rather stout, triquetrous, smooth, 50–100 cm by 3 mm at the base. *Leaves* subcoriaceous, mostly basal but sometimes one halfway up the stem, shorter than the stems, linear, long-attenuate, with strongly revolute margins, vesiculose-asperous by whitish vesicles especially on the upper surface, (3–)7–10 mm wide; lower sheaths reddish brown, densely but minutely hispidulous, eventually fraying into fibres. *Inflorescence* a slender, interrupted or sub-continuous, decompound panicle up to 50 cm long; partial panicles 4–12, at up to 8 nodes, mostly single, sometimes binate, oblong-lanceolate, erect, rather dense, 3–9 cm long, upper ones approximate, lower ones distant on slender, rigid, scabrid peduncles more or less exerted from the sheaths; rachis hispid. Lower bracts foliaceous, as long as or longer than the inflorescence, long-sheathing, upper much reduced; bracteoles glumiform, with hispidulous awns. *Spikelets* numerous, androgynous, oblong or ovoid, 5–12 mm long, the ♂ part shorter than to about as long as the ♀ part. *Glumes* broadly ovate, often broader than long, obtuse, translucent, glabrous or the lower ones hispidulous, pale fulvous to dark reddish, finely several-nerved, (2/4–)1–1 1/2 mm, the midnerve excurrent into a strong, antorsely scabrid, up to 2 mm long awn. *Utricles* trigonous, not inflated, ellipsoid or slightly obovoid, membranous, patent, straight or more or less recurved, with (3–)4–6 strong nerves on each face, glabrous and smooth, or hispidulous on the margins in the upper part, subabruptly beaked, light green to stramineous, (2 1/2–)3–4 mm by 1–1 1/4 mm; beak slender, compressed, somewhat tapering, straight or slightly curved, scabrid on the margins, shorter than to about as long as the body of the utricle, (1–)1 1/2 mm long; mouth bidentate, not or scarcely oblique. *Nut* ellipsoid or slightly obovoid, triquetrous with shallowly concave sides, brown, 1 1/2–2 by 2/10–1 mm. *Style-base* slightly thickened. Stigmas 3.

Distr. *Malesia*: throughout New Guinea, also known from some adjacent islands.

Ecol. Primary forests (often *Fagaceae* forests), secondary growths, rarely in wet grassland, 850–2700 m.

Vern. *Anifi*, Wapi lang.

Note. NELMES distinguished *C. papuana* from *C. lamprochlamys* by the narrower leaves and the darker glumes and utricles of the former. To me those differences are insufficient for specific separation. The type collection of *C. tytholepis* I cannot distinguish from *C. lamprochlamys*.

8. *Carex nodiflora* BOECK. Bot. Jahrb. 5 (1884) 516; KÜK. Pfl. R. Heft 38 (1909) 288; Philip. J. Sc. 6 (1911) Bot. 61; MERR. En. Philip. 1 (1923) 140; NELMES, Reinwardtia 1 (1951) 260; *ibid.* 2 (1954) 374. — *C. cumingii* ['BOOTT' in VIDAL, Phan. Cuming. (1885) 156; Rev. Pl. Vasc. Filip. (1886) 286, *nomen*]; *ex* CLARKE, J. Linn. Soc. Bot. 37 (1904) 11; Philip. J. Sc. 2 (1907) Bot. 107. — *C. vulcanica* ELMER, Leaf. Philip. Bot. 10 (1938) 3526. — Fig. 118.

Rhizome shortly creeping, woody, covered with the fibrous remains of old scales. *Stems* tufted, triquetrous, smooth, surrounded below the leaves by a few bladeless, brown sheaths or their fibrous remains, 50–70 cm by 1 1/4–2 mm. *Leaves* basal, sometimes 1–2 higher on the stem, much exceeding the stems, rigid, flat, long-attenuate, scabrid on the margins in the upper part, 7–16 mm wide; cauline leaves long-sheathing. *Inflorescence* a slender, compound panicle, continuous above, interrupted below, 15–35 cm long; secondary panicles 4–6, single at the nodes, erect, spiciform or the middle ones again branched, oblong, dense, 2–6 by 1–2 cm; lower peduncles more or less exerted from the sheaths, smooth, or scabrid above; rachis hispidulous especially above. Lower bracts foliaceous, overtopping the inflorescence, long-sheathing, upper much reduced. *Spikelets* numerous, androgynous, ovoid, oblong, or subglobose, 5–10 mm long, the ♀ part rather longer than the ♂ part. *Glumes* ovate-lanceolate, acutish or obtuse, membranous, nerved, shortly setulose above or glabrescent, sparsely ciliolate, greenish white or light brown with whitish hyaline margins, 2 mm long, the midnerve excurrent in a smooth or hispidulous, 1/2 mm long awnlet. *Utricles* much overtopping the glumes, trigonous, ellipsoid-rhomboid, with prominent angles and flattish faces, membranous, suberect, many-nerved, straight, whitish setulose (except at the base), scarcely stipitate, rather abruptly beaked, finally dark brown, 3 1/2–4 1/2 by 1 1/2–2 mm; beak oblong-conical, bidenticulate, with slightly oblique mouth, 1 mm long. *Nut* triquetrous, ellipsoid-rhomboid, sessile, narrowly discoid-annulate at the apex, ferruginous to blackish, 2 1/4–2 1/2 by 1 1/2–1 3/4 mm. *Style-base* pyramidally thickened, persistent on the nut. Stigmas 3.

Distr. *Malesia*: Philippines (Luzon; according to MERRILL, *l.c.*, also in Alabat and Mindanao: Agusan).

Ecol. Primary forests at low and medium altitudes.

Note. According to NELMES (1951: 262) in this species it is the style-base which is discoid-annulate, not the apex of the nut. I do not see any difference with the nut and style-base of the allied species.

9. *Carex sarawaketensis* KÜK. Bot. Jahrb. 69 (1938) 262; *ibid.* 70 (1940) 464, incl. var. *minor*; NELMES, Reinwardtia 1 (1951) 316. — *C. melano-*

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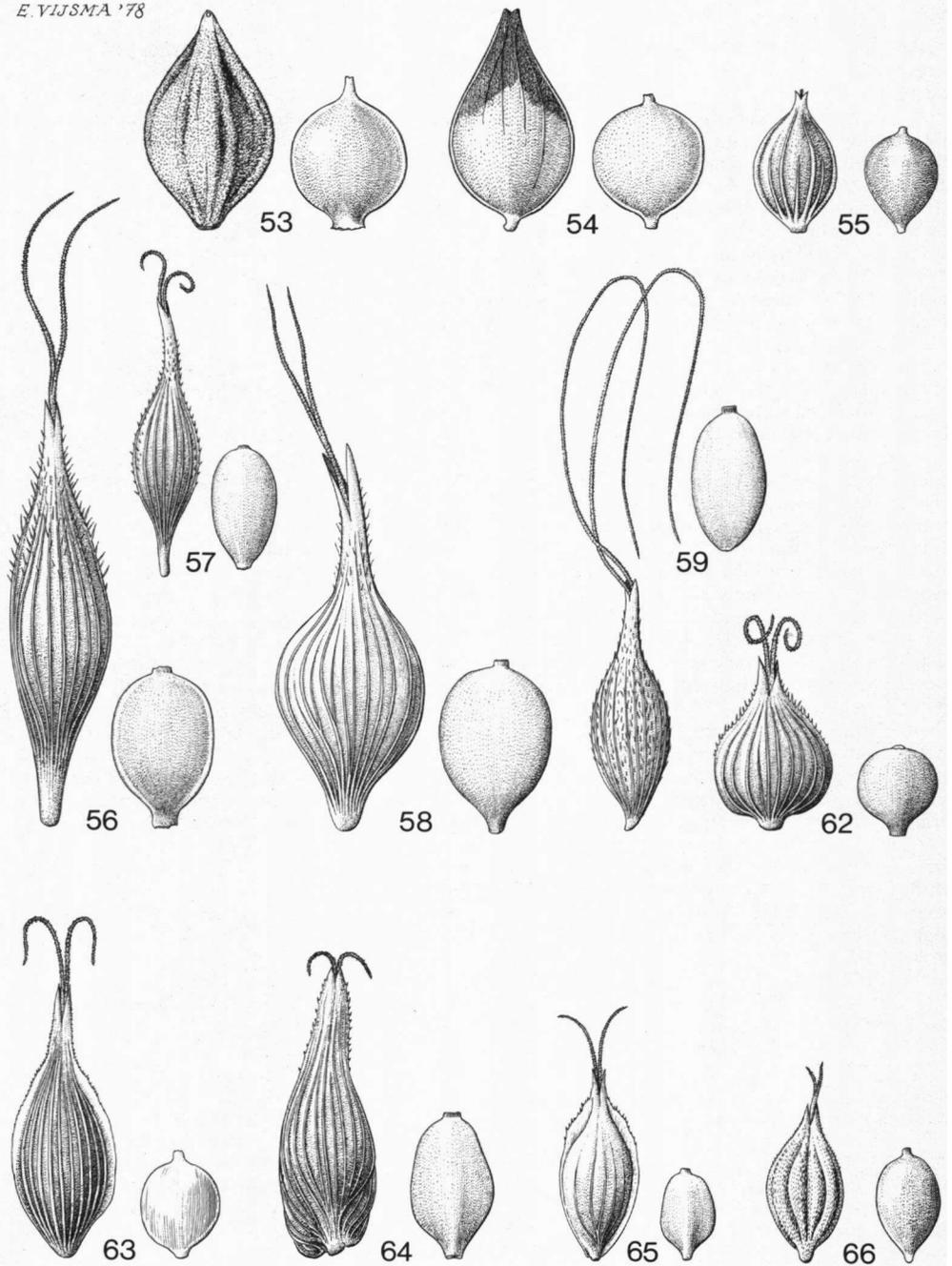


Fig. 123. Utricles and nuts of *Carex*. Species numbered as in the text (53 VAN STEENIS 4624, 54 DE WILDE c.s. 13329, 55 BRASS 9284, 56 BRASS 9515, 57 EYMA 3862, 58 herb. VAN SOEST 88, 59 VAN STEENIS 9804, 62 HOOGLAND & SCHODDE 7470, 63 JESWIET 39, 64 DE WILDE c.s. 13323, 65a KOORDERS 43403, 66 BRASS 9539). All  $\times 10$ .

*phora* S. T. BLAKE, J. Arn. Arb. 28 (1947) 106, f. 2B. — Fig. 118.

Rhizome emitting slender stolons covered with brown or blackish scales. *Stems* erect or somewhat curved, solitary or tufted, slender, obtusely trigonous, smooth or scaberulous at the top, 3–40 (–60) cm by  $\frac{1}{2}$ –1 mm, the base surrounded by the fibrous, reddish-black remains of old leaf-sheaths. *Leaves* basal, rarely 1 higher on the stem, rigid, shorter than the stems, linear, long-attenuate, flat or with revolute margins, conspicuously keeled, scabrid on the margins and keel in the upper part, 2–4 mm wide; lower sheaths fuscous to blackish-purple. *Inflorescence* a decomposed, narrow panicle interrupted at the base, 10–20(–30) cm long; partial panicles 3–14, at 2–8 nodes, single and binate, oblong, dense, 1–5 cm long, upper ones approximate, lower on slender, erect, scabrid, up to 8 cm long peduncles exerted from the sheaths. Lower bracts foliaceous, not or scarcely overtopping the inflorescence, long-sheathing, upper ones much reduced; bracteoles glume-like, hispidulous, awned; rachis hispid. *Spikelets* androgynous, suberect or appressed, oblong, 4–10 by 2–2 $\frac{1}{2}$  mm, the ♂ part inconspicuous, mostly shorter than the ♀ part. *Glumes* ovate, membranous, acute, mucicous or minutely mucronulate, rarely awned, slenderly nerved, glabrous or the lower ones minutely hispidulous, blackish-fuscous with white-hyaline margins, 2–3 mm long. *Utricles* trigonous, not inflated, ellipsoid, narrowed at both ends, suberect, membranous, straight, obscurely nerved (only 2 nerves more prominent), glabrous at the base, otherwise densely scabrid-pubescent, gradually narrowed into the beak, blackish-fuscous, 2 $\frac{1}{4}$ –4 $\frac{1}{2}$  by  $\frac{4}{10}$ –1 $\frac{1}{5}$  mm; beak straight, compressed, deeply bidentate (teeth  $\frac{1}{2}$ – $\frac{2}{3}$  mm) but often originally oblique, scabrid on the margins, 1–1 $\frac{3}{4}$  mm long, the mouth with whitish-hyaline margins. *Nut* triquetrous with shallowly concave sides, ellipsoid or broadly ellipsoid, stipitate, conspicuously apiculate, stramineous-brown, 1 $\frac{1}{2}$ –1 $\frac{3}{5}$  by  $\frac{4}{5}$ –1 mm. *Style* scabrid, not or scarcely incrassate at the base. Stigmas 3.

Distr. *Malesia*: New Guinea (W. New Guinea: Carstensz Mts, Mt Wilhelmina, Hellwig Mts; NE. New Guinea: Mt Sarawaket, Lake Nahu).

Ecol. Wet places in alpine grassland, steep mountain slopes, open places in mountain forests, moist grassy cliffs, 2700–3950 m.

10. *Carex stramentitia* BOOTT ex BOECK. Linnaea 40 (1876) 351; CLARKE, Fl. Br. Ind. 6 (1894) 717; J. Linn. Soc. Bot. 37 (1904) 9; KÜK. Pfl. R. Heft 38 (1909) 264; CAMUS, Fl. Gén. I.-C. 7 (1912) 188; NELMES, Kew Bull. (1950) 191; Reinwardtia 1 (1951) 267; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 120; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 45, 99, f. 28 (map); Dansk Bot. Ark. 23 (1965) 254; KERN in BACK. & BAKH. f. Fl. Java 3 (1968) 492. — Fig. 118, 124m–n.

Rhizome shortly creeping, stout, woody. *Stems* loosely tufted, trigonous, scaberulous below the nodes to almost smooth, 30–130 cm by 1 $\frac{1}{2}$ –3 mm, the base clothed with fuscous, bladeless sheaths and comose by their fibrous remains. *Leaves* subcoriaceous, subbasal and 1–2 higher on the stem, exceeding the stems, linear, long-attenuate, flat or with revolute margins, scabrid on the margins in the upper part, pale green, 5–10(–15) mm wide. *Inflorescence* a pale, compound, erect, much interrupted, narrow, 10–40 cm long panicle; secondary panicles 2–4, single at the nodes, erect, lanceolate or oblong, very dense, distant, up to 10 cm long; peduncles smooth or scaberulous, the lower ones much exerted from the sheaths, the upper ones scarcely so; rachis hispid. Lower bracts foliaceous, exceeding the inflorescence, long-sheathing, hispidulous in front or at the mouth, upper reduced. *Spikelets* androgynous, sessile, suberect, 5–15 mm long, the ♀ part few-flowered, rather shorter than the ♂ part. *Glumes* oblong or oblong-ovate, thinly membranous, obtuse or slightly emarginate, slenderly nerved, glabrous or sparsely hispidulous, not ciliate, pale stramineous to whitish, 2–2 $\frac{1}{4}$  mm long, the midnerve excurrent into an antrorsely scabrid,  $\frac{3}{4}$ –2 mm long awn. *Utricles* distinctly trigonous, rhomboid-ellipsoid, with prominent angles and flattish faces, membranous, not inflated, patulous, many-nerved (nerves 5–7 on each face), glabrous, straight to slightly recurved, curved-tapering below into a cuneate basal part, suddenly narrowed above into the beak, greenish to light brown, 4–5 by c. 1 $\frac{1}{2}$  mm; beak straight or slightly curved, often somewhat inflated at the base, glabrous or very sparsely scabrid, 1 $\frac{1}{2}$ –2 mm long; mouth dorsally very oblique, not bidentate. *Nut* trigonous, rhomboid-ellipsoid, erostrate, curved-tapering below into a stout cuneate part, with prominent angles and concave faces, brown, 2 $\frac{1}{4}$ –3 by 1 $\frac{1}{2}$ –1 $\frac{4}{5}$  mm. *Style-base* pyramidally thickened, persistent on the nut. Stigmas 3.

Distr. India, Lower Burma, S. China (Kweichow), Thailand, Laos, Tonkin, Annam; in *Malesia* only known from a single collection from W. Java (Krawang: Plèrèd near Purwakarta); see map in RAYMOND, 1959, *l.c.*

Ecol. In Krawang abundant in jungle at low altitude under seasonal climatic conditions.

Vern. *Lilisungan*, S.

Note. In spite of its different facies because of the stiff, linear leaves, *C. stramentitia* is very near *C. commixta*, which it closely resembles in the size and shape of the utricles. According to NELMES the leaves of *C. stramentitia* can reach a width of 20 mm.

11. *Carex vesiculosa* BOOTT, Ill. 3 (1862) 107, t. 323; BOECK. Linnaea 40 (1876) 345; CLARKE, Fl. Br. Ind. 6 (1894) 717, *incl. var. paniculata* CLARKE; KÜK. Pfl. R. Heft 38 (1909) 283, f. 43, *incl. var.*

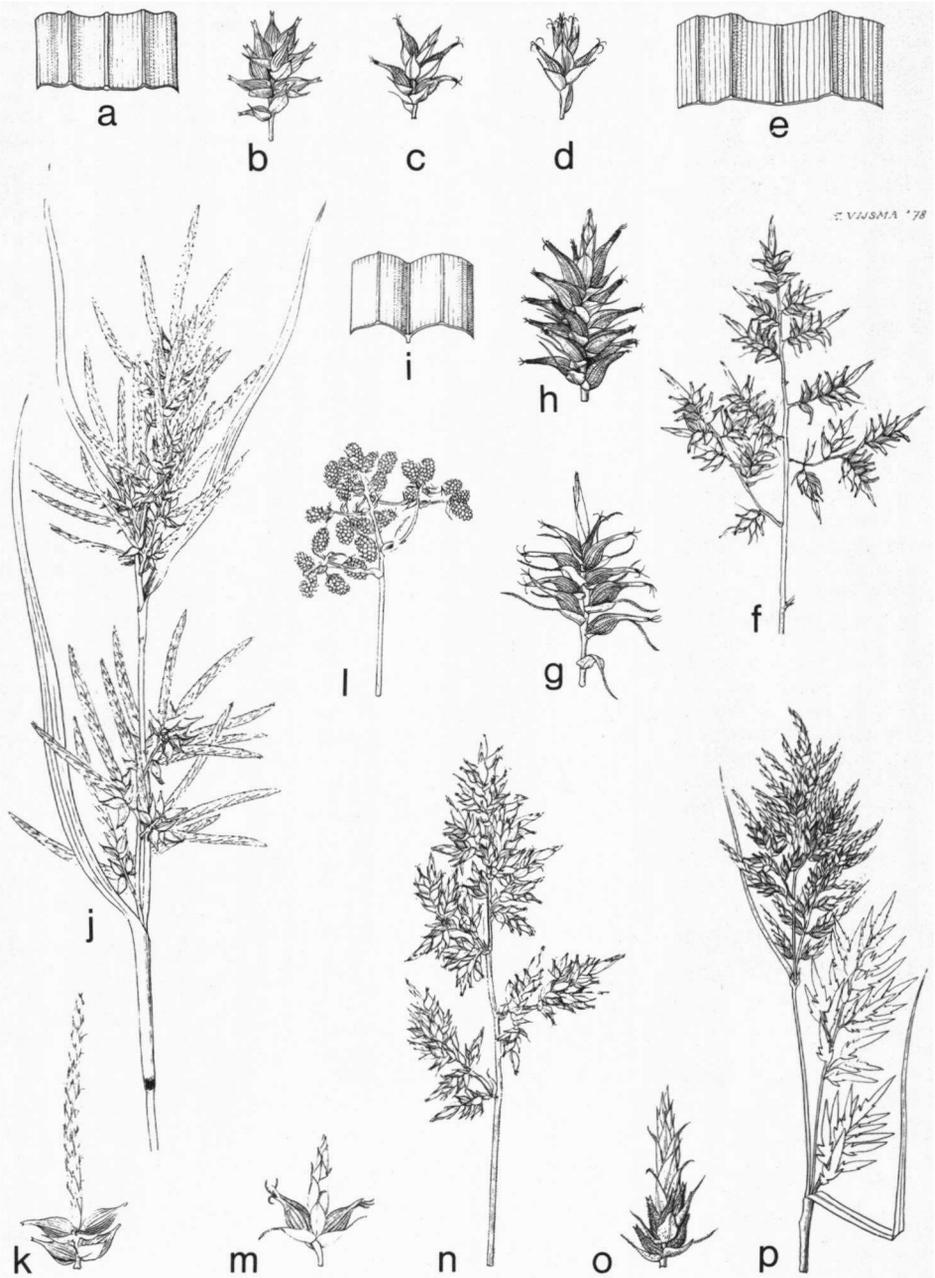


Fig. 124. Inflorescence (nat. size), spikelets and (occasionally) venation ( $\times 2$ ). — 3a. *Carex cruciata* WAHLENB. var. *cruciata*, a-b. — 3b. var. *rafflesiana* (BOOTT) NOOT., c-d. — 5. *C. horsfieldii* BOOTT, e-g. — 7. *C. lamprochlamys* S. T. BLAKE, h-i. — 13. *C. hypolytroides* RIDL. l. — 10. *C. stramentitia* BOOTT, m-n. — 11. *C. vesiculosa* BOOTT, o-p. (a-b CHEW, CORNER & STAINTON 1706, c VAN OOSTSTROOM 13154, d VERHEIJEN 2585, e-g NGF 21261, h-i BRASS 24684, j-k RIDLEY 15721, l BÜNNEMEIJER 9820, m-n BAKHUIZEN VAN DEN BRINK 6565, o-p VAN STEENIS 4140).

*congesta* KÜK.; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 68; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 492. — *C. impunctata* BOOTT, Ill. 3 (1862) 107, t. 326 (pl. *depauperata*); BOECK. Linnaea 40 (1876) 342. — *C. gembolensis* CLARKE, J. Linn. Soc. Bot. 37 (1904) 10; NELMES, Reinwardtia 1 (1951) 294, incl. var. *crebra* NELMES; *ibid.* 2 (1954) 376. — *C. rhizomatosa* var. *impunctata* KÜK. Pfl. R. Heft 38 (1909) 291. — *C. vesiculosa* var. *latifolia* KÜK. in Hochr. Candollea 6 (1931) 341. — Fig. 118, 1240–p.

Rhizome shortly creeping, woody, covered with the fibrous remains of decayed sheaths. *Stems* loosely tufted, stiff, trigonous, smooth, 30–150 cm by 2–3 mm, surrounded below the leaves by bladeless, reddish or fuscous sheaths and their fibrous, often reticulate remains. *Leaves* coriaceous, basal and 1–2 higher on the stem, usually much shorter than the stems, narrow, long-attenuate, keeled, with strongly revolute margins when dry, scabrous on the margins, often vesiculose-asperous above especially towards the apex, 2–8 mm wide. *Inflorescence* a decompound, interrupted, ferruginous, 15–40 cm long panicle; secondary panicles 5–10, at 4–6 nodes, lowest 1–2 often single, remainder usually unequally binate, erect, often with nodding top, oblong-pyramidal, dense or very dense, rarely loose, up to 10 by 5 cm, upper ones approximate, lower distant on exerted, smooth or scabrid, up to 15 cm long peduncles; rachis hispidulous on the angles. Lower bracts foliaceous, narrow, shorter than the inflorescence, long-sheathing, the upper ones much reduced; bracteoles pilose, excurrent in a curved, hispidulous awn. *Spikelets* numerous, androgynous, obliquely patent, 5–

15 mm long, the ♂ part in the longer spikelets much longer than the few-flowered ♀ part. *Glumes* lanceolate-ovate, acutish, sometimes lightly emarginate, membranous, translucent, glabrous or somewhat hispidulous, ferruginous or castaneous, 2<sup>1</sup>/<sub>2</sub>–4<sup>1</sup>/<sub>2</sub> mm long, the midnerve in the upper glumes excurrent in a hispid, up to 1<sup>3</sup>/<sub>4</sub> mm long awn. *Utricles* triquetrous, narrowly ellipsoid, subcoriaceous, not inflated, obliquely erect, straight or but slightly recurved, slenderly or obscurely nerved, rather densely setulose in the upper <sup>3</sup>/<sub>4</sub>, scarcely stipitate, rather abruptly beaked, reddish with castaneous flecks, 3–5 by 1–1<sup>3</sup>/<sub>4</sub> mm; beak slender, scabrid on the margins, mouth not oblique, 1<sup>1</sup>/<sub>4</sub>–2 mm long. *Nut* triquetrous, ellipsoid or slightly obovoid, with concave faces, shortly stipitate, abruptly beaked, 1<sup>1</sup>/<sub>2</sub>–2<sup>1</sup>/<sub>2</sub> by 1–1<sup>1</sup>/<sub>2</sub> mm. *Style-base* scarcely thickened. Stigmas 3.

Distr. Nepal to Thailand; in *Malesia*: Java (in W. Java on Mt Papandajan, not rare in the mountains of Central and E. Java), Lesser Sunda Is. (Bali, Lombok, Flores, Timor).

Ecol. In dry grass-lands, open stony places, mountain scrub, *Casuarina* forests, 1200–3500 m.

Notes. In old specimens the leaves are often less asperous because the vesiculose (bulbous-based) hairs have broken off. The former presence of vesicles is indicated by small, circular scars.

If *C. gembolensis* is specifically distinct from *C. vesiculosa*, its correct name is *C. impunctata* BOOTT, based on ZOLLINGER 2563 from Java. This collection NELMES rightly included in *C. gembolensis*.

Var. *congesta* KÜK. (= *C. gembolensis* var. *crebra* NELMES) has no taxonomic value.

## 2. Section Japonicae

KÜK. Pfl. R. Heft 38 (1909) 252. — *Sect. Paciricae* OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 458; NELMES, Reinwardtia 1 (1951) 329; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 20, 52. — *Sect. Indicae subsect. Japonicae* (KÜK.) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 152.

Type species: *Carex nikoensis* FRANCH. & SAVAT.

12. *Carex satzumensis* FRANCH. & SAVAT. En. Pl. Jap. 2 [(1877) 132, *nomen*] (1878) 558; FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris III, 8 (1896) 259 (t. 4, f. 1 ut *C. nikoensis*); AKIYAMA, J. Fac. Sc. Hokk. Imp. Un. V, 2 (1932) 84, f. 36; Car. Far East. Reg. Asia (1955) 135, t. 121; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 458; NELMES, Reinwardtia 1 (1951) 330; KOYAMA, Nat. Canad. 82 (1955) 197; Contr. Inst. Bot. Un. Montréal n. 70 (1957) 10; YOSHIKAWA, Ic. Jap. Carex 2 (1958) 236, t. 118; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 52. — *C. nikoensis* FRANCH. & SAVAT. En. Pl. Jap. 2 [(1877) 132, *nomen*] (1878)

558; KÜK. Pfl. R. Heft 38 (1909) 252, f. 38A–E ('*nikkoensis*'); Philip. J. Sc. 6 (1911) Bot. 59; MERR. En. Philip. 1 (1923) 140. — *C. contracta* BOECK. Cyp. Nov. 2 (1890) 34. — Fig. 119.

Rhizome long-creeping, clothed with large, brown scales. *Stems* erect, triquetrous, ribbed, smooth, or scabrid just below the inflorescence, 3–20(–30) cm by 1–1<sup>1</sup>/<sub>2</sub> mm, surrounded at the base by the fibrous remains of old leaf-sheaths. *Leaves* subbasal, rigid, flattish to conduplicate, longer than the stems, often recurved, scabrid on the margins and on the upper surface towards the long-attenuate apex, 2–5 mm wide. *Inflorescence*



Fig. 125. *Carex indica* L. a. Habit,  $\times \frac{4}{3}$ , b-c. glumes, d. fruit in utricle, e. fruit, all  $\times 7$  (SCHODDE 2972).

simple, spiciform, sometimes slightly branched at the base, cylindrical-conical, acute, 2-8 cm by 1-2 $\frac{1}{2}$  cm at the base; rachis smooth. Lower bracts subulate to subfoliaceous, shorter than the inflorescence, not sheathing, upper filiform. Spikelets 12-numerous, androgynous, sessile, patent, ovate to oblong, densely flowered, lower 5-14 mm, upper 3-7 mm long, all the lateral ones

arising from a  $\pm$  utriculiform, gibbous prophyll containing a  $\text{♀}$  flower. Glumes lanceolate-ovate, acute to obtuse, glabrous, pale, slenderly nerved, 2-3 mm long, the midrib sometimes slightly excurrent. Utricles oblong-ellipsoid, obtusely trigonous, hardly inflated, glabrous, slenderly plurinerved, greenish, 2 $\frac{1}{2}$ -3 $\frac{1}{2}$  by  $\frac{3}{4}$ -1 mm, rather gradually narrowed into a long, conical, bilobed beak with

oblique mouth. *Nut* oblong-obovoid, triquetrous, shortly beaked, dark brown,  $1\frac{1}{4}$ – $1\frac{1}{2}$  mm long. *Style* pyramidally thickened at the base. Stigmas 3.

Distr. Japan, Formosa, Tonkin; in *Malesia*: Philippines (Luzon: Benguet).

Ecol. Along trails in the mossy forest, at c. 2300 m, also along roadsides under pine-trees at 400 m.

Notes. Readily recognizable by its spike-like inflorescence with non-sheathing bracts.

*Carex nikoensis* FRANCH. & SAVAT., with slightly larger spikelets in denser spikes and somewhat

longer beak of the utricle than in typical *C. satzumensis*, was already reduced to *C. satzumensis* by FRANCHET (1896).

The specific epithet is frequently spelt '*satsumensis*', but the spelling '*satzumensis*', employed when the species was validly published, must be retained.

In an abnormal inflorescence of SANTOS 5776 from Luzon I found in all branches between the fertile cladophyll and the normal utricles some deeply split utricles containing one or some ♂ flowers besides the ♀ one, a situation normal in *Schoenoxiphium* and *Kobresia*.

### 3. Section Hypolytroides

NELMES, Kew Bull. (1951) 121; Reinwardtia 1 (1951) 246; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 20, 21.

Type species: *Carex hypolytroides* RIDL.

13. *Carex hypolytroides* RIDL. J. Fed. Mal. St. Mus. 8 (1917) 124; NELMES, Reinwardtia 1 (1951) 246; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 96; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 21, f. 3, 102, f. 31 (map). — *C. hypolytroides* GROSS & MATTF. Notizbl. Berl.-Dahl. 14 (1938) 190. — *C. hypolytropsis* GROSS in Fedde, Rep. 50 (1941) 213. — Fig. 119, 124I, 126.

Rhizome woody, emitting strong stolons covered with lanceolate, fuscous sheaths. *Stems* rigid, erect, rather acutely trigonous, smooth, 100–250 cm by 3–5 mm, surrounded at the base by a few reddish brown, bladeless sheaths. Leaves at regular intervals throughout the stem, shorter than the stem, stiff, flattish, or with revolute margins when dry, smooth, or scabrid on the margins, sparsely to rather densely covered with long, pale hairs beneath, 4–8 mm wide; sheaths smooth, hairy above, membranous in front, with concave mouth; ligule elongate, hairy, ferruginous. *Inflorescence* a compound, interrupted panicle, 25–40 cm long; secondary panicles 5–8, erect, broadly pyramidal, single at the nodes, or lowest sometimes binate, rather loose, upper approximate, lower distant, on exserted, hispidulous peduncles with patent branches. Lower bracts foliaceous, slightly exceeding the inflorescence, long-sheathing, upper reduced. *Spikelets* usually unisexual; ♀ ones numerous, shortly cylindrical, very dense, 5–8 by  $3\frac{1}{2}$ – $4\frac{1}{2}$  mm, sometimes with a few ♂ flowers at the top; ♂ ones inconspicuous, few, lateral, 1–5 just below some of the terminal ♀ spikelets, sessile, ellipsoid, 4 by 1–2 mm. Cladophylls of branches and peduncles utriculiform, hairy, those of the ♂ spikelets sometimes enclosing a ♀ flower, those of the partial panicles ocreiform. *Glumes* thinly membranous, ovate-lanceolate, acute, hairy, slenderly nerved, with narrow whitish-hyaline margins

and shortly excurrent midnerve,  $2$ – $2\frac{3}{4}$  mm long, in ripe spikelets almost completely hidden among the utricles. *Utricles* obtusely trigonous, obovoid, not or but slightly inflated, horizontally patent, straight, glabrous or very sparsely hispidulous, slenderly nerved (2 nerves more prominent), fuscous, densely reddish glandular-spotted,  $1\frac{1}{4}$ – $1\frac{2}{3}$  by c. 1 mm, subabruptly narrowed into a very short, bidenticulate beak. *Nut* triquetrous, obovoid, filling the utricle, sessile, brown, whitish papillose,  $1\frac{1}{5}$ – $1\frac{1}{3}$  by  $\frac{9}{10}$ –1 mm. *Style-base* thickened. Stigmas 3.

Distr. Tonkin, Annam; in *Malesia*: Central Sumatra (Mt Kerintji), Borneo (Mt Kinabalu: Lumu-lumu, Mesilau Cave). See the distribution map by RAYMOND, *l.c.*

Ecol. In wet spots in forests, on Mt Kerintji between 2200 and 2750 m, on Mt Kinabalu at 1800 m.

Notes. The infructescence so strongly recalls a *Hypolytrum* that RIDLEY and GROSS independently of each other chose the epithet *hypolytroides* for it.

The ♂ spikelets are inserted laterally, as they are borne from a utriculiform prophyll, and therefore cannot have degraded from an originally terminal position as was supposed by NELMES, Reinwardtia 1 (1951) 248.

*Carex hypolytroides* is closely related to *C. moupinensis* FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris II, 10 (1888) 102; *ibid.* III, 8 (1896) 257, t. 7 f. 2; CLARKE, J. Linn. Soc. Bot. 36 (1904) 209; KÜK. Pfl. R. Heft 38 (1909) 289; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 21, f. 2. — *Homalostachys sinensis* BOECK. Cyp. Nov. 1 (1888) 38, non *C. chinensis* RETZ. — *Scleria sinensis* H. PFEIFF. in Fedde, Rep. 26 (1929) 263, only known from China (Hupeh, Szechuan, Yunnan).



Fig. 126. *Carex hypolytroides* RIDL. *a*. Habit,  $\times \frac{4}{3}$ , *b*. terminal ♀ and lateral ♂ spikelet,  $\times 3$ , *c-d*. fruit in utricle, *e*. fruit, both  $\times 13$  (JACOBS 4332).

The latter species is much lower, with narrower leaves, and usually all the spikelets of the terminal partial panicle ♂; it is especially characterised by

the slightly larger (2 by  $1\frac{1}{3}$ , mm), much inflated utricles truncate or depressed at the top, and the nut not filling the utricle.

4. Section *Mapaniifoliae*

NELMES & AIRY SHAW in Hook. Ic. Pl. 35 (1943) t. 3434; NELMES, *Reinwardtia* 1 (1951) 248; RAYM. *Mém. Jard. Bot. Montréal n. 53* (1959) 20, 27; 93, f. 23 (map). — *Sect. Indicae subsect. Scaposae* KÜK. Pfl. R. Heft 38 (1909) 285, p.p.

Type species: *Carex helferi* BOECK.

14. *Carex helferi* BOECK. *Linnaea* 40 (1876) 365; CLARKE, Fl. Br. Ind. 6 (1894) 714; KÜK. Pfl. R. Heft 38 (1909) 286; NELMES in Hook. Ic. Pl. (1947) t. 3468; Kew Bull. (1950) 189; *Reinwardtia* 1 (1951) 248; *Mém. Mus. Hist. Nat. Paris n.s. B4* (1955) 99; RAYM. *Mém. Jard. Bot. Montréal n. 53* (1959) 30; *Dansk Bot. Ark.* 23 (1965) 252; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 491. — *C. mapaniifolia* RIDL. *J. Fed. Mal. St. Mus.* 10 (1920) 124; NELMES, *Mém. Mus. Hist. Nat. Paris n.s. B4* (1955) 98; RAYM. *Mém. Jard. Bot. Montréal n. 53* (1959) 30. — Fig. 119.

Rhizome short, stout, woody, clothed with some brown bladeless sheaths or their fibrous remains. Stems central, erect, scapiform, trigonous or subterete, smooth, or scabrid on the angles, (5-)20-40 cm by 1-2 mm, the base enveloped by some brown, infundibuliform, up to 10 cm long sheaths. Leaves overtopping the stems, broadly linear, duplicate below (narrowed into a pseudopetiole), otherwise flat, long-acuminate, minutely scabrid on the margins in the upper part, with the midnerve and 2 mid-lateral nerves prominent, 1½-3½ cm wide; ligule elongate-triangular, brown-bordered, 1½-2 cm long. Inflorescence paniculate, consisting of (2-)3-7 partial inflorescences, up to 25 cm long; partial inflorescences erect, oblong-ovoid, very dense, head-like, upper approximate, lower distant, single at the nodes, with hispid rachis, 2-3½ by 1-2½ cm, on exerted, smooth or finely scabrid peduncles. Bracts sheath-like, amplate, infundibuliform, short-bladed, light brown or spadiceous. Spikelets densely crowded, androgynous, ovoid, patent, 6-10 by 5-8 mm, the ♂ part usually much longer than the few-flowered ♀ part. Glumes thinly membranous, oblong-ovate, obtuse to truncate-bilobed, many-

nerved, glabrous or hispidulous, pale brown with broad, whitish hyaline margins, 2-4 mm long, the midnerve excurrent in a 1-4 mm long, scabrous, often recurved awn. Utricles trigonous, ellipsoid, with shallowly concave faces, patulous, glabrous at the base, hispidulous above, shortly stipitate, strongly 6-8-nerved on each face, stramineous to brown, 6-7 by 1½-1¼ mm (the long beak included); beak hispidulous, curved, bulbous at the base (to hold thickened style-base), nearly linear above, with very oblique mouth (its base 1½-1¾ mm from the apex), 3-3½ mm long. Nut trigonous, ellipsoid or slightly obovoid, scarcely stipitate, shortly beaked and suddenly expanded into the conical style-base, dark brown with pale angles, 2½-2¾ by 1½-1¾ mm. Style-base pyramidally thickened, subpersistent on the nut. Stigmas 3.

Distr. Lower Burma, SE. & Peninsular Thailand; in *Malesia*: W. Java (Priangan). Wrongly recorded for Sumatra and Borneo by NELMES (1950, p. 100).

Ecol. In forests, 1100 m.

Notes. This is the only Malesian member of the wide-leaved *sect. Mapaniifoliae*, which section appears to be almost confined to the Indo-Chinese Peninsula, where it is represented by several species.

The few Javan specimens hitherto collected are vegetatively much less developed than those from the continent, but agree with them in floral and fruit characters.

By its broad leaves, scapiform flowering stems, and shape of the inflorescence *Carex helferi* deceptively resembles *Hypolytrum humile* (STEUD.) BOECK. It can be distinguished by the long-beaked utricles, the 3 stigmas, and the trigonous nuts.

5. Section *Polystachyae*

[TUCKERM. *En. Meth.* (1843) 10, *nomen* ('*Polystachae*')]; *ex* KÜK. *Bot. Jahrb.* 27 (1899) 517, *quoad basion.*; Pfl. R. Heft 38 (1909) 257; NELMES, *Reinwardtia* 1 (1951) 322; RAYM. *Mém. Jard. Bot. Montréal n. 53* (1959) 20, 49. — *Sect. Acrarrhenae* FRIES *Sippe Longebracteatae* PAX in *E. & P. Nat. Pfl. Fam.* 2, 2 (1887) 124. — *Sect. Polystachyae* CLARKE [ser.] *Longispicae* CLARKE, *J. Linn. Soc. Bot.* 37 (1904) 4, p.p. — *Sect. Extensae* FRIES *subsect. Baccantes* KOYAMA, *J. Fac. Sc. Un. Tokyo* III, 8 (1962) 151.

Type species: *Carex myosurus* NEES.

15. *Carex baccans* NEES in Wight, Contr. Bot. Ind. (1834) 122; KUNTH, En. 2 (1837) 513; BOOTT, Ill. 2 (1860) 83, t. 234–236, 238, 239; BOECK. Linnaea 40 (1876) 339; O. K. Rev. Gen. Pl. 2 (1891) 747, *incl. var. nigra* O. K.; CLARKE, Bot. Mag. III, 49 (1893) t. 7288; Fl. Br. Ind. 6 (1894) 722; J. Linn. Soc. Bot. 37 (1904) 14, *incl. var. siccifructus* CLARKE; Philip. J. Sc. 2 (1907) Bot. 108; KÜK. Pfl. R. Heft 38 (1909) 258, f. 39E–H; Philip. J. Sc. 6 (1911) Bot. 59; KOORD. Exk. Fl. Java 1 (1911) 211; CAMUS, Fl. Gén. I.-C. 7 (1912) 185; MERR. En. Philip. 1 (1923) 136; RIDL. Fl. Mal. Pen. 5 (1925) 184; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 462; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 68; NELMES, Kew Bull. (1950) 194; Reinwardtia 1 (1951) 322; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 50; KOYAMA, J. Fac. Sc. Tokyo Un. III, 8 (1962) 216; Dansk Bot. Ark. 23 (1965) 257; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 493; STEEN. Mt. Fl. Java (1972) pl. 15–1. — *C. curvirostris* KUNZE, Suppl. Riedgr. (1840–50) 79, t. 20; MIQ. Fl. Ind. Bat. 3 (1856) 350; CLARKE, J. Linn. Soc. Bot. 37 (1904) 14; STEUD. [in Zoll. Syst. Verz. 1 (1854) 60, *nomen*] Syn. 2 (1855) 207 (*'recurvirostra'*). — *C. javanica* BOECK. Cyp. Not. 1

(1888) 43. — *C. walkeri* (non ARN. ex BOOTT) KÜK. Pfl. R. Heft 38 (1909) 546; *cf.* BACK. Brittonia 3 (1938) 76. — Fig. 119, 127, 131i.

Rhizome short, stout, woody. *Stems* usually robust, loosely tufted, erect, triquetrous or trigonous, smooth, 60–150 cm by up to 5 mm, the base surrounded by reddish, bladeless sheaths splitting in front into reticulate fibres. *Leaves* all over the stem, often overtopping the inflorescence, long-attenuate, coriaceous, flat or with revolute margins, asperous on the upper surface in the apical part, with scabrous margins, 5–18 mm wide; sheaths long, often splitting up in front. *Inflorescence* paniculate, compound or decompound, oblong, occupying  $\frac{1}{3}$ – $\frac{1}{2}$  of the stem, erect or somewhat nodding at the top; partial panicles 5–8, single at the nodes, much branched, upper approximate, lower distant on long-exserted, smooth or scabrid peduncles. Lower bracts usually much overtopping the inflorescence, foliaceous, long-sheathing, upper much reduced. *Spikelets* very numerous, androgynous, suberect to patent,  $2\frac{1}{2}$ –8 cm long; ♀ part cylindrical, densely flowered, usually longer than the slenderer ♂ part. *Glumes* ovate or oblong-ovate, acute to subobtuse, glab-



Fig. 127. *Carex baccans* NEES in pioneer tufts with sand-binding capacity in the sand plain and dunes of volcanic ash of the Tengger Sandsea, East Java, c. 1900 m altitude (CLASON).

rous or hispidulous, strongly nerved, purplish or castaneous with whitish-hyaline margins, mucicous or the midrib excurrent in a scabrid mucro,  $2\frac{1}{2}$ - $3\frac{1}{2}$  mm long. *Utricles* inflated, obscurely trigonous, obovoid to subglobose, patent, subcoriaceous, strongly nerved, glabrous except for the hispidulous margins at the apex, shining, at first yellowish green, ultimately red and more or less succulent,  $3\frac{1}{2}$ - $4\frac{1}{2}$  mm long, abruptly beaked; beak recurved, bidentate. *Nut* triquetrous, ellipsoid, with flattish or shallowly concave faces, dark brown,  $2\frac{3}{4}$ -3 mm long. *Style-base* not thickened. Stigmas 3.

Distr. Ceylon, India (Sikkim and Khasia), S. China and Formosa, and through Thailand and Indo-China to Malasia; in *Malasia*: Sumatra, Malay Peninsula (Pahang), Java, Lesser Sunda Is. (Bali, Lombok), Philippines (Luzon), New Guinea.

Ecol. In damp thickets, open places in forests, in the mossy forest on the higher mountains, sometimes in mountain savannahs, or as pioneer in the Sandsea and on fresh landslides, on volcanoes, talus; (600-)-1000-3300 m.

Vern. *Ladingan, ria-ria-batu, sukēt kērisan, J, ilat beureum, ilateun tēki, S*; Philip.: *gihidsan, Bon., mankat, silak, Ig.*; New Guinea: *djugudjigufa, Dunantina, djugudjuguha, Asoro: Kefamo, pul, Chimbu: Masue, koimin, Wahgi: Minj.*

Note. This beautiful species seems to be sometimes cultivated as an ornamental in temperate regions; see NICHOLSON, Ill. Dict. Gard. 1 (1885-89) 267, f. 367).

16. *Carex myosurus* NEES in Wight, Contr. Bot. Ind. (1834) 122; KUNTH, En. 2 (1837) 507; STEUD. Syn. 2 (1855) 207; BOOTT, Ill. 2 (1860) 82, t. 229, 230, 232; BOECK. Linnaea 40 (1876) 334; CLARKE, Fl. Br. Ind. 6 (1894) 723, *incl. var. eminens* (NEES) CLARKE; KÜK. Pfl. R. Heft 38 (1909) 258; MERR. En. Philipp. 1 (1923) 139; NELMES, Kew Bull. (1950) 195, *incl. var. celebica* NELMES; Reinwardtia 1 (1951) 325; *ibid.* 2 (1954) 377; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 51; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 493; STEEN. Mt. Fl. Java (1972) pl. 14-2. — *C. eminens* NEES in Wight, Contr. Bot. Ind. (1834) 122. — *C. longibracteata* STEUD. [in Zoll. Syst. Verz. 1 (1854) 60, *nomen*] Syn. 2 (1855) 205 ('*longibracteata*'), non SCHLEICH. Cat. Pl. Helv. ed. 4 (1821) 11, *nomen*; MIQ. Fl. Ind. Bat. 3 (1856) 348, *incl. var. major* MIQ.; BOECK. Linnaea 39 (1875) 108; CLARKE, J. Linn. Soc. Bot. 37 (1904) 15; KÜK. Pfl. R. Heft 38 (1909) 260, *incl. f. distans* KÜK. et *f. angustifolia* KÜK.; Bull. Jard. Bot. Btzg III, 16 (1940) 314, *incl. var. gigantea* KÜK.; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 70; NELMES, Reinwardtia 1 (1951) 327; *ibid.* 2 (1954) 377. — *C. floribunda* BOECK. Linnaea 40 (1876) 335. — *C. kuntzeana* BOECK. Cyp. Nov. 1 (1888) 51. — *C. composita* (non BOOTT) CLARKE, J. Linn. Soc. Bot. 37 (1904) 14. — Fig. 119.

Rhizome short, stout, woody. *Stems* slender,

loosely tufted, erect, trigonous, smooth, (20-)50-150 cm by up to 4 mm at the base, clothed at the base with fuscous to purplish sheaths or their fibrous, reticulate remains. *Leaves* mainly subbasal, a few widely spaced on the stem, equalling or exceeding the inflorescence, long-attenuate, coriaceous, flat or with revolute margins, asperous on the upper surface in the upper part, with scabrous margins, (2-)5-10 mm wide; sheaths long, often reddish, frayed in front into reticulate fibres. *Inflorescence* from almost simple to decompound, narrow, (10-)25-100 cm long, erect or somewhat nodding at the top; secondary panicles 5-9, single at the nodes, upper approximate, lower distant on exerted, more or less scabrid peduncles, sometimes all reduced to simple spikelets. Lower bracts foliaceous, long-sheathing, exceeding the stem, upper much reduced. *Spikelets* androgynous, suberect to patulous, the longer ones on a plant 3 to 10 cm long, ♂ and ♀ parts often about equal in length, but sometimes the terminal spikelet almost wholly ♂ and some of the lateral almost wholly ♀. *Glumes* oblong or oblong-ovate, acute to obtuse, glabrous, or sparsely hispidulous, slenderly nerved, pale to castaneous, with whitish-hyaline margins,  $2\frac{1}{2}$ -4 mm long, the midrib usually excurrent in a hispidulous awn up to 2 (rarely 3) mm long. *Utricles* trigonous, ellipsoid or ellipsoid-obovoid, patulous, membranous, slenderly nerved, sparsely to subdensely hispidulous at least towards the apex, straight or slightly bent, pale to castaneous,  $3-4\frac{1}{2}$  mm long, subgradually to subabruptly narrowed into a hispidulous-margined, bidentate,  $\frac{3}{4}$ -1 mm long beak. *Nut* triquetrous, ellipsoid, oblong-ellipsoid, or slightly obovoid, with flattish to slightly concave sides, dark brown, abruptly beaked, 2-3 mm long; stipe and beak straight to bent at the base. *Style-base* not thickened. Stigmas 3.

Distr. India, Burma, Indo-China; in *Malasia*: Sumatra (Atjeh, W. Coast Res.), Java, Lesser Sunda Is. (Lombok: Mt Rindjani), Philippines (Luzon: Bontoc), SW. Celebes (Mt Bonthain).

Ecol. In open or lightly shaded places, on forested slopes, in mountain scrub, heath formations, a pioneer on sterile crater soil, sometimes dominant; 1700-3300 m.

Notes. *Carex myosurus* in the wide circumscription here accepted is extremely polymorphous. CLARKE, Fl. Br. Ind. 6 (1894) 723, distinguished between typical *C. myosurus* (from Nilghiri Mts and Coromandelia) and *C. myosurus var. eminens* (NEES) CLARKE (occurring throughout the Himalayas), the latter mainly characterized by the shorter and usually broader utricles with often rather deeply bifid beak, although in some Sikkim and Bhotan plants (distinguished by BOECKELER as *C. floribunda*) the beak is not more notched than in the Nilghiri plants. *Carex spiculata* BOOTT, with narrower leaves, denser spikelets with obliquely ascending utricles and more rigid panicles he

considered specifically distinct. Obviously he had not seen Malesian specimens of *C. longibracteata* STEUD. (cf. J. Linn. Soc. Bot. 37, 1904, 15).

KÜKENTHAL, Pfl. R. Heft 38 (1909) 259, distinguished *var. eminens* by the shorter and broader utricles and the usually fuscous glumes, and *var. floribunda* (BOECK.) KÜK. by its profusely branched inflorescences; *C. spiculata* was reduced to sub-specific rank. On the other hand, *C. longibracteata* was upheld as a species. As in numerous Indian *myosurus* specimens the inflorescence is paniculate or even spicate (see KÜKENTHAL's description!) it is clear that *C. longibracteata* cannot be separated from *C. myosurus* on account of the characters used in KÜKENTHAL's key ("inflorescentia subdepaniculata, spiculae numerosae" in *C. myosurus*, versus "inflorescentia paniculata rarius spicata, spiculae haud numerosae" in *C. longibracteata*).

No more can I understand in what way NELMES

distinguished between *C. myosurus* and *C. longibracteata*, for the former is said to have leaves 5–10 mm wide and secondary panicles composed of 3 to rather numerous spikelets, whereas the latter should differ in having leaves 2–6 mm wide and secondary panicles composed of 1–7 spikelets. Besides, in the Lombok specimens referred to *C. myosurus*, the leaves are only 2–3 mm wide.

*Carex longibracteata* is very similar to *C. myosurus var. eminens*; usually the inflorescence is less compound (but profusely branched inflorescences occur, see KERN 8376!) and the utricles are still somewhat broader. In the Celebes and Lombok specimens referred by NELMES to *C. myosurus* the utricles are considerably narrower.

The only Javan collection NELMES referred to *C. myosurus* (VAN STEENIS 12267) was gathered together with VAN STEENIS 12269, which was named *C. longibracteata* for reasons I do not understand.

## 6. Section Oligostachyae

CLARKE, J. Linn. Soc. Bot. 37 (1904) 4. — *Sect. Polystachyae* CLARKE [ser.] *Longispicae* CLARKE, l.c., p.p. — *Sect. Frigidae* FRIES subsect. *Decorae* KÜK. Pfl. R. Heft 38 (1909) 541. — *Sect. Decorae* (KÜK.) OHWI, Mém. Coll. Sc. Kyoto Imp. Un. B11 (1936) 338; NELMES, Reinwardtia 1 (1951) 332; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 54, 71; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 154. — *Sect. Borneenses* NELMES, Kew Bull. (1951) 121; Reinwardtia 1 (1951) 347; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 54, 82.

Type species: *Carex borneensis* CLARKE (lectotype).

17. *Carex celebica* KÜK. Bot. Jahrb. 70 (Jan. 1940) 465; Bull. Jard. Bot. Btzg III, 16 (Feb. 1940) 318; NELMES, Kew Bull. (1949) 389; Reinwardtia 1 (1951) 345. — *C. constricta* S. T. BLAKE, J. Arn. Arb. 28 (1947) 112, f. 4A. — Fig. 119.

Rhizome creeping, emitting slender stolons. Stems solitary or somewhat tufted, erect or curved, triquetrous, smooth, often hidden in the leaf-sheaths, 2–25 cm by c. 1½ mm, surrounded below the leaves by purplish cataphylls or their fibrous remains. Leaves subbasal, often recurved, longer than the stem, flattish or canaliculate, rigid, scabrid in the upper part, gradually attenuate into a firm point, 1½–5 mm wide; sheath purplish. Inflorescence consisting of 5–15 spikelets, 2–10 cm long. Lower bracts foliaceous, much exceeding the inflorescence, shortly sheathing, upper much reduced. Spikelets suberect, ½–3 cm long, upper approximate on hardly or not exerted; smooth peduncles; lower sometimes distant on longer peduncles, terminal ♂, linear, 1–2 mm thick, lateral ♀ or with a few ♂ flowers at the top, cylindrical, 3–4 mm thick, lowest solitary, upper in fascicles of 2–3 (at least one of the fascicles of 3). Glumes ovate or oblong-ovate, obtuse to emarginate, more

rarely acute, reddish brown with whitish-hyaline margins, slenderly few-nerved, 2–3 mm long, the midrib excurrent in a mucro or in an up to 3 mm long awn. Utricles triquetrous, ovoid or ellipsoid, with flat faces, nerveless (except for two marginal nerves), glabrous, smooth, patulous, slightly recurved, finally dark brown, 2½–3½ by 9/10–1 mm, subabruptly narrowed into a smooth or sparsely hispidulous-margined ¾–1 mm long beak; mouth subentire or bidenticulate. Nut ellipsoid or ovoid, triquetrous with flat faces, densely punctulate, dilate-annulate at the apex, 1½–1½ by 4/5–1 mm. Style-base thickened. Stigmas 3.

Distr. *Malesia*: Sumatra (G. Leuser), SW. Celebes (Mt Pokapindjang), New Guinea (W.: Carstensz Mts; NE.: Mt Hagen, Mt Michael, Mt Piora, Mt Wilhelm, Mt Sarawaket, Sattelberg; Papua: S. Highlands, Mt Ambua, Mt Giluwe, Mt Victoria, Owen Stanley Range).

Ecol. Open places, mountain heaths, alpine grasslands and swamps; 2400–4040 m.

Vern. New Guinea: *tudik*, Mendi language.

Note. The original descriptions of both *Carex celebica* and *C. constricta* were based on dwarf specimens a few cm tall. Collections recently made

in New Guinea have shown that the species can reach a height of 25 cm and the leaves a width of 5 mm. Stout specimens are very similar to 20. *C. verticillata*, a close ally of *C. celebica*, but easily distinguished by the long stipitate  $4\frac{1}{2}$ - $6\frac{1}{2}$  mm long utricles in the latter.

18. *Carex perakensis* C. B. CLARKE, Fl. Br. Ind. 6 (1894) 720; J. Linn. Soc. Bot. 37 (1904) 9; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 116; Fl. Mal. Pen. 5 (1925) 184; UITT. Rec. Trav. Bot. Néerl. 32 (1935) 201; NELMES, Kew Bull. (1950) 189; Reinwardtia 1 (1951) 253; Mém. Mus. Hist. Nat. Paris n.s. 4 (1955) 114; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 74, f. 18; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 156; RAYM. Dansk Bot. Ark. 23 (1965) 259. — ? *C. arridens* CLARKE, Fl. Br. Ind. 6 (1894) 726; KÜK. Pfl. R. Heft 38 (1909) 548; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 117; Fl. Mal. Pen. 5 (1925) 184; NELMES, Reinwardtia 1 (1951) 333; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 139; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 74. — *C. tonkinensis* FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris III, 8 (1896) 251; KÜK. Pfl. R. Heft 38 (1909) 292; NELMES, Kew Bull. (1950) 190; Reinwardtia 1 (1951) 254; RAYM. Nat. Canad. 82 (1955) 165, f. 5. — *C. wightiana* NEES var. *perakensis* KÜK. Pfl. R. Heft 38 (1909) 288. — *C. leucostachys* RIDL. Kew Bull. (1928) 77; NELMES, Reinwardtia 1 (1951) 251; Mém. Mus. Hist. Nat. Paris n.s. 4 (1955) 113. — *C. nodiflora* (non BOECK.) KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 316. — *C. pseudorivulorum* KÜK. l.c. 319, *quoad specim. cit., non C. rivulorum* RIDL. (basionym). — *C. setulifolia* NELMES, Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 116. — Fig. 119, 131b-d.

*Further synonyms under the varieties.*

Rhizome short or shortly creeping (thick) woody. Stems tufted, erect, trigonous or triquetrous, smooth or sparsely scabrid on the angles, especially above, 15-175 cm by  $\frac{1}{2}$ -4 mm below, surrounded below the leaves by brown to purplish brown bladeless sheaths or their fibrous remains. Leaves basal and subbasal, rarely spaced throughout the stem, shorter than to exceeding the stem, flattish, rather stiff, scabrid or smooth on the margins, asperous towards the long acuminate apex, (2-)-3-16 mm wide; sheaths often dark nerved, hispidulous or puberulous at the mouth. Inflorescence usually consisting of 2-7 fascicles, or spikelets single, binate or ternate at each node; the fascicles formed by single spikelets (2-14 spikelets in the whole inflorescence), or by up to 20 panicles (in the whole inflorescence); the panicles consist of a very lax raceme of up to 10 secondary spikelets, each secondary spikelet subtended by a whether or not sheathing glumiform, often long awned bractlet, and surrounded at the base by an ocreiform cladophyll. The lower fascicles or spikelets distant, on long exerted smooth peduncles,

the higher approximate. Lower bracts foliaceous, long sheathing, the sheaths often ampliate; higher bracts much reduced, when glumiform the inflorescence is terminated by a seemingly more compound panicle. Spikelets androgynous, cylindrical, but the ♂ part tapering, up to 10 in each panicle, the ♀ part mostly lax flowered, from much shorter to longer than the ♂ part, 3-8 mm thick. Glumes oblong to ovate or lanceolate acute to obtuse or acuminate, glabrous or hispidulous, nerved, light or red brown, or whitish to fulvous, usually with whitish hyaline margins,  $2\frac{1}{2}$ -7 mm long, the midrib just below the apex apiculate or excurrent into an up to 5 mm long awn. Utricles trigonous, oblong to narrowly ellipsoid, or obovoid,  $5-9\frac{1}{2}$  by  $1-2\frac{1}{3}$  mm, suberect to patulous, straight or obliquely bent at the apex, many-nerved, hispidulous, shortly stipitate or sessile, subabruptly beaked or gradually narrowed, beak bidentate, often with oblique mouth,  $1\frac{1}{2}$ -3 mm long. Nut trigonous with flat to slightly concave faces, ellipsoid to oblong ellipsoid or obovoid, shortly stipitate and beaked, 3-4 mm long. Style-base slightly thickened. Stigmas 3.

Distr. S. China (Yunnan and Kwangsi), Formosa, Tonkin, Annam, Laos, Lower Burma, Thailand; in Malesia: Sumatra (Atjeh, East Coast, Palembang), Malay Peninsula (Perak, Larut, Pahang, Selangor), Borneo, SW. & SE. Celebes.

Ecol. See under the varieties.

Notes. The species is very variable, three varieties being distinguished. *Carex borneensis* seems at first sight to be a different species, although closely allied to *C. vansteenisii* s.s., because in most of the material of *C. borneensis* the spikelets are not compound. In the Malay Peninsula, however, this difference fades away, the spikelets of *C. borneensis* becoming also compound. *Carex vansteenisii*, a very rare plant, possesses exactly the same inflorescence as *C. perakensis*, the utricles are narrower, and their length overlaps with the range of those of *C. perakensis* (7-9 mm in *C. vansteenisii*, 5-6(-8) mm in *C. perakensis*).

NELMES distinguished also between *C. borneensis* and *C. kinabaluensis*, although there are no differences at all between the two. The Celebes collection (*C. eymae* NELMES) is young and differs hardly from the Bornean specimens of *C. borneensis*.

*Carex kinabaluensis* was considered an ally of 57. *C. brunnea*, as STAFF made a mistake in describing it as having 2 stigmas (in fact the number of stigmas is the only difference between the two sections!).

In the specimens of *C. borneensis* from the Malay Peninsula, as mentioned in the first note, some of the spikelets are branched (into 2-4 secondary spikelets). On account of this NELMES maintained *C. breviglumis* RIDL. as a species distinct from the Bornean plants of *C. borneensis*, in which the spikelets are usually unbranched. However, this difference does not always hold.

NELMES considered *C. tonkinensis* and *C. leuco-*

*stachys* specifically distinct from *C. perakensis* s.s., but I could not find differences, and his key characters are unfit for discrimination.

*Carex leucostachys* has been recorded from Pahang (P. Tioman), S. Sumatra (G. Pesagi), and Tonkin. In the type collection the inflorescence is a dense, head-like panicle, and the utricles are about 8 mm. The inflorescence is still too young for good description, but it shows resemblance with *C. vansteenisii* s.s. in the utricles, and several other collections show transitions to *C. perakensis* s.s.

CLARKE based *C. arridens* on two collections (Lower Burma, KURZ, n.v., and Perak, KING's coll. 2801). The Perak specimen, the only one ever collected in Malesia (in 1882) is very young with quite undeveloped flowers. It has the dark-nerved basal sheaths and the pale indumentum of the young utricles of *C. perakensis* s.s. The glumes are darker than is usual. In 1951 NELMES placed it in subg. *Carex*, but *C. perakensis*, *C. tonkinensis* and *C. leucostachys* in subg. *Indocarex*. The two subgenera he distinguished by their cladoprophylls (utriculiform in subg. *Indocarex*, ocreiform in subg. *Carex*). He described the cladoprophylls of *C. perakensis* as "utriculi-glumiform", those of *C. tonkinensis* as "more or less ocreiform" of *C. leucostachys* as "subocreiform below, glumiform above" and of *C. arridens* as "subutriculiform below, glumiform above". In 1955 he removed *C. tonkinensis* to subg. *Carex*, *C. leucostachys* and *C. perakensis* he left in subg. *Indocarex*.

#### KEY TO THE VARIETIES

1. Spikelets single or binate at the nodes, not com' pound. Utricles 5-9 $\frac{1}{2}$  mm, gradually tapering into the 2-3 mm long beak. Leaves 2-8 mm wide
  - b. var. *borneensis*
1. Spikelets compound, or when simple in fascicles at the nodes.
2. Utricles densely pale to golden hispidulous, subabruptly beaked, sessile, ellipsoid or ellipsoid-obovoid, 5-6(-8) mm long. Glumes translucent, whitish, or fulvous with broad whitish margins, 3 $\frac{1}{2}$ -5 $\frac{1}{2}$  mm long. Inflorescence consisting of up to 20 panicles which are single, binate or ternate at the nodes. Each panicle consists of a raceme of up to 10 shortly peduncled 8-40 mm long secondary spikelets which is sometimes branched. The ♂ part of the spikelets from much shorter to longer than the ♀ part. Number of ♀ flowers usually less than 10 . . . . . a. var. *perakensis*
2. Utricles brown or olivaceous, gradually beaked, shortly stipitate, narrowly ellipsoid or fusiform, 5-9 $\frac{1}{2}$  mm. Glumes light brown or reddish brown, the margin often whitish hyaline, 2 $\frac{1}{2}$ -7 mm long. Inflorescence consisting of 2-14 spikelets branched into 2-4 secondary spikelets, single or binate at the nodes, or 4-7 fascicles of spikelets or panicles.

3. Inflorescence consisting of 2-14 spikelets, which are often branched into 2-4 secondary spikelets, the ♂ part shorter to much longer than the ♀ part. Glumes 2 $\frac{1}{2}$ -4 mm long, light brown with whitish hyaline margins

b. var. *borneensis*

3. Inflorescence consisting of 4-7 fascicles of spikelets or panicles. The panicles consisting of a very lax raceme of up to 7 secondary spikelets. Spikelets (or secondary spikelets) up to 10 in each fascicle, lax flowered, the ♀ part much longer than the ♂ part. Glumes brown or reddish brown, 5-7 mm long

c. var. *vansteenisii*

a. var. *perakensis*. — All synonyms under the species. — Fig. 119, 131c-d.

Stems tufted, erect, trigonous or triquetrous, smooth or sparsely scabrid on the angles above, 60-175 cm by 2-4 mm. Leaves 4-12(-16) mm wide. Spikelets 1-2(-4) cm long, the ♂ part much shorter than the 5-7 mm thick ♀ part. Awn of glumes up to 1 $\frac{1}{2}$  mm long. Beak of the 1 $\frac{1}{2}$ -2 $\frac{1}{3}$  mm wide utricles 1 $\frac{1}{2}$ -2(-3) mm long, often obliquely bent.

Distr. China (Yunnan, Kwangsi), Formosa, Tonkin, Annam, Thailand, Lower Burma; in Malesia: Sumatra (Atjeh, E. Coast, Palembang), Malay Peninsula (Perak: Larut; Pahang, Selangor), Borneo (Sarawak: Mt Dulit; Sabah: Mt Kinabalu), SW. Celebes (Mt Poka Pindjang).

Ecol. In swampy localities and primary forest, 750-1700 m, on Mt Kinabalu up to 2700 m.

b. var. *borneensis* (CLARKE) NOOT., *comb. nov.* — *C. borneensis* CLARKE, J. Linn. Soc. Bot. 37 (1904) 14; Kew Bull. add. ser. 8 (1908) 76; KÜK. Bull. Jard. Bot. Btzig III, 16 (1940) 320, *incl. var. clemensii* (KÜK.) KÜK. f. *angustifrons* KÜK.; NELMES, Reinwardtia 1 (1951) 351. — *C. fusiformis* (non NEES) STAPP, Trans. Linn. Soc. II, 4 (1894) 246. — *C. fusiformis* NEES var. *borneensis* (CLARKE) KÜK. Pfl. R. Heft. 38 (1909) 598. — *C. kinabaluensis* STAPP, J. Linn. Soc. Bot. 42 (1914) 183; NELMES, Kew Bull. (1950) 200; Reinwardtia 1 (1951) 349; *ibid.* 2 (1954) 377; RAYM. Mém. Jard. Bot. Montréal n. 53 (1919) 82. — *C. rivulorum* RIDL. J. Fed. Mal. St. Mus. 6 (1915) 195, *non* DUNN, 1908. — *C. breviglumis* RIDL. Fl. Mal. Pen. 5 (1925) 183; NELMES, Reinwardtia 1 (1951) 348. — *C. clemensii* KÜK. in Fedde, Rep. 29 (1931) 202. — *C. pseudorivulorum* KÜK. Bull. Jard. Bot. Btzig III, 16 (1940) 319, *quoad basionym.* — *C. eymae* NELMES, Kew Bull. (1950) 199; Reinwardtia 1 (1951) 352. — Fig. 119, 131b.

Stems erect, triquetrous, smooth or slightly scabrid, (15-)40-140 cm. Leaves shorter than to as long as the stem, (2-)3-5(-8) mm wide. Inflorescence narrow, up to 30 cm long, consisting of 2 to 14 spikelets. Spikelets up to 5 cm long, single or binate at the middle nodes, erect or suberect, simple or branched into 2-4 secondary spikelets, the ♂

part shorter to much longer than the lax-flowered 3–5 mm thick ♀ part. Glumes light brown with whitish hyaline margins,  $2\frac{1}{2}$ –4 mm long, apiculate or midrib excurrent into an up to 5 mm long awn. Utricles olivaceous,  $5$ – $9\frac{1}{2}$  by 1–2 mm, gradually tapering into a hispidulous margin, 2–3 mm long beak.

Distr. Annam (Prov. Kontum; Ngoe Pang); in *Malesia*: Malay Peninsula (Pahang: G. Tahan, G. Jasar, G. Berumban), Borneo (Sabah: Mt Kinabalu, Mt Tambuyokan, G. Alab; Sarawak: Mt Poë, Mt Dulit; SE. Borneo: W. Kutei), SE. Celebes (Enrekang). See the map by RAYMOND, *l.c.* p. 103.

Ecol. Wet places in forests and in shady places along streams; 800–3300 m.

Note. Specimens with very regularly puckered-bullate leaves were twice collected on Mt Kinabalu. The strange abnormality of the leaves may be due to some disturbance during the growth period. The same phenomenon has been observed in some *Aponogeton*, *Cryptocoryne*, and *Halophila* species.

*c. var. vansteenisii* (Kük.) NOOT., *comb. nov.* — *C. vansteenisii* KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 320, *incl. var. brevispiculosa* KÜK. *l.c.* 321; NELMES, Reinwardtia 1 (1951) 444; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 141; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 73. — Fig. 119.

Stems rather stout, erect, triquetrous, smooth, *c.* 150 cm by 3–4 mm. Leaves shorter than the stem, stiff, 3–15 mm wide, sheaths shining membranous in front. Inflorescence consisting of 4–7 fascicles of panicles consisting of a very lax raceme of up to 7 secondary spikelets. Spikelets lax-flowered, 2–6 cm long, 4–8 mm thick, the ♀ part much longer than the ♂ part, from *c.* 4- to *c.* 10-flowered. Glumes (reddish) brown, 5–7 mm long, awn 0–1 mm long. Utricles exceeding the glumes, suberect to patulous, gradually narrowed into the 2–3 mm long beak, 7–9 by 1– $1\frac{1}{2}$  mm.

Distr. Tonkin, Laos; in *Malesia*: N. Sumatra (Atjeh: Losir massif).

Ecol. Mountain heaths, 2100–2500 m. In the Losir area this variety is found at higher altitude than *var. perakensis*.

19. *Carex turrita* C. B. CLARKE, J. Linn. Soc. Bot. 37 (1904) 13; Philip. J. Sc. 2 (1907) Bot. 108; Kew Bull. add. ser. 8 (1908) 74; Kük. Philip. J. Sc. 5 (1911) Bot. 63; MERR. En. Philip. 1 (1923) 142; NELMES, Reinwardtia 1 (1951) 335. — Fig. 119, 131e–f.

See for synonyms under the varieties.

Rhizome short or shortly creeping, woody. Stems erect, trigonous, smooth, up to more than 1 m by  $\frac{1}{2}$ –3 mm below. Leaves basal and up to 3 higher on the stem, shorter than the stem, stiff, flat or with slightly revolute margins, with scabrid margins and asperous upper surface towards the long attenuate apex, 2–7 mm wide; sheaths usually

reddish or purplish, glabrous, with concave to convex mouth, the basal ones fraying into fibres. Inflorescence an often interrupted slender panicle to 50 cm long, consisting of 3–8 fascicles, lower fascicles distant, upper approximate. Lower bracts foliaceous, shorter to longer than their fascicles but much exceeded by the stem, long sheathing, upper much reduced; sheaths similar to those of the stem. Lower spikelets often single or binate, upper 2–6 together, often branched into 2–6 secondary spikelets, all androgynous, the ♂ part from much shorter to longer than the ♀ part, 2–8 cm by  $2$ – $3\frac{1}{2}$  mm, much exerted from their sheaths. Glumes oblong-ovate, obtuse to emarginate, glabrous or sparsely hispidulous towards the apex, dark red with wide white hyaline margins, nerved,  $2$ – $3\frac{1}{2}$  mm long, the midrib excurrent into an up to 2 mm long hispidulous awn. Utricles trigonous, oblong to ellipsoid, slenderly nerved to nerveless except 2 submarginal nerves, dark red, reddish or brown, straight or slightly curved, glabrous or hispidulous, at least above, the margins sparsely hispidulous from the middle or above the middle upwards, 3–6 by  $\frac{3}{5}$ –1 mm, gradually tapering into a hispidulous margin, 1–2 mm long bidentate beak. Nut triquetrous, ellipsoid, with flattish or concave faces, brown or fulvous, stipitate,  $1\frac{1}{2}$ – $3\frac{1}{2}$  mm long. Style-base slightly thickened. Stigmas 3.

Distr. *Malesia*: Philippines and New Guinea.

*a. var. turrita*. — *C. turrita* C. B. CLARKE. — *C. walkeri* ARN. *ex* BOOTT *var. turrita* (CLARKE) KÜK. Pfl. R. Heft 38 (1909) 546. — *C. atosanguinea* NELMES, Kew Bull. (1950) 197; Reinwardtia 1 (1951) 339. — Fig. 119, 131e–f.

Glumes  $3$ – $3\frac{1}{2}$  mm long, with an awn of  $\frac{1}{2}$ –2 mm. Utricles slenderly nerved, 5–6 mm long, with a beak of 2 mm. Nut  $3$ – $3\frac{1}{2}$  mm long.

Distr. *Malesia*: Philippines (Luzon: Abra, Bontoc, Ifugao, Benguet), New Guinea (W. New Guinea: Mt Treub; NE. New Guinea: Morobe Distr.; Papua: W. Highlands, Kubor Range, E. Highlands, Central Div.).

Ecol. Open places in mossy forest, montane rain-forest, 1500–3040 m.

Vern. Philippines: *tangtaño*, Bon.

Notes. NELMES distinguished the New Guinean *C. atosanguinea* from the Philippine *C. turrita* by the simple spikelets of the former. Additional collections from New Guinea have shown that also here specimens with branched spikelets occur; it must, however, be admitted that in general the spikelets in the Philippines are more compound.

I have not seen *C. gibbsiae* RENDLE, J. Linn. Soc. Bot. 39 (1909) 180, from Fiji, which is, according to NELMES, closely related to his *C. atosanguinea*, but looking “very distinct because of its different colouring”. I suspect it to be also conspecific with *C. turrita*.

b. *var. merrillii* (Kük.) NOOT., *comb. nov.* — *C. merrillii* Kük. in Fedde, Rep. 8 (1910) 7; Philip. J. Sc. 6 (1911) Bot. 63; MERR. En. Philip. 1 (1923) 139; NELMES, Reinwardtia 1 (1951) 336; *ibid.* 2 (1954) 377. — *C. pullei* NELMES, Kew Bull. (1950) 198; Reinwardtia 1 (1951) 338. — Fig. 119.

Glumes 2–2½ mm long, awn up to ½ mm. Utricles nerveless to slenderly few-nerved, 3–3¼ mm long, with a beak of 1–1½ mm. Nut 1½–1¾ mm long.

Distr. *Malesia*: Philippines (Luzon, Ifugao, Benguet), New Guinea (W. New Guinea: Mt Treub; NE. New Guinea: Morobe Distr.).

Ecol. Mossy forest, open places along trails, also on steep slopes; 1800–2490 m.

Note. KERN (in manuscript) reduced *C. pullei* to *C. turrita* with a question-mark. He noted: "It seems to differ mainly by the smaller utricles only 3–4 mm long, and may represent a depauperated state". NELMES described the utricles as being "almost nerveless to rather slenderly 1–3-nerved". As these were the only differences between *C. turrita* and *C. merrillii*, I have reduced the latter to a variety of the former.

20. *Carex verticillata* ZOLL. & MOR. in Mor. Syst. Verz. (1846) 98; STEUD. Syn. 2 (1855) 222; MIQ. Fl. Ind. Bat. 3 (1857) 353; BOECK. Linnaea 41 (1877) 256; NELMES, Kew Bull. (1950) 195, *incl. var. havilandii* (CLARKE) NELMES *et var. lutescens* NELMES; Reinwardtia 1 (1951) 340; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 74; KERN in Bakh. & Bakh. f. Fl. Java 3 (1968) 488. — *C. hypsophila* MIQ. Fl. Ind. Bat. 3 (1857) 354; BOECK. Linnaea 41 (1877) 257; CLARKE, J. Linn. Soc. Bot. 37 (1904) 13; Kük. Pfl. R. Heft 38 (1909) 546, f. 89, *incl. var. havilandii* (CLARKE) Kük. *et var. verticillata* (ZOLL. & MOR.) Kük.; in Hochr. Candollea 6 (1936) 432. — *C. walkeri* (non BOOTT) BOECK. Linnaea 40 (1876) 332, *p.p.*; BACH. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 65. — *C. tartarea* RIDL. J. Bot. 23 (1885) 35. — *C. havilandii* CLARKE, J. Linn. Soc. Bot. 37 (1904) 13; Kew Bull. add. ser. 8 (1908) 75. — *C. sumatrensis* CLARKE, J. Linn. Soc. Bot. 37 (1904) 13; Kew Bull. add. ser. 8 (1908) 75. — *C. turrita* (non CLARKE) Kük. Bull. Jard. Bot. Btzig III, 16 (1940) 319. — *C. decora* BOOTT *var. losirensis* Kük. *l.c.* — *C. phacelostachys* NELMES, Kew Bull. (1950) 195; Reinwardtia 1 (1951) 344, *incl. var. losirensis* (Kük.) NELMES; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 72. — Fig. 119.

Rhizome creeping, woody. Stems solitary or somewhat tufted, erect, triquetrous, smooth, 25–100 cm by 1–2 mm, surrounded below the leaves by dark reddish, entire or fibrous remains of old leaf-sheaths. Leaves basal and 1–2 on the stem proper, shorter than to equalling the stem, flattish with often strongly revolute margins, stiff, coriaceous, with scabrid margins, asperous above especially towards the long-attenuated apex,

3–8 mm wide; sheaths of the lower leaves reddish to blackish red, upper ones pale. *Inflorescence* a lax to dense panicle, 15–50 cm long, consisting of 4–7 fascicles of up to 20 spikelets, lower fascicles rather distant, upper approximate. Bracts of the lower fascicles foliaceous, equalling or exceeding their fascicles but usually much exceeded by the whole inflorescence, long-sheathing, upper much reduced; sheaths amplate, glabrous, the mouth often prolonged into a short tongue. *Spikelets* erect or somewhat nodding, slenderly cylindrical, lax- to rather dense-flowered, up to 6 cm long, simple or longest ones sometimes branched into 1–3 short secondary spikelets, on slender, smooth peduncles more or less exerted from the sheaths; 1–2 spikelets of uppermost fascicle (sometimes of all the fascicles) ♂, remaining ones wholly ♀ or with a few ♂ flowers at the top; ♂ spikelets 1–2 mm thick, ♀ 3–5 mm. *Glumes* oblong-lanceolate, obtuse, glabrous, fulvous to dark reddish with wide whitish-hyaline margins, 3–4¾ mm long, the midrib often excurrent in a smooth or hispidulous awn up to 1 mm long. *Utricles* trigonous, narrowly ellipsoid, tapering at both ends, glabrous but the margins often hispidulous, nerveless or faintly nerved (except for the marginal or submarginal nerves), suberect to patulous, often somewhat recurved, long-stipitate, stipe (½)–¾–1 mm, subabruptly beaked, blackish red to golden, 4–6½ by ¼–1 mm; beak almost linear, sparsely hispidulous-margined, bidenticulate, (1–)2–3 mm long. *Nut* triquetrous with flattish faces, ellipsoid, brown, 1¾–2 mm long. *Style* not or scarcely thickened at the base. *Stigmas* 3.

Distr. Laos, Tonkin; in *Malesia*: Sumatra, Malay Peninsula (Perak: G. Kerbau), Java, N. Borneo (Mt Kinabalu).

Ecol. Damp open places in forests, open places in the subalpine region, near craters; 2000–3750 m.

Notes. Variable as to the colour of glumes and utricles. In most of the Mt Kinabalu specimens the glumes and utricles are very dark; they were distinguished as *var. havilandii* (CLARKE) NELMES.

A collection from E. Java (G. Semeru), in which the glumes and utricles are pale golden to fulvous, was distinguished as *var. lutescens* NELMES.

*Carex phacelostachys* NELMES only could be distinguished by the utricles which are faintly nerved against nerveless in *C. verticillata*. The collection VAN STEENIS 9624 from Atjeh has been identified as *C. verticillata* by both NELMES and KERN; after careful examination of the utricles I could not find any difference with *C. phacelostachys*. I examined many utricles of *C. verticillata* with translucent light. Most of them are nerveless indeed, but others are faintly nerved, often only at the base, at least in plants from Sumatra and Borneo. — (NOOT.)

The species might also be conspecific with *C. walkeri* ARNOTT *ex* BOOTT. — (NOOT.)

## 7. Section Surculosae

RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 20, 21. — *Sect. Scabrellae* KÜK. Pfl. R. Heft 38 (1909) 286, p.p.; NELMES, Reinwardtia 1 (1951) 243.

Type species: *Carex oligostachya* NEES (lectotype).

21. *Carex oligostachya* NEES in Hook. J. Bot. Kew Misc. 6 (1854) 29; NELMES, Reinwardtia 1 (1951) 244; *ibid.* 2 (1954) 373; Kew Bull. (1955) 301; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 95; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 22. — *C. cumingiana* STEUD. Syn. 2 (1855) 206; MIQ. Fl. Ind. Bat. 3 (1856) 349; BOOTT, Ill. 3 (1862) 107, t. 324, 325; BOECK. Linnaea 40 (1876) 367; F.-VILL. Nov. App. (1882) 310. — *C. rhizomatosa* STEUD. [in Zoll. Syst. Verz. 1 (1854) 60, *nomen*] Syn. 2 (1855) 206; MIQ. Fl. Ind. Bat. 3 (1856) 348; CLARKE, Fl. Br. Ind. 6 (1894) 721; J. Linn. Soc. Bot. 37 (1904) 12; Philip. J. Sc. 2 (1907) Bot. 108; KÜK. Pfl. R. Heft 38 (1909) 289, f. 44, *excl. var. impunctata* (BOOTT) KÜK.; Philip. J. Sc. 6 (1911) Bot. 61; CAMUS, Fl. Gén. I.-C. 7 (1922) 193; MERR. En. Philip. 1 (1923) 141; KÜK. Bull. Jard. Bot. Btzig III, 16 (1940) 316, *incl. var. aristulata* KÜK.; S. T. BLAKE, J. Arn. Arb. 28 (1947) 107; NELMES, Kew Bull. (1949) 378, 387. — *C. bukaënsis* PALLA in Rechinger, Bot.-Zool. Ergebn. Samoa & Solomon Ins. (1913) 58. — *C. breviceps* KÜK. Bot. Jahrb. 69 (1938) 263. — Fig. 120.

Rhizome shortly creeping, woody, like the stem-base clothed with brown or blackish, fibrous remains of old leaf-sheaths. Flowering stems lateral, approximate, subscapiform (bearing a few short-bladed leaves), triquetrous, smooth, 20–90 cm by  $\frac{3}{4}$ –2 mm. Leaves of the sterile shoots shorter than the flowering stems, stiffish, flat, rather abruptly acuminate, scabrid in the upper part, glaucous, 2–5 mm wide. Inflorescence a narrow panicle consisting of 6–12 head-like or racemose partial inflorescences, 10–50 cm long; partial inflorescences erect, subglobose to oblong-ovoid, with 1–8 spikelets, the lower ones single at the nodes, distant, on long-exserted, setaceous peduncles, the upper ones more approximate, unequally binate

(rarely ternate); axis and top of peduncles scabrid. Bracts foliaceous with blades shorter than 8 cm, their sheaths ampliate, membranous near the mouth, the upper ones much reduced, infundibuliform. Spikelets androgynous, ovoid to subcylindric, sessile, 4–10 mm long, the ♂ and ♀ parts usually about equal in length. Glumes ovate or lanceolate, acutish to slightly notched, usually sparsely hispidulous towards the apex, 5–10-nerved, brown, often with reddish spots, whitish hyaline-margined, 2–3 mm long, the midnerve usually excurrent in a short, scabrid awn up to 1 mm long. Utricles obtusely trigonous, ellipsoid, subinflated, patent, straight, glabrous or sparsely hispidulous in the upper  $\frac{1}{3}$ , strongly many-nerved, rather abruptly beaked, fuscous,  $2\frac{1}{4}$ –4 by 1–2 mm; beak  $\frac{3}{4}$ –1 mm long, bidenticulate. Nut trigonous, ellipsoid or obovoid, minutely stipitate,  $2-2\frac{1}{4}$  by  $1-1\frac{1}{4}$  mm. Style-base not thickened. Stigmas 3.

Distr. Assam, Upper Burma, S. China, Tonkin, through Malasia to the Solomon Is.; in Malasia: Sumatra (Atjeh, Tapanuli), Lesser Sunda Is. (Sumba, Sumbawa, Flores), Philippines (Luzon, Negros, Mindanao), SE. Celebes (Buton I.), New Guinea. According to MERRILL, *l.c.*, also in the Moluccas.

Ecol. In *Imperata*-fields, on open grassy slopes, often in places where the grass is burned annually; from low altitude up to 1400 m.

Vern. New Guinea: *simboro*, Orokaiva lang.

Notes. The utricles vary from wholly glabrous (*C. breviceps* KÜK.) to sparsely hispidulous above.

I have not seen *C. breviceps* var. *recurvirostris* KÜK. Bot. Jahrb. 70 (1940) 464, based on CLEMENS 8032 from NE. New Guinea, Morobe, Sattelberg. Stems 90 cm tall. Leaves 5–10 mm wide. Panicle 35 cm long. Spikelets longer, broadly oblong. Utricles green, subabruptly excurrent in a long, recurved beak.

## 8. Section Rhomboidales

KÜK. Pfl. R. Heft 38 (1909) 622; NELMES, Reinwardtia 1 (1951) 383; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 54, 66.

Type species: *Carex chinensis* RETZ. (lectotype).

22. *Carex anomocarya* NELMES, Kew Bull. (1950) 202; Reinwardtia 1 (1951) 383; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 163; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 66, f. 16, map p. 102, f. 32; Dansk Bot. Ark. 23 (1965) 259; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 489. — *C. harlandii* (non BOOTT) MERR. & CHUN, Sunyatsenia 2

(1935) 208. — *C. harlandii* BOOTT var. *angustior* KÜK. ex BACK.; GROSS, Notizbl. Berl.-Dahl. 14 (1938) 193; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 65. — *C. harlandii* BOOTT f. *longibracteata* GROSS, Notizbl. Berl.-Dahl. 14 (1938) 193. — *C. manca* BOOTT var. *contigua* GROSS, *l.c.* — Fig. 120, 128.



Fig. 128. *Carex anomocarya* NERMES. a. Habit,  $\times \frac{2}{3}$ , b. glume, c. fruit in utricule, d. fruit, all  $\times 6$  (RAHMAT SI BOEAA 10601).

Rhizome short, not creeping. *Stems* central, erect, triquetrous, smooth, 30–70 cm by  $1\frac{1}{2}$ –2 mm. *Leaves* basal (rarely one in the middle of the stem), flat, weak, scabrid on the margins, 6–15 (–20) mm wide. *Inflorescence* with 3–5 spikelets, erect; terminal spikelet ♂, cylindric,  $2\frac{1}{2}$ –5 cm by c. 2 mm, peduncled, lateral ones ♀, oblong-cylindric, approximate with one another and with the ♂ spikelet, but lowest often distant, subdense-flowered, on shortly exerted peduncles, 4–8 cm by 6–9 mm; peduncles stoutish, smooth. Bracts foliaceous, lower usually much exceeding the inflorescence, shortly sheathing; sheaths pale, membranous in front or only at the mouth, subampliate. *Glumes* of the ♀ spikelets oblong, subtruncate to slightly emarginate, dirty white with hyaline margins and 3-nerved centre, ciliolate at the apex, awned, 3– $4\frac{1}{2}$  mm long, those of the ♂ spikelets narrower, also long-awned; awns scabrid, up to 1 cm long. *Utricles* ellipsoid to rhomboid-lageniform, obtusely trigonous, surface uneven with concavities and convexities corresponding to the surface of the nut, densely many-nerved, coriaceous, glabrous, straight, suberect, shortly stipitate, stramineous, 7–8(–10) by 2– $2\frac{3}{4}$  mm, rather abruptly narrowed into a  $2\frac{1}{2}$ –4 mm long, conical, bidentate beak; teeth 1– $1\frac{1}{2}$  mm long, diverging, sparsely hispidulous at the mouth. *Nut* unevenly ellipsoid or ovoid, distorted-trigonous, excavate on the angles at the centre, with concave faces below, stipitate, abruptly beaked, 4– $5\frac{1}{2}$  mm long; beak cylindric,  $\frac{1}{2}$ – $1\frac{1}{4}$  mm long, expanding into the annulate apex. *Style-base* pyramidally thickened, persistent. Stigmas 3.

Distr. N. Burma, NE. Thailand, Tonkin, Annam, Hainan; in *Malesia*: N. Sumatra (E. Coast: Dolok Singgalang and G. Batu Lopang; Toba), W. Java (Priangan: Tjadas Malang S. of Tjiandjur; Mt Bèsèr near Tjidadap).

Ecology. In damp shady forest, in W. Java 1000–1200 m, in N. Sumatra at 1400–1700 m.

Note. Very near to *C. harlandii* BOOTT, Ill. 2 (1860) 87, t. 255; KÜK. Pfl. R. Heft 38 (1909) 630, f. 107, and possibly better treated as a race of that species. In *C. harlandii* the leaves are broader (up to 3 cm wide), the bracts much shorter, often not or hardly overtopping spikelet, the glumes of the ♂ spikelet rounded at the apex and mucous, those of the ♀ spikelets but shortly awned, the teeth of the utricles shorter (c.  $\frac{1}{2}$  mm long), and the beak of the nut slenderer, c.  $1\frac{1}{2}$  mm long. It is known from South and Central China.

(em. ed.) 10 (1949) fam. 246, p. 66; NELMES, Reinwardtia 1 (1951) 384; KOYAMA, Bot. Mag. Tokyo 70 (1957) 352, f. 10 & 12 A-A'; *ibid.* 72 (1959) 303; J. Fac. Sc. Un. Tokyo III, 8 (1962) 230; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 490; STEEN. Mt. Fl. Java (1972) pl. 14–3.

*ssp. jackiana*. — Fig. 120.

Rhizome short. *Stems* central, tufted, erect, triquetrous (angles prominent to narrowly winged), smooth, 15–100 cm by 1–2 mm, surrounded at the base by a few brownish sheaths or their fibrous remains. *Leaves* subbasal, sometimes one higher on the stem, shorter than to as long as the stem, flat, rather weak, scabrid at the top, 3–10 mm wide; sheaths pale to whitish. *Inflorescence* with 3–7 spikelets, erect; terminal spikelet ♂ (sometimes gynaeandrous), slenderly cylindric (or clavate), 1–3 cm by 2–4 mm, lateral ones ♀ (rarely androgynous), oblong-cylindric, sublux-flowered, 1–3 cm by 5–8 mm, upper erect, crowded with the ♂ spikelet, sessile or very shortly peduncled, lower distant on included to long-exserted, slender, smooth peduncles, often with 1–3 shorter spikelets branching from their peduncles. Bracts foliaceous, exceeding the inflorescence, lower long-sheathing, upper much shorter, scarcely to shortly sheathing. *Glumes* oblong-ovate, acute, very thin, dirty white with 3-nerved, greenish, central stripe, mucous or mucronulate, rarely with a short awn, 3– $5\frac{1}{2}$  mm long. *Utricles* fusiform-ellipsoid, trigonous, subcoriaceous, densely and strongly many-nerved, glabrous, straight, suberect, shortly stipitate, olivaceous,  $5\frac{1}{2}$ – $7\frac{1}{2}$  by  $1\frac{1}{2}$ –2 mm, gradually narrowed into the conical, straight, bidentate beak; teeth  $\frac{1}{4}$ – $\frac{3}{4}$  mm long, hardly diverging, smooth. *Nut* oblong-obovoid to suborbicular, triquetrous with prominent angles, with faces shallowly concave below, very shortly stipitate, abruptly shortly beaked,  $2\frac{1}{4}$ –3 mm long. *Style-base* not thickened. Stigmas 3.

Distr. Ceylon, India (Assam, Khasia), Yunnan; according to NELMES (1951) 386 also in Australia; in *Malesia*: Sumatra (W. Coast: Mt Kerintji), West and Central Java. Distribution maps in Bot. Mag. Tokyo 72 (1959) 303; Phytologia 17 (1968) 408. *Ssp. parviflora* (BOOTT) KÜK., often considered specifically distinct, differs from *ssp. jackiana* by its smaller utricles and shorter glumes; in S. Sachalin, Japes, S. Kuriles, Kyushu, and S. Korea.

Ecology. In marshes, swamps, and grassy plains; 1350–2550 m.

23. *Carex jackiana* BOOTT, Proc. Linn. Soc. 1 (1845) 260; Trans. Linn. Soc. 20 (1846) 132; Ill. 1 (1858) 9, t. 25; STEUD. Syn. 2 (1855) 226; MŪQ. Fl. Ind. Bat. 3 (1856) 353; BOECK. Linnaea 41 (1877) 277; CLARKE, Fl. Br. Ind. 6 (1894) 735, *excl. var. β*; J. Linn. Soc. 37 (1904) 15; KÜK. Pfl. R. Heft 38 (1909) 638; in Hochr. Candollea 6 (1936) 432, *excl. var. tumens* KÜK.; BACK. Bekn. Fl. Java

24. *Carex lateralis* KÜK. Pfl. R. Heft 38 (1909) 639; Bull. Jard. Bot. Btżg III, 16 (1940) 322; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 66; NELMES, Kew Bull. (1950) 204; Reinwardtia 1 (1951) 388; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 488. — *C. jackiana* BOOTT *var. minor* CLARKE, Fl. Br. Ind. 6 (1894) 735, *p.p. typ.* — *C. elmeri* KÜK. in Fedde, Rep. 8 (1910) 326;

ELMER, Leaf. Philip. Bot. 3 (1910) 853; KÜK. Philip. J. Sc. 6 (1911) Bot. 64; MERR. En. Philip. 1 (1923) 137; KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 322. — Fig. 120.

Rhizome short, tufted. Flowering stems lateral, obliquely erect or somewhat cernuous, very slender to subfiliform, weak, triquetrous, smooth, (5-)20-50 cm by  $1/4$ -1 mm, surrounded at the base by a few brown sheaths or their fibrous remains, and bearing a few small, bract-like or subfoliaceous leaves. Leaves of the sterile shoots much overtopping the stems, flat, revolute on the margins, stiff, with very rough margins, asperous towards the apex, 3-7 mm wide. Spikelets 3-4, crowded at the apex of the stem, subsessile on shortly exerted or wholly included peduncles, sometimes one 1-3 cm lower down; terminal spikelet ♂, cylindrical, 5-10 by  $1/2$ -1 mm, usually very inconspicuous when the lateral spikelets have developed utricles, few-flowered, lateral ones ♀, oblong, few- (up to 5-)flowered, erect, 7-12 by 5-7 mm. Bracts foliaceous, much exceeding the inflorescence, shortly sheathing. Glumes oblong or oblong-ovate, subacute to rounded, thin, whitish with 3-nerved greenish central stripe,  $2\frac{1}{2}$ - $3\frac{1}{2}$  mm long, excurrent in a flat, scabrous awn  $1\frac{1}{2}$ -6 mm long. Utricles ovoid-ellipsoid, trigonous, membranous, suberect, many-nerved below but few nerves extending more than halfway towards the apex, sparsely pubescent to glabrous, stipitate, shiny, pale green, 5-7 by 2- $2\frac{1}{4}$  mm, subabruptly contracted into a long, conical, somewhat recurved, bidentate beak. Nut ovoid-ellipsoid, triquetrous, with faces concave in the lowest  $1/3$ , brown to fuscous, stoutly stipitate, scarcely or not beaked at the rounded apex, 3-4 mm long. Style thickened at the base. Stigmas 3.

Distr. Ceylon, India; in Malesia: S. Sumatra (Palembang: Air Njuruk), W. Java (Priangan: Mt Papandajan), Central Celebes, Philippines (Luzon, Mindoro, Negros), Lesser Sunda Is.: Flores (Mt Ranaká).

Ecol. In forests, on road-sides; 1400-2200 m.

Note. The type of this species is THWAITES CP 3198 *p.p.*, not CLARKE 11061 as cited by NELMES. CLARKE's description of *C. jackiana* var. *minor*, based on this THWAITES collection and on CLARKE 11061 (!) refers to the species described above. *Carex jackiana* var. *minor* is therefore synonymous with *C. lateralis* and cannot be maintained as a variety of *C. jackiana* alongside of *C. lateralis*, as was done by KÜKENTHAL. BOECKELER's description of *C. jackiana* (Linnaea 41, 1871, 277), cited by CLARKE in the synonymy of his var. *minor*, obviously refers to typical 23. *C. jackiana*.

VELDKAMP 7130 has the entirely hairy utricles of *C. lateralis*, but lacks the awn on the glume; in that respect it fits in 25. *C. loheri*. The leaves are also

intermediate between *C. loheri* and *C. lateralis*. When more material becomes available, it is not impossible that the two species will have to be united. — (NOOT.)

See also note under 25. *C. loheri*.

25. *Carex loheri* CLARKE, J. Linn. Soc. Bot. 37 (1904) 14; Philip. J. Sc. 2 (1907) Bot. 108; KÜK. Pfl. R. Heft 38 (1909) 487; Philip. J. Sc. 6 (1911) Bot. 64, incl. f. *grandimacula* KÜK.; MERR. En. Philip. 1 (1923) 139; NELMES, Reinwardtia 1 (1951) 386. — Fig. 120.

Rhizome short, tufted. Flowering stems lateral, suberect or cernuous, filiform, weak, triquetrous, smooth, 10-40 cm by  $1/4$  mm, surrounded at the base by a few brown scales or their fibrous remains. Leaves crowded at the base, shorter than to exceeding the stems, flat with revolute margins, stiff, greyish or glaucous-green, with scabrid margins, asperous towards the apex,  $1\frac{1}{2}$ -3 mm wide. Spikelets 3-6, terminal ♂, cylindrical, 7-15 by 1-2 mm, lateral androgynous, 6-10 by 4-6 mm, with ♂ and ♀ parts about equal in length and few-flowered, upper one often approximate with the ♂ spikelet, lower on long, subbasal ones pendulous on very long, setaceous, smooth peduncles. Bracts of the lower spikelets subbasal leaves, of the other lateral spikelets subfoliaceous, rather long-sheathing. Glumes oblong-ovate, acute, thin, many-nerved, muticous or mucronulate, whitish, c. 4 mm long. Utricles ovoid-ellipsoid, trigonous, membranous, suberect, many-nerved, shining, glabrous below, sparsely to densely pubescent above, shortly stipitate, shining, pale green, 6-7 by  $1\frac{3}{4}$ -2 mm, subabruptly contracted into a long, conical, somewhat recurved, bidentate beak. Nut ovoid or ellipsoid, triquetrous with concave faces, brown to fuscous, shortly stipitate, hardly beaked,  $3\frac{1}{4}$ -4 mm long. Style thickened at the base. Stigmas 3.

Distr. Malesia: Philippines (Luzon: Lepanto, Bontoc, Benguet, Rizal, Zambales, Laguna, Tayabas).

Ecol. Mossy forest, 1300-2400 m.

Vern. *Silak*, Ig.

Notes. Very similar to 24. *C. lateralis*, to which it is certainly closely related, though KÜKENTHAL placed it in a different section.

*Carex tatsutakensis* HAYATA, Ic. Pl. Form. 6 (1916) 133, f. 45; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 396; KOYAMA, Nat. Canad. 82 (1955) 204; Contr. Inst. Bot. Un. Montreal n. 70 (1957) 19, not rare in Formosa and, according to KOYAMA, also in Tonkin (not mentioned for this country by RAYMOND!) is very near to *C. loheri*.

Also *C. sublateralis* KOYAMA, Jap. J. Bot. 15 (1956) 180, f. 9, from E. China (Kiangsu) belongs to this group of very closely related species.

9. Section *Cryptostachyae*

(OHWI) NELMES, Reinwardtia 1 (1951) 363; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 52, 61. — *Sect. Praecoces* CHRIST *subsect. Cryptostachydeae* FRANCH. ex OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 340.

Type species: *Carex cryptostachys* BRONGN.

26. *Carex cryptostachys* BRONGN. in Duperrey, Voy. Coq. Bot. (1828) 152, t. 25; MIQ. Fl. Ind. Bat. 3 (1856) 352; BOOTT, Ill. 3 (1860) 103, t. 310; BENTH. Fl. Hongk. (1861) 403; BOECK. Linnaea 40 (1876) 327; CLARKE, Fl. Br. Ind. 6 (1894) 714 ('*cyrtostachys*'); J. Linn. Soc. Bot. 36 (1903) 281; *ibid.* 37 (1904) 8; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 116; KÜK. Pfl. R. Heft 38 (1909) 471; CAMUS, Fl. Gén. I.-C. 7 (1922) 195, f. 27, 10-13; MERR. En. Philip. 1 (1923) 137; RIDL. Fl. Mal. Pen. 5 (1925) 181, f. 221; KÜK. in Hochr. Candollea 6 (1936) 432; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 342; ELMER, Leaf. Philip. Bot. 10 (1938) 3526; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 66; NELMES, Reinwardtia 1 (1951) 363; AKIYAMA, Car. Far East. Reg. Asia (1955) 176, t. 177; RAYM. Nat. Canad. 82 (1955) 151, f. 2; Mém. Jard. Bot. Montréal n. 53 (1959) 61, map p. 102, f. 34; Dansk Bot. Ark. 23 (1965) 258; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 491. — Fig. 120.

Rhizome elongate, horizontal or ascending, woody, clothed with fibrous remains of sheaths. Flowering stems arising from the axils of the leaves, and often almost hidden among them, single or binate, scapiform, suberect, flexuous, obtusely trigonous, smooth, 10-50 cm tall, with sheaths and peduncles almost from the base. Leaves crowded on a short stem, much longer than the flowering stems, firm, flat, long-acuminate, scabrid on the margins, grey- or glaucous-green, 3-18 mm wide, surrounded at the base with fibrous remains of older leaves. Inflorescence racemiform or paniculiform, with 6-30 spikelets; spikelets androgynous, oblong-lanceolate, lax-flowered, 8-30 by 3-5 mm; ♂ part

much shorter than the ♀ one. Bracts usually shorter than their spikelets, with funnel-shaped sheaths and short blades; peduncles sparsely scaberulous, lower exerted, upper included. Glumes ovate, amplexicaul, many-nerved, obtuse, ciliolate, often minutely appressed-hairy, whitish or stramineous, apiculate or mucronulate,  $2\frac{1}{4}$ - $2\frac{3}{4}$  mm long. Utricles oblong-rhomboid to obovoid-fusiform, obscurely trigonous, suberect, densely many-nerved, subcoriaceous, sparsely puberulous, ciliolate-scabrid on the margins, stramineous-green, stoutly stipitate, abruptly shortly beaked, with oblique, bidentate mouth,  $3\frac{1}{2}$ - $5\frac{1}{2}$  by  $1\frac{1}{2}$ -2 mm. Nut irregularly rhomboid-ellipsoid or oblong-obovoid, trigonous, with faces excavated at base and apex, broadly stipitate, seated on a spongy, disk-like body, c. 2 mm long; beak short, strongly deflexed; style bent upwards, thickened above, papillose. Stigmas 3. Vestigial rachilla sometimes present (according to KÜKENTHAL).

Distr. Formosa, Hainan, S. China (Kwangtung), Tonkin, Annam, Thailand, Queensland; in *Malesia*: Sumatra (also Banka), Malay Peninsula, W. Java, E. Borneo, Philippines (Luzon, Mindanao), Aru Is., New Guinea; the specimen in L from the Lesser Sunda Is. (leg. PLOEM) is probably mislabelled.

Ecol. In primary forests, on banks in woods, in open jungle, at low and medium altitude; in Malaya between 350 and 1200 m, in Banka at 40 m, in the Aru Is. at a few m above sea-level, in W. Java between 500 and 1250 m, in the Philippines ascending to 1000 m.

Vern. *Rumput ringgin*, Mal. Pen.; *ilat kampaän*, S.

10. Section *Lageniformes*

(OHWI) NELMES, Reinwardtia 1 (1951) 366; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 54, 63. — *Sect. Praecoces* CHRIST *subsect. Lageniformes* OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 340.

Type species: *Carex formosensis* LÉV. & VAN. (lectotype).

27. *Carex breviscapa* C. B. CLARKE, Fl. Br. Ind. 6 (1894) 736; KÜK. Pfl. R. Heft 38 (1909) 474; ELMER, Leaf. Philip. Bot. 10 (1938) 3525; MERR. En. Philip. 1 (1923) 137; KÜK. Bot. Jahrb. 69 (1938) 265; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 64; NELMES, Kew Bull. (1949)

390; Reinwardtia 1 (1951) 369; *ibid.* 2 (1954) 380; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 63, f. 14, map p. 102, f. 33; Dansk Bot. Ark. 23 (1965) 258; KOYAMA, Phytologia 17 (1968) 405, t. 14; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 489. — *C. jackiana* BOOTT *var. breviculmis* THW. En. Pl.

Zeyl. (1864) 356. — *C. curtisii* RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 117; Fl. Mal. Pen. 5 (1925) 183. — *C. lutchuensis* OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B5 (1930) 270; *ibid.* B11 (1936) 343, f. 5, t. 9 f. 8; AKIYAMA, Car. Far East. Reg. Asia (1955) 177, t. 178. — Fig. 120.

Rhizome short, cespitose. *Stems* central, sometimes more stems together, more or less hidden amongst the leaves, suberect, triquetrous, smooth, 5–20(–30) cm by c. 1 mm. *Leaves* basal, very much longer than the stems, flat, long-acuminate, scabrid on the margins and upper surface, 3–6(–8) mm wide; lower leaves reduced to bladeless brown sheaths or their fibrous remains. *Spikelets* usually 5–7, single at the nodes, erect or suberect, cylindrical, lax-flowered, lower ones somewhat distant; terminal spikelet ♂, 1–2 cm long, 1 mm thick, often overtopped by some of the ♀ spikelets; lateral spikelets ♀ or with some ♂ flowers at the top, 1–3 cm by 3–4 mm; peduncles scaberulous, lower ones exserted. Lower bracts foliaceous, much exceeding the inflorescence, shortly sheathing, upper much reduced. *Glumes* broadly ovate to oblong-ovate, usually rounded at the erose apex, much shorter than the utricles, slenderly nerved, with not or slightly (up to 1 mm) excurrent midnerve and hyaline margins, ciliolate, 2–3 mm long. *Utricles* rhomboid-lageniform, trigonous, broadest about the middle, subcoriaceous, straight, suberect, strongly multinerved, glabrous or sparsely puberulous above, stramineous or greenish, stipitate,  $3\frac{1}{2}$ –4 $\frac{1}{2}$  by  $1\frac{1}{4}$ –1 $\frac{1}{2}$  mm; beak hispid, bidenticulate,  $\frac{1}{2}$ –1 mm long. *Nut* narrowly rhomboid, triquetrous with concave faces, stipitate, truncate and hollowed out at the apex, dark brown with pale stipe, apex, and angles,  $2\frac{1}{4}$ –3 by  $1\frac{1}{4}$ –1 $\frac{1}{2}$  mm. *Style-base* slightly thickened. Stigmas 3.

Distr. Ceylon, NE. Thailand, Annam, Ryu Kyu Is., Formosa, N. Queensland; in *Malesia*: Sumatra (E. Coast Res., Lampongs), Malay Peninsula (Penang, Pahang, Negri Sembilan), W. Java, Borneo (Sarawak), Philippines (Luzon: Sorsogon; Palawan), W. & NE. New Guinea.

Ecol. In secondary forest, on forested ridges, from low altitude up to 1250 m.

Vern. *Ilat daun eurih*, S.

Note. In some of the ♂ flowers I observed stamens with connate filaments. — (NOOT.)

28. *Carex gracilispica* HAYATA, Ic. Pl. Form. 10 (1921) 62, f. 39; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 345; AKIYAMA, Car. Far East. Reg. Asia (1955) 178, t. 179; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 65. — *C. ligata* (non BOOTT) RIDL. Fl. Mal. Pen. 5 (1925) 181. — ? *C. tristachya* THUNB. var. *pseudopocilliformis* GROSS, Notizbl. Berl.-Dahl. 14 (1938) 191. — *C. malayana* NERMES, Kew Bull. (1950) 209; Reinwardtia 1 (1951) 366.

Rhizome short, cespitose. Flowering *stems* arising from basal leaf-axils, erect, compressed-

trigonous, smooth or scaberulous just below the inflorescence, 10–30 cm by  $\frac{3}{4}$ –1 mm. *Leaves* basal, much longer than the stems, plicate to flat, long-attenuated, with scabrid margins, 5–10 mm wide, surrounded at the base by brown, fibrous remains of old leaf-sheaths. *Spikelets* 4–6, approximate or lowest somewhat distinct, erect or suberect, cylindrical, 1–3 $\frac{1}{2}$  cm long; terminal spikelet ♂, 1 mm thick, lateral ones single at the nodes, wholly ♀ or with some ♂ flowers at the top, lax-flowered, 2–3 mm thick, their peduncles shortly exserted, smooth or scaberulous. Bracts foliaceous, lower as long as or exceeding the inflorescence, shortly sheathing, upper much reduced. *Glumes* oblong-ovate, acute to obtuse, slenderly nerved, with not or slightly excurrent midnerve, whitish hyaline margins, and erose-ciliate apex, 3–4 mm long. *Utricles* lageniform, obscurely trigonous, subcoriaceous, broadest 2–2 $\frac{1}{2}$  mm from the base, straight, suberect, strongly multinerved, sparsely puberulous, stramineous or greenish, shortly stipitate, 5–7 by  $1\frac{1}{2}$ –1 $\frac{1}{4}$  mm; beak  $1\frac{1}{2}$ –2 mm long, bidenticulate. *Nut* oblong, triquetrous, with faces concave below, stoutly stipitate, slightly constricted at the apex and re-expanded into a cylindrical, truncate neck  $\frac{2}{3}$ –1 mm long and wide, the whole nut 3–4 mm long. *Style-base* thickened, centred in the apical hollow of the nut. Stigmas 3.

Distr. Formosa, Indo-China (Annam, Tonkin); in *Malesia*: Malay Peninsula (Pahang: Mt Tahan).

Ecol. On Mt Tahan in damp woods by streams, at c. 1700 m.

29. *Carex palawanensis* KÜK. in Elmer, Leaf. Philip. Bot. 4 (1911) 1169; MERR. En. Philip. 1 (1923) 140; NERMES, Reinwardtia 1 (1951) 263; *ibid.* 2 (1954) 374. — Fig. 120.

Rhizome probably shortly creeping. *Stems* triquetrous, sparsely scabrid just below the inflorescence, otherwise smooth, 25–50 cm by  $\frac{1}{2}$ –1 mm, surrounded below the leaves by the fibrous remains of old leaf-sheaths. *Leaves* basal and one half-way up the stem, exceeding the stem, long-attenuate, rigid, with revolute margins, scabrid in the upper part, grey-green with a metallic hue, 3–7 mm wide; cauline leaf long-sheathing. *Inflorescence* spiciform (or almost so when its lowest node bears 2 spikelets), 2–4 cm long. Lowest bract foliaceous, patent, much overtopping the inflorescence, shortly sheathing, upper one(s) much reduced. *Spikelets* 2–10, androgynous, subglobose, dense, sessile or on very short included peduncles, 5–8 mm long, the ♂ part about as long as the ♀, but inconspicuous when the utricles are fully developed. *Glumes* ovate or ovate-lanceolate, acutish or obtuse, nerved, minutely ciliolate, otherwise glabrous, brownish with whitish hyaline margins,  $1\frac{1}{2}$ –2 mm long, the midnerve excurrent in a hispidulous,  $\frac{3}{4}$ –1 mm long awn. *Utricles* much overtopping the glumes, trigonous, rhomboid-lageniform, with

prominent angles and somewhat concave faces, subcoriaceous, patulous, strongly many-nerved, straight, glabrous, smooth except for a few setae in the upper part, not stipitate, curved-tapering to the base, rather gradually narrowed into the beak, greenish brown,  $4\frac{1}{4}$ –5 by  $1\frac{1}{2}$ – $1\frac{3}{4}$  mm; beak compressed, bidentate,  $1\frac{1}{2}$ –2 mm long, with slightly oblique mouth. *Nut* trigonous, broadly rhomboid, with thickened angles and concave faces, curved-tapering downwards to a short cylindrical stipe and upwards to a stout, cylindrical,  $\frac{1}{4}$ – $\frac{3}{4}$  mm long and  $\frac{1}{2}$ – $\frac{3}{4}$  mm wide neck, truncate at the apex, c.  $2\frac{1}{2}$  by  $1\frac{1}{2}$  mm. *Style-base* slightly thickened, centred in the hollowed apex of the nut. Stigmas 3.

Distr. *Malesia*: N. Borneo (Sabah: Lahad Datu, Mt Silam; Sandakan) and SW. Philippines (Palawan: Mt Pulgar).

Ecol. Common in wet, sandy, gravelly soil among shrubs bordering streams in the hills at 150–600 m.

Note. Only known from the type collection, ELMER 13146 from Palawan and SAN 37905 and 43845 from Sabah.

30. *Carex rynchachaenium* CLARKE in Merr. Publ. Gov. Lab. Philip. n. 35 (1906) 5; Philip. J. Sc. 2 (1907) Bot. 108; Kew Bull. add. ser. 8 (1908) 79; KÜK. Pfl. R. Heft 38 (1909) 480; Philip. J. Sc. 6 (1911) Bot. 62; MERR. En. Philip. 1 (1923) 142; NELMES, Reinwardtia 1 (1951) 368; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 65. — *C. hatusi-mana* OHWI, Jap. J. Bot. 7 (1934) 196; Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 344, f. 6, t. 9 f. 7; KOYAMA, Contr. Inst. Bot. Un. Montréal n. 70 (1957) 21, t. 3; AKIYAMA, Car. Far East. Reg. Asia (1955) 178; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 65, f. 15, map p. 102, f. 29. — Fig. 120.

Rhizome short, cespitose. *Stems* central, more or less hidden amongst the leaves, erect, triquetrous,

scaberulous above, 5–10(–30) cm by  $\frac{1}{4}$ – $\frac{1}{2}$  mm, surrounded below the leaves by brown, fibrous remains of old leaf-sheaths. *Leaves* basal, much longer than the stems, plicate to flat, long-attenuate, scabrid on the margins and upper surface, 1–3 mm wide; sheaths pubescent. *Spikelets* 3–6, upper approximate, lower distant, erect or suberect, cylindrical, lax-flowered; terminal spikelet ♂, 1(–2) cm long, 1 mm thick, lateral ones ♀ or with some ♂ flowers at the top,  $\frac{1}{2}$ –2 cm long, 3–4 mm thick; peduncles smooth or scaberulous, lower exerted. Lower bracts foliaceous, much exceeding the inflorescence, upper much reduced. *Glumes* elliptic-ovate to oblong-lanceolate, acute or with rounded apex, slenderly nerved, with not or scarcely excurrent midnerve and hyaline margins, erose-ciliate towards the apex, 2–3 mm long. *Utricles* lageniform, trigonous, broadest c. 2 mm from the base, subcoriaceous, straight, suberect, strongly multinerved, more or less puberulous above, stramineous or greenish, shortly stipitate,  $5\frac{1}{2}$ – $6\frac{1}{2}$  by  $1\frac{1}{4}$ – $1\frac{1}{2}$  mm; beak  $\frac{3}{4}$ –1 mm long, bidenticulate. *Nut* rhomboid, triquetrous, with faces concave below, stoutly stipitate, the apex subabruptly contracted into a cylindrical, truncate neck c. 1 mm long and  $\frac{3}{4}$  mm broad, the whole nut c. 4 mm long. *Style-base* scarcely thickened, centred in the apical hollow of the nut. Stigmas 3.

Distr. Formosa, Tonkin, Annam; in *Malesia*: Philippines (Luzon: Kalinga, Pampanga, Bataan, Benguet, Laguna; Mindanao: Bukidnon, Zamboanga).

Ecol. On forested ridges in and near the mossy forest, 800–2100 m.

Note. I have not seen CLEMENS 34431 from Borneo (Mt Kinabalu?) which may belong here (cf. NELMES, l.c. 369).

### 11. Section *Mitratae*

KÜK. Pfl. R. Heft 38 (1909) 458; NELMES, Reinwardtia 1 (1951) 371; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 52, 60. — *Sect. Praecoces* CHRIST, Bull. Soc. Bot. Belg. 24 (1885) 14, *nomen*; MACKENZ. N. Am. Fl. 18 (1935) 183; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 339. — Type species: *Carex mitrata* FRANCH.

Note. In this section many species have been described which differ only in slight characters and in my opinion several must be combined or deserve at most varietal rank. With the existing keys of KÜKENTHAL, OHWI, and KOYAMA identification appears often impossible. — (NOOT.).

31. *Carex breviculmis* R. BR. Prod. (1810) 242; BOOTT, Ill. 4 (1867) 181; BOECK. Linnaea 41 (1877) 209; BENTH. Fl. Austr. 7 (1878) 445; CLARKE, Fl. Br. Ind. 6 (1894) 746; KÜK. Pfl. R. Heft 38 (1909) 469; RIDL. Trans. Linn. Soc. Bot. II, 9 (1916) 247; S. T. BLAKE, J. Arn. Arb. 28 (1947) 112; NELMES, Kew Bull. (1949) 383; Reinwardtia 1 (1951) 373; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 489. — Fig. 121.

For synonyms see under the varieties.

Rhizome short (obliquely descending, woody). *Stems* tufted, slender, erect or oblique, (obtusely) trigonous, smooth, or scaberulous above, 1–40 cm by  $\frac{1}{2}$ –1 mm, clothed at the base by old leaf sheaths or their fibrous remains. *Leaves* basal and subbasal, from much shorter to much longer than the stems, often thickish, rigid, flat or with recurved or revolute margins, gradually attenuate to the triquetrous tip, smooth or mostly scabrid on margins and keel, 1–4(–6) mm wide. *Inflorescence*

simple, erect, with 3–7 approximate spikelets (sometimes lowest spikelet remote on a peduncle from the sheath of a basal leaf; in small plants sometimes only one ♂ and one ♀ spikelet, the other ♀ spikelets single on a long peduncle arising from the centre of the basal leaves together with the main inflorescence); terminal spikelet ♂, sometimes gynaeandrous (in *var. perciliata*), linear, 5–12(–20) by 1–2 mm, lateral ones ♀, sessile or (very) shortly peduncled, subglobose to shortly cylindrical, 5–15 (–30) by 3–4 mm, peduncles smooth or scabrous; lower bracts usually overlapping the inflorescence, foliaceous or setaceous, shortly sheathing, upper much reduced. *Glumes* ovate or oblong-ovate, acute to obtuse, whitish or brownish, excurrent into a scabrid awn in *var. breviculmis*, mucicous or with a short mucro in the other varieties, whitish or brownish and then with white hyaline margins, 3-nerved in the centre, 2–3 $\frac{1}{4}$  mm long. *Utricles* obtusely or obsoletely trigonous, lanceolate to ellipsoid or obovoid, membranous, except the 2 marginal nerves nerveless or obscurely nerved to more distinctly nerved, subabruptly to gradually beaked, from densely hispidulous to only hispidulous on the margins or glabrous, not or scarcely stipitate, light brown to stramineous or fulvous, 2 $\frac{1}{2}$ –4 by c. 1 mm. *Nut* triquetrous, with faces concave below, ellipsoid or ovoid to obovoid, stramineous to fuscous, 1 $\frac{1}{2}$ –2 $\frac{1}{2}$  by c. 1 mm, suddenly contracted into a very short neck and then suddenly expanded into an annulate apex. *Style-base* thickened, persistent on the annulus (but when the nuts are falling the style-base probably has disappeared). *Stigmas* 3.

*Distr.* Widely distributed from the Himalayas to China, Japan and Formosa through *Malesia* to Australia and New Zealand.

*Note.* The length of the stem varies considerably, even on the same plant. The same holds for the nerves on the utricles and for their hairiness, but these characters are rather constant in a single specimen. For these reasons I consider *C. breviculmis* R. BR., *C. perciliata* NELMES, and *C. montivaga* S. T. BLAKE to be conspecific, although it is possible to discriminate between them on varietal rank.

#### KEY TO THE VARIETIES

1. *Glumes* whitish, 2–3 mm long, excurrent into a scabrid awn. *Utricles* greenish becoming light brown, subabruptly beaked, several-nerved, usually more or less pubescent or hispidulous, 2 $\frac{1}{2}$ –3 $\frac{1}{2}$  mm long . . . . . **a. var. breviculmis**
1. *Glumes* brownish with white hyaline margin, acute or obtuse, mucicous or with a small mucro. *Utricles* stramineous to fulvous, gradually beaked, nerveless or faintly nerved, hispidulous to glabrous, 2 $\frac{1}{2}$ –4 mm.
2. *Utricles* usually hispidulous, at least above on the margins, 2 $\frac{1}{2}$ –3 mm . . . . . **b. var. perciliata**

2. *Utricles* glabrous, rarely obscurely hispidulous on the margins above, 3 $\frac{1}{2}$ –4 mm long  
c. **var. montivaga**

**a. var. breviculmis.** — *C. leuchochlora* BUNGE, En. Pl. Chin. Bor. (1833) 68; KOYAMA, Act. Phytotax. Geobot. 16 (1955) 9; YOSHIKAWA, Ic. Jap. Car. 1 (1957) 104, t. 52; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 60. — *C. royleana* NEES in Wight, Contr. (1834) 127; BOOTT, Ill. 1 (1858) 6, t. 19; CAMUS, Fl. Gén. I.-C. 7 (1922) 195. — *C. eggytera* STEUD. Syn. 2 (1855) 220. — *C. breviculmis ssp. royleana* KÜK. Pfl. R. Heft 38 (1909) 469; Philip. J. Sc. 6 (1911) Bot. 62, incl. *var. kingiana* KÜK.; MERR. En. Philip. 1 (1923) 137. — *C. jackiana* BOOTT *var. tumens* KÜK. in Hochr. Candollea 6 (1936) 432. — *C. rugata* (non OHWI) NELMES, Reinwardtia 1 (1951) 378. — *C. conorrhyncha* NELMES, Kew Bull. (1956) 182. — Fig. 121.

*Distr.* As for the species; in *Malesia*: E. Java (Mt Tengger and Mt Jang), SW. Celebes (Mt Bonthain), N. Borneo (Mt Kinabalu), Philippines (Luzon), and New Guinea.

*Ecol.* Open grassy slopes, among shrubs, 1750–3900 m.

**b. var. perciliata** KÜK. Pfl. R. Heft 38 (1909) 469. — *C. breviculmis*: CLARKE, J. Linn. Soc. Bot. 37 (1904) 16. — *C. bulbostylis var. ciliato-marginata* KÜK. *et var. hispidula* KÜK. Bot. Jahrb. 70 (1940) 464; Bull. Jard. Bot. Btzg III, 16 (1940) 318. — *C. tricholoma* S. T. BLAKE, J. Arn. Arb. 28 (1947) 110, f. 3A. — *C. brevis* S. T. BLAKE, l.c. 111, f. 3B; NELMES, Kew Bull. (1950) 202; Reinwardtia 1 (1951) 375. — *C. perciliata* (KÜK.) NELMES, Kew Bull. (1946) 26; *ibid.* (1949) 383, 391; Reinwardtia 1 (1951) 374. — Fig. 121.

*Distr. Malesia*: N. Borneo (Kinabalu), SW. Celebes (Latimodjong Range: Mt Rante Mario), New Guinea (W. New Guinea: Star Mts; Papua and Territory of New Guinea).

*Ecol.* Rock crevices, open bare ground, wet grassland, forest glades, 2400–4200 m.

**c. var. montivaga** (S. T. BLAKE) NOOT., *comb. nov.* — *C. montivaga* S. T. BLAKE, J. Arn. Arb. 28 (1947) 109; NELMES, Kew Bull. (1949) 383; Reinwardtia 1 (1951) 377. — *C. bulbostylis* KÜK. Bot. Jahrb. 69 (1938) 264; Bull. Jard. Bot. Btzg III, 16 (1940) 317, *excl. var. et specim. Born., non* MACKENZ. 1915. — Fig. 121.

*Distr. Malesia*: New Guinea (Lake Habbema, Mt Wilhelmina, Star Mts, Mt Sarawaket).

*Ecol.* Bogs, alpine grassland, wet grassy slopes, along water, also in mossy forest, 3200–3450 m.

32. *Carex dolichostachya* HAYATA, Ic. Pl. Form. 10 (1921) 61, f. 38; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 375; KOYAMA, Bull. Arts & Sc. Div. Ryukyu Un. (Math. & Nat. Sc.) n. 3 (1959) 72; AKIYAMA, Car. Far East. Reg. Asia (1955) 204,

t. 208, f. 2. — *C. ligata* BOOTT var. *nexa* KÜK. Philip. J. Sc. 6 (1911) Bot. 63; MERR. En. Philip. 1 (1923) 39, *quoad specim. cit.*, non *C. nexa* BOOTT. — *C. multifolia* OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B5 (1930) 264; *ibid.* B11 (1936) 373; NELMES, Reinwardtia 1 (1951) 371; AKIYAMA, Car. Far East. Reg. Asia (1955) 202, t. 206; YOSHIKAWA, Ic. Jap. Carex 1 (1957) 122, t. 61. — *C. foliosissima* (non F. SCHMIDT) FRANCH. Carex As. Or. (1898) n. 232; KÜK. Pfl. R. Heft 38 (1909) 478. — Fig. 121.

Rhizome short, cespitose, or shortly stoloniferous. Stems arising from basal leaf-axils, trigonous, smooth or sparsely scaberulous above, (15–)30–60 cm by  $\frac{1}{2}$ –1 mm, bearing a few short-bladed, bract-like leaves. Basal leaves about as long as the stems, flat, with scabrid margins and under surface above, 3–10 mm wide; sheaths reddish brown to spadiceous, older fibrous. Spikelets 3–7, distant, erect or suberect; terminal spikelet ♂, linear, ( $\frac{1}{2}$ –)3–6 cm by  $\frac{1}{2}$ –2 mm, lateral ♀ or with a few ♂ flowers at the top, lax-flowered, ( $\frac{1}{2}$ –)3–5 cm by  $\frac{2}{2}$ – $3\frac{1}{2}$  mm, on exserted, smooth or slightly scaberulous peduncles. Bracts vaginiform with a short blade or reduced to long, subampliate, bladeless sheaths. Glumes oblong or oblong-obovate, truncate or rounded at the erose-ciliate apex, translucent, whitish to brownish,  $\frac{2}{2}$ –3 mm long, the 3-nerved centre excurrent in a short, hispidulous awn c.  $\frac{1}{2}$  mm long. Utricles fusiform, trigonous with flat faces, straight, membranous, suberect, strongly many-nerved, hispidulous especially above, greenish to light brown, 3–4 by c. 1 mm; beak conical, 1 mm long, bidenticulate. Nut ellipsoid to oblong-ellipsoid, triquetrous with shallowly concave faces, stoutly stipitate, contracted at the apex and re-expanded into a discoid,  $\frac{1}{3}$  mm broad annulus, c. 2 by 1 mm. Style-base pyramidally thickened. Stigmas 3.

Distr. Japan, Ryu Kyu Is., Formosa; in Malesia: Philippines (Luzon: Kalinga, Bontoc, Rizal).

Ecol. Clearings and along edges of primary forest, 1200–1600 m.

Notes. The distinction between *C. multifolia* OHWI, common in the montane regions of Japan, and *C. dolichostachya* HAYATA, occurring from the Ryu Kyu Is. and Formosa to Luzon, is mainly made on account of the different colour of the basal leaf-sheaths. I have followed KOYAMA, who united the two as neither this character nor the other slight differences are constant.

HATUSIMA, Mem. Fac. Agric. Kagoshima Un. 5, 3 (1966) 59, referred specimens from the Batan Is. (N. Luzon), mentioned above as *C. ligata* var. *nexa* KÜK. (non *C. nexa* BOOTT), to *C. sociata* BOOTT in A. Gray, Bot. Jap. (1859) 420; Ill. 4 (1867) 200; OHWI, Cyp. Japon. 2 (1943) 376. If this identity is true, *C. sociata* BOOTT would be the correct name for this species.

A specimen from Sarawak (Mt Murud, 2400 m,

NOOTEBOOM 2030) undoubtedly belongs to *sect. Mitratae*, possibly in the vicinity of *C. dolichostachya*. The utricles, however, are longer together with the nuts, and the leaves are smaller. — (NOOT.)

33. *Carex formosensis* LÉV. & VAN. Mém. Soc. Nat. Sc. Nat. Math. Cherb. 35 (1906) 216, *et in Fedde*, Rep. 5 (1908) 31; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 345; NELMES, Reinwardtia 2 (1954) 379; AKIYAMA, Car. Far East. Reg. Asia (1955) 178, t. 180. — *C. ligata* BOOTT var. *formosensis* (LÉV. & VAN.) KÜK. Pfl. R. Heft 38 (1909) 474; MERR. En. Philip. 1 (1923) 139. — Fig. 121.

Rhizome short, cespitose. Stems central, erect, trigonous, smooth, 10–25(–50) cm by  $\frac{1}{2}$ –1 mm. Leaves basal, shorter to longer than the stems, flat, long-attenuate, with scabrid margins, 2–4(–6) mm wide, surrounded at the base by brown, fibrous remains of old leaf-sheaths. Spikelets 3–7, subapproximate or lower more distant, erect or suberect, cylindrical; terminal spikelet usually ♂, 1–2 cm long, 2–3 mm thick, lateral ones single at the nodes, usually gynaeandrous, with very few ♂ flowers at the base, subdensely flowered,  $3\frac{1}{2}$ –5 mm thick, their peduncles smooth, upper shortly, lower rather long-exserted. Lower bracts foliaceous, shorter to longer than the inflorescence, lower long-sheathing, upper much reduced. Glumes oblong, truncate to bilobed-emarginate,  $1\frac{1}{2}$ –2 mm long, nerveless except for a greenish, strongly 3-nerved central stripe excurrent in a hispid, up to  $\frac{1}{2}$  mm long awn. Utricles rhomboid, slightly lageniform or fusiform, trigonous, subcoriaceous, broadest below the middle, straight, suberect, multinerved, very sparsely puberulous, stramineous or greenish, shortly stipitate, c.  $3\frac{1}{2}$  mm by 1 mm; beak c. 1 mm long, bidentate. Nut rhomboid, trigonous, with deeply concave faces, shortly stipitate, slightly constricted at the apex and slightly re-expanding into a rather discoid-annulate  $\frac{1}{3}$ – $\frac{1}{2}$  mm wide apex, the whole nut c.  $2$ (– $2\frac{1}{2}$ ) mm long. Style-base slightly thickened. Stigmas 3.

Distr. Korea, Japan (Kyushu, Hondo), Formosa; in Malesia: Philippines (Luzon: Benguet Subprov., Ilocos Norte).

Ecol. Forested ridges, along streams and trails, on cliffs and steep banks in and near the mossy forest, 1000–2400 m.

Vern. *Egegedán*, Bon., *silak*, Ig.

34. *Carex tristachya* THUNB. Fl. Jap. (1784) 38; SCHKUHR, Riedgr. 2 (1806) 48, t. Ww f. 109; BOOTT, Ill. 4 (1867) 131, t. 424; KÜK. Pfl. R. Heft 38 (1909) 471; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 363; AKIYAMA, Car. Far East. Reg. Asia (1955) 195, t. 198; YOSHIKAWA, Ic. Jap. Carex 1 (1957) 118, t. 59.

The few Malesian collections belong to:

*var. pocilliformis* (BOOTT) KÜK. Pfl. R. Heft 38 (1909) 473, t. 75, f. A–F; Philip. J. Sc. 6 (1911) Bot. 62; MERR. En. Philip. 1 (1923) 142; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 364; YOSHIKAWA, Ic. Jap. *Carex* 1 (1957) 120, t. 60. — *C. pocilliformis* BOOTT, Ill. 4 (1867) 175, t. 593; NELMES, Kew Bull. (1949) 391; Reinwardtia 1 (1951) 381; AKIYAMA, Car. Far East. Reg. Asia (1955) 196, t. 199. — Fig. 121.

Rhizome short. *Stems* densely tufted, very slender, erect, trigonous, smooth, 10–40 cm by  $1\frac{1}{2}$ –1 mm, clothed at the base with dark brown, more or less fibrous remains of old leaf-sheaths. *Leaves* basal and subbasal, as long as or shorter than the stems, rather rigid, flat, gradually attenuate,  $1\frac{1}{2}$ –4 mm wide. *Inflorescence* with 3–7 spikelets, erect, fastigiate or lower spikelets more distant on exerted peduncles; terminal spikelet ♂ or gynaeandrous, cylindrical,  $\frac{1}{2}$ –3 cm by  $\frac{1}{2}$ –1 mm, lateral ones ♀, slenderly cylindrical, rather loosely flowered, 1–3 cm by 2– $2\frac{1}{2}$  mm; peduncles smooth. Lower bracts foliaceous, shorter than to slightly exceeding the inflorescence, upper reduced. *Glumes* of the ♂ spikelet cup-shaped (the margins more than halfway connate in front) but not so in gynaeandrous spikelets, mucicous, those of the ♀ spikelets ovate or oblong-ovate, rounded at the ciliolate apex, glabrous, mucicous or mucronulate, light brown with whitish hyaline margins and 3-nerved central stripe, 2 mm long. *Stamens* monadelphous (filaments connate almost throughout their length), not always so in lower flowers. *Utricles* trigonous, ellipsoid, membranous, many-nerved, sparsely pubescent, suberect, recurved at the top, shortly stipitate, gradually tapering above, green to brownish,  $2\frac{1}{2}$ –3 by  $\frac{3}{4}$ –1 mm; beak subconical, glabrous or hispidulous-margined, bidenticulate,  $\frac{1}{2}$  mm long. *Nut* oblong-ovoid or oblong-ellipsoid, triquetrous with faces concave below, stipitate, c. 2 mm long, stramineous to dark brown, rounded above and abruptly contracted into a short neck which is suddenly expanded into the annulate apex. *Style-base* pyramidally thickened, persistent. Stigmas 3.

Distr. *Var. tristachya* occurs in Japan, Korea,

Central and Eastern China, *var. pocilliformis* is also in Japan and Korea, but extends more southwards, through the Ryu Kyu Is. and Formosa to *Malesia*: Philippines (Luzon: Benguet: Mt Pulog), Borneo (Mt Kinabalu), and New Guinea (NE.: Mt Sarawaket).

Ecol. Open meadows and grassy slopes, 2200–2700 m.

Notes. *Carex tristachya* is remarkable for its monadelphous anthers, a feature very rare in the genus (according to BARROS also found in *C. acaulis* D'URV. of the Falkland Is. [cf. BRONGN. in DUPERREY, t. 28, f. A; ROEPER, Zur Flora Mecklenb. 2 (1844) 16!]).

There is no agreement on the taxonomical status of *C. pocilliformis* BOOTT. Whereas CLARKE (J. Linn. Soc. Bot. 36, 1904, 315) did not distinguish it from *C. tristachya*, it was reduced to varietal rank by KÜKENTHAL, OHWI, and others, but maintained as a distinct species by NELMES and AKIYAMA. The main difference is to be found in the glumes of the ♂ flowers, which are said to have free margins in typical *C. tristachya*. I think the difference is only gradual, as in the latter the margins of the glumes are also connate, though at the very base only.

Glumes with united margins are very rare in the genus; they are also known in some North American species belonging to *sect. Phyllostachyae* TUCKERM. (see MACKENZ. N. Am. Fl. 18, 1935, 174).

*Carex tristachya* is very near to *C. mitrata* FRANCH. & SAV., the main difference being in the ♂ spikelets, of which the glumes are infundibuliform and the filaments connate in *C. tristachya*. But in *C. tristachya var. tristachya* the margins of the glumes are connate at the very base only, and sometimes they are free. Besides, even in *var. pocilliformis*, I found perfectly free filaments and anthers, especially in the lower flowers (e.g. MERRILL 6629). It is very well possible that the mentioned characters in the ♂ spikelets are not very important, and that *C. tristachya* and *C. mitrata* have to be considered as subspecies of a single species. — (NOOT.)

## 12. Section Radicales

(KÜK.) NELMES, Reinwardtia 1 (1951) 389; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 54, 75. — *Sect. Digitatae* FRIES *subsect. Radicales* KÜK. Pfl. R. Heft 38 (1909) 480.

Type species: *Carex radicalis* BOOTT.

35. *Carex malaccensis* C. B. CLARKE, Fl. Br. Ind. 6 (1894) 722; J. Linn. Soc. Bot. 37 (1904) 9; RIDL. Mat. Fl. Mal. Pen. (Monoc.) 3 (1907) 116; KÜK. Pfl. R. Heft 38 (1909) 289; RIDL. Fl. Mal. Pen. 5 (1925) 183; NELMES, Reinwardtia 1 (1951) 257. — Fig. 121.

Rhizome shortly creeping, woody, covered with brown, readily fraying scales. *Stems* tufted, slender, triquetrous, very narrowly winged above, smooth below, slightly scabrid on the angles above, up to 50 cm by 1– $1\frac{1}{2}$  mm. *Leaves* basal and subbasal, shorter to longer than the stems, stiff, strongly

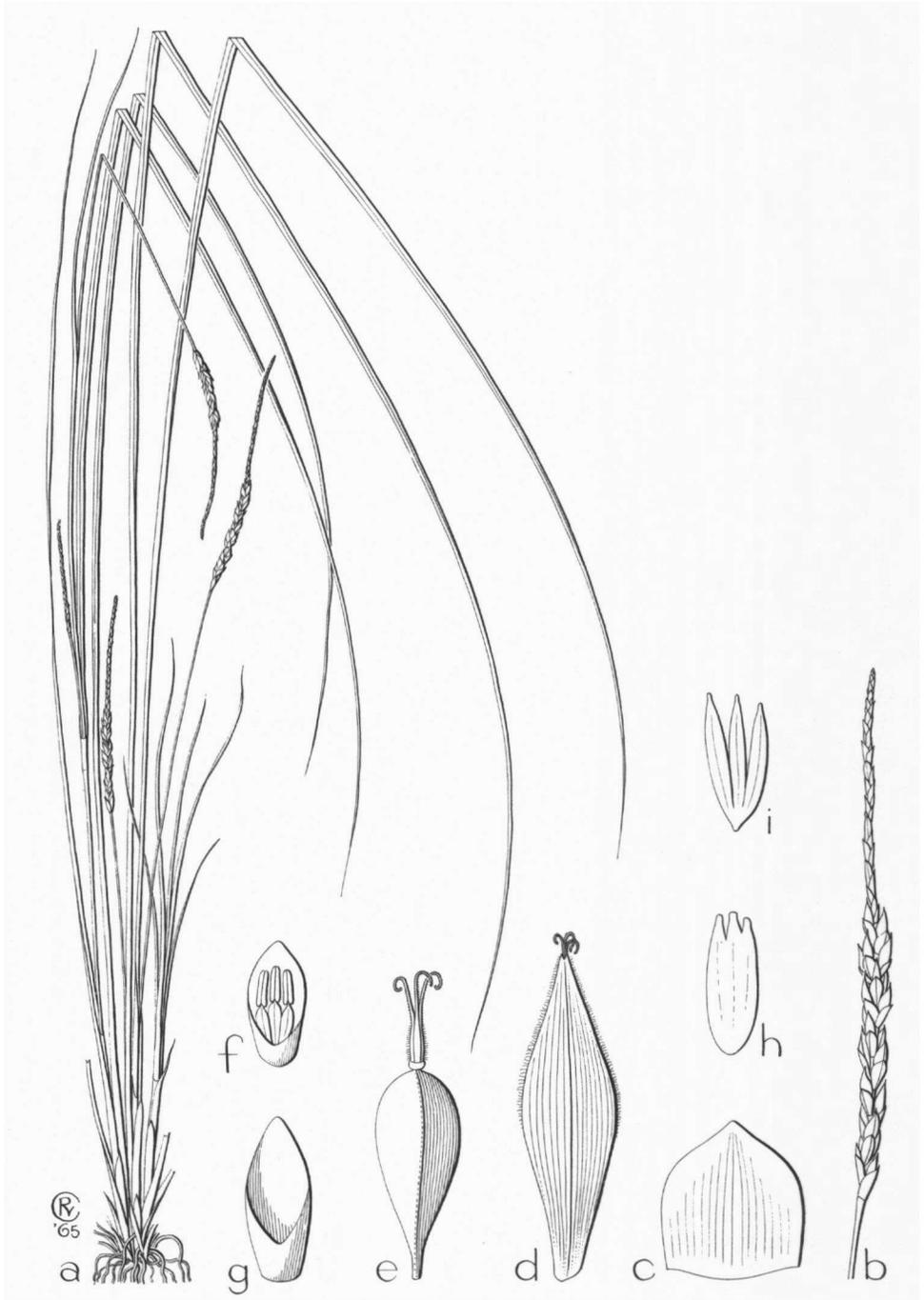


Fig. 129. *Carex speciosa* KUNTH. *a.* Habit,  $\times \frac{1}{2}$ , *b.* spikelet, lower part ♀, upper part ♂,  $\times \frac{1}{2}$ , *c.* glume, *d.* fruit in urticel, *e.* fruit, *f.* young stamens in glume, *g.* glume, *h.* seemingly connate filaments, *i.* filaments, all  $\times 13$  (WAITZ *s.n.*).

revolute when dry, long-attenuate, greyish green or glaucous, scabrous-asperous in the apical part, 2–6 mm wide; sheaths brown, membranous in front, outer ones bladeless. *Inflorescence* racemiform, consisting of 1–4 remote, subglobose or pyramidal heads on short (the lowest rather long), smooth or scabrid peduncles, each head composed of 1–4 crowded, sessile spikelets. Lower bracts foliaceous, much exceeding the inflorescence, not auricled, not or lowest very shortly sheathing, ultimately horizontally spreading, upper much reduced. *Spikelets* androgynous, the ♂ part about as long as or longer than the ♀, ovoid, patent, 5–10 mm long and wide. *Glumes* broadly ovate to oblong-ovate, obtuse, membranous, strongly nerved, ciliolate above, otherwise glabrous, white or light brown,  $2\frac{1}{4}$ –3 mm long, the midnerve excurrent in a stoutish, scabrid,  $\frac{1}{2}$ –1 mm long awn. *Utricles* trigonous, rhomboid or obovoid, membranous, suberect or patulous, strongly many-nerved, rather abruptly contracted into the beak, glabrous, narrowly marginate or winged, scabrid on the margins at the apex, stramineous,  $4$ – $6\frac{3}{4}$  by  $1\frac{1}{5}$ – $2\frac{1}{4}$  mm; beak linear-conical, flattened, curved inwards, bidenticulate, with oblique mouth 1–2 mm long. *Nut* triquetrous, pyriform, scarcely stipitate, brown but densely overlain white-scurfy,  $2$ – $2\frac{1}{4}$  by  $1\frac{3}{4}$  mm. *Style-base* pyramidally thickened, persistent on the nut. Stigmas 3.

Distr. *Malesia*: Malay Peninsula (Kedah, Langkawi Is.).

Ecol. On limestone along the sea-shore, on limestone rocks, at low altitude.

Notes. Like *Fimbristylis malayana* OHWI this interesting species is apparently endemic in the Langkawi Is., here exclusively growing on limestone. RIDLEY (*l.c.*) recorded it for Thailand, but it is not mentioned for that country either by NELMES or RAYMOND.

Its nearest ally is *C. leucantha* ARN. ex BOOTT, Proc. Linn. Soc. 1 (1845) 257; Trans. Linn. Soc. 20 (1846) 135; Ill. 1 (1858) 10, t. 28, from Ceylon and India, which differs by the long-sheathing lower bracts and the hairy utricles.

36. *Carex ramosii* KÜK. in Fedde, Rep. 8 (1910) 8; Philip. J. Sc. 6 (1911) Bot. 63; MERR. En. Philip. 1 (1923) 141; NELMES, Reinwardtia 1 (1951) 259; *ibid.* 2 (1954) 374. — Fig. 121.

Rhizome shortly creeping, woody, covered with brown, readily fraying scales. *Stems* very slender, erect but often curved, triquetrous, slightly incrassate just below the inflorescence, smooth, or slightly scabrid at the top, surrounded below the leaves by a few, bladeless, brown sheaths, 10–25 cm by  $\frac{1}{2}$ –1 mm. *Leaves* basal, up to twice as long as the stems, rigid, flat, with revolute margins when dry, long-attenuate, greyish green, scabrid in the apical part, 2–5 mm wide. *Inflorescence* either a single head of 1–3 sessile spikelets, ovoid or oblong-ovoid, 1–2 cm long, or spiciform with 1–2

additional subsessile heads near the base of the stem in the axil of a leafy bract very similar to and as long as the leaves. Bracts not sheathing, amplexicaul by ciliolate auricles, the lowest of the terminal head foliaceous, 5–10(–25) cm long. *Spikelets* androgynous, the ♂ part longer than the ♀ but finally hidden by the fully developed utricles, 6–10 by 5–7 mm. *Glumes* ovate-lanceolate, obtuse or acutish, membranous, strongly nerved, glabrous, stramineous with white margins,  $3$ – $4\frac{1}{4}$  mm long, the midnerve excurrent in a minutely scabrid,  $1$ – $1\frac{3}{4}$  mm long awn. *Utricles* trigonous, ellipsoid-rhomboid, subcoriaceous, suberect, strongly many-nerved, distinctly winged almost all round, scabrid-margined, gradually narrowed into the beak, glabrous, stramineous or brownish, 6–8 by  $2$ – $2\frac{2}{3}$  mm (wings included); beak compressed, subconical, bidenticulate, with oblique mouth, 3 mm long. *Nut* triquetrous, rhomboid-ellipsoid, sessile, livid, 3 by  $1\frac{3}{4}$ –2 mm. *Style-base* pyramidally thickened, persistent on the nut. Stigmas 3.

Distr. *Malesia*: Philippines (Luzon, Mindanao). Ecol. In forest at medium altitude.

37. *Carex speciosa* KUNTH, En. 2 (1837) 504; MIQ. Fl. Ind. Bat. 3 (1856) 348; BOOTT, Ill. 1 (1858) 53; BOECK. Linnaea 40 (1876) 388, *incl. var. minor* BOECK.; CLARKE, Fl. Br. Ind. 6 (1894) 729; KÜK. Pfl. R. Heft 38 (1909) 481, *incl. var. courtallensis* KÜK. *et var. angustifolia* KÜK.; CAMUS, Fl. Gén. I.-C. 7 (1922) 197; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 63; NELMES, Reinwardtia 1 (1951) 390; *ibid.* 2 (1954) 381; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 160, *incl. var. angustifolia*; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 80; Dansk Bot. Ark. 23 (1965) 260; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 488, 492. — *C. concolor* NEES in Wight, Contr. (1834) 125, *non* R. BR. 1823. — *C. courtallensis* NEES ex BOOTT, Ill. 1 (1858) 52, t. 138, *incl. var. angustifolia* BOOTT; CAMUS, Fl. Gén. I.-C. 7 (1922) 197, f. 28, 1–8; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 78, f. 19. — *C. longispica* BOECK. Allg. Bot. Zeitschr. 2 (1896) 174. — *C. speciosa var. abscondita* KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 318. — *C. stenura* NELMES, Kew Bull. (1950) 202; Reinwardtia 1 (1951) 392. — Fig. 121, 129.

Rhizome short, descendent, woody. *Stems* tufted, erect or suberect, slender, triquetrous, often narrowly winged at the top, smooth or finely scaberulous, 5–50 cm by  $\frac{1}{2}$ – $1\frac{1}{2}$  mm, surrounded below the leaves by fuscous sheaths and fibres. *Leaves* subbasal, longer to much longer than the stems, stiff, flat (but margins revolute when dry), scabrous on the margins, asperous on the upper surface towards the long-attenuate apex, greyish or glaucous-green, 3–10 mm wide. *Spikelets* 1–3(–4), 5–20 cm distant from one another, lowest sometimes arising from a basal leaf-sheath, androgynous, cylindrical, 2–8 cm long, rather laxly 6–18-flowered, on shortly exerted smooth peduncles,

the ♀ part 3–7 mm thick, half as long to about as long as the slender ♂ part. Bracts foliaceous, usually overtopping the inflorescence, sheathing. *Glumes* of the ♂ flowers with free margins or rarely the margins connate in front in the lower  $\frac{2}{3}$ – $\frac{1}{2}$ , those of the ♀ flowers triangular-broadly ovate, rounded to subacute, translucent, many-nerved, with prominent midrib, mucous, minutely ciliate above, long-persistent,  $2\frac{1}{2}$ –3 mm long. *Utricles* ovoid-ellipsoid or ovoid-pyramidal, triquetrous, coriaceous, suberect, strongly many-nerved, straight or slightly curved, with whitish-pubescent margins, greenish-stramineous, 4–7 by 1– $2\frac{1}{2}$  mm, spongy at the base, gradually narrowed into the short, bidenticulate beak. *Nut* obovoid or ellipsoid, triquetrous, shortly stipitate, abruptly shortly beaked, pale to dark brown with prominent pale angles, 3–4 by  $1\frac{1}{2}$ –2 mm. *Style-base* pyramidally thickened, ciliate, persistent. *Stigmas* 3.

*Distr.* Widely distributed in India (from Nepal to Sikkim, also in S. India), S. China (Yunnan), Thailand, Indo-China; in *Malesia*: Sumatra (Atjeh, E. Coast Res.), Malay Peninsula (Ulu Kelantan: Bertam, Gua Musang), SE. Borneo (N. of Bandjermasin, once), and Java (rare in W. and E., more common in Central Java), also in Kangean I.

*Ecol.* Primary forest, often in teak-forest, distinctly preferring seasonal climatic conditions, in Borneo on dry serpentine rock (once), at low and medium altitude, from sea-level up to 1500 m.

*Vern. Java*: *ilat djepun*, S.

*Notes.* According to RAYMOND, *l.c.*, the leaves in *C. speciosa* are  $1\frac{1}{2}$ –2 mm wide, the number of spikelets 1–4, and the utricles 4–5 mm long. He kept *C. courtallensis* apart from *C. speciosa* on account of its broader leaves, the greater number of spikelets, and the larger utricles. The type-collection of *C. speciosa* (WALLICH 3391) does not answer RAYMOND's description of this species. I agree with NELMES that *C. courtallensis* is conspecific with *C. speciosa*; the specimens from Sumatra and Java agree very well with the type of *C. courtallensis* (WIGHT 991 in K.).

The Bornean specimens are remarkable by the narrow leaves, the long, tail-like ♂ part of the spikelets, and especially by the infundibuliform glumes of the ♂ flowers (the last character not mentioned by NELMES). I have not seen the Tonkin specimens NELMES (1955) referred to *C. speciosa* var. *angustifolia* (BOOTT) KÜK. They have leaves only  $1\frac{1}{2}$ –2 mm wide, and utricles  $3\frac{1}{2}$ –4 mm long. It is not clear how NELMES distinguished between this variety and his *C. stenura*.

Another member of *sect. Radicales* from Lower Burma was described as *C. pterocaulos* NELMES in Hook. Ic. Pl. 35 (1947) t. 3467; Mém. Mus. Nat. Hist. Paris B4 (1955) 159, according to NELMES a very distinct species because of its widely winged stems, its sometimes empty bract, and the very

stout ♀ part of its spikelets. In some specimens collected in Thailand, Chiangmai, Doi Chiangdao, at 1200 m (SLEUMER & SMITNAND 1063, L.), the stems are strikingly winged (4 mm broad) and the bracts very long and sometimes empty, but the glumes are only 3– $3\frac{1}{2}$  mm long, the (young) utricles 4 mm (not 4–5 mm and 6–7 mm respectively); the ♀ part of the spikelets is therefore not stouter than in *C. speciosa*. I doubt whether *C. pterocaulos* is specifically distinct from *C. speciosa*.

The polymorphism of the group is badly in need of special study.

The record of *C. speciosa* var. *angustifolia* for NE. New Guinea, based on CLEMENS 7909a (KÜK. Bot. Jahrb. 70, 1940, 465) is very doubtful for plant-geographical reasons.

The filaments are often coherent to such a degree as to give the impression of their being connate.

38. *Carex tricephala* BOECK. Flora 58 (1875) 263; KÜK. Pfl. R. Heft 38 (1909) 289; KOORD. Exk. Fl. Java 1 (1911) 205; KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 316; NELMES, Kew Bull. (1950) 190; Reinwardtia 1 (1951) 256; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 117; KOYAMA, Contr. Inst. Bot. Un. Montréal n. 70 (1957) 15, t. 1; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 76; Dansk Bot. Ark. 23 (1965) 260; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 491. — *C. madoerensis* CLARKE, J. Linn. Soc. Bot. 37 (1904) 15; Kew Bull. add. ser. 8 (1908) 77. — *C. thorelii* CAMUS, Not. Syst. 1 (1910) 295; Fl. Gén. I.-C. 7 (1922) 196; NELMES, Kew Bull. (1946) 15, 23. — *C. plesiocephala* TURR. Kew Bull. (1910) 385; *ibid.* (1912) 427. — *C. hispidangula* KOYAMA, Nat. Canad. 82 (1955) 200, t. 1. — Fig. 121.

Rhizome shortly creeping, woody, covered with the fibrous, fuscous remains of old scales. *Stems* slender, triquetrous, narrowly winged just below the inflorescence, smooth below, antrorsely scabrous-setulose above, 10–50 cm by 1 mm (up to 2 mm in the winged part), the base clothed with the fibrous remains of old leaf-sheaths. *Leaves* basal and 1–2 cauline, shorter than to much exceeding the stems, rigid to rather weak, flat, with revolute margins when dry, long-attenuate, scabrid in the upper part, light green, 3–10 mm wide; cauline leaves long-sheathing; ligule short, triangular. *Inflorescence* spiciform, consisting of (1–)3(–4) dense, sessile, ovoid or subglobose spikelets 0–5 cm distant, and 6–10(–12) mm long and wide. Lower 1–2 bracts foliaceous, usually much exceeding the inflorescence, not sheathing, amplexicaul by ciliate auricles, upper much reduced. *Spikelets* androgynous, the ♂ part about as long as the ♀, but inconspicuous when the utricles are fully developed. *Glumes* oblong-ovate to ovate, membranous, nerved, densely setulose, white, or brownish with white margins,  $2\frac{1}{2}$ – $4\frac{1}{2}$  mm long; midnerve excurrent in a scabrid,  $\frac{1}{2}$ –1 mm long awn.

*Utricles* trigonous, ovoid or rhomboid-ovoid, membranous, patent, slenderly nerved, rather abruptly narrowed into the beak, densely hispidulous in the upper  $\frac{2}{3}$ , whitish or brownish, 4–6 by  $1\frac{1}{5}$ – $2\frac{1}{3}$  mm; beak conic-cylindric, bidentate, with slightly oblique mouth, 1– $2\frac{1}{2}$  mm long. *Nut* triquetrous, ellipsoid, rhomboid, or slightly obovoid, scarcely stipitate, cinereous, dark brown on the angles,  $2\frac{1}{2}$ –3 by  $1\frac{3}{4}$ –2 mm. *Style-base* pyramidally thickened, persistent on the nut. Stigmas 3.

Distr. Yunnan, Upper Burma, Thailand, Indo-

China; in *Malesia* only known from Madura I. off NE. Java (type locality!).

Ecol. In grassy fields on heavy calcareous marl, in muddy places in teak-forests, at low altitude (up to 200 m), obviously bound to a distinct seasonal climate and its range apparently coinciding with that of teak. See NELMES 1951, *l.c.*

Note. NELMES placed this species, together with *C. malaccensis* and *C. ramosii* in sect. *Stramentitiae*, but as RAYMOND 1959, *l.c.*, pointed out, it has very little in common with the other members of that section.

### 13. Section *Trachychlaenae*

DREJER, *Symb. Caric.* (1844) 9; KÜK. Pfl. R. Heft 38 (1909) 415. — *Sect. Anomalae* (*non* CAREY) NELMES, *Reinwardtia* 1 (1951) 413; RAYM. *Mém. Jard. Bot. Montréal n.* 53 (1959) 54, 71.

Type species: *Carex hispida* WILLD. (lectotype).

39. *Carex maculata* BOOTT, *Trans. Linn. Soc.* 20 (1846) 128; Ill. 1 (1858) 9, t. 26; BOECK. *Linnaea* 41 (1877) 191; BENTH. *Fl. Austr.* 7 (1878) 447; CLARKE, *Fl. Br. Ind.* 6 (1894) 735; KÜK. Pfl. R. Heft 38 (1909) 427, *incl. var. neurochlamys* KÜK.; OHWI, *Mem. Coll. Sc. Kyoto Imp. Un.* B11 (1936) 434; KÜK. *Bull. Jard. Bot. Btżg III*, 16 (1940) 317, *incl. var. sanguineo-squamata* KÜK. *et f. humilior* KÜK.; OHWI & KOYAMA, *Misc. Rep. Nat. Sc. Mus. Tokyo n.* 5 (1952) 1, t. 1; AKIYAMA, *Car. Far East. Reg. Asia* (1955) 120, t. 105, f. 1; YOSHIKAWA, *l.c. Jap. Carex* 2 (1958) 206, t. 103; NELMES, *Kew Bull.* (1950) 205; *Reinwardtia* 1 (1951) 414; RAYM. *Mém. Jard. Bot. Montréal n.* 53 (1959) 71; *Dansk Bot. Ark.* 23 (1965) 259; KERN in *Back. & Bakh. f. Fl. Java* 3 (1968) 489; STEEN. *Mt. Fl. Java* (1972) pl. 14–5. — *C. neurochlamys* F.v.M. *Fragm.* 8 (1874) 258; NELMES, *Kew Bull.* (1949) 391; *Reinwardtia* 1 (1951) 413. — *C. samoensis* BOECK. *Bot. Jahrb.* 25 (1898) 588. — *C. elibates* NELMES, *Kew Bull.* (1937) 353; *ibid.* (1950) 205; *Reinwardtia* 1 (1951) 416. — *C. pruinosa* (*non* BOOTT) KÜK. *Bull. Jard. Bot. Btżg III*, 16 (1940) 317. — *C. pruinosa* BOOTT *f. tristigmata* BACK. *Bekn. Fl. Java* (em. ed.) 10 (1949) fam. 246, p. 62. — Fig. 121.

Rhizome short, woody. *Stems* densely tufted, slender, erect, trigonous, smooth, (5–)15–60 cm by 1– $1\frac{1}{2}$  mm, surrounded below the leaves by a few ferruginous or brownish, bladeless sheaths or their fibrous remains. *Leaves* subbasal, shorter to longer than the stems, flat with often revolute margins, greyish green, scabrous towards the long-attenuated apices, (1–)3–8 mm wide; sheaths pale to ferruginous, membranous in front. Lower bracts sheathing, leaf-like, usually overtopping the inflorescence. *Spikelets* (2–)3–5(–6), upper approximate, lower distant, cylindric, densely flowered; terminal spikelet ♂, sessile, pale, 1–2 mm thick,

lateral ones ♀, suberect, dark, 1–4 cm by 3–5 mm, upper sessile or shortly peduncled, lower on short to long, firm, smooth peduncles. *Glumes* ovate or oblong-ovate, acute or subobtuse, thin, translucent, often minutely ciliate, ferruginous to castaneous with narrow whitish-hyaline margins and 3-nerved, pale green central stripe, muticous or scarcely mucronulate, 2–3 mm long. *Utricles* ellipsoid, compressed-trigonous, membranous, distinctly several-nerved, suberect to patulous, straight, glabrous but densely ferruginous-papillose, scarcely stipitate, 2–3(–4) by 1– $1\frac{3}{4}$  mm, subabruptly contracted into a very short, up to  $\frac{1}{2}$  mm long, entire or slightly emarginate beak. *Nut* ellipsoid or obovoid, triquetrous, shortly stipitate and beaked,  $1\frac{1}{4}$ –2 by  $\frac{3}{4}$ – $1\frac{1}{4}$  mm, both stipe and beak usually bent. *Style-base* oblique, somewhat thickened. Stigmas 3 (rarely 2 in some fruits).

Distr. Widely distributed from Ceylon and India through Thailand, China, and Korea to Formosa, Japan and the Ryu Kyu Is., and through *Malesia* to Queensland, New South Wales, New Caledonia and Samoa; in *Malesia*: Malay Peninsula (Pahang), N. Sumatra (Atjeh), Java (West: Mt Papanadajan; Central: Diëng Plateau; East: Jang plateau), Lesser Sunda Is. (Flores), Celebes (Minahassa, Poso), and New Guinea. Distr. map: MEUSEL, *Vergl. Arealkunde* 2 (1943) Karte 32c.

Ecol. In swamps, marshes, boggy meadows, wet mountain heaths, open places in mossy woods, 1600–3500 m.

Vern. New Guinea: *sisik*, Tomba, *toni*, *ititu*, Mendi, *era*, *teleleme*, Onim.

Notes. Very variable. I cannot follow NELMES in assigning specific rank to *C. neurochlamys* and *C. elibates*. His descriptions are fairly well covered by that of *C. maculata*. *C. elibates* has darker coloured glumes and often stiffer and narrower

leaves than typical *C. maculata*, and for this reason KÜKENTHAL distinguished it as *var. sanguineosquamata*. The other characters given by NELMES are valueless: in all *Carices* with a ♂ terminal spikelet this spikelet may bear some ♀ flowers; the very short beak of the utricle in *C. maculata* is variable in length, and so it is in *C. elibates*. F.v.MUELLER distinguished *C. neurochlamys* from *C. maculata* mainly by the non-papillose, strongly nerved utricles, a mistake apparently due to inaccurate observation. According to NELMES the glumes in *C. neurochlamys* are usually mucronulate, not usually so in *C. maculata*; I fail to see any difference. KÜKENTHAL reduced *C. neurochlamys* to varietal rank and distinguished it by the stouter

stems, the leaves much overtopping the inflorescence, and the many-nerved, less densely papillose utricles. These characters are not found in the New Guinea specimens referred to *C. neurochlamys* by NELMES.

*Carex maculata* is closely related to species of *sect. Praelongae* (*C. phacota* and *C. pruinosa*). One collection of N. Sumatra (DE WILDE c.s. 13251) has several fruits with only 2 styles, and becoming as long as 4 mm, thus exactly resembling the fruits of *C. pruinosa*. These fruits occur in the same spikelet as the 'normal' 3-styled fruits. Another deviating feature in this collection is that some of the utricles are not glabrous, but minutely scabrid on the margins. — (NOOT.)

#### 14. Section Capitellatae

MEINSH. Act. Hort. Petrop. 18 (1901) 280, 309; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 437; NELMES, Reinwardtia 1 (1951) 404; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 17, 18. — *Sect. Rarae* CLARKE, Kew Bull. add. ser. 8 (1908) 143. — *Sect. Unciniaeformes* KÜK. *subsect. Capitellatae* (MEINSH.) KÜK. Pfl. R. Heft 38 (1909) 100. — *Sect. Extensae* FRIES *subsect. Capitellatae* (MEINSH.) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 202.

Type species: *Carex capitellata* BOISS. & BAL.

40. *Carex capillacea* BOOTT, Ill. 1 (1858) 44, t. 110; BOECK. Linnaea 39 (1875) 37; BENTH. Fl. Austr. 7 (1878) 438; CLARKE, Fl. Br. Ind. 6 (1894) 713; J. Linn. Soc. Bot. 37 (1904) 7; Philip. J. Sc. 2 (1907) Bot. 107; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 441; S. T. BLAKE, J. Arn. Arb. 28 (1947) 101; NELMES, Kew Bull. (1949) 381; Reinwardtia 1 (1951) 405; *ibid.* 2 (1954) 381; AKIYAMA, Car. Far East. Reg. Asia (1955) 42, t. 6, f. 1 A-D; YOSHIKAWA, Ic. Jap. Carex 2 (1958) 218, t. 109; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 18; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 206; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 488; STEEN. Mt. Fl. Java (1972) pl. 14-8. — *C. simplicissima* F.v.M. Fragm. 9 (1875) 191. — *C. rara* (non BOOTT) STAFF, Trans. Linn. Soc. II, Bot. 4 (1894) 246; CLARKE, J. Linn. Soc. Bot. 37 (1904) 7; KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 313; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 64. — *C. rara* BOOTT *ssp. capillacea* KÜK. in Mats. Index Pl. Jap. 2 (1905) 130, *quoad* *synon.*; Pfl. R. Heft 38 (1909) 102; Philip. J. Sc. 6 (1911) Bot. 58; MERR. En. Philip. 1 (1923) 141; STEEN. Trop. Natuur 19 (1930) 87, 89 f. 14. — Fig. 121, 130.

Rhizome short, woody. *Stems* densely tufted, slender, erect, triquetrous, smooth or slightly scaberulous just below the inflorescence, 5-50 cm by  $\frac{1}{2}$ - $\frac{3}{4}$  mm, clothed below the leaves by brownish, bladeless sheaths and their fibrous remains. *Leaves* subbasal, much shorter than to slightly

exceeding the stems, flat or canaliculate, smooth or nearly so, erect,  $\frac{1}{2}$ -2 mm wide; sheaths pale, membranous in front. *Spikelet* solitary, terminal, androgynous, ovoid or shortly cylindrical, densely but rather few-flowered, 5-15 mm long, the ♂ part c. 1 mm thick, shorter than to about as long as the ♀ part, the latter becoming 4-6 mm thick. *Glumes* ovate or oblong-ovate, obtuse to acutish, mucous, translucent, ferruginous to brown with narrow paler margins and 3-nerved, pale central stripe, caducous,  $1\frac{1}{2}$ -3 mm long. *Utricles* oblong-ovoid or oblong-ellipsoid, rounded at the base, obscurely trigonous, subinflated, membranous, finally widely patent to somewhat reflexed, glabrous, several-nerved, scarcely stipitate, often minutely reddish resinous-dotted, ( $1\frac{1}{2}$ -) $2\frac{1}{2}$ - $3\frac{1}{2}$ (-4) by c. 1 mm, rather gradually tapering to a very short, subentire or slightly emarginate beak. *Nut* ellipsoid or oblong-ellipsoid, triquetrous, shortly stipitate, abruptly short-beaked, stramineous to brownish,  $1\frac{1}{2}$ - $2\frac{1}{2}$  by c. 1 mm. *Style-base* slightly thickened. *Stigmas* 3.

Distr. From the Himalayan region to Annam, Manchuria, Korea, Japan, and extending as far north as Sachalin (*var. sachalinensis* OHWI); through Malesia to Australia (New South Wales) and New Zealand; in *Malesia*: Sumatra (North: Atjeh; Central West: G. Singalang), W. Java (Mt Papandajan), N. Borneo (Mt Kinabalu), SW. Celebes (Mt Rante Mario), Philippines (Luzon), and New Guinea.

Ecol. Swamps, wet alpine grasslands, open seepages, wet borders of small streams, marshy places in forests, 2000–4000 m.

Vern. New Guinea: *ere, tep*, Mendi lang.

Notes. Closely related to the Indian *C. rara* BOOTT, Proc. Linn. Soc. 1 (1845) 284; Ill. 1 (1858) 44, t. 109. BOOTT distinguished *C. capillacea* from *C. rara* by the capillary stems and leaves, the shorter, ovoid spikelet, the smaller, reflexed, punctulate utricles, and the caducous glumes. Except for the much longer, linear spikelets ( $\delta$  part much longer than the  $\eta$  one), and the suberect utricles of *C. rara*, these characters are unreliable. The two might possibly better be regarded as subspecies of a single species.

In typical *C. capillacea* (*var. capillacea*) the stems and leaves are filiform and the utricles 2–2½ mm long. The above description comprises also stouter plants with leaves up to 2 mm wide and

utricles 3–4 mm long, which have been distinguished as:

*var. sachalinensis* (F. SCHMIDT) OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 442; AKIYAMA, Car. Far East. Reg. Asia (1955) 42, t. 6, f. 1 E–H; YOSHIKAWA, Ic. Jap. Carex 3 (1960) 386, t. 193. — *C. nana* BOOTT in A. Gray, Mem. Am. Ac. n.s. 6 (1859) 418; Ill. 4 (1867) 139, t. 44, f. 2, non CHAM. ex STEUD. 1855. — *C. uda* MAXIM. *var. sachalinensis* F. SCHMIDT, Reisen Amurl. (1868) 191. — *C. capillacea var. nana* FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris III, 8 (1896) 198. — *C. rara ssp. capillacea var. nana* KÜK. Pfl. R. Heft 38 (1909) 103. — *C. capillacea var. major* NELMES, Kew Bull. (1949) 381; Reinwardtia 1 (1951) 406.

Known from Sachalin, Japan, Korea, and Malesia. The Malesian specimens are often difficult to refer to one of the varieties.

### 15. Section Rhizopoda

OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 443; NELMES, Reinwardtia 1 (1951) 411; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 17. — *Sect. Extensae* FRIES *subsect. Rhizopoda* (OHWI) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 202.

Type species: *Carex rhizopoda* MAXIM.

41. *Carex eremostachya* S. T. BLAKE, J. Arn. Arb. 28 (1947) 99, f. 1A; NELMES, Kew Bull. (1949) 381; Reinwardtia 1 (1951) 412. — Fig. 121.

Rhizome creeping, slender, 1–2 mm thick, covered with brown, striate scales. Stems approximate or loosely tufted, erect or suberect, slender and rather flaccid, triquetrous, scabrid at the top, 20–45 cm by ½–1 mm. Leaves subbasal, as long as to longer than the stems, flat, shortly attenuate, glabrous, scabrid on margins and nerves towards the apex, 2–3 mm wide, the lower ones reduced to brown, entire, bladeless or short-bladed sheaths. Spikelet 1, terminal, erect, androgynous, oblong-ellipsoid to shortly cylindrical, densely many-flowered, 10–15 by 5–6 mm, the  $\delta$  part shorter than the  $\eta$  one. Glumes ovate or ovate-lanceolate, acute or the upper obtusish, thin, glabrous, reddish brown with 3-nerved, pale, central stripe, 3–4 mm

long, lower mucronate (mucro up to 1 mm), upper muticous. Utricles ellipsoid, triquetrous, angled dorsally, obliquely erect, membranous, glabrous and smooth, distinctly 4–5-nerved on each face, pale green, 4½–5 by 1¼–1½ mm, shortly stipitate, rather abruptly narrowed into a slender, linear, bidentate, c. 1½ mm long beak. Nut obovoid, triquetrous, apiculate, c. 2 by 1½ mm. Style-base scarcely thickened. Stigmas 3.

Distr. Malesia: W. New Guinea, 9 km NE of Lake Habbema; only known from the type collection.

Ecol. Massed on open beaches of small stream in forest, 2800 m.

Note. Closely allied to *C. rhizopoda* MAXIM. from Japan, which is however clearly distinct by its more flaccid, usually broader leaves, and its longer, oblong-cylindrical spikelet with pale green glumes much shorter than the utricles.

### 16. Section Anomalae

[CAREY in Gray, Man. Bot. N. Un. St. (1848) 557, *pro subsect.*]; MACKENZ. N. Am. Fl. 18 (1935) 339. — *Japonicae* FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris III, 10 (1898) 107, *nomen.* — *Sect. Tumidae* KÜK. Pfl. R. Heft 38 (1909) 611; AKIYAMA, J. Fac. Sc. Hokkaido Imp. Un. V, 2 (1932) 188; NELMES, Reinwardtia 1 (1951) 394; non MEINSH. 1901. — *Sect. Dispalatae* OHWI, Mem. Coll. Sc. Kyoto

Imp. Un. B11 (1936) 480; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 54, 82. — *Sect. Confertiflorae* FRANCH. ex OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 474; AKIYAMA, Car. Far East. Reg. Asia (1955) 144. — *Sect. Molliculae* OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 450; KOYAMA, Bot. Mag. Tokyo 72 (1959) 307; Quart. J. Taiwan Mus. 13 (1960) 226. — *Sect. Extensae* FRIES ser. *Tumidae* (KÜK.) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 202.

Type species: *Carex scabrata* SCHWEIN. (lectotype).

42. *Carex alopecuroides* D. DON, Trans. Linn. Soc. 14 (1825) 332; Prod. Fl. Nepal. (1825) 43; BOOTT, Ill. 2 (1860) 88, t. 258; BOECK. Linnaea 41 (1877) 172.

In *Malesia* only:

*var. chlorostachys* (D. DON) CLARKE, J. Linn. Soc. 36 (1903) 271 (*'chlorostachya'*); KOYAMA, Nat. Canad. 82 (1955) 199; Contr. Inst. Bot. Un. Montréal n. 57 (1957) 14; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 85; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 490. — *C. chlorostachys* D. DON, Trans. Linn. Soc. 14 (1825) 330; Prod. Fl. Nepal. (1825) 43; non STEVEN, 1813. — *C. doniana* SPRENG. Syst. 3 (1826) 825; NEES in Wight, Contr. (1834) 128; DREJER, Symb. Caric. (1844) 26, t. 13; S. T. BLAKE, J. Arn. Arb. 28 (1947) 115; Kew Bull. (1950) 204, *incl. var. cacuminis* NELMES; NELMES, Reinwardtia 1 (1951) 399; *ibid.* 2 (1954) 381; AKIYAMA, Car. Far East. Reg. Asia (1955) t. 161. — *C. japonica* (non THUNB.) BOOTT, Ill. 2 (1860) 88, t. 257, *excl. var. minor* BOOTT; BOECK. Linnaea 41 (1877) 283, *excl. syn.* SCHKUHR t. Ww f. 110; CLARKE, Fl. Br. Ind. 6 (1894) 736; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 70. — *C. japonica var. chlorostachys* KÜK. ex MATSUM. Ind. Pl. Jap. 2 (1905) 116; Pfl. R. Heft 38 (1909) 620; MERR. En. Philip. 1 (1923) 139; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 212. — *C. subtransversa* CLARKE, Philip. J. Sc. 2 (1907) Bot. 108; Kew Bull. add. ser. 8 (1908) 92; KÜK. Pfl. R. Heft 38 (1909) 614, *in nota*; Philip. J. Sc. 6 (1911) Bot. 63; MERR. En. Philip. 1 (1923) 142; S. T. BLAKE, J. Arn. Arb. 28 (1947) 115; NELMES, Reinwardtia 1 (1951) 401. — *C. japonica var. mesogyne* KÜK. Bot. Jahrb. 69 (1938) 265. — *C. japonica ssp. subtransversa* (CLARKE) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 213. — Fig. 121.

Rhizome emitting long, slender stolons covered with pale brown sheaths. *Stems* tufted, slender, erect, very acutely triquetrous to narrowly winged, smooth or scabrid on the angles above, (2-)30-90 cm by 1-2 mm, surrounded below the leaves by a few pale, bladeless sheaths. *Leaves* subbasal and 1 higher on the stem, shorter to much longer than the stem, flat, stiffish, long-acuminate, scabrid on the margins and often asperous on the upper surface, 2-10 mm wide. *Spikelets* (2-)3-6, erect, cylindrical, (1½-)2-5 cm long, approximate and fastigiate, or lower 1-2 somewhat distant, sessile,

or lower shortly peduncled; terminal spikelet ♂ (not rarely gynaeandrous), pale, 1-3 mm thick, lateral ones ♀, greenish or stramineous, 4-6 mm thick. Lower bracts foliaceous, overtopping the inflorescence, not sheathing, upper much reduced. *Glumes* oblong-ovate, acute to obtuse, 2-2½ mm long, whitish with 3-nerved, green, central stripe excurrent in a scabrid, (¼-)1-1¼ mm long awn. *Utricles* ellipsoid, obscurely trigonous, subinflated, membranous, plurinerved, glabrous, ultimately patent, straight, greenish to stramineous, 3-4 by 1-1¼ mm, rather gradually narrowed into a 1-1¼ mm long, linear-conic, bidenticulate, smooth or almost smooth beak. *Nut* ellipsoid, obovoid, or oblong-obovoid, triquetrous, 1½-2 by ¾-1 mm. *Style* straight or slightly bent at the scarcely thickened base. *Stigmas* 3, about half as long as the utricle.

Distr. Nepal, Sikkim, and Khasia to Central and S. China, Korea, Japan, Ryu Kyu Is., Formosa, Tonkin and Annam, and *Malesia*: Sumatra (Atjeh; W. Coast: Mt Kerintji), Java (Mt Wajang in W., Mt Tengger: Ranu Regulo in E.), Central Celebes (Mt Kambuno), Philippines (Luzon), and New Guinea.

Ecol. Margins of lakes, riversides, openings in the mossy forest, also on dry, open slopes, stated to be a common trackside sedge in New Guinea; 1500-2900 m.

Vern. New Guinea: *akele*, Lalibu.

Notes. The only collection known from Celebes (EYMA 1395) was distinguished as *C. doniana var. cacuminis* NELMES, which has no taxonomic value; the dwarfish habit has apparently been caused by continuous grazing of anoa, the small wild buffalo of Celebes, *Bos (Bubalus) depressicornis*.

Both *C. alopecuroides* and its *var. chlorostachys* are treated as varieties of *C. japonica* THUNB. by KÜKENTHAL, and also recently by KOYAMA, but *C. japonica* seems to be distinct by its short-cylindric, not crowded, peduncled, usually pendulous spikelets, not distinctly awned glumes, and its very long stigmas. In typical *C. alopecuroides* the leaves are usually narrower than in *var. chlorostachys*, the spikelets very slender, and the utricles somewhat narrower, less inflated, but the two are very near to each other and connected by intermediates. *C. subtransversa* CLARKE was described from N. Luzon, where also *C. alopecuroides var. chlorostachys* occurs. I fail to see differences



Fig. 130. *Carex capillacea* BOOTT. Habit,  $\times \frac{1}{3}$   
(from Mt Papandajan, VAN STEENIS).

between the two but for the narrower leaves of the former, which is said to differ also by the suberect—not patent—utricles; the specimens are not fully ripe and the degree of reflexion of the utricles

depends upon maturity. KÜKENTHAL placed *C. subtransversa* under *C. brownii* and its var. *transversa* (BOOTT) KÜK., with which it is certainly not closely related.

43. *Carex brownii* TUCKERM. En. Meth. Car. (1843) 21 (or 15? 'brownii?'); BOOTT, Ill. 4 (1867) 161, t. 532 (*pl. dextrae*); BOECK. Linnaea 41 (1877) 151, incl. var. *viridis* BOECK.; BENTH. Fl. Austr. 7 (1878) 447; KÜK. Pfl. R. Heft 38 (1909) 612, f. 104 A-D; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 477; S. T. BLAKE, J. Arn. Arb. 28 (1947) 115; NELMES, Kew Bull. (1949) 384; Reinwardtia 1 (1951) 398; KOYAMA, Act. Phytotax. Geobot. 18 (1959) 23; J. Fac. Sc. Un. Tokyo III, 8 (1962) 215; Phytologia 17 (1968) 409, t. 16. — *C. striata* R. BR. Prod. (1810) 243; KUNTH, En. 2 (1837) 458; STEUD. Syn. 2 (1855) 226; DREJER, Symb. Caric. (1844) 28, t. 15; non MICHX, 1803. — *C. nipposinica* OHWI, Act. Phytotax. Geobot. 11 (1942) 255; AKIYAMA, Car. Far East. Reg. Asia (1955) 144, t. 133; YOSHIKAWA, Ic. Jap. Carex 2 (1958) 256, t. 128.

a. *ssp. brownii*. — Fig. 122.

Rhizome short, without stolons. Stems slender, erect, triquetrous, smooth or almost so, 25–75 cm by 1–1½ mm. Leaves basal and often 1 higher up the stem, flat, weak, shorter than the stems, long-acuminate, scabrous on nerves and margins, 3–4 mm wide, lowest ones reduced to bladeless, reddish-brown sheaths. Spikelets 3–4(–5), erect, short-cylindric to cylindric, upper approximate, fastigate, lowest often more or less distant; terminal spikelet ♂, or rarely gynaeandrous, subsessile, pale, (½)–1–2½ cm by 2(–3) mm; lateral spikelets ♀, subsessile or lowest sometimes on a long, exerted peduncle, short-cylindric, obtuse, densely flowered, 1½–2½(–3) cm by 5–6 mm. Lowest bract foliaceous, overtopping the inflorescence, more or less sheathing, upper much shorter, not or hardly exceeding the inflorescence. Glumes ovate or oblong-ovate, obtuse, scarious, 1–2 mm long, whitish with 3-nerved green central stripe excurrent in a scabrous, ½–3½ mm long awn. Utricles broadly ellipsoid to subglobose, obscurely trigonous, inflated, membranous, strongly many-ribbed, glabrous, straight, patent, dark olive-green to dark brown, contrasted against the white glumes, 3–4 by 1½–1¾ mm, suddenly contracted into a very short, bidenticulate beak. Nut obovoid, triquetrous, yellowish, 2¼–2½ by 1½–1⅔ mm, with a very short, (sometimes indistinctly) bent stipe and beak. Style-base slightly thickened. Stigmas 3.

Distr. Japan, Korea, Formosa, E. China (Yangtze R. valley), Australia (New South Wales, Victoria), New Zealand; in *Malesia*: New Guinea (W. New Guinea: Balim R. valley; Terr. of New Guinea: W. Highlands, lower Tale valley and

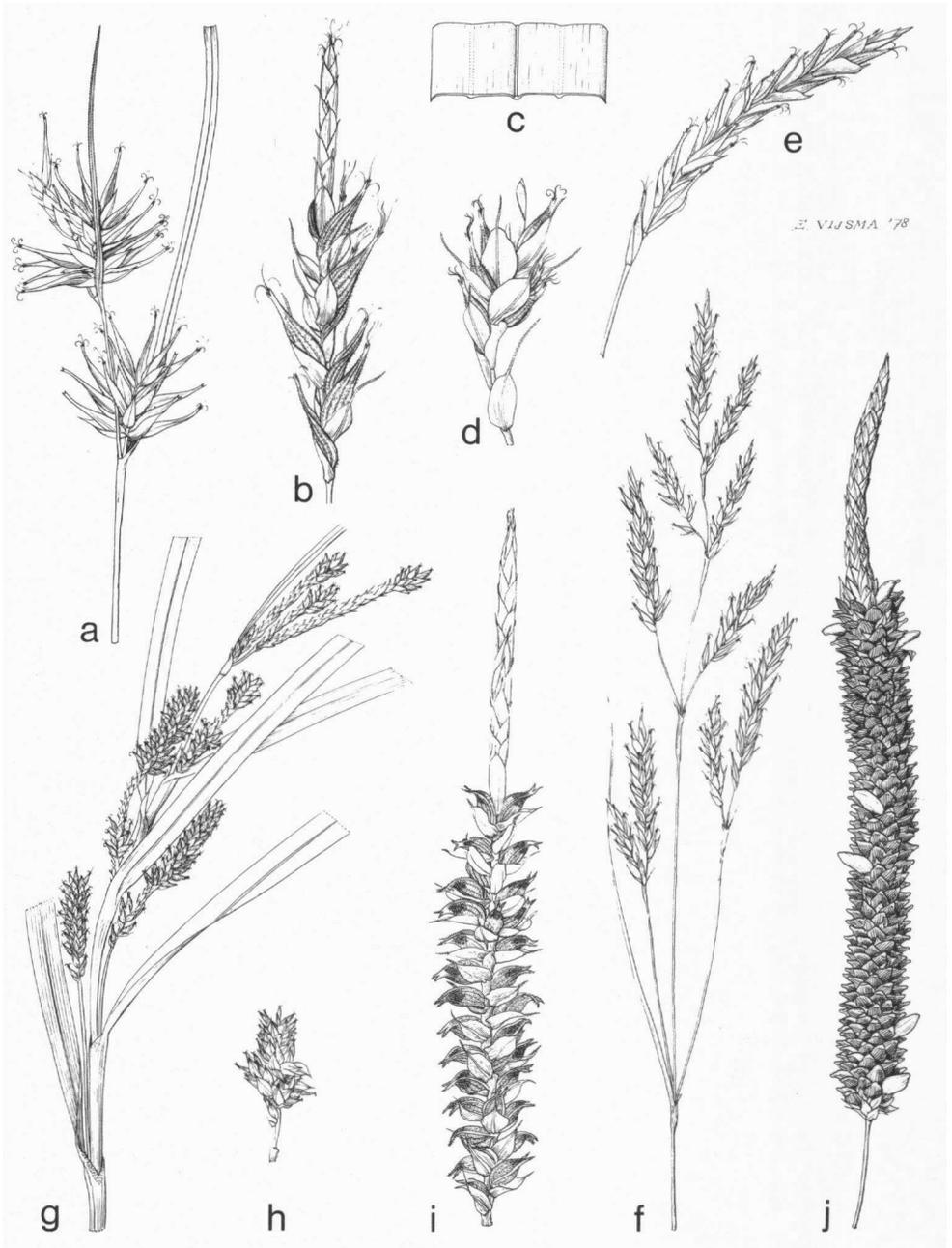


Fig. 131. Inflorescence (nat. size), spikelets and (occasionally) venation ( $\times 2$ ). — 48. *Carex michauxiana* BOECK., a. — 18b. *C. perakensis* CLARKE var. *borneensis* (CLARKE) NOOT., b. — 18a. var. *perakensis*, c-d. — 19a. *C. turrita* CLARKE var. *turrita*, e-f. — 50. *C. maubertiana* BOOTT, g. — 64. *C. echinata* MURR., h. — 15. *C. baccans* NEES, i. — 51. *C. graeffeana* BOECK., j (a SCHODDE 1992, b BROOKE 8561, c-d VAN STEENIS 8277, e-f ANU 15532, g KOSTERMANS 14005, h DE WILDE c.s. 13323, i ELBERT 62, j SINCLAIR 979').

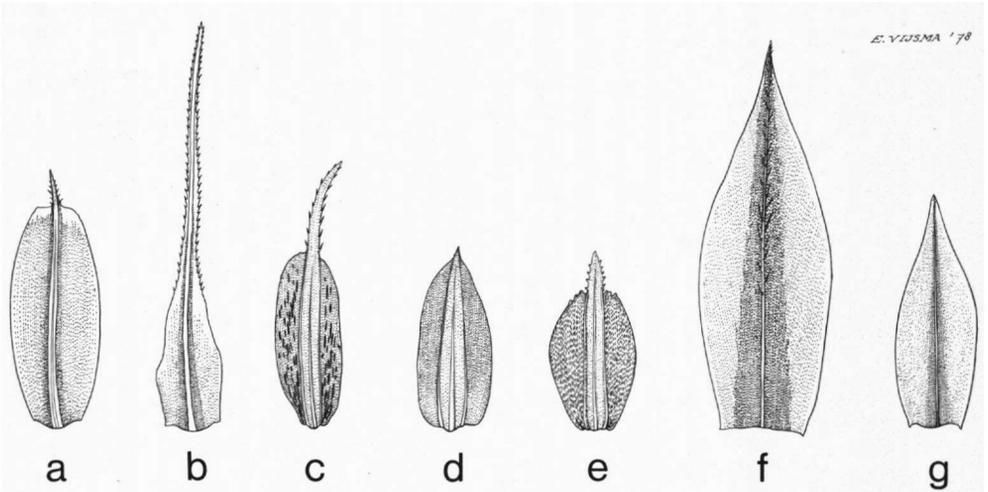


Fig. 132. Glumes,  $\times 10$ . — 46. *Carex brachyathera* OHWI, a. — 49. *C. pseudocyperus* L. var. *fascicularis* (SOLAND. ex BOOTT) BOOTT, b. — 52. *C. phacota* SPRENG., c. — 53. *C. pruinosa* BOOTT, d. — 54. *C. teres* BOOTT, e. — 56. *C. bilateralis* HAYATA, f. — 57. *C. brunnea* THUNB., g (a BRASS 9803, b EYMA 4709, c JERMY 4634, d VAN STEENIS 4624, e DE WILDE c.s. 13329, f BRASS 9515, g EYMA 3862).

Sirunki; E. Highlands, Aiyura, and Kainantu, Morobe Distr., Langiman R.). Distr. map in Acta Phytotax. Geobot. 18 (1959) 24.

Ecol. In wet places, pools, drains, etc., also open grassy area; 1500–2500 m.

Vern. *Kariandend*, Enga lang.

b. *ssp. transversa* (BOOTT) KERN, *stat. nov.* — *C. transversa* BOOTT, Perry Exp. 2 (1857) 324; III. 4 (1867) 202; FRANCH. & SAV. En. Pl. Jap. 2 (1879) 149, *incl. var. dissociata* FRANCH. & SAV.; FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris III, 10 (1898) 48, t. 3, f. 1; CLARKE, J. Linn. Soc. Bot. 36 (1904) 314; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 478; AKIYAMA, Car. Far East. Reg. Asia (1955) 145, t. 134; YOSHIKAWA, Ic. Jap. Carex 2 (1958) 258, t. 129. — *C. brownii* var. *transversa* KÜK. ex MATSUM. Index Pl. Jap. 2 (1905) 103; KÜK. Pfl. R. Heft 38 (1909) 614. — *C. furusei* KOYAMA, J. Jap. Bot. 30 (1955) 135, *pro C. brownii*  $\times$  *transversa*. — *C. brownii* var. *dissociata* KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 215. — Fig. 122.

Utricles ovoid-ellipsoid, up to 6 mm long, gradually narrowed into a c. 2 mm long beak.

Distr. Japan, Ryu Kyu Is., Korea, China (Yangtze valley region); in *Malesia*: New Guinea (W. Highlands, Sirunki).

Ecol. In New Guinea near water-course on clay soil, at c. 2500 m.

Note. The long-beaked utricles are so different from those of *C. brownii* s.s., that I prefer to treat this taxon as a subspecies, not as a variety of *C. brownii*.

44. *Carex oedorrh amph a* NELMES, Kew Bull. (1939) 659; *ibid.* (1949) 384; Reinwardtia 1 (1951) 396; *ibid.* 2 (1954) 381; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 83; Dansk Bot. Ark. 23 (1965) 261; KERN in BACK. & Bakh. f. Fl. Java 3 (1968) 490. — *C. tumida* BOOTT, III. 1 (1858) 66, t. 181; BOECK. Linnaea 41 (1877) 243; CLARKE, Fl. Br. Ind. 6 (1894) 741; J. Linn. Soc. Bot. 37 (1904) 16; KÜK. Pfl. R. Heft 38 (1909) 615; Bull. Jard. Bot. Btzg III, 16 (1940) 321, *non* BEILSCHM. 1850. — *C. olivacea* (*non* BOOTT) KÜK. Bot. Jahrb. 70 (Jan. 1940) 467; Bull. Jard. Bot. Btzg III, 16 (Feb. 1940) 321, *incl. var. altissima* KÜK.; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 70, *p.p.* — *C. oedorrh amph a* var. *arfakiana* OHWI, Bot. Mag. Tokyo 56 (1942) 214. — *C. oedorrh amph a* var. *microcarya* NELMES, Kew Bull. (1950) 204; Reinwardtia 1 (1951) 398. — Fig. 122.

Rhizome short, in large tussocks, without stolons. Stems tufted, slender, erect, triquetrous, smooth, 50–125 cm by 2–3 mm below. Leaves subbasal and 1–2 higher up the stem, about as long as the stem, flat, stiffish, long-acuminate, scabrous on margins and main nerves, 4–8 mm wide, few lowest reduced to reddish purple sheaths readily fraying into thin strips; ligula elongate, up to  $1\frac{1}{2}$  cm long. Spikelets 4–6, erect or subcernuous, upper approximate and fastigate, lower distant; terminal spikelet  $\delta$ , long-linear, subsessile, not or slightly exceeding the uppermost lateral spikelet, pale, 2–6 cm long, 1–2 mm thick, lateral spikelets  $\text{f}$ , narrowly cylindrical, densely flowered,  $2\frac{1}{2}$ –12 cm long, 4–6 mm thick, upper on shortly, lower on long-exserted, scabrid peduncles. Lower bracts

foliaceous, much exceeding the inflorescence, long-sheathing, upper more or less reduced. *Glumes* oblong to ovate-lanceolate, obtuse, translucent, glabrous or sparsely hispidulous,  $1\frac{3}{4}$ –2 mm long, whitish with 3-nerved, green, central stripe excurrent in a scabrid awn 1–2 mm long. *Utricles* ellipsoid, membranous, somewhat inflated, pluri-nerved, glabrous, obliquely erect to subpatent, olive-brown to fuscous,  $3\frac{3}{4}$  by  $1\text{--}1\frac{1}{2}$  mm, rather gradually narrowed into a  $1\text{--}1\frac{1}{2}$  mm long, conic-linear, smooth, minutely notched beak which is often somewhat swollen at or below the middle. *Nut* ellipsoid, triquetrous, yellow to brownish, shortly stipitate, distinctly beaked,  $(1\frac{1}{2}\text{--})2\text{--}2\frac{1}{4}$  by c. 1 mm. *Style* straight, thickened at the base. Stigmas 3.

Distr. E. Himalaya, S. China (Yunnan), N. Thailand, Tonkin, Assam; in *Malesia*: Sumatra (Atjeh; W. Coast Res.: Mt Kerintji), W. Java (Mt Papandajan), Moluccas (Buru), New Guinea.

Ecol. Wet places in forests, lake margins, swampy grasslands, 1200–2400 m.

Notes. BOOTT's figure, showing a distinct swelling in the middle of the beak (hence his specific epithet) is, according to CLARKE, taken from a not fully ripe collection. In mature utricles the lower half of the beak is cylindrical, somewhat swollen, the upper conic. In the specimens from Mt Kerintji the beak is scarcely swollen; they were distinguished as *var. microcarya* NELMES.

Besides to *C. olivacea* the species is closely related to *C. ischnostachya* STEUD. from Japan, which is easily distinguishable by the mucous glumes, but otherwise very similar.

45. *Carex olivacea* BOOTT, Proc. Linn. Soc. 1 (1846) 286; Ill. 1 (1858) 56, t. 149; CLARKE, Fl. Br. Ind. 6 (1894) 741; J. Linn. Soc. Bot. 37 (1904) 15; KÜK. Pfl. R. Heft 38 (1909) 617; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 70, p.p.; NELMES, Reinwardtia 1 (1951) 395; KOYAMA, Bot. Mag. Tokyo 72 (1959) 304; J. Fac. Sc. Un. Tokyo III, 8 (1962) 215; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 490.

*ssp. olivacea*. — Fig. 122, 133.

Rhizome stout, woody, emitting long, stout stolons. *Stems* stout, erect, triquetrous, smooth or scabrid on the angles above, 50–110 cm by up to 5 mm below. *Leaves* basal and subbasal, much exceeding the stems, flat, stiffish, long-acuminate, scabrous on the margins towards the top, the broader ones 1–2 cm wide; sheaths stramineous, somewhat spongy, deeply concave in front, ligule elongate, up to 5 cm long. *Spikelets* 4–9 (according to BOOTT up to 14), erect, long-cylindric, upper approximate, fastigate, lower somewhat distant; terminal spikelet ♂ (often with some ♀ flowers at the base), peduncled,  $5\frac{1}{2}$ –16 cm long and 5 mm thick, often a second, shorter ♂ spikelet added at



Fig. 133. *Carex olivacea* BOOTT in the Kerintji area, Westcoast of Sumatra, Rawal Bento, 1400 m altitude (MEIJER 6656, Aug. 1956).

the base, remaining spikelets ♀ (but usually with short ♂ apices), very densely flowered, sessile but lowest sometimes distinctly peduncled, up to 16 cm by 5–8 mm. Lower bracts foliaceous, much overtopping the inflorescence, semi-amplexicaul by dark auricles, upper shorter, usually none sheathing (lowest sometimes more or less sheathing). *Glumes* oblong, obtuse, vinaceous to dark red with 3-nerved, green,  $1\frac{1}{4}$ –3 mm long, central stripe excurrent in a scabrid awn  $\frac{3}{4}$ –3 mm long. *Utricles* obovoid or ellipsoid, membranous, much inflated when ripe, rugose when dry, slenderly plurinerved, patent or reflexed, glabrous, olive-brown,  $3\frac{1}{2}$ – $4\frac{2}{3}$  by  $1\frac{1}{2}$ –2 mm, suddenly narrowed into a short, conic, often recurved, minutely bidenticulate beak ciliate at the mouth. *Nut* obovoid or oblong-obovoid, triquetrous, beaked, stramineous to yellowish, c. 2 by 1 mm. *Style* straight, not or hardly thickened at the base. Stigmas 3.

Distr. NE. India; in *Malesia*: W. Sumatra (Mt Kerintji), W. Java (Telaga Bodas, once collected by H. O. FORBES in 1880). The record for

Indo-China (Reinwardtia 1, 1951, 396) refers to a collection of *C. nemostachya* STEUD. Distr. map in Bot. Mag. Tokyo 72 (1959) 304, f. 26 (the occurrence in Java erroneously indicated as comprising the whole western and central part of that island, the Sumatran locality unknown at the time).

Ecol. On Mt Kerintji in swamp at 1400 m altitude, at Telaga (= lake) Bodas "in warm water, 1500 m."

Notes. Closely related to 44. *C. oedorrhampha* NELMES, but much stouter, and distinguished from all other members of its section by its very wide leaves and very long spikelets.

*Ssp. confertiflora* (BOOTT) KOYAMA, Bot. Mag. Tokyo 72 (1959) 307; Phytologia 17 (1968) 413, t. 17 (*C. confertiflora* BOOTT in A. Gray, Bot. Jap. 1859, 418; Ill. 4, 1867, 184; *C. olivacea* var. *minor* KÜK. Pfl. R. Heft 38, 1909, 618), from Japan, and *ssp. recurvisaccus* (KOYAMA) KOYAMA, l.c. (*C. recurvisaccus* KOYAMA, J. Jap. Bot. 15, 1956, 166, f. 2), from China, Kwantung, differ but slightly from the typical subspecies.

### 17. Section Ferrugineae

[TUCKERM. En. Meth. (1843) 12, *nomen*]; ex BAILEY, Proc. Am. Ac. 22 (1886) 92, as group; NELMES, Reinwardtia 1 (1951) 409. — *Sect. Frigidae* FRIES *subsect. Ferrugineae* (BAILEY) KÜK. Pfl. R. Heft 38 (1909) 559.

Type species: *Carex ferruginea* SCOP.

46. *Carex brachyathera* OHWI, Jap. J. Bot. 7 (1934) 190; Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 332, f. 4, t. 8 f. 5; AKIYAMA, Car. Far East. Reg. Asia (1955) 133, t. 118; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 158, incl. var. *brevispiculosa* KOYAMA. — *C. breviculmis* var. *perciliata* (non KÜK.) RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 247. — *C. tricuspidata* KÜK. Bot. Jahrb. 70 (1940) 466, incl. var. *brevispiculosa* KÜK. et var. *minor* KÜK.; S. T. BLAKE, J. Arn. Arb. 28 (1947) 113; NELMES, Kew Bull. (1949) 384; Reinwardtia 1 (1951) 410. — Fig. 122, 132a.

Rhizome thick, woody, obliquely descending, sometimes elongated. *Stems* erect, somewhat cernuous at the top, triquetrous, smooth or slightly scaberulous just below the inflorescence, (5–)20–70 cm by 1–1½ mm, at the base covered with a thick mass of fibrous, brownish remains of leaf-sheaths. *Leaves* basal or 1–2 higher on the stem, shorter than the stem, flat, or involute when dry, stiffish, asperous, long-attenuate, 1–3½ mm wide. *Spikelets* 3–5, single at the nodes, erect to cernuous, often subfastigiate, rather densely flowered above, lax-flowered below, 1½–6 cm long, terminal one ♂, subclavate, 1–2 mm thick, long-peduncled, lateral ones ♀, linear-cylindric, 2½–3½ mm thick, on exserted, slender, smooth or antrorsely scabrid

peduncles. Lower bracts foliaceous, shorter to slightly longer than their spikelet, long-sheathing, upper reduced. *Glumes* oblong, often asymmetrical, truncate or emarginate, thin, brown, whitish hyaline at the top, 3–4½ mm long, with strong midrib excurrent in a hispidulous, up to 1 mm long awn. *Utricles* ellipsoid or ellipsoid-fusiform, obtusely compressed-trigonal, angled ventrally, membranous, nerveless except for 2 submarginal nerves, sparsely to rather densely subappressed-hispid, suberect, stipitate, 3–4½ by c. 1 mm, rather gradually narrowed into a stout, straight or slightly bent, bidentate, 1–1½ mm long beak with oblique, white-hyaline mouth. *Nut* ellipsoid, triquetrous, c. 2 by 1 mm. *Style-base* pyramidally thickened. Stigmas 3 (according to NELMES 2 or 3).

Distr. Ryu Kyu Is., Formosa; in *Malesia*: New Guinea (Mt Carstensz, Mt Wilhelmina in W., Mt Sarawaket in E.).

Ecol. In mountain grasslands, on steep rocks, seepages, sandy margins of streams, 3000–4000 m.

Notes. The New Guinea collections exhibit a high degree of variability in size, length of bracts, spikelets, and utricles, probably due to their growing at high altitude, often in uncongenial habitats. I do not see any reason to treat them as varietally distinct from the Formosan plants, as was

done by KOYAMA, on account of the longer bracts and — according to NELMES — sometimes digynous flowers.

To judge from its description and excellent

figure, *C. drepanorhyncha* FRANCH. Pl. David. 2 (1888) 141; Nouv. Arch. Mus. Hist. Nat. Paris III, 9 (1897) 178, t. 4, f. 1; KÜK. Pfl. R. Heft 38 (1909) 563, from Szechuan, is very near to *C. brachyathera*.

### 18. Section *Sylvaticae*

[TUCKERM. En. Meth. (1843) 12, *nomen*]; BOOTT *ex* MACKENZ. N. Am. Fl. 18 (1935) 283; NELMES, Reinwardtia 1 (1951) 402. — *Sect. Hymenochlaenae* DREJER *subsect. Debiles* (CAREY) KÜK. Pfl. R. Heft 38 (1909) 594, p.p.

Type species: *Carex sylvatica* HUDS.

47. *Carex finitima* BOOTT, Ill. 1 (1858) 44, t. 112; BOECK. Linnaea 41 (1877) 247; CLARKE, Fl. Br. Ind. 6 (1894) 736; KÜK. Pfl. R. Heft 38 (1909) 598, f. 101 E-H; NELMES, Kew Bull. (1949) 385, 391; *ibid.* (1950) 204; Reinwardtia 1 (1951) 403; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 218. — *C. remotiflora* HAYATA, Ic. Pl. Form. 10 (1921) 68, f. 45; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 446; AKIYAMA, Car. Far East. Reg. Asia (1955) 155, t. 148, f. 2. — *C. fusiformis* NEES *var. enervosa* KÜK. Bot. Jahrb. 70 (1940) 467. — *C. atjehensis* KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 314; in Fedde, Rep. 53 (1944) 105 ('*atjehensis*'). — Fig. 122.

Rhizome short. *Stems* tufted, erect, triquetrous, smooth, (10-)30-90 cm by 1-2 mm below, surrounded below the leaves by a few reddish bladeless sheaths. *Leaves* basal and 1-2 higher up the stem, shorter than to slightly exceeding the stem, flat, smooth except for the minutely scaberulous margins, long-attenuate, 2-8 mm wide. *Spikelets* 4-8(-12 according to BOOTT), linear-cylindric, terminal one ♂ or rarely gynaeandrous, peduncled, 1½-4½ cm by c. 1 mm (sometimes a smaller second ♂ spikelet added), remaining ones ♀, lax-flowered, erect or lower cernuous, upper approxi-

mate, lower remote, 2-9 cm by 3-7 mm; peduncles very slender, smooth or sparsely scaberulous above, lower long-exserted. Lower bracts foliaceous, slightly shorter than to much exceeding the inflorescence, long-sheathing, upper much reduced; sheaths pale to reddish brown. *Glumes* oblong-ovate, acute to very obtuse, 3½-4(-6) mm long, translucent, with broad, white margins and greenish midrib, the latter not reaching the apex but sometimes excurrent below the apex in a short, up to 1(-2) mm long awn. *Utricles* fusiform, trigonous, membranous, with 2 marginal nerves, otherwise nerveless or obscurely few-nerved, glabrous, smooth, obliquely erect, shining, light green, 5-7½ by 1-2 mm, rather gradually narrowed into a linear-cylindric, long, smooth beak with oblique, scariosus mouth. *Nut* ellipsoid or oblong-ellipsoid, triquetrous, finally dark brown, shortly stipitate, abruptly beaked, 2¼-3 by 1-1½ mm. *Style* thickened at the base. *Stigmas* 3, long, slender.

Distr. E. Himalaya, S. China (Szechuan, Yunnan), Formosa; in *Malesia*: N. Sumatra (Atjeh: Gajolands), E. New Guinea.

Ecol. Grassy and bushy slopes, alpine grasslands, 2400-3900 m.

### 19. Section *Folliculatae*

MACKENZ. in Britt. & Brown, Ill. Fl. ed. 2, 1 (1913) 353; N. Am. Fl. 18 (1935) 426. — *Sect. Orthocerates* KOCH *subsect. Folliculatae* (MACKENZ.) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 234.

Type species: *Carex folliculata* L.

48. *Carex michauxiana* BOECK. Linnaea 41 (1877) 336; CLARKE, J. Linn. Soc. Bot. 36 (1904) 298; KÜK. Pfl. R. Heft 38 (1909) 705; MACKENZ. N. Am. Fl. 18 (1935) 427; N. Am. Car. 2 (1940) t. 489; FERN. in Gray's Man. Bot. ed. 8 (1950) 375, f. 742; GLEASON, New Britt. & Brown Ill. Fl. 1 (1952) 358 f. — *C. rostrata* MICHX, Fl. Bor.-Am. 2 (1803) 173; BOOTT, Ill. 2 (1860) 91, t. 267; *non*

STOKES, 1787. — *C. abacta* L. H. BAILEY, Bull. Torr. Bot. Club 20 (1893) 427.

The Asiatic plants are distinguished as:

*var. asiatica* (HULTÉN) OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 491; AKIYAMA, Car. Far East. Reg. Asia (1955) 163, t. 158 f. 2; YOSHIKAWA, Ic. Jap. Carex 2 (1958) 268, t. 134; KOYAMA,

J. Fac. Sc. Un. Tokyo III, 8 (1962) 235; KERN, *Blumea* 13 (1965) 125. — *C. michauxiana* ssp. *asiatica* HULTÉN, Kungl. Svenska Vet. Ak. Handl. 5 (1927) 207, f. 14, t. 223; *Phytologia* 17 (1968) 417, t. 19. — *C. michauxiana* f. *asiatica* (HULTÉN) AKIYAMA, J. Fac. Sc. Hokkaido Imp. Un. 5 (1932) 220, f. 162. — *C. dolichocarpa* C. A. MEY. ex KREZ. in Komar. Fl. U.R.S.S. 3 (1935) 458, 623. — Fig. 122, 131a.

Rhizome short, thick. *Stems* densely tufted, stiffly erect, slender, trigonous, smooth, at the base clothed with the remains of old leaf-sheaths, 20–60 cm by 1–2 mm. *Leaves* subbasal, shorter to longer than the stems, firm, flat, long-attenuate, scabrid towards the apex, light green, 2–5 mm wide; sheaths tight, white-hyaline ventrally, ligule as long as wide. *Inflorescence* consisting of 1 terminal ♂ spikelet and (1–)2–4 ♀ spikelets. Bracts long-sheathing, leaf-like, the lower overtopping the inflorescence; sheaths concave at the mouth. ♂ *Spikelet* (see note) shortly peduncled or subsessile, few-flowered, 8–20 by 1½–2½ mm; glumes oblong-ovate, acute, yellowish brown with 3-nerved green centre and hyaline margins; upper ♀ spikelets subsessile, crowded and sometimes hiding the ♂ one (see note), the lower 1–2 remote, on slender, more or less exerted, erect, smooth peduncles, subglobose or broadly ovoid, 5–20-flowered, 15–25 mm long and wide. *Glumes* ovate, acutish, hyaline with conspicuously 4–5-nerved centre, ½–¾ as long as the utricule. *Utricles* at first appressed-ascending, soon divergent, lanceolate-subulate, obtusely trigonous, subcoriaceous, glabrous, many-nerved, stipitate, spongy at the base,

shining yellowish green, (8–)12–13 by 1½–2 mm, gradually tapering into the scabrid bidentate beak; teeth erect, ⅓ mm. *Nut* trigonous with convex sides, oblong-ovoid, shortly stipitate, shining yellow, c. 3 by 1½ mm. *Style* continuous with the nut, tortuous, subincrassate at the base. Stigmas 3.

Distr. The typical variety in northeastern N. America, the var. *asiatica* in eastern Asia: S. Kamchatka, Kuriles, Yezo, Hondo, China (Shanghai); in *Malesia*: E. New Guinea.

Ecol. In swamps, bog grasslands, 2250–2650 m. Vern. *Tudik*, Mendi lang., *koale*, Enga lang.

Notes. The differences between the American plants and the Asiatic ones are but slight, and it is questionable whether recognition of two geographical races is justified. In the few American specimens I could examine the ♂ spikelet does not overtop the upper ♀ ones (but this is not rarely also the case in Asiatic specimens!), the leaves are slightly narrower (2–3 mm wide), the ♀ glumes 3-nerved, and the utricles in general somewhat smaller. I fail to see the difference in the relative length of the glumes mentioned by KOYAMA. If the detailed description by MACKENZIE, *l.c.*, refers to American plants only, the distinction of two varieties seems unjustified, as the Asiatic plants almost completely fall within the limits of variation there given.

It is worth noticing that most of the terminal spikelets in the Mt Giluwe specimens are not strictly ♂, but bear some ♀ flowers at the top. Sometimes the ♂ spikelet is either inconspicuous or absent.

A northern element in the New Guinea mountain flora.

## 20. Section *Pseudocypereae*

[TUCKERM. En. Meth. (1843) 13, *nomen*]; ex BAILEY, Proc. Am. Ac. 22 (1886) 69, as group; KÜK. Pfl. R. Heft 38 (1909) 693. — *Sect. Orthocerates* KOCH *subsect. Pseudocypereae* (BAILEY) KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 234.

Type species: *Carex pseudocyperus* L.

49. *Carex pseudocyperus* LINNÉ, Sp. Pl. 2 (1753) 978; BOOTT, Ill. 4 (1867) t. 451, 452; BOECK, Linnaea 41 (1877) 321; KÜK. Pfl. R. Heft 38 (1909) 695.

In *Malesia* only:

var. *fascicularis* (SOLAND. ex BOOTT) BOOTT, Ill. 4 (1867) 41; KÜK. Pfl. R. Heft 38 (1909) 696; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 234; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 490. — *C. fascicularis* SOLAND. ex BOOTT in Hook. f. Fl. Nov. Zel. 1 (1853) 283; BOOTT, Ill. 1 (1858) 53, t. 139, 140; S. T. BLAKE, J. Arn. Arb. 28 (1947) 116; NELMES, Reinwardtia 1 (1951) 393. — *C. pseudocyperus* (non L.) R. BR. Prod. (1810) 243;

BENTH. Fl. Austr. 7 (1878) 448; CLARKE, J. Linn. Soc. Bot. 37 (1904) 16. — Fig. 122, 132b.

Rhizome very short, woody. *Stems* stout, tufted, erect, triquetrous with flat or slightly concave sides, smooth except just below the inflorescence, surrounded below the leaves by a few bladeless, somewhat fibrous sheaths, 50–150 cm by 3–4 mm. *Leaves* subbasal, longer than the stems, flat, stiffish, rough-margined, conspicuously septate-nodulose, long-acuminate, light or yellowish green, 6–10 mm wide. *Spikelets* 3–7, usually close together (lowest 1–2 sometimes distant), the terminal ♂, peduncled, 3–7 mm thick, the lateral ♀, cylindrical, very densely flowered, 2½–5 cm long and 7–15 mm thick, the upper shortly peduncled, the lower on slender,

smooth or scabrid peduncles at length pendulous. Lower bracts leaf-like, far exceeding the inflorescence, scarcely sheathing (occasionally long-sheathing in distant spikelets), upper subfoliaceous to setaceous, not sheathing. *Glumes* oblong or oblong-spathulate, obtuse, translucent, eventually ferruginous, with 3-nerved green centre, ciliate above, 2–2½ mm, excurrent into a flat, antrorsely scabrous awn 2–4 mm long. *Utricles* ovoid or ovoid-lanceolate, obscurely trigonous, strongly and densely many-nerved, coriaceous, glabrous, when ripe widely spreading or even reflexed, somewhat inflated, distinctly stipitate (stipe 2/3–1 mm, in some Australian specimens up to 1½ mm), greenish to stramineous, 4–5(–7) by 1–1½ mm, tapering above into a 1½–2 mm long, smooth, deeply 2-cleft beak (teeth c. 1 mm, divergent). *Nut* obovoid or ellipsoid, triquetrous, scarcely stipitate, golden or brown, 1½–1⅔ by 1(–1⅓) mm. *Style* continuous with the nut, contorted. Stigmas 3.

Distr. *Carex pseudocyperus* in the circumscription here accepted shows an almost worldwide distribution. The typical variety is widely distributed in the northern hemisphere (Eurasia

from W. Europe to Kashmir and Japan, N. Africa, eastern N. America). Other varieties occur in North and South America; *var. fascicularis* in Australia (Tasmania to Queensland) and in New Zealand, in Malasia: New Guinea (W. New Guinea: Lake Habbema, Wissel Lake region; Terr. of New Guinea: W. Highlands, Kandep valley; Yobobos grassland area; Lake Inin). Specimens of this variety in BM and K are labelled "Java, Horsfield"; recent collections from this island are not extant.

Ecol. In pools and swamps, along lakes, riversides; 1750–3225 m.

Vern. *Kwai'a'reh, koali*, Enga lang., Kepilam.

Notes. *Var. fascicularis* differs from *var. pseudocyperus* in its darker, ferruginous glumes, its subinflated utricles with more divergent teeth to their beaks and longer stipe, and its contorted style.

The varieties certainly represent geographical races and might therefore better be considered subspecies. They are often treated at specific level, but the differences are so slight that it is here preferred to follow BOOTT (1867) and KÜENTHAL (1909).

## 21. Section *Occlusae*

CLARKE, Kew Bull. add. ser. 8 (1908) 147; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 55, 87; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 169. — *Sect. Scleriticulmes* NELMES, Kew Bull. (1951) 121; Reinwardtia 1 (1951) 407; KOYAMA, J. Jap. Bot. 29 (1954) 44; Act. Phytotax. Geobot. 16 (1955) 108.

Type species: *Carex maubertiana* BOOTT.

50. *Carex maubertiana* BOOTT, Ill. 1 (1858) 45, t. 114; CLARKE, J. Linn. Soc. Bot. 36 (1904) 297; CAMUS, Fl. Gén. I.-C. 7 (1922) 200, f. 29, 5–8; NELMES, Reinwardtia 1 (1951) 408; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 87; KOYAMA, Act. Phytotax. Geobot. 16 (1955) 39; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 489. — *C. hebecarpa* C. A. MEY. *var. lachnosperma* CLARKE, Fl. Br. Ind. 6 (1894) 747, *quoad specim.*, non *C. lachnosperma* NEES. — *C. hebecarpa var. maubertiana* FRANCH. Nouv. Arch. Mus. Hist. Nat. Paris III, 10 (1898) 70; KÜK. Pfl. R. Heft 38 (1909) 745. — *C. hebecarpa var. ligulata* (non KÜK.) BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 69. — Fig. 122, 131g.

Rhizome very short. *Stems* tufted, erect, triquetrous, smooth, for the greater part hidden by the leaf-sheaths, 40–60 cm by 2–3 mm. *Leaves* of normal length only in the upper half of the stem, exceeding the inflorescence, flattish to strongly revolute, stiff, greyish green, asperous above towards the long-attenuated apices, 3–7 mm wide, merging above into the foliaceous lower bracts and below into short-bladed to bladeless, purplish,

rather tight sheaths; ligule obtuse, membranous, ferruginous. *Spikelets* 4–9, erect or suberect, cylindrical, dense-flowered, 1½–4 cm long, upper approximate, fastigate, on included or shortly exerted peduncles, lower somewhat distant, on scarcely to long-exserted, scabrid peduncles; terminal spikelet ♂, 1–2 mm thick, sometimes a second, smaller ♂ spikelet added; remaining spikelets ♀, 4–6 mm thick. Lower bracts foliaceous, exceeding the inflorescence, their sheaths hispidulous especially near the mouth, upper much reduced. *Glumes* ovate, obtuse to acutish, transparent, glabrous or hispidulous at the top, pale with hyaline margins and 3-nerved, greenish central stripe, covered with resinous flecks and streaks, mucicous or mucronulate, 1½–2½ mm long. *Utricles* ellipsoid, trigonous, submembranous, obliquely patent, with 2 marginal nerves displaced on to the dorsal face, densely white-hispid, broadly stipitate, 3–3¾ by 1¼–1¾ mm, abruptly narrowed into a c. 1 mm long, bidentate, finally somewhat upcurved beak. *Nut* ellipsoid, triquetrous, c. 2 mm long. *Style-base* thickened. Stigmas 3.

Distr. Himalaya, Annam, China (Hupeh); in *Malesia*: Sumatra (Atjeh; W. Coast Res.: Mt Kerintji), W. and E. Java (Priangan; Besuki), E. Borneo (Berouw: Mt Ilas Mapulu), New Guinea

(Morobe Distr., near Bulolo). Distr. map in Act. Phytotax. Geobot. 16 (1955) 38.

Ecol. Primary forests, forest-borders, bushy slopes, 400–2100 m.

## 22. Section Longispicae

CLARKE, J. Linn. Soc. Bot. 37 (1904) 3; NELMES, Reinwardtia 1 (1951) 417.

Type species: *Carex graeffeana* BOECK.

51. *Carex graeffeana* BOECK. Flora 58 (1875) 123; CLARKE, J. Linn. Soc. Bot. 37 (1904) 5; Philip. J. Sc. 2 (1907) Bot. 107; KÜK. Pfl. R. Heft 38 (1909) 403; Philip. J. Sc. 6 (1911) Bot. 62; in Hochr. Candollea 6 (1936) 433; Bot. Jahrb. 69 (1938) 264; MERR. Philip. J. Sc. 5 (1910) Bot. 335; En. Philip. 1 (1923) 138; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 62; NELMES, Kew Bull. (1938) 109, incl. var. *samoensis* NELMES; *ibid.* (1955) 317; KERN in BACK. & BAKH. f. Fl. Java 3 (1968) 494; STEEN. Mt. Fl. Java (1972) pl. 14–9. — *C. rechingeri* PALLA, Oest. Bot. Z. 57 (1904) 424. — *C. philippinensis* NELMES, Kew Bull. (1938) 109; *ibid.* (1949) 385, 392; Reinwardtia 1 (1951) 419; *ibid.* 2 (1954) 381. — *C. exploratorum* NELMES, Kew Bull. (1938) 108; Reinwardtia 1 (1951) 418. — *C. pandanus* OHWI, Bot. Mag. Tokyo 56 (1942) 214. — *C. euphlebia* S. T. BLAKE, J. Arn. Arb. 28 (1947) 108, f. 3C. — Fig. 122, 131j.

Rhizome short, woody, forming large clumps. Stems densely tufted, stoutish, erect, triquetrous, scabrid on the angles at the top, 30–110 cm by up to 4 mm below, surrounded below the leaves by shining brown to blackish red sheaths splitting into herring-bone-shaped fibres. Leaves basal and subbasal, often 1–2 higher up the stem, stiff, subcoriaceous, flat but margins often revolute, scabrid on the nerves, long-attenuate, greyish or glaucous-green, much overlapping the stems, 3–12 mm wide. Bracts not sheathing, 2–3 lower ones foliaceous, semi-amplexicaul and blackish red auricled at the base, middle ones subfoliaceous, upper ones reduced to long-awned glumes. Spikelets (6–)10–15(–50), single or binate at the nodes, upper approximate, fastigiate, subsessile, lower more distant, on capillary, scabrid, up to 5 cm long peduncles, more or less nodding, all androgynous or 1(–2) at the base of the uppermost much smaller and wholly ♂, exceptionally terminal spikelet wholly ♂, linear-cylindric, (3–)6–13 cm long, very densely flowered, the ♂ part occupying the upper  $\frac{1}{4}$ – $\frac{1}{2}$ , 1–3 mm thick, the ♀ part 4–6 mm thick. Glumes ovate or oblong-ovate, obtusish, purplish black, with wide, 3-nerved, greenish central stripe and very narrow hyaline margins,  $1\frac{1}{2}$ –2(– $2\frac{1}{2}$ ) mm long, excurrent in a hispid, short mucro sometimes 1 mm long. Utricles elliptic or obovate-elliptic, biconvex or plano-convex, multinerved, longer than (rarely about as long as) the glumes, finally divaricate, not stipitate, somewhat acuminate at the

top but scarcely beaked, often puncticulate, sometimes minutely and sparsely setulose at the truncate or emarginate mouth,  $1\frac{1}{2}$ – $2\frac{1}{2}$  by  $\frac{9}{10}$ – $1\frac{1}{4}$  mm. Nut elliptic or obovate, biconvex, brown,  $1\frac{1}{2}$ – $1\frac{3}{4}$  by  $\frac{1}{2}$ – $1\frac{1}{4}$  mm. Style short, not thickened towards the base. Stigmas 2.

Distr. W. Polynesia (Samoa, Fiji Is.) and *Malesia*: New Guinea (incl. New Britain), Philippines (Luzon, Negros, Leyte, Mindanao), N. Borneo (Mt Kinabalu), Lesser Sunda Is. (Flores), W. Java (Mt Gedeh).

Ecol. On slopes in open places, on open banks of streams, in peaty alpine grasslands, and in mossy forest; on Mt Gedeh at 1600–1800 m, in the Philippines at 1500–2200 m (once collected at 400 m), on Mt Kinabalu at 1200 m, in New Guinea between 800 and 3800 m.

Vern. *Ilateum*, S; Philippines: *alajas*, Buk., *bagibi*, *giron*, Bag., *kigid*, Bon., *sidak*, *silak*, Ig.

Notes. NELMES (1938) distinguished between *C. graeffeana* (Fiji) with its var. *samoensis* (Samoa), *C. philippinensis* (Java, Philippines, New Guinea), and *C. exploratorum* (Borneo), mainly using width of leaves, number and length of spikelets, and size of utricles as specific characters. For the New Guinea specimens two more specific names are available, *C. pandanus* OHWI and *C. euphlebia* S. T. BLAKE. From NELMES's later publications it is clear that the characters used for discrimination are by far not so constant as was originally supposed. There is indeed considerable variation in the specimens collected in New Guinea or in the Philippines, and even in those from the only Javanese locality. The utricles are remarkably small in the Fiji specimens, but not in those from Samoa (the latter NELMES in 1955 no longer treated as varietally distinct.) *Carex exploratorum* is only known from the type collection (Mt Kinabalu, CLEMENS 34297), in which the much compressed, sterile, and elongate utricles are apparently diseased. The few well-developed, nut-bearing utricles hardly differ from those of the other *Malesian* materials. The glumes are larger than usual, but not until more Kinabalu specimens are available will it be possible to judge of their taxonomical value.

On Mt Pulog (Luzon) the lower spikelets are often branched into a raceme of secondary spikelets, the total number of spikelets reaching up to c. 50.

23. Section *Praelongae*

(KÜK.) NELMES, Reinwardtia 1 (1951) 421; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 52, 55. — *Sect. Acutae* FRIES *subsect. Praelongae* KÜK. Pfl. R. Heft 38 (1909) 345.

Type species: *Carex praelonga* CLARKE.

52. *Carex phacota* SPRENG. Syst. 3 (1826) 826; NEES in Wight, Contr. (1834) 126; KUNTH, En. 2 (1837) 420; DREJER, Symb. Caric. (1844) 15, t. 4, *excl. syn. C. notha et C. punctata*; BOOTT, Ill. 1 (1858) 63, t. 168; BOECK. Linnaea 40 (1876) 434; CLARKE, Fl. Br. Ind. 6 (1894) 708; J. Linn. Soc. Bot. 37 (1904) 6 (*'phacodes'*); KÜK. Pfl. R. Heft 38 (1909) 350, f. 56A-C; Philip. J. Sc. 6 (1911) Bot. 62; MERR. En. Philip. 1 (1923) 140; KÜK. in Hochr. Candollea 6 (1936) 431; Bull. Jard. Bot. Btzig III, 16 (1940) 317; OHWI, Bot. Mag. Tokyo 56 (1942) 214; S. T. BLAKE, J. Arn. Arb. 28 (1947) 107; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 62; NELMES, Reinwardtia 1 (1951) 426; *ibid.* 2 (1954) 382; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 55; Dansk Bot. Ark. 23 (1965) 257; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 494; STEEN. Mt. Fl. Java (1972) 48a, pl. 14-7. — *C. lenticularis* D. DON, Trans. Linn. Soc. 14 (1824) 331; Prod. Fl. Nepal. (1825) 43; *non* MICHX, 1803. — *C. platycarpa* HOCHST. *ex* STEUD. Syn. 2 (1855) 214. — *C. hexasticha* REINW. *ex* MIQ. Fl. Ind. Bat. 3 (1857) 353, *p.p.* — *C. pruinosa* var. *aristata* O. K. Rev. Gen. Pl. 2 (1891) 748. — Fig. 122, 132c.

Rhizome short. Stems tufted, slender, erect, triquetrous, smooth or sparsely scaberulous just below the inflorescence, 20–120 cm by 1–3 mm, surrounded below the leaves by a few ferruginous to dark brown, bladeless sheaths split into fine, sometimes reticulate fibres. Leaves subbasal and occasionally 1–2 higher up the stem, shorter to much longer than the stems, stiff, with strongly revolute margins, gradually attenuated, 3–8 mm wide. Spikelets 4–6, rarely more, subapproximate or the lowest more distant, cylindrical, 2–8(–10) cm, terminal wholly ♂ or with a few ♀ flowers, erect, 1½–4½ mm thick, remainder androgynous (♂ part short) or wholly ♀, 4–6 mm thick, lower usually nodding on slender, smooth or scabrid, long peduncles. Lower bracts foliaceous, much overtopping the inflorescence, upper ones much smaller, none sheathing, but dark brown auricled at the base. Glumes oblong, obtuse, truncate, or bilobed-emarginate, thinly membranous, ferruginous to castaneous, or pale with reddish flecks, 1¼–3 mm long, with 3-nerved central stripe excurrent in a wide, scaberulous-margined awn ½–2 mm long. Utricles elliptic, obovate, or suborbicular, compressed-biconvex, membranous, nerveless, narrowly marginate, glabrous, densely beset with ferruginous or reddish, raised glandular papillae, obliquely erect, shortly stipitate, 2¼–3(–3½) by 1½–2¼ mm; beak extremely short,

entire. Nut pyriform to suborbicular, compressed-biconvex, broadly stipitate and beaked, 1¾–2 by 1¼–1¾ mm. Style thickened at the base. Stigmas 2.

Distr. Ceylon, Himalayan region, N. Thailand, S. & E. China, Korea, Formosa, Ryu Kyu Is., and Japan; in *Malesia*: Sumatra, Java, Lesser Sunda Is. (Flores), Philippines (Luzon), N. Celebes, and New Guinea.

Ecol. In open damp places, swampy grassland, 1500–2700 m.

On Mt Diëng (Java) VAN STEENIS (1972, *l.c.*) observed in the shallow crater marsh Telaga Pongan that it formed in a stand of *Scirpus mucronatus* L. large, solid, hummocky tussocks, 75 cm high and 50 cm thick, similar as do *C. paniculata* L. and the grass *Molinia caerulea* (L.) MOENCH. in Europe and *C. secta* BOOTT ('nigger-head') in New Zealand. This peculiar habit is obviously for a large part developing with a fluctuating water-level. — (Ed.)

Vern. New Guinea: *int*, *koole*, *kwajare*, *Enga*, *tsineme*, *Mendi*, *gogowe*, *Kapauku*, *yaguogufa*, *Okapa*, *tsiri ku*, Upper Kangel valley.

53. *Carex pruinosa* BOOTT, Proc. Linn. Soc. 1 (1845) 255; Trans. Linn. Soc. 20 (1846) 131; Ill. 1 (1858) 65, t. 174; STEUD. Syn. 2 (1855) 213; MIQ. Fl. Ind. Bat. 3 (1856) 352; CLARKE, Fl. Br. Ind. 6 (1894) 709; J. Linn. Soc. Bot. 34 (1898) 111; *ibid.* 37 (1904) 7, *excl. syn.*; KÜK. Pfl. R. Heft 38 (1909) 352; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 62, *excl. f. tristigmatosa* BACK.; NELMES, Reinwardtia 1 (1951) 428; KOYAMA, Bot. Mag. Tokyo 72 (1959) 300, 306; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 56; Dansk Bot. Ark. 23 (1965) 258; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 494. — *C. hexasticha* REINW. *ex* MIQ. Fl. Ind. Bat. 3 (1857) 353, *p.p.* — *C. pruinosa* f. *submutica* O. K. Rev. Gen. Pl. 2 (1891) 748. — Fig. 123, 132d.

Closely related to 52. *C. phacota* SPRENG., from which it is distinguished by the following characters:

Glumes lanceolate or elliptic, acute to obtusish (but not truncate-emarginate), mucicous or (the lower ones) excurrent in a short awn up to 1 mm long. Utricles slightly larger, 3–4 mm long, dorsally slenderly 2–5-nerved, ventrally 1–3-nerved, the glandular papillae usually whitish. Spikelets more approximate, fastigiate, and suberect to subcernuous, ¾–5½ cm long. Leaves greyish green to glaucous, 2–6 mm wide; sheaths not splitting into fibres.

Distr. Assam, Annam, NE. Thailand; in *Malesia*: Java (West: several localities in Priangan;

Central: Diëng plateau; East: Jang plateau). In the Leyden Herbarium there is a sheet labelled "Sumatra, WAITZ", but WAITZ probably did not visit this island. See Fl. Males. I, 1 (1950) 554. KÜENTHAL's record for the Moluccas (Buru) refers to a collection of *C. phacota*; see there. The rather different *ssp. maximowiczii* (MIQ.) KÜK. (*C. maximowiczii* MIQ.) in Japan and Korea; see KOYAMA, l.c., with map.

Ecol. Swamps, damp grassy places, along streams, 1500–2500 m.

Notes. According to BACKER l.c., 52. *Carex phacota* and *C. pruinosa* would be connected by intermediates, but I have not seen any transitional forms and I find the two clearly distinct.

*Carex pruinosa* f. *tristigmata* BACK. belongs to 39. *C. maculata* BOOTT.

54. *Carex teres* BOOTT, Ill. 1 (1858) 62, t. 167, excl. *utriculo imo*; BOECK. Linnaea 40 (1876) 393; CLARKE, Fl. Br. Ind. 6 (1894) 707; J. Linn. Soc. Bot. 34 (1898) 110; KÜK. Pfl. R. Heft 38 (1909) 348; KERN in BACK. & BAKH. f. Fl. Java 3 (1968) 494. — *C. teres* var. *spathulata* KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 316. — *C. phacota* (non SPRENG.) KÜK. l.c. — *C. spathulata* NELMES, Kew Bull. (1950) 207; Reinwardtia 1 (1951) 423. — *C. kemiriensis* NELMES, Kew Bull. (1950) 206; Reinwardtia 1 (1951) 422. — *C. pecticalis* NELMES, Kew Bull. (1950) 205; Reinwardtia 1 (1951) 424. — Fig. 123, 132e.

Probably loosely tufted on a woody, ascending rhizome. Stems erect, stiff, triquetrous, smooth, 50–120 cm by 2–3 mm, at the base surrounded by bladeless to short-bladed, brownish to dark sheaths fraying into fine reticulate fibres. Leaves subbasal, crowded in the lower  $\frac{1}{3}$  of the stem, flattish with revolute margins, stiff, 4–7(–11) mm wide. Spikelets 4–8, cernuous, upper subapproximate, fastigate, lower more separated, gynaeandrous usually with short ♂ base, or lower wholly ♀, cylindrical, dense-flowered but often laxer at the base, 3–6(–8) cm long, the ♀ part 5–9 mm thick, the ♂ part 2–3(–5) mm, upper on short, lower on long, smooth peduncles. Lower bracts foliaceous, much to little exceeding the inflorescence, upper setaceous to glumiform, none sheathing but dark-auricled at the base. Glumes elliptic-oblong or oblong-obovate, subobtusate to very obtuse, truncate or bilobed,  $2\frac{1}{2}$ – $3\frac{1}{2}$  mm long, dark red with wide, 3-nerved, pale central stripe excurrent in a flat, more or less

hispidulous awn up to  $1\frac{3}{4}$  mm long. Utricles ovate to elliptic, plano-convex, membranous, obscurely to distinctly 3–5-nerved on each face, straight, patulous, stramineous, usually densely covered with purplish flecks and minutely granular-punctulate, scarcely stipitate, gradually beaked, 3–4(– $4\frac{1}{2}$ ) by  $1\frac{1}{2}$ –2 mm; beak short,  $\frac{1}{2}$ – $\frac{3}{4}$  mm long, entire or slightly emarginate. Nut broadly elliptic or suborbicular, compressed-biconvex,  $1\frac{1}{2}$ – $2\frac{1}{2}$  mm long, brown, shortly stipitate and beaked. Style slightly thickened at the base. Stigmas 2, short.

Distr. E. Himalaya; in Malesia: Sumatra (Atjeh: Mt Kemiri, Mt Losir, Senubong Mts; W. Coast: Mt Ophir, Mt Singgalang, Mt Kerintji), W. Java (Mt Papandajan).

I have not seen KERR 21031 from Laos, Pu Bia, the type collection of *C. kemirii* NELMES, Kew Bull. (1939) 304; *ibid.* (1946) 7, 28; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 175; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 56. From the description I infer that it is not specifically distinct from *C. teres*.

Ecol. In marshes, damp mountain meadows and heaths, in ericoid forest, in Sumatra between 2100 and 3500 m, in Java at 2300 m.

Notes. Variable, particularly as to the size of spikelets and utricles, and the nervation of the latter, but I do not see how to distinguish between the three "endemic species" into which NELMES split up the rather scanty Malesian materials. According to him *C. spathulata* differs from *C. teres* principally in its stouter and shorter spikelets, *C. pecticalis* from *C. spathulata* by its longer inflorescence (11–13 versus 7–10 cm), longer spikelets (3–6 versus 2– $4\frac{1}{2}$  cm), and shorter utricles ( $2\frac{3}{4}$ – $3\frac{1}{2}$  versus  $3\frac{1}{2}$ – $4\frac{1}{2}$  mm) with shorter beak. *Carex kemiriensis*, only known from a single collection, is said to differ by the densely papillose utricles, a difference I am unable to find.

KÜENTHAL thought the Sumatran and Javan plants to be varietally distinct from the continental Asian ones by the reticulate-fibrous basal sheaths, the shorter spikelets, the spatulate glumes, and slightly larger utricles. However, in the type collection of *C. teres* the basal sheaths are distinctly fibrous-reticulate and the glumes variable in shape, just like in the Malesian plants (see also BOOTT's figure!).

Provisionally I prefer to include both the Indian and Malesian materials in the variable *C. teres*, a mountain species with a broken-up area.

#### 24. Section *Carex*

*Sect. Vulgares* (ASCHERS.) NELMES, Reinwardtia 1 (1951) 429.

Type species: *Carex acuta* (L.)

55. *Carex gaudichaudiana* KUNTH, En. 2 (1837) 417; CLARKE, J. Linn. Soc. 37 (1904) 6; KÜK. Pfl. R. Heft 38 (1909) 312; Bot. Jahrb. 69 (1938) 264,

incl. var. *humilior* KÜK.; OHWI, Bot. Mag. Tokyo 56 (1942) 215; S. T. BLAKE, J. Arn. Arb. 28 (1947) 107; KOYAMA, Act. Phytotax. Geobot. 18 (1959)

22, f. 28. — *C. caespitosa* (non L.) R. BR. Prod. (1810) 243. — *C. vulgaris* FR. var. *gaudichaudiana* BOOTT, Ill. 4 (1867) 169, t. 567; BENTH. Fl. Austr. 7 (1878) 442. — *C. vulgaris* (non FR.) F.V.M. Fragm. 8 (1874) 257. — *C. lacevans* KÜK. Pfl. R. Heft 38 (1909) 326; NELMES, Kew Bull. (1949) 385, 392; Reinwardtia 1 (1951) 430. — Fig. 123.

Rhizome emitting short to rather long, horizontal stolons clothed with reddish, ribbed scales. *Stems* erect, triquetrous, scabrid above, 3–40 (–75) cm by 1–1½ mm. *Leaves* subbasal, often longer than the stem, somewhat rigid, flat or canaliculate, scabrid on the margins, 1½–4 mm wide, with involute margins when dry, the lower reduced to reddish to blackish red sheaths. *Spikelets* 3–6, approximate to rather distant, cylindrical, terminal ♂, 1–4 cm by 2–3 mm, peduncled, sometimes a second smaller one immediately under it also ♂, remainder ♀ (or sometimes with a few ♂ flowers at the top), sessile or lowest very shortly peduncled, suberect, (1–)2–4(–6) by 3–4(–6) mm, densely flowered. Lower bracts foliaceous, usually overtopping the inflorescence, not sheathing, dark-auricled at the base, upper much reduced. *Glumes* ovate or oblong-ovate, obtuse to rather acute, reddish to blackish red, with a central 3-nerved pale stripe, 2–3½ mm long, the midrib sometimes very shortly excurrent. *Utricles* elliptic, ovate, or ovate-lanceolate, compressed, plano-convex, obliquely erect, submembranous, strongly 5–7(–9)-nerved on the dorsal, 3–5-nerved on the ventral face, glabrous, green, becoming brownish, often minutely reddish-punctulate especially towards the apex, scarcely stipitate, subabruptly beaked,

2–3(–3½) by 1–1½ mm; beak short, entire or bidenticulate. *Nut* elliptic, obovate, or suborbicular, compressed, biconvex or plano-convex, shortly stipitate and apiculate, brown, 1½–2 mm long. *Style* not or scarcely thickened at the base. *Stigmas* 2.

Distr. Australia (Tasmania to Queensland) and New Zealand to E. China and Japan; in *Malesia*: throughout New Guinea. Distr. maps: DURJETZ, Act. Phytogeogr. Succ. 13 (1940) 219; KOYAMA, Act. Phytotax. Geobot. 18 (1959) 24.

Ecol. Open marshes, edges of lakes, marshy banks of streams, boggy alpine grasslands, 1450–3800 m.

Vern. New Guinea: *kwajare*, *lebandili*, Enga, *taua-tane*, Tari.

Notes. Very similar to *C. nigra* (L.) REICH., a common European and N. American species, and sharing with it an extreme polymorphism. *Carex gaudichaudiana* is characterized by the strongly nerved, more distinctly beaked utricles, and the lower bracts usually exceeding the terminal spikelet.

The type of *C. gaudichaudiana* is from Australia. The Asiatic plants have been distinguished as var. *thunbergii* (STEUD.) KÜK. Pfl. R. Heft 38 (1909) 313. — *C. thunbergii* STEUD. Flora 29 (1846) 23; Syn. 2 (1855) 221 (type from Japan).

The differences between the Australian plants and the Asiatic ones are but slight; see KOYAMA, l.c.

*Carex appendiculata* (TRAUTV.) KÜK. Pfl. R. Heft 38 (1909) 338 from E. Siberia, according to KOYAMA also only a variety of *C. gaudichaudiana*, is *C. nigra* (L.) REICH.

## 25. Section *Graciles*

[TUCKERM. En. Meth. (1843) 10]; ex KÜK. Bot. Jahrb. 27 (1899) 516, *quoad basion.*; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 464; NELMES, Reinwardtia 1 (1951) 353; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 52, 57; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 161. — *Sect. Hymenochlaenae* DREJER *subsect. Graciles* (KÜK.) KÜK. Pfl. R. Heft 38 (1909) 599.

Type species: *Carex gracilis* R. BR.

56. *Carex bilateralis* HAYATA, Mat. Fl. Form. (1911) 380; Ic. Pl. Form. 6 (1916) 127, f. 40 e–i; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 471, p.p.; AKIYAMA, Car. Far East. Reg. Asia (1955) 105, t. 84, f. 2; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 163. — *C. subteinogyna* OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 469, f. 17 & t. 15, f. 22; AKIYAMA, Car. Far East. Reg. Asia (1955) 102. — *C. spathaceo-bracteata* KÜK. Bot. Jahrb. 70 (1940) 466; NELMES, Reinwardtia 1 (1951) 356. — *C. acrophila* S. T. BLAKE, J. Agr. Arb. 28 (1947) 114; NELMES, Kew Bull. (1949) 382; Reinwardtia 1 (1951) 354. — *C. asperinervis* KOYAMA, Act. Phytotax. Geobot. 16 (1955) 6, t. 3,

f. U–V & f. W (ut *C. subteinogyna*). — Fig. 123, 132f.

Rhizome very short, woody. *Stems* tufted, slender, erect, trigonous, smooth except on the angles above, 20–90 cm by ¾–1½ mm, surrounded below the leaves by shining, fuscous to blackish, bladeless sheaths tending to split in front into reticulate fibres. *Leaves* shorter to longer than the stems, rigid, conduplicate, keeled, often flexuous at the long-attenuate top, scabrid, 1–2½ mm wide when flattened out. *Inflorescence* with 4–6 fascicles of (1–)2–3(–5) spikelets, narrow, 5–15 cm long; fascicles approximate or lower somewhat distant. *Spikelets* erect (or some possibly slightly cernuous),

linear-cylindric, simple, rather densely flowered, androgynous (♀ part considerably longer than to subequalling the ♂ part), 1–4 cm long, upper sessile or subsessile on included peduncles, lower on included to long-exserted, smooth or scaberulous peduncles. Lower bracts setaceous, shorter than longer than their fascicles but usually much shorter than the inflorescence, suddenly widening into a spathaceous, strongly nerved, reddish brown base with membranous margins clasping the base of the spikelets, with ampliate, short or long sheaths; upper bracts much reduced. *Glumes* slightly shorter than utricles, oblong-lanceolate, acute to very obtuse, translucent, glabrous or very sparsely hispidulous on the midrib towards the apex, 3-nerved in the centre, ferruginous to fuscous with rather wide, whitish-hyaline margins, muticous or apiculate, 4–6 mm long. *Utricles* narrowly elliptic, plano-convex (occasionally trigonous), membranous, slenderly multinerved, suberect, reddish brown, whitish-hispidulous on the margins in the upper half and often on the nerves,  $3\frac{1}{2}$ – $5\frac{1}{2}$  (– $6\frac{1}{4}$ ) by  $1$ – $1\frac{1}{2}$  mm, contracted below into a stout, stipe-like base  $\frac{1}{2}$ –1 mm long, rather gradually narrowed into a bidenticulate,  $1\frac{1}{4}$ – $1\frac{3}{4}$  mm long beak. *Nut* elliptic, oblong-elliptic, or oblong-obovate, compressed-biconvex (occasionally trigonous), not stipitate, shortly beaked, brown,  $1\frac{3}{4}$ – $2\frac{1}{4}$  by  $1$ – $1\frac{1}{3}$  mm. *Style-base* slightly thickened. *Stigmas* 2 (occasionally 3), 3–7 mm long.

*Distr. Malasia:* New Guinea (Carstensz Mts, Lake Habbema, Mt Wilhelmina, Star Mts in W., Morobe Distr., Mt Sarawaket in E.).

*Ecol.* Alpine grasslands, marshy hollows, high mountain ridges, (2100?–)3000–4050 m.

57. *Carex brunnea* THUNB. Fl. Jap. (1784) 38; SCHUHR, Riedgr. 2 (1806) 16, t. Xx f. 111; BOECK. Linnaea 39 (1875) 145; CLARKE, Fl. Br. Ind. 6 (1894) 705; J. Linn. Soc. Bot. 37 (1904) 5; Philip. J. Sc. 2 (1907) Bot. 107; KÜK. Pfl. R. Heft 38 (1909) 599; in Fedde, Rep. 8 (1910) 8, *incl. var. subteinogyna* KÜK.; Philip. J. Sc. 6 (1911) Bot. 63; CAMUS, Fl. Gén. I.-C. 7 (1922) 194; MERR. En. Philip. 1 (1923) 137; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 466; NELMES, Kew Bull. (1950) 201, *incl. var. dolichocarpa* NELMES; Reinwardtia 1 (1951) 357; Kew Bull. 2 (1955) 309; RAYMOND, Mém. Jard. Bot. Montréal n. 53 (1959) 58; KOYAMA, Micronesica 1 (1964) 109, *incl. var. meyenii* (NEES) KOYAMA; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 493. — *C. gracilis* R. Br. Prod. (1810) 242, *non* CURT. 1777; KUNTH, En. 2 (1837) 513; BOOTT, Ill. 1 (1858) 59, t. 154–156; BENTH. Fl. Austr. 7 (1878) 442. — *C. meyenii* NEES, Nova Acta Nat. Cur. 19, Suppl. 1 (1843) 123; KRAUSS, Pac. Sc. 4 (1950) 264–267, f. 8–9. — *C. hattoriana* NAKAI ex TUYAMA, Bot. Mag. Tokyo 49 (1935) 508, t. 15; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 466; AKIYAMA, Car. Far East. Reg. Asia (1955) 103, t. 82, f. 1; KOYAMA, J. Fac. Sc. Un.

Tokyo III, 8 (1962) 164. — *C. kanehirae* OHWI, Act. Phytotax. Geobot. 8 (1939) 67; J. Jap. Bot. 18 (1942) 138. — *C. spadicico-vaginata* OHWI, Bot. Mag. Tokyo 56 (1942) 215. — *C. teinogyna* (*non* BOOTT) BACK. Bekn. Fl. Java (em. ed.) 1 (1949) fam. 246, p. 61. — *C. buruensis* NELMES, Kew Bull. (1950) 201; Reinwardtia 1 (1951) 360; *ibid.* 2 (1954) 379. — *C. megacarpa* KOYAMA, Bot. Mag. Tokyo 69 (1956) 210, f. 2. — Fig. 123, 132g.

Rhizome very short, woody. *Stems* tufted, slender, erect, triquetrous, smooth, or scaberulous on the angles above, (10–)30–100 cm by  $\frac{1}{2}$ – $1\frac{1}{2}$  mm, surrounded below the leaves by dull brown bladeless sheaths tending to split in front into reticulate fibres. *Leaves* subbasal, shorter than longer than the stems, rigid, flattish or conduplicate, rarely subfiliform, usually asperous above, gradually attenuated towards the apex, (1–)2–6 mm wide. *Inflorescence* with (2–)4–8 fascicles of 2–7 spikelets (rarely all the spikelets solitary), narrow, erect or more or less nodding, c. 5–50 cm long, upper fascicles or spikelets approximate and some fastigate, lower rather distant, one of the spikelets at each node (especially at the lower ones) usually longer than the others and with some smaller spikelets branching from it. *Spikelets* erect or suberect, cylindric or narrowly cylindric, rather densely to rather loosely flowered, androgynous (♀ part usually much longer and thicker than the ♂ part, 2–4 mm thick),  $1$ – $4\frac{1}{2}$  cm long, upper sessile or subsessile on included or shortly exserted peduncles, lower on long-exserted, smooth or scaberulous peduncles. Lower bracts foliaceous or subfoliaceous, longer than their fascicles but usually shorter than the inflorescence, long-sheathing, upper bracts much reduced. *Glumes* from much shorter than to almost as long as the utricles, ovate to ovate-lanceolate, acute to obtuse, glabrous, obsoletely nerved but distinctly 3-nerved in the centre, muticous or apiculate, rarely an awn to 2 mm present, light castaneous, sometimes with whitish-hyaline margins, 2–4(–5) mm long. *Utricles* ovoid to oblong-elliptic, plano-convex, membranous, prominently multinerved, shortly whitish setulose at least on the margins, suberect, cinnamonaceous to castaneous, cuneately tapering to a  $\frac{1}{2}$ –1 mm long stipe, subabruptly beaked,  $2\frac{1}{2}$ –5(–6) by  $1$ – $1\frac{1}{2}$  mm; beak  $\frac{1}{2}$ –2 mm, bidenticulate. *Nut* ovate or oblong-ovate, compressed-biconvex, scarcely stipitate and beaked, stramineous,  $1\frac{1}{2}$ – $2\frac{1}{2}$  by  $1$ – $1\frac{1}{4}$  mm. *Style-base* slightly thickened. *Stigmas* 2 (or rarely 3), up to about as long as the utricles.

*Distr.* Widely distributed from Madagascar and the Mascarene Is. to Ceylon, India, Farther India, China, Japan, the Hawaiian Is., New Caledonia, Australia (New South Wales and Queensland); in *Malasia:* New Guinea, Moluccas (Buru), Philippines (Luzon, Bohol, Negros, Mindanao), Celebes, Lesser Sunda Is. (Lombok, Sumbawa, Flores), NW. Borneo (Sarawak), Java (a few localities in

W., Central & E.), N. Sumatra (Pajakumbuh; Gajolands: Ketambe).

Ecol. Primary forest, mossy forest, exposed ridges, grassy slopes, (80–)800–2800(–3100) m, in Lombok in monsoon forest scrub on dry calcareous soil, 200–400 m, in W. Sumatra on limestone hills.

Vern. Philippines: *selak*, Ig., *tayalid*, Bag.

Notes. As will be seen from the above description *C. brunnea* in the sense accepted here is extremely polymorphic, which is to be expected in so wide-ranging a species. Especially Japanese taxonomists have split it up into several micro-species and infraspecific taxa among which I do not see sharp distinctions. To me it is even very doubtful whether 59. *C. teinogyne* and 56. *C. bilateralis*, both closely related to *C. brunnea*, but which I have decided to treat provisionally as separate species, can be upheld as such in future.

Typical *C. brunnea*, described from Japan, has small, broadly ovate, c. 2½ mm long utricles subtended by distinctly shorter glumes. Malesian specimens approaching this have only been found in N. Luzon.

According to KOYAMA (1962) the greater part of the Malesian specimens belong to *C. hattoriana* NAKAI ex TUYAMA, occurring from Bonin and Formosa through Malesia to Australia. To him it is quite distinct from *C. brunnea* by the strikingly large utricles 4–4½ mm long, the longer glumes, and the larger ♂ part of the spikelets.

*Carex spadiceo-vaginata* OHWI, from New Guinea, is said to differ from *C. brunnea* by its looser spikelets, sparsely setulose, 3 mm long utricles with longer beak.

The type of *C. buruensis* NELMES is a very delicate plant with almost filiform leaves and reduced inflorescences, which may be due to the habitat. Essential differences with *C. brunnea* I cannot find. It is connected with broader-leaved specimens of *C. brunnea* by a collection from New Guinea, which to NELMES “represents a new variety or perhaps a new species”.

I share the opinion of KOYAMA that *C. meyenii* NEES (*C. brunnea* ssp. *meyanii* (NEES) KOYAMA) differing from typical *C. brunnea* by the lanceolate, 3–4½ mm long, long-beaked utricles setulose only on the margins, falls within the variability of *C. brunnea*, but refrain from maintaining it as a subspecies. I also agree with KOYAMA in the reduction of *C. kanehirae* OHWI from Micronesia, to *C. brunnea*. I expect that several other ‘species’ described from Japan and the Pacific will have to be reduced to the polymorphic *C. brunnea*.

*Carex brunnea* var. *subteinogyne* KÜK. (non *C. subteinogyne* OHWI), from the Philippines was described as having looser spikelets, lighter coloured, longer, acuminate glumes 5 mm long, and very long-beaked and sparsely setulose utricles with longer stipe. NELMES (1950) altered this

circumscription considerably so as to cover also specimens from Celebes and New Guinea, and described moreover a var. *dolichocarpa* NELMES with 5–5¾ mm long utricles from Java. The latter variety is undoubtedly the same as *C. megacarpa* KOYAMA. I fail to see how to draw a line between the two varieties.

The collection DE WILDE 14068 from the Gajolands often has 3 styles and accordingly trigonous (fertile) nuts, and the terminal spikelets are wholly ♂. This might be a hybrid with 20. *C. verticillata*. — (NOOT.)

58. *Carex longipes* D. DON, Trans. Linn. Soc. 14 (1825) 329; DREJER, Symb. Caric. (1844) 24, t. 10; MIQ. Fl. Ind. Bat. 3 (1856) 347; BOOTT, Ill. 4 (1867) 190; BOECK. Linnæa 40 (1876) 376; CLARKE, Fl. Br. Ind. 6 (1894) 704; J. Linn. Soc. Bot. 34 (1898) 108; *ibid.* 36 (1903) 295; KÜK. Pf. R. Heft 38 (1909) 603; Bot. Jahrb. 70 (1940) 467, *incl. var. ramosa* KÜK.; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 61; NELMES, Reinwardtia 1 (1951) 361; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 58; KERN in BACK. & Bakh. f. Fl. Java 3 (1968) 493; STEEN. Mt. Fl. Java (1972) pl. 14–6. — Fig. 123, 134.

Rhizome very short. *Stems* tufted, slender, erect, trigonous, smooth except on the angles above, 15–80 cm by 1–1½ mm, surrounded below the leaves by the fibrous, brownish remains of old leaf-sheaths. *Leaves* subbasal, rarely one higher up the stem, shorter to somewhat longer than the stem, flat, scabrid, 1½–6 mm wide. *Inflorescence* very lax, with up to 7 spikelets, 10–40 cm long. *Spikelets* single at the nodes, erect or the lower circinnous, cylindrical, simple or the lower 1–3 branched near the base, lax-flowered, androgynous (♀ part much longer than the very short ♂ part), rarely wholly ♀, 1–3½(–4½) cm by 4–6 mm, upper approximate, sessile, or subsessile on shortly exerted peduncles, lower distant on filiform, minutely scabrid, usually long-exserted peduncles, the lowest often near the base of the stem. Lower bracts foliaceous, shorter than inflorescence, long-sheathing, upper much reduced. *Glumes* 3–4 mm, shorter than the utricles, ovate-lanceolate to lanceolate, acute or subtruncate to bilobed-emarginate, pale ferruginous with whitish hyaline margins, glabrous, with darker 3-nerved central stripe, the midnerve excurrent in a stoutish, straight, antorsely scabrid, up to 5 mm long awn often overtopping the utricule. *Utricles* elliptic, compressed, biconvex, membranous, dorsally strongly 6–9-nerved, less distinctly nerved ventrally, glabrous and smooth or rarely the margins setulose, straight, obliquely erect, scarcely stipitate, pale green, fully ripe yellowish to light brown, shining, subabruptly long-beaked, 5–7 by 1½–2 mm; beak sparsely hispid above, 2–3 mm long, deeply bidentate (teeth ½–¾ mm). *Nut* broadly elliptic to ovate, biconvex, stipitate, abruptly beaked, 2½–3 by 1½–

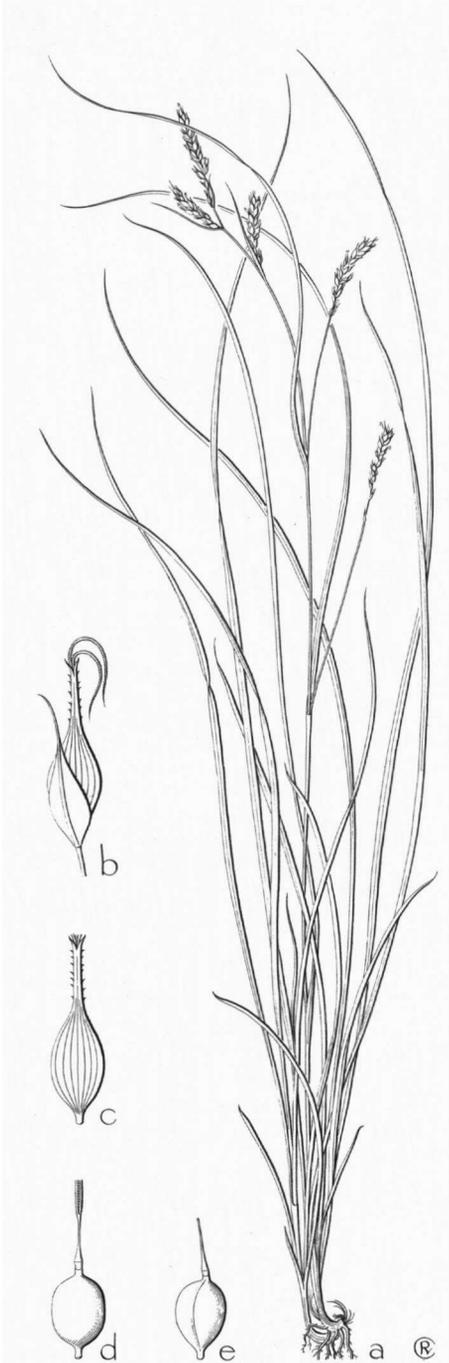


Fig. 134. *Carex longipes* D. DON. a. Habit,  $\times \frac{1}{2}$ , b. young fruit with utricule in axil of bract, c. fruit in utricule, d-e. fruits, all  $\times 7$  (VAN STEENIS 6788).

$1\frac{3}{4}$  mm. *Style* distinctly thickened at the base, subsistent. *Stigmas* 2, shorter than the utricule.

Distr. Nepal and India to China (Hupeh) and Indo-China (Tonkin); in *Malesia* very rare: Java (a few localities in W., Central and E.), Celebes (Menado, Poso, top of G. Lumut), and NE. New Guinea (Sattelberg).

Ecol. In forests, along forest-trails, on swampy mountain meadows, 1500-2200 m.

59. *Carex teinogyna* BOOTT, Ill. 1 (1858) 60, t. 158; BOECK. *Linnaea* 39 (1875) 145; CLARKE, Fl. Br. Ind. 6 (1894) 705; KÜK. Pfl. R. Heft 38 (1909) 602, f. 102 F-H ('*teinogyna*'), incl. var. *scabriculum* KÜK.; Bull. Jard. Bot. Btzig III, 16 (1940) 320, excl. pl. jav.; NELMES, Reinwardtia 2 (1954) 378; Mém. Mus. Hist. Nat. Paris n.s. B4 (1955) 146; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 59; KOYAMA, Bot. Mag. Tokyo 72 (1959) 307; J. Fac. Sc. Un. Tokyo III, 8 (1962) 162. — *C. scabriculum* OHWI, Act. Phytotax. Geobot. 2 (1933) 27; Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 468; AKIYAMA, Car. Far East. Reg. Asia (1955) 102, t. 80; YOSHIKAWA, Ic. Jap. Carex 2 (1958) 246, t. 123. — *C. brunnea* (non THUNB.) NELMES, Kew Bull. (1950) 200. — Fig. 123.

Rhizome very short, woody. *Stems* tufted, slender, erect, triquetrous, smooth or scabrid on the angles above, 20-60 cm by  $\frac{1}{2}$ -1 mm, surrounded below the leaves by spadiceous sheaths ultimately fraying into persistent fibres. *Leaves* subbasal, shorter to slightly longer than the stems, flat to conduplicate, stiff, long-attenuate, asperous especially in the upper part, 2-3(-4) mm wide. *Inflorescence* with 3-6 fascicles of 1-3 spikelets, narrow, 10-20 cm long, upper fascicles approximate, lower more distant. *Spikelets* erect, mostly simple, rarely branched at the base, lax-flowered, androgynous ( $\varnothing$  part longer than the  $\sigma$  one), upper on scarcely, lower on shortly to rather long-exserted, smooth or scabrid peduncles, up to 3 cm long. Lower bracts foliaceous, longer than their fascicles but usually shorter than the inflorescence, long-sheathing, upper much reduced. *Glumes* about as long as utricles, oblong-lanceolate, acuminate, acute, translucent, glabrous, ferruginous, sometimes with pale-hyaline margins above, muticous or with an awn up to 2 mm long,  $3\frac{1}{2}$ -5 mm long. *Utricules* elliptic, plano-convex or compressed-biconvex, membranous, slenderly multinerved, suberect, castaneous, whitish appressed-hispidulous, cuneate-stipitate, subabruptly beaked,  $3\frac{1}{2}$ - $4\frac{1}{2}$  (-5) by  $1-1\frac{1}{3}$  mm; stipe  $\frac{1}{3}$ - $\frac{1}{2}$  mm; beak  $1\frac{1}{2}$ -2 mm, bidentate. *Nut* elliptic to oblong-elliptic, compressed-biconvex, not stipitate, shortly beaked, brown,  $2(-2\frac{1}{2})$  by  $1(-1\frac{1}{4})$  mm. *Style-base* slightly thickened. *Stigmas* 2, very long (7-12 mm), flexuous, persistent.

Distr. Assam, Upper Burma, S. China (Hunan), Tonkin, Annam, Japan (Honshu, Shikoku,

Kyushu), Korea (Quelpaert); in *Malesia*: N. Sumatra (Atjeh: Leuser; Gajolands: Mt Kemiri and Sangir Valley).

Ecol. Rocky riverbanks, ravines, 200–1150 m. Note. Sometimes the glumes of the ♂ flowers cup-shaped, the margins connate in front.

## 26. Section Paludosae

[FRIES, Fl. Scan. (1835) 190, *pro grege*; TUCKERM. En. Meth. (1843) 14; O. F. LANG, Linnaea 24 (1851) 618]; BAILEY, Proc. Am. Ac. 22 (1886) 74, as group; KÜK. Pfl. R. Heft 38 (1909) 730. — *Subsect. Lacustres* CAREY in Gray, Man. (1848) 561. — *Sect. Tumidae* MEINSH. Act. Hort. Petrop. 18 (1901) 283, 376.

Type species: *Carex paludosa* GOODEN.

Insufficiently known

### 60. *Carex* sp.

Rhizome woody, emitting stout stolons covered with pale sheaths. *Stem* rather stout, triquetrous, smooth, leafy, c. 60 cm by 3 mm. *Leaves* basal, overtopping the stem, long-attenuate, flat or somewhat folded lengthwise, septate-nodulose, glaucous-green, subcoriaceous, c. 5 mm wide; ligule lanceolate, acute, c. 1½ cm long; margins smooth below, scabrid above; lower sheaths strongly septate-nodulose, not fibrous, stramineous or light brown. *Inflorescence* erect, consisting of 4 spikelets. Terminal *spikelet* ♂, c. 1½ cm long, 2 mm wide, lateral spikelets ♀, erect, cylindrical, densely flowered, the upper 2 approximate, subsessile, the lowest distant on a smooth, 1½ cm long peduncle. Bracts foliaceous overtopping the inflorescence, not or scarcely sheathing. *Glumes* of the ♀ flowers ovate, deeply emarginate at the top, pale with purplish margins, c. 3 mm long, the

strong midrib excurrent in a firm, smooth or scabrid awn about as long as the glume; glumes of the ♂ flowers similar, more oblong, purplish with pale centre. *Utricles* young, lanceolate, glabrous, many-nerved, 5–5½ by 1½ mm, rather gradually narrowed into the stout, straight, bidentate beak with straight, ⅓ mm long teeth. *Style* straight, ciliolate, c. 2 mm, not thickened at the base. Stigmas 3, longer than the style.

Distr. *Malesia*: New Guinea: Western Highlands, Sirunki, swamp near Nanguris village, in fast flowing very deep water course (water depth approx. 230 cm), at c. 2500 m, 14 Sept. 1962: WALKER ANU 691 (CANB).

Note. Only a single, immature specimen was collected. The plant is related to the Eurasian *C. riparia* CURT., from which it differs by the narrower leaves, the small, single ♂ spikelets, and the deeply incised ♂ and ♀ glumes, and to the Japanese *C. rugulosa* KÜK. (not seen).

## II. Subgenus Vignea

(BEAUV.) CLARKE, Fl. Br. Ind. 6 (1894) 700; KÜK. Bot. Jahrb. 27 (1899) 495; Pfl. R. Heft 38 (1909) 111; NELMES, Reinwardtia 1 (1951) 431. — *Vignea* BEAUV. in Lestib. Ess. Fam. Cyp. (1819) 22.

Type species: *Carex arenaria* L.

### 27. Section Divisae

[CHRIST, Bull. Soc. Bot. Belg. 24 (1885) 18, *nomen*]; (KÜK.) KÜK. Pfl. R. Heft 38 (1909) 119; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 234. — *Sect. Capituligerae* KÜK. *subsect. Divisae* CHRIST ex KÜK. Bot. Jahrb. 27 (1899) 500.

Type species: *Carex divisiva* HUDS.

61. *Carex duriuscula* C. A. MEY. Mém. Ac. St. Pétersb. 1 (1831) 214, t. 8; KUNTH, En. 2 (1837) 373; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 234. — *C. stenophylla* WAHLENB. var. *duriuscula* TRAUTV. Act. Hort. Petrop. 10 (1887–

89) 537; KÜK. Pfl. R. Heft 38 (1909) 121. — *Carex* sp. NELMES, Kew Bull. (1949) 386; Reinwardtia 1 (1951) 446.

Rhizome creeping, slender, c. 1 mm thick, clothed with brown sheathing scales. *Stems* erect

or curved, trigonous, smooth, or scaberulous below the inflorescence, 7–15 cm by *c.* 1/2 mm. *Leaves* subbasal, shorter than the stems, rigid, curved, circinnate at the apex, canaliculate to convolute, smooth or scaberulous towards the apex, *c.* 1 mm wide. *Spikelets* 4–7, androgynous ( $\delta$  part about as long as the  $\text{♀}$ ), sessile, approximate, elliptic-lanceolate (very young), subdense-flowered, 5–7 mm long, forming a more or less oblong head 1–1 1/2 by *c.* 1/2 cm. Bracts glumiform, the lower long-awned. *Glumes* oblong-lanceolate or ovate-lanceolate, acutish, very thin, translucent, castaneous with broad whitish-hyaline margins, 3 1/2–4 mm long, the midrib not extending to the apex to very shortly excurrent. *Utricles* (very immature) elliptic, plano-convex, nerveless, glabrous, scabrid on the margins in the upper half, 3–4 by *c.* 1 mm, tapering above into a short beak

with oblique mouth. Stigmas 2, about as long as the utricule.

Distr. Siberia, N. Mongolia and Manchuria; in *Malesia*: New Guinea, Lake Habbema (BRASS 9235) in W., Mt Victoria (LAE 61670) and Kondo, Mt Hagen (NGF 43535) in E.

Ecol. In New Guinea in sunny bog and alpine grassland, 2400–3225 m.

Note. NELMES, *l.c.*, supposed this New Guinea collection to be close to *C. arenicola* F. SCHMIDT, but I agree with S. T. BLAKE, *J. Arn. Arb.* 28 (1947) 116, that it is evidently allied to *C. stenophylla* WAHLENB. of the northern hemisphere. The resemblance to small, narrow-leaved specimens of the latter is surprising. I have seen extra-Malesian material of *C. duriuscula*; the BRASS collection very well matches the collection I saw of this species, which is apparently very near to *C. stenophylla*.

### 28. Section Paniculatae

[KUNTH, *En.* 2 (1837) 389, *nomen*]; MEINSH. *Act. Hort. Petrop.* 18 (1901) 281, 313; KÜK. *Pfl. R. Heft* 38 (1909) 174; NELMES, *Reinwardtia* 1 (1951) 432. — *Sect. Muricatae* FRIES *subsect. Paniculatae* KUNTH *ex* KÜK. *Bot. Jahrb.* 27 (1899) 515.

Type species: *Carex paniculata* L.

62. *Carex appressa* R. BR. *Prod.* (1810) 242; KUNTH, *En.* 2 (1837) 389; KUNZE, *Suppl. Riedgr.* (1840–50) 45, t. 11; BOOTT, *Ill.* 1 (1858) 46, t. 119, 120; BOECK. *Linnaea* 39 (1875) 99; KÜK. *Pfl. R. Heft* 38 (1909) 178, f. 29 E–J; *Bot. Jahrb.* 69 (1938) 261; OHWI, *Bot. Mag. Tokyo* 56 (1942) 214; S. T. BLAKE, *J. Arn. Arb.* 28 (1947) 101; NELMES, *Kew Bull.* (1949) 386, 392; *Reinwardtia* 1 (1951) 432; *Kew Bull.* 2 (1955) 318. — *C. paniculata* (*non* L.) BENTH. *Fl. Austr.* 7 (1878) 440. — Fig. 123.

Rhizome short, stout, woody, forming very dense clumps. *Stems* densely tufted, erect, triquetrous (often very acutely so), rigid, scabrid on the angles above (see note), 30–180 cm by 2–4 mm, surrounded below the leaves by spadicous, dark-nerved, bladeless sheaths and their fibrous remains. *Leaves* in the lower 1/4–1/3 of the stem, shorter than the stem, very stiff, flat to conduplicate, long-acuminate, with very scabrous margins, pale green, 3–10 mm wide. *Inflorescence* a slender, oblong-cylindric, contracted, spike-like panicle, 5–25 by 1–2 cm; branches numerous, erect, often appressed or even partly adnate to the stems, upper crowded, lower approximate or slightly distant. Bracts inconspicuous, setaceous, lower sometimes as long as the branches, upper reduced to glumes. *Spikelets* very numerous, sessile, androgynous, ovoid or ovoid-lanceolate, few-flowered ( $\delta$  and  $\text{♀}$  parts about equal in length), 4–8 mm long. *Glumes* ovate, acute, thin and

translucent, with ciliolate margins, otherwise glabrous, slenderly nerved, ferruginous to castaneous with hyaline margins, 2–3 mm long, the midrib often excurrent in a short mucro up to 1/2 mm long. *Utricles* ovate, plano-convex, with obtuse margins, coriaceous, 6–12-nerved dorsally, 3–6-nerved ventrally, glabrous, distinctly setulose-margined above, subpatent, stramineous to dark brown, rounded at the spongy-thickened base, shortly stipitate, subabruptly beaked, 2 1/2–3 1/2 by 1 1/4–2 mm; beak 1/2–1 mm long, bidentate, grooved on the back, with slightly oblique mouth. *Nut* ovate to obovate, compressed-biconvex, broadly stipitate, beakless or shortly beaked, 1 1/4–1 3/4 by *c.* 1 mm. Stigmas 2.

Distr. Widespread in Australia, also in New Zealand and New Caledonia; in *Malesia*: New Guinea (Arfak Mts, Lake Habbema in W. and Western Highlands, Finisterre Range, Mt Sarawaket, in E.).

Ecol. Open marshes, shores of lakes, alpine meadows, 1900–3225 m, on Mt Sarawaket as low as 900 m.

Vern. *Kwajare*, Enga.

Note. The stems are sometimes smooth or almost so:

*var. virgata* (SOL. *ex* BOOTT) KÜK. *Pfl. R. Heft* 38 (1909) 179 (*C. virgata* SOL. *ex* BOOTT in Hook. *f. Fl. Nov. Zel.* 1 (1853) 282; *Ill.* 1 (1858) 46, t. 121, 122; BOECK. *Linnaea* 39 (1875) 98.) — Only known from New Zealand and Tasmania.

## 29. Section Multiflorae

[KUNTH, En. 2 (1837) 387, *nomen*]; (CAREY) BAILEY, Proc. Am. Ac. 22 (1886) 135, as group; KÜK. Pfl. R. Heft 38 (1909) 142; NELMES, Reinwardtia 1 (1951) 433; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 19. — Sect. *Vigneae* BEAUV. *subsect. Multiflorae* CAREY in Gray, Man. Bot. N. Un. St. (1848) 540. — Sect. *Muricatae* FRIES *subsect. Multiflorae* KÜK. Bot. Jahrb. 27 (1899) 514.

Type species: *Carex multiflora* MUEHL. ex WILLD.

63. *Carex nubigena* D. DON, Trans. Linn. Soc. 14 (1825) 326; NEES in Wight, Contr. (1834) 120; KUNTH, En. 2 (1837) 385; BOOTT, Ill. 1 (1858) 1, t. 2; BOECK. Linnaea 39 (1875) 90; CLARKE, Fl. Br. Ind. 6 (1894) 702; J. Linn. Soc. Bot. 37 (1904) 5, *incl. var. fallax* CLARKE; KÜK. Pfl. R. Heft 38 (1909) 145, *incl. var. fallax* KÜK.; in Hochr.

Candollea 6 (1936) 430; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 60; NELMES, Reinwardtia 1 (1951) 434, *excl. specim. Sumatrae*; KOYAMA, Bot. Mag. Tokyo 72 (1959) 302; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 494; STEEN. Mt Fl. Java (1972) pl. 14-1. — *C. fallax* STEUD. [in Zoll. Syst. Verz. (1854) 60]; Syn. 2 (1855) 189;



Fig. 135. *Carex nubigena* D. DON in tufts around a shallow depression (sawahan), probably the site of an old silted-up crater, covered with a heavily deer-grazed, very short turf of herbs and grasses subject to frost in the dry season; background some scattered *Casuarina junghuhniana* MIQ. Mixed with tussocks of *Pennisetum alopecuroides* (L.) SPR. East Java, Mt Jang, c. 2000 m altitude (VAN STEENIS, 1936).

MIQ. Fl. Ind. Bat. 3 (1856) 347; BOECK. Linnaea 39 (1875) 57; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 247 (var. *franchetiana* OHWI). — Fig. 123, 135.

Rhizome short, woody, forming dense tufts. *Stems* erect, slender but rigid, smooth or slightly scaberulous just below the inflorescence, obtusely trigonous, 20–60(–100) cm by 1–3 mm, clothed below the leaves by brownish to pale, bladeless sheaths and their fibrous remains. *Leaves* subbasal, shorter to longer than the stems, rigid, canaliculate to conduplicate, with scabrid margins,  $1\frac{1}{2}$ –3 mm wide. *Inflorescence* pyramidal to oblong, head-like or spike-like, 1–3(–5) cm by 7–13 mm. *Spikelets* 5–10(–15), crowded, or lowest 1–2 sometimes slightly separated, ovoid to subglobose, sessile, androgynous (with very few ♂ flowers), 5–10 by 5–7 mm. Lower 2–3 bracts foliaceous, membranous-margined at the base, erect or curved, lowest much exceeding, other equalling to exceeding the inflorescence, upper much reduced to glume-like, none sheathing. *Glumes* ovate to oblong-lanceolate, acutish, very thin, translucent, ferruginous to whitish hyaline, with brownish to greenish, 3-nerved central stripe,  $2\frac{1}{4}$ – $3\frac{1}{2}$  mm long, with a mucro up to 1 mm long. *Utricles* ovate or

ovate-lanceolate, plano-convex, membranous, strongly many-nerved on both faces, winged, glabrous, obliquely erect, greenish to brown, spongy-thickened at the base, shortly stipitate, subgradually beaked,  $3\frac{1}{2}$ – $4\frac{1}{2}$  by  $1\frac{1}{3}$ –2 mm; beak c.  $1\frac{1}{2}$  mm, serrulate-margined, dorsally grooved, bidentate. *Nut* elliptic to suborbicular, biconvex, broadly stipitate, shortly beaked,  $1\frac{1}{4}$ – $1\frac{3}{4}$  by  $\frac{1}{5}$ –1 mm. *Style-base* not or scarcely thickened. *Stigmas* 2 (according to BOOTT occasionally 3).

Distr. From Ceylon, S. India and the Himalaya to China (Hupeh, Yunnan), Formosa and Japan; in *Malesia*: Java (Central: Diëng Plateau; East: Mts Kawi, Tengger-Semeru & Jang). Distr. map in Bot. Mag. Tokyo 72 (1959) 302, f. 23 (the area in *Malesia* should be restricted to Central and East Java!).

Ecol. Marshy places, along streams, according to BACKER 1600–3000 m, sometimes gregarious. On Mt Jang deer feed on this species of which the leaf-bases have a sweet taste, as in *Gahnia javanica* (VAN STEENIS, l.c.).

Note. The immature collection LAE 65208 from New Guinea (W. slope of Mt Kenive, 9° 10' S and 147° 45' E) might possibly be referred to this species. — (NOOT.)

### 30. Section *Stellulatae*

KUNTH, En. 2 (1837) 399; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 253; NELMES, Reinwardtia 1 (1951) 441. — *Sect. Elongatae* KUNTH *sensu* KÜK. Pfl. R. Heft 38 (1909) 226, p.p.

Type species: *Carex stellulata* GODEN.

64. *Carex echinata* MURR. Prod. Stirp. Gotting. (1770) 76; BOECK. Linnaea 39 (1875) 124; BENTH. Fl. Austr. 7 (1878) 439. — *C. stellulata* GODEN. Trans. Linn. Soc. 2 (1794) 144; KÜK. Pfl. R. Heft 38 (1909) 228. — *C. nubigena* (non DON) KÜK. Bull. Jard. Bot. Btzig III, 16 (1940) 314. — *C. perileia* S. T. BLAKE, J. Arn. Arb. 28 (1947) 102; NELMES, Kew Bull. (1949) 386, 392; Reinwardtia 1 (1951) 441. — *C. gajonum* NELMES, Kew Bull. (1952) 84; Reinwardtia 2 (1954) 382. — *C. omiana* FRANCH. & SAV. var. *perileia* KOYAMA, Bot. Mag. Tokyo 69 (1956) 211. — Fig. 123, 131h.

Rhizome short, forming dense tufts. *Stems* slender, erect, obtusely trigonous below, more acutely so above, smooth or slightly scaberulous just below the inflorescence, 15–90 cm by 1–2 mm. *Leaves* subbasal, shorter to longer than the stems, canaliculate-conduplicate, long-attenuate, scabrid on the margins above, 1–3 mm wide, the lower ones reduced to pale to castaneous, bladeless sheaths. *Inflorescence* ovoid to oblong, head-like or spike-like,  $1\frac{1}{2}$ – $3\frac{1}{2}$ (– $4\frac{1}{2}$ ) cm long. *Spikelets* 3–8, gynaeandrous (♂ flowers very few), ellipsoid, obovoid or ovoid to subglobose, sessile, dense-

flowered, approximate or lowest somewhat distant, 5–10 by 5–8 mm, finally squarrose by the widely spreading utricles. Bracts glumiform, the lowest with a setaceous awn, others more shortly aristate, or indistinguishable from the glumes or the lower bracts foliaceous, overtopping the inflorescence. *Glumes* ovate, acute, thin, wholly pale or brownish with wide whitish-hyaline margins, 3-nerved in the centre,  $2\frac{1}{2}$ – $3\frac{1}{2}$  mm long. *Utricles* elliptic or ovate-lanceolate to broadly ovate, rounded to cordate at the base, plano-convex, membranous, several-nerved on both faces, glabrous, smooth, straight or slightly recurved, widely patent to reflexed when mature, spongy-thickened at the base, scarcely stipitate, (3)–4–5(– $5\frac{1}{2}$ ) by (1)– $1\frac{1}{2}$ –2 mm, yellowish green to brownish, subgradually narrowed into a bidenticate beak more or less scabrid on the margins or rarely wholly smooth and with a dorsal split with brown overlapping margins. *Nut* oblong-ovoid, plano-convex, scarcely stipitate and beaked, brownish, 2– $2\frac{1}{2}$  by 1– $1\frac{1}{2}$  mm. *Style-base* slightly thickened. *Stigmas* 2.

Distr. N. America, Eurasia to Australia and New Zealand; in *Malesia*: N. Sumatra (Gajolands:

Mts Kemiri, Losir, Bandahara) and New Guinea (Arfak and Lake Habbema in W., and many mountains in E.).

Ecol. Peat swamps, wet alpine grasslands, marshy lake shores, 1850–3600 m, locally often abundant.

Vern. New Guinea: *kisis*, *pemp*, Papua, Mendi lang., *koali*, Enga lang., *armemsèna*, *kul*, Mani-kiong lang.

Notes. In the wide sense here accepted *C. echinata* is a widely spread species. The characters used for differentiating the numerous microspecies described in *sect. Stellulatae* are far from reliable; they mainly refer to the width of the leaves, the size of the utricles, the scabridity of their margins and the intensity of their nervation. For N. America MACKENZIE, N. Am. Fl. 18 (1931) 99–114 recognized c. 20 spp. which can hardly be maintained. I have not seen Japanese materials of the section, but to judge from the descriptions and figures *C. basilata* OHWI, Act. Phytotax. Geobot. 11 (1942) 258; YOSHIKAWA, Ic. Jap. Carex 3 (1960) 296, t. 148 [*C. muricata* (non L.) OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 253; AKIYAMA, Car. Far East. Reg. Asia (1955) 64, t. 31] is hardly different from the European plants, and *C. omissa* FRANCH. & SAV.; OHWI, l.c. 254; AKIYAMA, l.c. t. 32 with its lanceolate utricles less scabrid margins must be very near to the New Guinean specimens.

*Carex perileia* S. T. BLAKE was based on a specimen with a single fruiting culm, and distinguished from *C. echinata* by its narrower leaves and its longer utricles with relatively larger beak deeply

split on the back with entirely smooth margins. Several additional collections have shown that size and scabridity of the utricles are very variable. Sometimes the utricles are not longer and hardly less scabrid than in European materials. In typical *C. echinata* the uppermost spikelet is seemingly long-stalked by the relatively large number of ♂ flowers at its base and sometimes almost wholly ♂, in the New Guinean specimens also this spikelet is sessile as there are so few ♂ flowers that it has a wholly ♀ appearance. This may be the same in some Australian forms of *C. echinata*, as according to BENTHAM, l.c., there are very few ♂ flowers at the base of the spikelets, sometimes even none.

Whether *C. perileia* represents a special New Guinea race cannot be decided without a critical study of the whole section or of at least the Australasian and E. Asian representatives; in my opinion it is not specifically distinct.

*Carex gajonum* NELMES, from N. Sumatra (Gajolands: Mts Losir and Kemiri), was distinguished because the lower bracts are foliaceous, much overtopping the inflorescence, and the utricles being broader, cordate at the base, and obliquely erect instead of widely patent when mature. In some Sumatran plants, however, the lower bracts are setaceous, in some New Guinean ones they are foliaceous, overtopping the inflorescence. In the collection DE WILDE 13323, from Mt Bandahara, the ripe utricles are patent as in true *C. echinata*, making the spikelets squarrose. Furthermore I compared several utricles, and although they are generally broader in Sumatra, there is no constant difference. — (NOOT.)

### 31. Section *Elongatae*

KUNTH, En. 2 (1837) 402; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 256; KÜK. Pfl. R. Heft 38 (1909) 226, p.p.; NELMES, Reinwardtia 1 (1951) 438.

Type species: *Carex elongata* L.

65. *Carex remota* LINNÉ, Amoen. 4 (1759) 293; BOECK. Linnaea 39 (1875) 129; KÜK. Pfl. R. Heft 38 (1909) 233.

The typical subspecies is widely distributed in Europe, extending to N. Africa and W. Asia; in *Malesia* two other subspecies occur:

a. *ssp. alta* (BOOTT) KÜK. Pfl. R. Heft 38 (1909) 234, incl. var. *brizopyrum* KÜK.; BACK. Bekn. Fl. Java (em. ed.) 10 (1949) fam. 246, p. 60; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 494; STEEN. Mt. Fl. Java (1972) pl. 14–4. — *C. alta* BOOTT, Proc. Linn. Soc. 1 (1845) 254; Trans. Linn. Soc. 20 (1846) 130; Ill. 1 (1858) 59, t. 153; MIQ. Fl. Ind. Bat. 3 (1855) 347; BOECK. Linnaea 39 (1875) 126; CLARKE, Fl. Br. Ind. 6 (1894) 707; J. Linn. Soc. 37 (1904) 6; NELMES, Reinwardtia 1 (1951) 438. —

*C. brizopyrum* KUNZE, Suppl. Riedgr. (1840–50) 169, t. 43. — *C. remota* var. *rochebrunii* CLARKE, J. Linn. Soc. 37 (1904) 6, p.p. (*quoad* ZOLLINGER 3192). — *C. craspedotricha* NELMES, Kew Bull. (1939) 657; *ibid.* (1946) 28; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 19; Dansk Bot. Ark. 23 (1965) 252. — ? *C. imbricata* KÜK. in Hand.-Mazz. Symb. Sin. 7 (1936) 1260, f. 38 n. 2. — ? *C. squamata* KREZC. Not. Syst. Herb. Inst. Bot. Ac. Sc. URSS 9 (1946) 196. — Fig. 123.

Rhizome very short, woody. Stems densely tufted, stiff to rather weak, erect or suberect, smooth, 15–80(–120) cm by 1–1½ mm, surrounded at the base by brown, fibrous remains of old leaf-sheaths. Leaves in the lower ½ of the stem, shorter to longer than the stems, flat, scabrid on the margins especially towards the long-attenuated

apex, 1½–4 mm wide; sheaths long, mouth concave in front. *Spikelets* 5–18(–24) in an up to c. 15 cm long, spiciform inflorescence, sessile, obliquely erect, upper densely crowded, lower separated to their own length from one another, lowest 1–2 often distant, ellipsoid to ellipsoid-cylindric, densely flowered, gynaeandrous with only a few ♂ flowers, 5–15 by 3–5 mm. Lower bracts foliaceous, far exceeding the inflorescence, not sheathing, upper glumiform. *Glumes* ovate or oblong-ovate, acute, thin and translucent, finely nerved, whitish with greenish 3-nerved centre, 2–3 mm long, usually excurrent in a short, up to ½ mm long mucro. *Utricles* ellipsoid or ovoid-ellipsoid (often in outline broadest above the middle because of the wings), obliquely erect, plano-convex, membranous, slenderly nerved on both sides in the lower centre, glabrous, winged in the upper ½–¾, yellowish green to brownish, scarcely stipitate, subabruptly beaked, 2¾–3 by 1–1¼ mm; wings varying in width, denticulate-ciliate; beak c. ½ mm long, bidentate with slender, straight teeth. *Nut* ellipsoid or ovoid, biconvex, shortly stipitate and beaked, 1⅓–1⅔ by ⅔–⅝ mm. *Style* slightly thickened at the base. *Stigmas* 2.

*Distr.* Insufficiently known; according to literature from India (Himalaya) to Central China; *C. crapedotricha* NELMES from Thailand undoubtedly belongs here. The type collection of both *C. alta* BOOTT and *C. brizopyrum* KUNZE are from Java; in Malesia only known from Java (from Mt Patuha in W. to Jang in E.).

*Ecol.* In moist or swampy grasslands, along water-courses, damp forest-borders, 1500–2200 m; once collected at 1150 m.

*b. ssp. rochebrunii* (FRANCH. & SAV.) KÜK. Pfl. R. Heft 38 (1909) 234; KERN in Back. & Bakh. f. Fl. Java 3 (1968) 494. — *C. rochebrunii* FRANCH. & SAV. En. Pl. Jap. 2 (1879) 126, 555; NELMES, Kew Bull. (1946) 29. — *C. remota* var. *rochebrunii* CLARKE, Fl. Br. Ind. 6 (1894) 707. — *C. monopleuria* KREZC. Not. Syst. Herb. Inst. Bot. Ac. Sc. URSS 7 (1937) 35; NELMES, Kew Bull. (1950) 208; Reinwardtia 1 (1951) 440.

Usually slenderer than *ssp. alta*, with narrower leaves. Inflorescence up to 10 cm long, with 3–9 spikelets; upper spikelets not rarely sterile. *Glumes* ¾–4 mm long. *Utricles* lanceolate, ventrally nerveless or nearly so, narrowly winged, 4–4½ mm long. *Nut* elliptic-oblong, c. 2 by 1 mm.

*Distr.* India (Sikkim), China, Japan, Formosa; in Malesia: Sumatra (Atjeh: G. Leuser, and W.: Mt Kerintji) and W. Java (Mt Papandajan).

*Ecol.* Marshy places in forests, along rivers and streamlets, 1700–2700 m.

*Notes.* *Ssp. rochebrunii* is very near to the European *ssp. remota*, mainly differing by the narrow, lanceolate, narrowly winged utricles and the oblong nuts. In my opinion the differences between *C. rochebrunii* (described from Japan) and *C. monopleuria* (based on Sikkim material) are too slight to justify specific separation.

In its extreme tall form, with relatively dense inflorescence and broadly winged utricles, *ssp. alta* gives the impression of being a separate species, but slender, weak plants occur (they were distinguished as var. *brizopyrum* by KÜENTHAL), and the width of the wings of the utricles is variable.

KUNZE, *l.c.*, in describing *C. brizopyrum*, stressed the importance of the bristly appendage of the connective, but this is also found in European *C. remota*.

### 32. Section Heleonastes

KUNTH, En. 2 (1837) 393; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 261; NELMES, Reinwardtia 1 (1951) 443.

Type species: *Carex heleonastes* EHRH.

66. *Carex curta* GOODEN. Trans. Linn. Soc. 2 (1794) 145; SCHKURH, Riedgr. 1 (1801) 43, t. C, f. 13; KUNTH, En. 2 (1837) 403; S. T. BLAKE, J. Arn. Arb. 28 (1947) 101; NELMES, Kew Bull. (1949) 386; Reinwardtia 1 (1951) 443; YOSHIKAWA, Ic. Jap. Carex 1 (1957) 32, t. 16. — *C. canescens* (non L.) BOOTT, Ill. 4 (1867) 154, t. 496; BOECK. Linnæa 39 (1875) 122, excl. var. β; BENTH. Fl. Austr. 7 (1878) 439; CLARKE, Fl. Br. Ind. 6 (1894) 706; KÜK. Pfl. R. Heft 38 (1909) 216, f. 35 C–E; OHWI, Mem. Coll. Sc. Kyoto Imp. Un. B11 (1936) 268; AKIYAMA, Car. Far East. Reg. Asia (1955) 60, t. 26. — Fig. 123.

Rhizome short, forming dense tufts. *Stems* slender, erect, triquetrous, slightly scaberulous just

below the inflorescence, 10–40(–60) cm by 1–1½ mm, surrounded below the leaves by light brown, withered leaf-bases. *Leaves* subbasal, shorter to longer than the stems, flat to conduplicate, grey-green, scabrid on the margins above, long-attenuate to the triquetrous apex, 2–3(–5) mm wide. *Inflorescence* oblong, spike-like, 2–3½(–6) cm long. *Spikelets* 4–8, gynaeandrous (♂ part few-flowered, inconspicuous), ovoid, ellipsoid, or sub-cylindric, sessile, dense-flowered, approximate or contiguous, 6–9 by 4–5 mm. Bracts glumiform, shortly aristate, the lowest rarely subulate to subherbaceous. *Glumes* ovate, acute, very thin, whitish, 3-nerved in the centre, 2–2½ mm long, the midrib sometimes slightly excurrent. *Utricles* ovate

or ovate-elliptic, biconvex, membranous, several-nerved on both faces, scarcely marginate, glabrous or slightly papillose at the apex, golden yellow, densely whitish punctulate, straight, suberect, very shortly stipitate, 2-2½ by 1-1½ mm, scarcely beaked; mouth minutely bidentate. *Nut* elliptic to broadly ovate, plano-convex or biconvex, scarcely stipitate, abruptly beaked, light brown, c. 1½ by 1 mm. *Style-base* not thickened. Stigmas 2.

Distr. Widely spread in N. America, extra-tropical S. America, Eurasia (also Kashmir and Japan), and SE. Australia (New South Wales, Victoria); in *Malesia*: New Guinea (Lake Habbema in W., Neon basin 15 km NNE of Waitape in E.).

Ecol. Plentiful in open grassland on wet sandy soil and on marshy flats, 2800-c. 3225 m

Note. For the correct name of this species, which has commonly been called *C. canescens* L., see E. S. MARSHALL, *J. Bot.* 45 (1907) 365; S. T. BLAKE, *J. Arn. Arb.* 28 (1947) 101; NELMES, *Reinwardtia* 1 (1951) 444.

#### Doubtful (*Sect. Vigneastra*)

*Carex subfilicina* OHWI, *Bot. Mag. Tokyo* 56 (1942) 213; NELMES, *Reinwardtia* 1 (1951) 446 (under doubtful species). — I did not see any collections of this species. From the description it is possibly conspecific with either *C. filicina* NEES or *C. cruciata* WAHLENB. — (NOOT.)

#### Excluded

*Carex arnottiana* NEES ex DREJER, *Symb. Caric.* (1844) 16, t. 5; BOECK. *Linnaea* 40 (1876) 436. — This species is endemic in Ceylon. BOECKELER, *l.c.*, cited it also to occur in "Java, alt. 6000 ped. (Arnott)". As the annotation for the type specimen is exactly matching this and ARNOTT never collected in Java, this record is based on a miswritten label.

*Carex cladostachya* WAHLENB. *Vet.-Ak. Handl.* 24 (1803) 149; BOECK. *Linnaea* 40 (1876) 361; KÜK. *Pfl. R. Heft* 38 (1909) 267. — This Central American species was recorded by BOECKELER, *l.c.*, also from the Philippines on the strength of CUMING 625. This specimen must certainly belong to CUMING's American collections, which were separately numbered from the Philippine ones.

*Carex dimorpholepis* STEUD. *Syn.* 2 (1855) 214. — *C. cernua* BOOTT, *Ill.* 4 (1867) 171, t. 578, non J. F. GMEL. 1791. — The old specimens of this species in the Leyden Herbarium annotated "Arch. Ind. ? Leg. ?" in all probability do not originate from the Malayan Archipelago, as they would be the only Malesian collection extant. *C. dimorpholepis* is known from India, Upper Burma, and China to Korea and Japan. See NELMES, *Kew Bull.* (1950) 208.

*Carex divulsa* STOKES *var. javanica* NELMES, *Kew Bull.* (1950) 208; *Reinwardtia* 1 (1951) 436. — See below under *C. pairaei*.

*Carex erythrolepis* KÜK. *Pfl. R. Heft* 38 (1909) 628; BACK. *Bekn. Fl. Java* (em. ed.) 10 (1949) fam. 246, p. 65. — "Java, Hillebrand in herb. musei berol. sine indicatione loci." Wrongly localized; see *Fl. Males.* I, 1 (1950) 232. The name must be referred to the synonymy of *C. wahuensis* C. A. MEY., an endemic of the Hawaiian Islands. See NELMES, *Kew Bull.* (1950) 203.

*Carex haenkeana* PRESL, *Rel. Haenk.* 1 (1828) 205; STEUD. *Syn.* 2 (1855) 241; MIQ. *Fl. Ind. Bat.* 3 (1857) 354; F.-VILL. *Nov. App.* (1882) 310. — "Habitat in insulis Philippinis." This is *C. pseudocyperus* L. *var. haenkeana* (PRESL) KÜK. *Bot. Jahrb.* 27 (1899) 550; *Pfl. R. Heft* 38 (1909) 696, a S. American plant. The record attributed to the Philippines was based on an erroneously localized Malaspina Expedition specimen. See MERRILL, *En. Philip.* 1 (1923) 142.

*Carex lindleyana* NEES in Wight, *Contr.* (1834) 121; BOECK. *Linnaea* 40 (1876) 362; KÜK. *Pfl. R. Heft* 38 (1909) 280. — This is a species from the Deccan Peninsula and Ceylon. BOECKELER recorded it besides from the Philippines on the strength of an unnumbered collection of CUMING. If correctly identified this certainly rests on an erroneous localisation; it might have been collected in Ceylon by CUMING himself.

*Carex pairaei* F. SCHULTZ *var. javanica* NELMES, *Kew Bull.* (1950) 208; *Reinwardtia* 1 (1951) 437.

*Carex divulsa* STOKES and *C. muricata* L. (= *C. pairaei* F. SCHULTZ) were recorded by NELMES from Java, the only ones from outside Europe, both based on a single specimen, that of *C. divulsa* even on a single culm. The scanty materials were alleged to have been collected by RIDLEY during his Java tour on Mt Papandajan.

However, there is no doubt that the specimens were mislocalized, possibly by using drying paper to which remnants of rambles in Europe adhered. The *Carex* flora of the easily accessible Mt Papandajan is well known, e.g. by the intensive search for *Carices* by VAN STEENIS.

Similar records opposing all rules of plant distribution are those of *Elisma natans* for Java, *Linaria alpina* for the Malay Peninsula, and *Scheuchzeria palustris* for Sumatra (see Taxon 5, 1956, 157). NELMES, *in litt.* Dec. 17, 1953, admitted that the records must be due to an error.

*Carex scabrifolia* STEUD. *Syn.* 2 (1855) 237; MIQ. *Fl. Ind. Bat.* 3 (1857) 354. — "Carex nr 67 et 83. Herb. Zollinger. Java." The type is not from Java, but from Japan, Decima in Nagasaki. See ZOLL.

Syst. Verz. 1 (1854) 60; KÜK. Pfl. R. Heft 38 (1909) 737; KOYAMA, J. Fac. Sc. Un. Tokyo III, 8 (1962) 248. — HUBERT WINKLER 2097, wrongly distributed as *C. scabrifolia*, belongs to *C. baccans* NEES.

*Carex typhoides* BORY; HASSK. Cat. Bog. 296; MIQ. Fl. Ind. Bat. 3 (1857) 352. — This is *C. borbonica* LAMK from the Mascarenes; certainly not occurring in Malasia.

## 29. UNCINIA

PERS. Syn. Pl. 2 (1807) 534; BOECK. Linnaea 41 (1877) 339; CLARKE, J. Linn. Soc. Bot. 20 (1883) 389; KÜK. Pfl. R. Heft 38 (1909) 50; NELMES, Kew Bull. (1949) 140; HAMLIN, Dom. Mus. Bull. 19 (1959) 1; BALGOOY, Pac. Pl. Areas 3 (1975) 320, map 209; NOOT. Blumea 24 (1979) 511. — Fig. 137a–d.

Perennial, monoecious herbs, glabrous (or with hispid utricles). *Stems* central, tufted or approximate on a more or less creeping rhizome, erect or ascendent, sharply trigonous to subterete, striate, smooth, or scabrid below the inflorescence. *Leaves* narrowly linear, flat or involute, more or less scabrid on margins and nerves; basal sheaths bladeless, often disintegrating into fibres. *Inflorescence* a single, terminal spikelet; ♂ part above, shorter than the lower ♀ part. *Glumes* spirally arranged, ovate to oblong, concave, persistent or caducous, all flower-bearing, the lowest often produced into a setaceous to foliaceous bract. — ♂ *Flowers* naked, consisting of (1–)2–3 stamens with linear (or dilated, New World *spp.*) filaments and linear anthers; connective shortly produced. — ♀ *Flowers* naked, enclosed in a bottle-shaped, obtusely trigonous organ (utricle, perigynium) which is closed up to the truncate top, glabrous (in all Mal. and Austr. *spp.*) or hispid; style incrassate at the base; stigmas 3, exserted from the utricle. *Rachilla* (see note) reduced to a rigid bristle below the nut and produced far beyond the mouth of the utricle, hooked at the top. *Nut* trigonous.

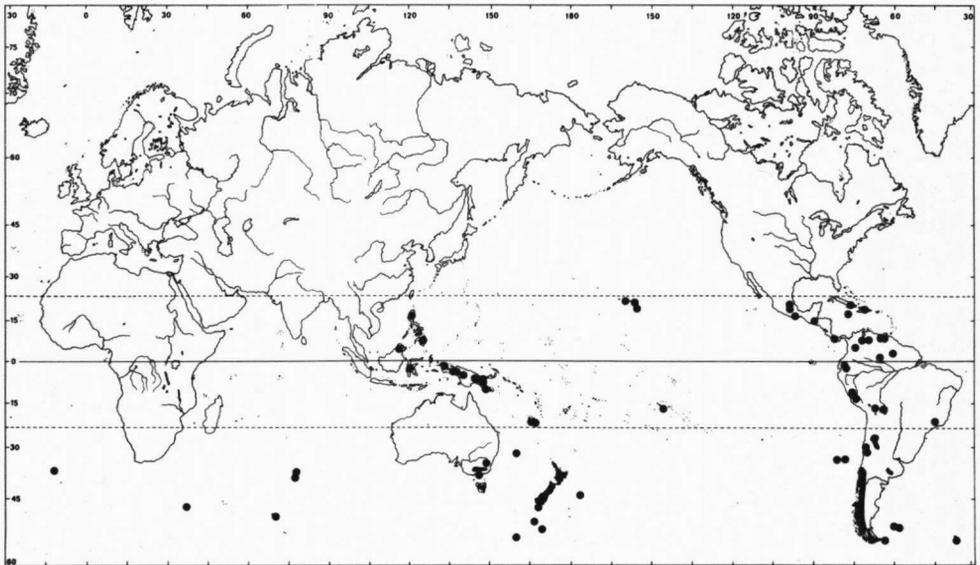


Fig. 136. Range of the genus *Uncinia* PERS. (from VAN BALGOOY, Pac. Pl. Areas 3, 1975, 320, map 209)

Distr. A genus of probably Antarctic origin, with wide southern distribution; from the extreme south of S. America including the Falkland Is., along the Andes to Mexico and Jamaica; islands in the southern parts of the Atlantic and of the Indian Ocean; from Tasmania through E. Australia northwards to *Malesia*, Mt Pulog in the Philippines being the most northern extension; highly developed in New Zealand and neighbouring islands, from there one species extending to Hawaii. Fig. 136.

Note. *Subdivision of the genus*. KÜKENTHAL divided *Uncinia* into two subgenera, *Uncinia* ('*Eu-Uncinia*') and *Pseudocarex*, the latter containing only *U. kingii* BOOTT from Antarctic S. America, in which the rachilla is but shortly hooked. *Subg. Uncinia* is divided into two sections which are to some extent also geographically defined: *sect. Uncinia*, mainly Australian with few species in S. America, and *sect. Platyan-dra* which is exclusively American.

## KEY TO THE SPECIES

1. Glumes persistent. Stems sharply trigonous, scabrid beneath the inflorescence . . . 1. *U. riparia*  
 1. Glumes caducous, when young often an abscission layer visible. Stems obscurely trigonous, smooth . . . 2. *U. compacta*

1. *Uncinia riparia* R. BR. Prod. (1810) 241; BOOTT in Hook. f. Fl. Tasmania 2 (1860) 102, t. 152 f. B; BENTH. Fl. Austr. 7 (1878) 434; CLARKE, J. Linn. Soc. Bot. 20 (1883) 392, *excl. var.*; KÜK. Pfl. R. Heft 38 (1909) 63, *excl. var.*; S. T. BLAKE, J. Arn. Arb. 35 (1954) 234; NOOT. Blumea 24 (1979) 513. — *Carex riparia* (R. BR.) POIR. in Lamk, Enc. Méth. Suppl. 3 (1813) 282. — *U. sclerophylla* NELMES, Kew Bull. (1949) 143. — *U. ohwiana* KOYAMA, Bot. Mag. Tokyo 69 (1956) 214, f. 6.

Rhizome more or less creeping. Stems approximate on the rhizome, very slender, sharply trigonous, scabrid in the upper half, (10-)40-75 cm by 1/2-1 mm. Leaves from slightly shorter to slightly longer than the stems, rigid, flat or canaliculate, long attenuate, scabrous on margins and nerves in upper half, 1 1/2-3(-74) mm wide; basal sheaths bladeless or short-bladed, fuscous. Spikelet narrowly linear, often very loosely flowered, ebracteate or with a filiform bract usually not overtopping the inflorescence, 3-7(-15) by 2-5 mm, the ♂ part few-flowered, 1-1 1/2(-2) cm long. Glumes persistent, oblong-ovate, acute, mucituous, rigid, stramineous with broad 3-nerved green centre and sometimes brown margins, (4-)5-6(-78 1/2) mm long, the midrib not reaching the apex. Utricles slightly exceeding the glumes, erect, linear-oblong or linear-lanceolate, compressed-trigonous, glabrous and smooth, fine-nerved, stramineous, 6-7 by c. 1 mm, at the base subgradually narrowed into a c. 1 1/2 mm long stipe, at the apex into a c. 1 1/2 mm long, compressed-conical beak with narrow, hyaline mouth. Nut narrow ellipsoid.

Distr. New Zealand, Tasmania, SE. Australia (Victoria, Upper Hume R. and Mt Kosciusko, according to BENTHAM, *l.c.*; no specimens seen); in *Malesia*: New Guinea (West Irian, summit of Mt Wilhelmina; Papua New Guinea).

Ecol. In shaded places, usually between moss on the floor of the mossy or subalpine forest, 3000-4100 m, above 4000 m also in grassland with shrubs. Fl. fr. Jan.-Dec.

Note. Whether the glumes are persistent or caducous can often only be seen in old inflores-

cences. It is not impossible that hybrids occur with *U. compacta*, thus giving more variability and plants in which the glumes fall very late. In these plants the sharply triquetrous culms become more or less rounded and smooth instead of scabrous (not found in *Malesia*).

2. *Uncinia compacta* R. BR. Prod. (1810) 241; BOOTT in Hook. f. Fl. Tasmania 2 (1860) 103; F.V.M. Fragm. 8 (1874) 152; BENTH. Fl. Austr. 7 (1878) 434; CLARKE, J. Linn. Soc. Bot. 20 (1883) 395; CHEESEMAN, Man. New Zeal. Fl. (1906) 800; KÜK. Pfl. R. Heft 38 (1909) 65; CHEESEMAN, Man. New Zeal. Fl. ed. 2 (1925) 245; LOURTEIG, Bull. Com. Nat. Fr. Rech. Antarct. (1968) 25; NOOT. Blumea 24 (1979) 515. — *Carex compacta* POIR. in Lamk, Enc. Méth. Suppl. 3 (1813) 282. — *U. rupestris* RAOUL, Ann. Sc. Nat. III, 2 (1844) 117; BOOTT in Hook. f. Fl. Nov. Zel. 1 (1853) 286; CLARKE, J. Linn. Soc. Bot. 20 (1883) 392; KÜK. Pfl. R. Heft 38 (1909) 64, *incl. var. capillacea* KÜK.; HAMLIN, Dom. Mus. Bull. 19 (1959) 39. — *U. filiformis* BOOTT in Hook. f. Fl. Nov. Zel. 1 (1853) 286; HAMLIN, Dom. Mus. Bull. 19 (1959) 43. — *U. nervosa* BOOTT in Hook. f. Fl. Tasmania 2 (1860) 102. — *U. riparia* R. BR. *var. stolonifera* KÜK. & STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 213. — *U. riparia* (*non* R. BR.) OHWI, Bot. Mag. Tokyo 56 (1942) 213. — *U. subtrigona* NELMES, Kew Bull. (1949) 144. — Fig. 137a-d.

Plant laxly to densely caespitose or with short rhizome and stems densely tufted, erect; sometimes stems decumbent, forming new tufts; culms slender, rarely more than 1 mm thick, obscurely trigonous, smooth, 5-45 cm. Leaves shorter or longer than stems, flat, involute, convolute or conduplicate, sometimes (*var. nervosa*) plano-convex and then often canaliculate, long attenuate, scabrous on margins and nerves at least in upper half, 1/4-3 mm wide, the tip mostly rather acute, triquetrous, rarely flat or plano-convex and blunt (*var. nervosa*); basal sheaths bladeless, brown. Spikelets narrowly oblong, loosely to very densely flowered, sometimes bracteate, (1-)1 1/2-5 1/2 cm by 2 1/2-



Fig. 137. *Uncinia compacta* R. BR. var. *nervosa* CLARKE. a. Habit, nat. size, b. leaf tip,  $\times 7$ . — *U. compacta* R. BR. var. *alpina* NOOT. c. Habit, nat. size, d. utricle,  $\times 10$ . — *Exocarya scleroides* (F.v.M.) BENTH. e. Flower diagram (a-b ANU 7161, c-d ANU 7289).

20 mm, the ♂ part  $1\frac{1}{2}$ - $1\frac{1}{2}$  cm long. *Glumes* caducous, when young the abscission line often already visible, oblong-ovate or lanceolate, acute, mucous, at least the margins hyaline, greenish or brown, with 3-nerved central stripe but often with several more nerves, 4-6(-8 mm in the Antarctic Is.) by 1.6-3 mm. *Utricles* shorter to slightly longer than glumes, obliquely erect to patent, lanceolate elliptic or ovoid, with 2 conspicuous submarginal nerves, sometimes slenderly nerved towards the base or striate when these nerves are prolonged,  $3\frac{1}{2}$ -6(-7) by 1-2 mm, at the base contracted into a  $1$ - $1\frac{1}{2}$  mm long stipe, at the apex (gradually) narrowed into a 1-2 mm long beak. *Nut* ellipsoid.

Distr. Australia (Victoria, New South Wales, Tasmania), New Zealand, Amsterdam I., Kerguelen, Crozet, Marion, Gough and Tristan da Cunha; in *Malesia*: Philippines (Luzon: Mts Pulog & Banahao; Mindanao: Mt Apo), N. Borneo (Mt Kinabalu), Celebes (Latimodjong Mts), New Guinea.

Ecol. In the tropics in the high mountains, 2000-4300 m, outside the tropics in temperate and cold climates, in open places and in forest.

Note. The second character in the key to the species differentiating *U. compacta* from *U. riparia* breaks partly down in some specimens from Victoria and New South Wales; these specimens have a sharply triquetrous and (interruptedly) scabrous stem.

KEY TO THE VARIETIES

- 1. Spikelets c. 1 cm long. Leaves strongly circinate towards the apex. Usually small plants  
c. var. *alpina*
- 1. Spikelets  $1\frac{1}{2}$ - $5\frac{1}{2}$  cm. Leaves not or less circinate. Plants often larger.

- 2. Leaves flat (always in New Guinea), involute, convolute or conduplicate with acute, trigonous or triquetrous tip. . . . a. var. *compacta*
- 2. Leaves plano-convex with flat, or plano-convex blunt tip. . . . . b. var. *nervosa*

a. var. *compacta*.

Spikelets  $1\frac{1}{2}$ - $5\frac{1}{2}$  cm. Leaves flat, involute, convolute or conduplicate. Leaf tip acute, trigonous or triquetrous, undulate or (somewhat) circinnate.

Distr. As the species.

Ecol. In forest, 2000-3700 m. *Fl. fr.* Jan.-Dec.

b. var. *nervosa* CLARKE, J. Linn. Soc. Bot. 20 (1883) 395. — *U. nervosa* BOOTT in Hook. f. Fl. Tasmania 2 (1860) 102; HAMLIN, Dom. Mus. Bull. 19 (1959) 50. — Fig. 137a-b.

Spikelets  $1\frac{1}{2}$ -3 cm. Leaves plano-convex, usually canaliculate, sometimes some of the leaves convolute. Leaf tip flat, or plano-convex, blunt.

Distr. Australia (New South Wales, Kosciusko area and Tasmania), New Zealand; in *Malesia*: New Guinea.

Ecol. In open places, mostly in grassland, 3000-4026 m. *Fl. fr.* June-Nov.

c. var. *alpina* NOOT. Blumea 24 (1979) 519. — Fig. 137c-d.

Spikelets c. 1 cm long. ♀ Flowers c. 5; utricles  $3\frac{1}{2}$ -4 mm. Leaves involute, strongly circinnate towards the triquetrous or trigonous apex.

Distr. *Malesia*: New Guinea (Mt Wilhelm and Mt Giluwe).

Ecol. In exposed places, often temporarily covered by snow, also on solifluction terraces, 3770-4350 m. *Fl. fr.* Nov.-April.

ADDENDA

7: 452 Add to A. SUBFAMILY CYPEROIDEAE I. *Tribe Hypolytreeae* after 6. *Paramapania*: 6a. *Exocarya*.

Change in the SYNOPTICAL KEY TO THE MALESIAN GENERA fork 6, second lead, into:

6. Hypogynous scales 2 or 4.

6'. Hypogynous scales 2. . . . . 7. *Hypolytrum*

6'. Hypogynous scales 4. . . . . 6a. *Exocarya*

7: 454 Change in the KEY TO THE GENERA fork 19, first lead, into:

19. Hypogynous scales 2 or 4. Stigmas 2. Inflorescence paniculate.

19'. Hypogynous scales 2, either of them with a stamen in its axil . . . . . 7. *Hypolytrum*

19'. Hypogynous scales 4, stamens 3 . . . . . 6a. *Exocarya*

6a. EXOCARYA

BENTH. in Hook. Ic. Pl. 3 (1877) pl. 1206. — Fig. 137e.

*Leaves* situated throughout the stem. *Inflorescence* an umbellate panicle, the lower 2-3 bracts long, foliaceous. *Spikelets* small, the upper 1 or 2 flowers bisexual, the other 2-3 flowers male. *Glumes* imbricate, the lower ones often empty. *Flowers*

compressed, the 2 outer hypogynous scales subopposite, folded, transverse and sharply keeled, the 2 inner ones flat or concave, parallel with the glumes. *Stamens* 3. *Style* broadened towards the base, with 2 filiform stigmas. *Nut* exerted from the glumes, crowned by the persistent style-base.

Distr. Monotypic. Australia (Queensland, New South Wales); in *Malesia*: E. New Guinea (Ferguson I.).

1. *Exocarya scleroides* (F.v.M.) BENTH. in Hook. Ic. Pl. 3 (1877) pl. 1206; F. M. BAILEY, Queensl. Fl. 6 (1902) 1777; S. T. BLAKE, Proc. R. Soc. Queensl. 54 (1943) 72. — *Cladium scleroides* F.v.M. Fragm. 9 (1875) 12. — *Scleria ustulata* F. M. BAILEY, 3rd Suppl. Syn. Queensl. Fl. (1890) 81. — *E. montivaga* DOMIN, Bibl. Bot. XX, Heft 85 (1915) 484. — Fig. 137e.

*Stems* from a creeping rhizome, to c. 1 m high, foliaceous, 3-angled. *Leaves* flat, to 6½ mm broad, tapering into long subulate points; sheaths close, with minutely fimbriate mouth. *Inflorescence* an umbellate panicle, varying in size, but often very large, to 20 cm Ø, the longest rays up to 15 cm, pedicels filiform. Involucral bracts several, foliaceous, the longest scarcely as long as the inflorescence. *Spikelets* dark brown, narrowly obovate, c. 4 mm long. Lower *glumes* empty, outer ones very short, c. 1 mm, gradually passing into the c. 2 mm long flowering ones. Hypogynous scales as long as the glumes. *Nut* much exerted, ovoid-oblong (or globose: '*E. montivaga*'), c. 4 mm long,

smooth, the remains of the spikelet forming a small tuft at its base. *Style-base* black, larger than the ovary at the time of flowering but not enlarged afterwards.

Distr. E. Australia (New South Wales, Queensland); in *Malesia*: Papua New Guinea (once collected in Ferguson I.).

Ecol. In forest, 720 m. *Fl. fr.* Nov.

Although sometimes rather abundant, its occurrence in Australia is very sporadic over its rather extensive geographical range. It seems to be usually a constituent of some of the less densely closed forests.

A notable feature is that only a small proportion of the spikelets produce mature nuts (BLAKE, *l.c.*).

Note. This plant belongs to the tribe *Hypolytreae* and is obviously intermediate between *Paramapania* and *Hypolytrum*, differing from the former in the presence of only 2 interior, flat hypogynous scales, while *Hypolytrum* lacks those scales. The stomata are tetracytic, as in *Lepironia* and *Scirpodendron*.

#### Excluded

*Eriophorum comosum* (WALL. in Roxb.) NEES in Wight, Contr. (1837) 110; Miq. Fl. Ind. Bat. 3 (1856) 330; STEEN. Bull. Jard. Bot. Btzg III, 13 (1933) 200.

MIQUEL cited this to occur in Malaya (Penang I.); on what grounds is uncertain. It must be a mystification or mislocalisation of specimens. CLARKE (1893) did not mention this locality in Fl. Br. Ind.

In Herbarium Bogoriense VAN STEENIS, *l.c.*, found specimens of *E. comosum*, said to have been collected in Karimata I. (off W. Borneo), mixed with specimens of *Machaerina rubiginosa*. This was interpreted as an unintentional mixture; *E. comosum* certainly does not occur in the low Karimata I.

*Eriophorum filamentosum* BOECK. Bot. Jahrb. 5 (1884) 506 was based on a GRIFFITH collection credited to have been collected in Malaya.

CLARKE (Fl. Br. Ind. 6, 1893, 664) reduced this to *Xerotes leucocephala* R. BR., of which *Xerotes filamentosum* A. CUNN. msc. is a synonym. This is not a Cyperaceous plant, but belongs to *Lomandra* of the *Liliaceae sens. lat.*, a genus which occurs outside Australia only in New Guinea. It is hard to believe that BOECKELER made such an error. This may be a slip of the pen by CLARKE.

The identity of BOECKELER's type should still be checked; but no *Eriophorum* has ever been found in Malaya.