

S. 370
.F. 55
1. 9
2. 1
3. 2

B. A. Krukoff
P. O. Box 352
Smithtown, N. Y. 11787

FLORA MALESIANA

SERIES I - SPERMATOPHYTA
Flowering Plants

Vol. 9, part 1
Revisions

INDEX TO REVISED FAMILIES

<p>Aceraceae 4: 3, 592 Actinidiaceae s. str. 4: 37 Aizoaceae 4: 267 Alismataceae 5: 317; 6: 915 Amaranthaceae 4: 69, 593; 6: 915 Anacardiaceae 8: 395 Ancistrocladaceae 4: 8 Aponogetonaceae 4: 11; 7: 213 Araliaceae-1 9: 1 Balanophoraceae 7: 783 Basellaceae 5: 300 Batidaceae 5: 414 Betulaceae 5: 207; 6: 917 Bignoniaceae 8: 114 Bixaceae s. str. 4: 239 Burmanniaceae 4: 13, 592 Burseraceae 5: 209, 567; 6: 917; 7: 820 Butomaceae 5: 118 Byblidaceae 7: 135 Callitrichaceae 4: 251 Campanulaceae 6: 107, 928 Cannabinaceae 4: 223 Capparidaceae 6: 61 Caprifoliaceae 4: 175, 598; 6: 928 Cardiopteridaceae 7: 93 Celastraceae 6: 227, 389, 930 Centrolepidaceae 5: 421 Ceratophyllaceae 4: 41 Chenopodiaceae 4: 99, 594; 6: 932 Clethraceae 7: 139 Cochlospermaceae 4: 61 Combretaceae 4: 533; 5: 564; 6: 932 Connaraceae 5: 495; 6: 933 Convolvulaceae 4: 388, 599; 5: 558; 6: 936; 7: 823 Cornaceae 8: 85 Corynocarpaceae 4: 262; 5: 557 Crassulaceae 4: 197 Crypteroniaceae 8: 187 Cyperaceae 7: 435; 9: 107 Datisceae 4: 382 Dichapetalaceae 5: 305; 6: 941 Dilleniaceae 4: 141; 7: 824 Dioscoreaceae 4: 293</p>	<p>Dipsacaceae 4: 290 Droseraceae 4: 377; 5: 557 Elatinaceae 4: 203 Epacridaceae 6: 422 Ericaceae 6: 469, 943 Erythroxylaceae 5: 543 Fagaceae 7: 265 Ficoidaceae 4: 267 Flacourtiaceae 5: 1, 565; 6: 943; 7: 827 Flagellariaceae 4: 245 Geraniaceae 6: 445 Gnetaceae 4: 336; 6: 944 Gonystylaceae 4: 349 Goodeniaceae 5: 335, 567; 6: 949; 7: 827 Haemodoridae 5: 111 Haloragaceae 7: 239 Hamamelidaceae 5: 363 Hippocrateaceae 6: 389 Hydrocaryaceae 4: 43 Hydrocharitaceae 5: 381; 6: 952 Hydrophyllaceae 4: 207 Hypericaceae 8: 1 Icacinaceae 7: 1 Iridaceae 8: 77 Juglandaceae 6: 143 Juncaceae 4: 210 Juncaginaceae 4: 57 Labiatae 8: 301 Leeaceae 7: 755 Lemnaceae 7: 219 Lentibulariaceae 8: 275 Liliaceae-I 9: 189 Loganiaceae 6: 293, 953 Lophopyxidaceae 7: 89 Malpighiaceae 5: 125 Martyniaceae 4: 216 Molluginaceae 4: 267 Moringaceae 4: 45 Myoporaceae 4: 265 Myricaceae 4: 277 Najadaceae 6: 157 Nyctaginaceae 6: 450 Nyssaceae 4: 29 Ochnaceae 7: 97 Onagraceae 8: 98 Oxalidaceae 7: 151 Papaveraceae 5: 114</p>	<p>Passifloraceae 7: 405 Pedaliaceae 4: 216 Pentaphragmataceae 4: 517 Pentaphragmataceae 5: 121 Phylodraceae 4: 5 Phytolaccaceae 4: 229 Pittosporaceae 5: 345 Plumbaginaceae 4: 107 Podostemaceae 4: 65; 6: 963 Polemoniaceae 4: 195 Pontederiaceae 4: 255 Portulacaceae 7: 121 Primulaceae 6: 173 Proteaceae 5: 147 Punicaceae 4: 226 Restionaceae 5: 416 Rhizophoraceae 5: 429; 6: 965; 8: 550 Salicaceae 5: 107 Salvadoraceae 4: 225 Sarcospermaceae 4: 32 Saururaceae 4: 47 Seyphostegiaceae 5: 297; 6: 967 Simaroubaceae 6: 193, 968 Sonneratiaceae 4: 280, 513; 6: 973 Sparganiaceae 4: 233 Sphenocleaceae 4: 27 Stackhousiaceae 4: 35 Staphyleaceae 6: 49 Styliidiaceae 4: 529 Styracaceae 4: 49 Symplocaceae 8: 205 Taccaceae 7: 806 Thymelaeaceae 4: 349; 6: 1, 976; 7: 830 Trapaceae 4: 43 Trigoniaceae 4: 59 Turneraceae 4: 235 Typhaceae 4: 243 Ulmaceae 8: 31 Umbelliferae 4: 113, 595; 5: 555; 6: 983; 7: 830 Valerianaceae 4: 253 Violaceae 7: 179, 831 Xyridaceae 4: 366, 598 Zygophyllaceae 4: 64</p>
--	---	--

LIBRARY

**THE NEW YORK BOTANICAL GARDEN
 BRONX, NEW YORK 10458**

Dr. B. Kruehlf

WITH THE COMPLIMENTS FROM
 Dr. C.G.G.J. VAN STEENIS.

29/11/78

ARALIACEAE—I (W. R. Philipson, Christchurch)

Trees, shrubs, lianas, woody epiphytes or (*extra-Mal.*) more rarely herbs. Branches usually stout with leaves clustered at their ends; armed or unarmed; glabrous or with a tomentum of stellate or simple hairs; buds either covered by the stipular sheaths of leaves or by cataphylls. *Leaves* spiral or rarely opposite or in whorls; petiole usually clasping the stem; stipules either distinct or united into a ligule or absent (in *Osmoxylon* the petiole bears \pm elaborate crests around its base); lamina digitately compound or pinnate, sometimes to the second or third degree, or simple, when either entire or pinnately or palmately lobed, margin entire or dentate. *Inflorescence* terminal or more rarely lateral; either simple or compound racemes or spikes, or more commonly of umbels or capitula, either solitary or arranged in compound umbels or panicles; bracts usually small and caducous; pedicel either articulated with the flower or continuous with it. *Flowers* hermaphrodite or hetero-sexual, sometimes dioecious; actinomorphic. *Calyx* lobes small, or reduced to a rim, or rarely absent. *Petals* 3 to numerous, often 5, sometimes fused into a calyptra, or forming a tube with spreading lobes (*Osmoxylon*), valvate or imbricate in bud, usually with a broad base but rarely narrowed below. *Stamens* usually as many as the petals and alternating with them, or twice as many, or indefinite; filaments inserted at the edge of the disk; anthers dorsifixed, introrse, pollen sacs 4 or rarely 8. *Ovary* inferior, half inferior, or very rarely (*extra-Mal.*) superior, 1- to many-celled, the top of the ovary usually a fleshy disk; styles and stigmas as many as the cells, either connate or wholly or partially free. *Ovules* solitary, pendulous, anatropous, with the raphe ventral. *Fruit* baccate or drupaceous, exocarp usually fleshy, endocarp forming cartilaginous or membranaceous pyrenes around the seeds. *Seeds* one per pyrene, with a small embryo within smooth or ruminant endosperm.

Distribution. About 50 genera with a roughly estimated 1150 species, ranging mainly in the warmer parts of both hemispheres (especially in montane zones), a small number in or extending to cool-temperate regions. With the exception of SE. Asia, the family and its centres of distribution are largely found within the land masses derived from ancient Gondwanaland. In Malesia 17 genera with a total (excluding *Schefflera*) of 117 species in 16 genera. (The largest genus, *Schefflera*, with an estimated 250 species for the region, is omitted from this account.)

Three genera are endemic to Malesia (or nearly so). One of these, *Anakasia* (related to *Polyscias*) is of very local distribution in West New Guinea; the two others, *Harmsioplanax* (Java, Lesser Sunda Is., Celebes, to New Guinea) and *Aralidium* (Malay Peninsula, Sumatra and Borneo, with an extension to Thailand) are more widely distributed.

Five other genera have their main centres of distribution within Malesia. Two of these extend further eastwards: *Mackinlaya* ranges from the Philippines and Celebes through New Guinea to the Solomon Is. and NE. Australia; *Osmoxylon* occurs from Botel Tobago (Taiwan) and the Marianas to Borneo, the Philippines, Celebes, the Moluccas, New Guinea to the Solomon Is. and the New Hebrides. A third, *Trevesia*, is confined to western Malesia (Lesser Sunda Is., Java, Borneo, Sumatra, and Malaya), with an extension into the Asian mainland. Wider ranges are recorded for *Gastonia* (widespread in Malesia to the Solomon Is.) with an additional range in the Seychelles, Mascarenes, and Madagascar (but not East Africa as previously reported) and *Arthrophyllum* (all over Malesia with extensions to Thailand, Laos, the Nicobar Islands, and New Caledonia).

A significant element in the Malesian representation of the family consists of six genera which occur mainly in SE.-E. Asia, two of which further extending to the Americas, *viz* *Aralia* (in

(1) The genus *Schefflera* is omitted and will be treated separately by Dr D. G. Frodin (University of Papua New Guinea). I enjoyed his assistance in drawing the general chapters.

America south to Mexico) throughout Malesia, and *Dendropanax* (tropical America) in West Malesia (Sumatra, Malay Peninsula, Borneo). The remaining four genera range in Malesia as follows: *Macropanax* and *Brassaiopsis* in Malay Peninsula, Sumatra and Java, *Acanthopanax* in Malay Peninsula, Sumatra and the Philippines, and *Pentapanax* only in East Java.

Only one genus, *Delarbrea*, has its main centre of distribution to the east of Malesia (Melanesia, mostly New Caledonia) and Queensland, and extends through New Guinea to the Moluccas and Lesser Sunda Is. as far west as Timor.

Two other genera have wider distributions. *Schefflera*, including several segregate genera, is pantropical although with but few representatives (13) on the African mainland. However, the several sections of *Schefflera* as redefined by FRODIN (1970, 1975) often show distinctive regional distributions paralleling those of several of the other genera. The type section ranges from the New Hebrides to Samoa and New Zealand, including Fiji and New Caledonia.

Polyscias is widely dispersed in the Old World tropics from the African mainland eastwards to the Society Is. and Australia, but with only a few species in SE. Asia and western Malesia. As in *Schefflera*, the diverse series of species comprising the genus show distinctive regional distribution patterns, with the type series being mainly Melanesian and East Malesian (in West Malesia it is only cultivated or adventive).

As said above several Malesian genera extend into, or have their main centres in, mainland Asia, but only *Polyscias* (in Sri Lanka) and *Schefflera* are shared with Africa and the same genera (with *Gastonia*) with Madagascar. Only *Polyscias* and *Gastonia* occur in the Mascarene Islands and *Gastonia* and *Schefflera* in the Seychelles. Two other genera are restricted to mainland Africa. *Hedera* of temperate Eurasia extends to the Canary Islands. The Americas have two (or three) distinctive endemic genera with recognizable affinities, as well as disjunct groups of the Australasian *Pseudopanax*, the Asiatic *Pentapanax* and *Dendropanax* and (in North America) *Oplopanax*, *Aralia* and *Panax*, all very closely related to those in East Asia; there are also distinctive sections of *Schefflera* in the neotropics which are nearer those in Africa than in Asia. Many distinctive endemic genera (or parts of the larger genera) occur in Oceania, the New Zealand region and Australia, some of them taxonomically very isolated.

The ratio of species : genus is here estimated as 23 : 1, but if the very large genus *Schefflera* is not accounted for this reduces to 13 : 1. Some 30 genera have five or fewer species; in view of the considerable insular endemism at generic or infrageneric level, weak intercontinental links, and great distinctiveness of many genera (even though small), the family is surely of great antiquity, although much of the available palaeobotanical evidence requires re-evaluation (*cf.* DILCHER & DOLPH, 1970). Many fossils previously referred to *Oreopanax* must now be placed in *Platanaceae* (DOYLE, pers. comm.). *Dendropanax* has reliably been reported from Tertiary deposits in both Europe and North America where it is now absent (DILCHER & DOLPH, *l.c.*).

References: DILCHER & DOLPH, *Amer. J. Bot.* 57 (1970) 153–160; FRODIN, The complex of *Cephaloschefflera* in *Schefflera* (*Araliaceae*), Thesis, Cambridge, U.K. (1970); J. Arn. Arb. 56 (1975) 427–448.

Ecology. Malesian *Araliaceae* are usually small trees, shrubs, or lianas, with a number being sometimes or always epiphytic (especially in *Schefflera*), and where terrestrial usually in the undergrowth or lower stories of rain-forest, seldom reaching over 20 m. A remarkable exception is provided by the two species of *Gastonia*; of these *G. spectabilis* (HARMS) PHILIPSON of Papuaia can attain the great height of 40 m with a stem of 1.75 m \varnothing ; it is the largest araliad known and is of very striking appearance. Fig. 27.

Araliads are almost always found scattered in forest and other vegetation, at least in Malesia. However, a notable exception is provided by the tree *Schefflera rugosa* (BL.) HARMS in Java; LAM (1924) recorded its gregarious occurrence on the volcanic cone of Mt Slamet in Central Java where it is co-dominant with the pyrophilous *Albizia lophantha* ВТН. in elfin forest between 2500–3050 m, above which it gives way to the open, rocky, treeless slopes below the summit (3428 m). It is also gregarious on Mt Tjeremai in West Java, where LAM (1925) noted that above some 2650 m a low forest dominated by this species replaces the high forest of *Dacrycarpus imbricatus*; this low forest extends to *c.* 3000 m. On the Gedeh-Pangrango complex above Puntjak Pass in West Java *Schefflera rugosa* is frequent in forest borders. On Mt Ulu Kali in Malaya, east of Kuala Lumpur, *S. nervosa* (KING) VIG. is common in young regrowth along the main road

below the Genting Highlands hotel/casino complex from 1300–1600 m. This pioneering tendency is shared by a number of other species in the genus, especially in montane parts of Papuaia. Many of these species are terrestrial as pioneers or in secondary formations, but epiphytic in closed forest (and then often much more scattered).

Gregarious occurrence, usually in pioneering situations or in forest borders, has also been observed in the various species of *Harmsioplanax*; STEUP (1938) observed *H. aculeatus* (BL.) WARB. ex BOERL. as a characteristic pioneer in grass thickets on hills in SW. Celebes. *H. harmsii* K. SCH. behaves similarly around Wau, Bulolo, and Sogeri (Rouna) in Papua New Guinea, especially in narrow intermontane valleys, while *H. ingens* PHILIPSON can be locally abundant in open situations in the highlands of New Guinea. *Gastonia spectabilis* (HARMS) PHILIPSON can be locally frequent as a pioneer in hill areas, e.g. around Bulolo and on the Madang-Ramu Divide; while *Polyscias elegans* (C. MOORE & F.V.M.) HARMS is frequently seen in stable monsoon scrub and forest borders in the Port Moresby region and *P. ledermannii* HARMS can be an exceedingly common regrowth tree in cut-over montane forest subject to frequent cloudiness and rain.

In the subalpine zone of New Guinea BRASS (1941) found two species of *Schefflera* conspicuous in the stunted forest of *Xanthomyrtus-Vaccinium-Papuacedrus-Phyllocladus* between 3200–3800 m on Mt Wilhelmina. From Lake Habbema upwards, the characteristic overtopping tree is *S. altigena* FRODIN (sect. *Brassaia*), with its large foliage contrasting sharply with the surrounding microphyllous vegetation; at higher altitudes it gives way to *S. pagiophylla* HARMS (*S. falcata* PHILIPSON), a species of uncertain affinities. *Schefflera chibuensis* FRODIN and *S. straminea* FRODIN are likewise often seen in forest borders on Mt Wilhelm and Mt Giluwe respectively in Papua New Guinea.

In contrast to the large and conspicuous species of *Schefflera*, many others are more or less shade-loving epiphytes or vines of lower storeys within the forest, although they may occur in sunnier situations where clouding is frequent (*S. singularis* B. C. STONE on Mt Ulu Kali). One group of species in New Guinea is almost limited to perhumid moist or wet rain-forests and usually are small epiphytic shrubs or even herbs (*S. gemma* FRODIN). A few species are conspicuous rosette-trees of the forest understorey (*S. stahlia* (WARB.) FRODIN).

Climate. In Malesia *Araliaceae* for the most part shun regions subject to a seasonal climate; all species are evergreen. A few exceptions include *Schefflera thaumasiantha* HARMS from open savanna in the hill zone in SE. New Guinea and *S. actinophylla* (ENDL.) HARMS as a gallery tree in seasonal parts of southern New Guinea, but especially *Harmsioplanax aculeatus* whose range is for the greater part subject to an annual drought period; in addition to SW. Celebes, it is also frequent on old lava-streams on Mt Idjen in East Java together with *Wightia*, *Casuarina junghuhniana*, *Dodonaea*, and *Wendlandia*, and is one of the few araliads in the Lesser Sunda Islands.

With respect to altitude, most *Araliaceae* occur in the lowland, hill and montane zone below 2300 m. The only genera of which all Malesian representatives occur in the hills and mountains above 1000 m are *Pentapanax* and *Dendropanax*, but even these do not exceed 3000 m. Only certain species of *Schefflera* and *Harmsioplanax* continue upwards much higher, especially in New Guinea where the highest known record belongs to *S. pagiophylla* HARMS on the Carstensz complex, where F. J. WISSEL found it in 1936 at 3900 m.

Flower biology. Little has been recorded about the floral biology of the family in Malesia, but BECCARI's account (1878) of the 'false fruits' of *Osmoxylon* (including *Boerlagiodendron*) serving to attract doves which are assumed to effect pollination has become a classic description and example of ornithophily.

Heterosexual flowers, usually involving combinations of perfect and male flowers, occur frequently but understanding will require intensive study in the living state.

Though flowers are not generally showy and often veritably inconspicuous, the disk produces abundant nectar. They also may spread a rather disagreeable scent, somewhat spermatic, that in *Schefflera rugosa* resembling that of *Ligustrum*. For this species DOCTERS VAN LEEUWEN (1933) observed on Mt Gedeh, West Java, only rare visits (notably by *Diptera*), but assumed that cross-pollination will be the rule. Flowers (at least those of *Fatsia*) will also be visited by *Hymenoptera*. In *Schefflera stahlia* (WARB.) FRODIN, the thick fleshy flowers, numerous stamens, and position of the inflorescence below the rosette of leaves all point to bat pollination.

Dispersal in the family takes place generally by fruit-fall; but as fruits are baccate or (more

usually) drupaceous, they will also be eaten by birds (for the most part) and bats, as recorded by RIDLEY (1930) for *Aralia*, *Hedera*, and *Schefflera*. The black fruits of *Schefflera sect. Brassaiia* in New Guinea and Australia are especially popular with birds. The hooked mericarps of *Harmsioplanax* are exceptional.

Seed germination is most likely after the seed having passed the gut of a bird or after mastication of the fruit by a bat.

References: BECCARI, *Malesia* 1 (1878) 193–198; BRASS, *J. Arn. Arb.* 22 (1941) 271–342, esp. 318, 320, 323, 327; DOCTERS VAN LEEUWEN, *Verh. Kon. Ak. Wet. A'dam sect. 2*, 31 (1933) 195; H. J. LAM, *Trop. Natuur* 13 (1924) 20; *ibid.* 14 (1925) 6; RIDLEY, *Disp.* (1930); STEUP, *Trop. Natuur* 27 (1938) 142.

Morphology. Most erect *Araliaceae* are sparingly branched or even unbranched; their limbs are upright and the often massive, easily broken twigs generally bear rosettes of big, long-stalked leaves which leave large scars when they fall. Few form a true crown (*Arthrophyllum*, *Gastonia*, some species of *Schefflera* and *Polyscias*), while the others often look like elongated and grotesque shrubs with a candelabrum-like framework. Branches in most *Araliaceae* are entirely orthotropic; generally speaking, the plants would fit into the so-called Holttum, Corner, Tomlinson, Chamberlain and Leeuwenberg models of HALLÉ *c.s.* (1970, 1978), or their intermediates.

Aralia scandens (MERR.) HA is a true climber. Epiphytic species only occur in the genus *Schefflera*; it is not yet recorded that any of them may appear to turn into a hemi-epiphytic habit.

Hedera (not native in Malesia) is almost the only genus with differentiated shoots and marked vegetative dimorphism.

A preliminary account of shoot-morphology in the family has been given by PHILIPSON (1978), but much further field work is required in this area. Vegetative buds may be either proleptic or sylleptic; in the resting phase such buds may be covered by the clasping bases of foliage leaves (*Osmoxylon*, *Schefflera*) or (more rarely) specialized cataphylls (*Acanthoplanax*). In both types of bud the primordia and young leaves may be covered by exudations of resinous slime.

There is so far little recorded evidence of the changes in leaf shape and configuration during the somatic phase of the life cycle known in many araliads in other parts of the world; however, recent observations in New Guinea made by FRODIN suggest that heteroblastism does occur, although its manifestation is not constant for a given species. Distinctive juvenile and intermediate foliage has been found in *Schefflera eriocephala* HARMS and (to a lesser extent) in *S. stolleana* HARMS. Other examples are seen in *Brassaiopsis*, *Trevesia* and *Schefflera subg. Agalma* (*S. aromatica* (BL.) HARMS; *S. nervosa* (KING) VIG.); juvenile leaves of some of these are preserved in Herbarium Bogoriense. In *Harmsioplanax*, the configuration of the leaves changes abruptly just below the inflorescence, a phenomenon paralleled in some other genera although less dramatically. In *Mackinlaya celebica* (HARMS) PHILIPSON and *M. schlechteri* (HARMS) PHILIPSON, leaf polymorphism is very marked with the result that in the past several 'paper species' have been described on too limited a range of material; in this revision many reductions have been made.

References: HALLÉ & OLDEMAN, *Essai sur l'architecture et la dynamique de croissance des arbres tropicaux*, Paris (1970); HALLÉ, OLDEMAN & TOMLINSON, *Tropical trees and forests: an architectural analysis*, Berlin (1978); PHILIPSON in Tomlinson & Zimmermann (eds.), *Tropical trees as living systems* (1978) 269–284.

Anatomy. General accounts of the vegetative anatomy of the ivy family are given by GÜSSOW (1900), VIGUIER (1906, 1909) and METCALFE & CHALK (1950). Secretory canals are characteristic of the stems and leaves, but are absent from *Aralidium*. A comparison of the wood anatomy of *Araliaceae* and *Cornaceae* is made by PHILIPSON (1967), and an extensive account of vegetative anatomy in the context of woody *Umbellales* was provided by RODRIGUEZ (1957, 1971). The xylem of the former family is characterized by fibres with small, simple pits, and the presence of scalariform and reticulate perforation plates in the vessel elements (as opposed to simple perforations) is thought to be a less advanced feature. Recent special reports bearing on taxonomy include: on stomatal development (INAMDAR *c.s.*, 1969); on sieve-tube plastids (BEHNKE, 1972), and on epidermal papillae (BUI, 1974).

Floral anatomy is discussed by BAUMANN-BODENHEIM (1955), PHILIPSON (1967, 1970) and especially by EYDE & TSENG (1971). Embryological characteristics of the family have been re-

viewed by DAVIS (1966) as well as by RAO (1972). The single pendulous anatropous ovule has the funiculus and ovular vascular bundle axial (PHILIPSON, 1970). The embryo is small in a mass of endosperm (MARTIN, 1946; GRUSHVITZKY, 1967).

References: BAUMANN-BODENHEIM, Bull. Soc. Bot. Suisse 65 (1955) 481–510; BEHNKE, Bot. Rev. 38 (1972) 155–197; BUI NGOC-SANH, Bull. Mus. Hist. Nat. Paris III, Bot. 18 (1974) 85–91 (whole no 271); DAVIS, Systematic embryology of the angiosperms, New York (1966); EYDE & TSENG, J. Arn. Arb. 52 (1971) 205–239; GRUSHVITZKY, Proc. Int. Symp. Physiol. Ecol. & Biochem. of Germination (ed. H. Borris) (1967); GÜSSOW, Beiträge zur vergleichende Anatomie der *Araliaceae*, Thesis, Breslau (Wrocław) (1900) 67 pp., illus.; INAMDAR, GOPAL & CHOCHAN, Ann. Bot. n.s. 33 (1969) 67–73; MARTIN, Amer. Midl. Nat. 36 (1946) 513–660; METCALFE & CHALK, Anatomy of the dicotyledons II, Oxford (1950); PHILIPSON, New Zeal. J. Bot. 5 (1967) 134–165; in Robson, Cutler & Gregory (eds.), New research in plant anatomy, London (1970) 87–100; RAO, Phytomorphology 22 (1972) 75–87; RODRIGUEZ, Univ. Calif. Publ. Bot. 29 (1957) 145–318; in Heywood (ed.), The biology and chemistry of the *Umbelliferae*, London (1971) 63–91; VIGUIER, Ann. Sci. Nat. Bot. IX, 4 (1906) 1–209; *ibid.* IX, 9 (1909) 305–405.

Palynology. Palynological studies of Malesian *Araliaceae* include: on *Gastonia* (TSENG, 1971); on *Tupidanthus* and *Plerandra* (= *Schefflera*) (TSENG, 1973); on *Osmoxylon* (as *Boerlagiodendron*) (TSENG, 1974) and on *Schefflera* (TSENG & SHOUP, 1978). A detailed consideration of the relations of Araliaceous pollen to those in other orders is given by HIDEAUX & FERGUSON (1976), and of the affinities of *Klotzschia* (*Umbelliferae*/*Hydrocotyloideae*) to *Araliaceae* by SHOUP & TSENG (1977). To date, much useful new evidence has been made available, but better correlation with other classes of attributes is required.

References: HIDEAUX & FERGUSON in Ferguson & Muller (eds.), The evolutionary significance of the exine, London (1976); SHOUP & TSENG, Amer. J. Bot. 64 (1977) 461–463; TSENG, Amer. J. Bot. 58 (1971) 505–516; Grana 13 (1973) 51–56; Amer. J. Bot. 61 (1974) 717–721; TSENG & SHOUP, Amer. J. Bot. 65 (1978) 384–394.

Chromosome numbers. Lists of chromosome numbers for members of *Araliaceae* are given by DARLINGTON & WYLIE (1955), SHARMA & CHATTERJI (1964) and BOLKOVSKIKH *c.s.* (1969). The family shows considerable constancy of the basic number of $x = 12$, although $x = 11$ has been recorded for one non-Malesian group of *Schefflera*. The implications of chromosome data on the wider relationships of the *Araliaceae* are discussed by MOORE (1971).

References: BOLKOVSKIKH *c.s.*, Chromosome numbers of flowering plants, Leningrad (1969); DARLINGTON & WYLIE, Chromosome atlas of flowering plants, ed. 2, London (1955); MOORE in Heywood (ed.), The biology and chemistry of the *Umbelliferae*, London (1971) 233–255; SHARMA & CHATTERJI, Cytologia 29 (1964) 1–12.

Phytochemistry. Information on the chemistry of the *Araliaceae* should be sought in HEGNAUER (1964, 1978) where references to original sources are given. The family is characterized by the occurrence of essential oils and resins in canals and by the presence of polyacetylenic compounds (especially falcarinone-type), triterpenic sapogenins of the oleanene-, ursene- and dammarene-types, seed oils with petroselinic acid, and by the absence of true tannins. The chemistry of the family fully confirms its close relationship with the *Umbelliferae* and also more distantly with the *Pittosporaceae* and the *Compositae* (HEGNAUER, 1969, 1971; BOHLMANN, 1971). The rareness of flavones and the predominance of flavonols in *Araliaceae* suggests closer relationship with two of the three subfamilies of the *Umbelliferae*, flavones having not yet been found in *Hydrocotyloideae* and *Saniculoideae* (HARBORNE, 1971). The absence of iridoid substances and true tannins and the presence of polyenes, petroselinic acid and isoprenylated coumarins in the *Umbellales* contrasts with the *Cornales* (HEGNAUER, 1969; JENSEN *c.s.*, 1975), and this led to a suggestion that the *Umbellales* and *Cornales* had to be separated (BATE-SMITH *c.s.*, 1975), an argument with increasing support from other lines of inquiry. However, insufficient evidence appears to be yet available for the detection of possible lines of relationship within the *Araliaceae*.

References: BATE-SMITH *c.s.* Biochem. Syst. Ecol. 3 (1975) 79–89; BOHLMANN in Heywood (ed.), The biology and chemistry of the *Umbelliferae* (1971) 279–291; HARBORNE, *l.c.* 293–314; HEGNAUER, Chemotaxonomie der Pflanzen 3 (1964); in Harborne & Swain (eds.), Perspectives in phytochemistry (1969) 121–138; in Heywood (ed.), The biology and chemistry of the *Umbelli-*

ferae (1971) 267–277; in Cauwet-Marc & Carbonnier (eds.), *Les Umbellifères. Contributions pluridisciplinaires à la systématique*. Perpignan (1978) 335–363; JENSEN, NIELSEN & DAHLGREN, *Bot. Notis.* 128 (1975) 148–180.

Taxonomy. The *Araliaceae* are on all grounds closely connected with the *Umbelliferae*, a very large but mainly temperate and tropical-montane group comprising mostly aromatic herbs with a restricted floral scheme. It seems likely that the ancestors of the ivy family were the woody tropical stock from which the herbaceous *Umbelliferae* evolved under the rigours of cooler climates (CORNER, 1940) with the arborescent *Heteromorpha* of upland Africa and *Myrrhidendron* in Central and South America, both in the subfamily *Apioideae*, perhaps representing relics of the transition on account of the presence of a number of attributes primitive for the family (RODRIGUEZ, 1957); on the other hand, the umbellifers may have originated as megaherbs on tropical mountains (PHILIPSON, 1978). A few Araliaceous genera exhibit some features characteristic of *Umbelliferae*, such as *Harmsioplanax*, *Mackinlaya*, and especially *Myodocarpus* (from New Caledonia) and *Stilbocarpa* (from southern New Zealand and associated 'subantarctic' islands).

This led HARMS (1898) to show three different lines leading from *Araliaceae* to *Umbelliferae*, suggesting that considerable overlap between the families existed; more recently RODRIGUEZ (1971) again called attention to this phenomenon and THORNE (1968, 1973) has gone further by merging *Umbelliferae* into *Araliaceae* (a step also advocated by HALLIER *f.* in 1905) and assuming the three subfamilies of the former to have arisen separately, perhaps in different parts of the world at different times, from proto-Araliaceous ancestors. However both he and RODRIGUEZ have concluded in agreement with CORNER (*l.c.*) and BAUMANN-BODENHEIM (1946) that the *Araliaceae sensu stricto*, "because of their greater evolutionary breadth and their retention of many more primitive features, would seem closest to the proto-araliad stock" (THORNE, 1973).

Nevertheless, the concept of *Araliaceae* as a separate natural family appears to serve a useful purpose and has been retained for this Flora. An isolated, doubtfully included genus is the West Malesian *Aralidium*; it is the only genus lacking resin ducts but it would be equally anomalous in the *Cornaceae* to which it has also been referred. It shows some resemblance with the New Zealand genus *Griselinia*, usually relegated to the *Cornaceae*, be it as a marginal member (PHILIPSON, 1967).

Subdivision. Since the first significant family monograph by SEEMANN (1868), several systems have been proposed which, taken together, are notable for their lack of consistency. This results from a lack of agreement on the relative importance of the comparatively minor structural and gross anatomical features of reproductive parts traditionally used and by conflicting claims on the relative 'antiquity' of polymery *versus* pentamery. Until recently, there has been for *a priori* reasons (*cf.* EYDE, 1975) little recognition of the potential value of vegetative features and their acceptance as valid evidence for a system; and information from wood anatomy, floral histology, palynology, karyology, phytochemistry, and other areas is only beginning to be utilized. While woodiness is generally accepted as a primitive feature in *Araliaceae*, the impact of the work of CORNER and others on tree structure and growth rhythms (summarized in HALLÉ, OLDEMAN & TOMLINSON, 1978; see also BORCHERT, 1969; HLADIK, 1970; PHILIPSON, 1978) has still to be fully assimilated. Much more work is also required on inflorescences, although FRODIN (1970), PHILIPSON (1970b) and others have made a beginning. The monothetic interpretation of most attribute states usual in systems of the family was first challenged by BAUMANN-BODENHEIM (*l.c.*) who considered that phyletic changes could have taken place in parallel; and EYDE & TSENG (1969) showed that at least some supposedly unidirectional sequences were reversible. This has tended to reduce the supposed importance of many of the traditional attributes, with a consequent reduction in the number of genera.

Sufficient evidence is not yet available, however, for the construction of a more balanced, polythetically based system of the family, and the long-standing subdivision proposed by HARMS (1898) into three tribes, *Schefflereae*, *Aralieae*, and *Mackinlayeae*, based monothetically on the structure and aestivation of the perianth, is retained. In spite of its now recognized imperfections, it is more valid than the systems of VIGUIER (1906) and HUTCHINSON (1967) and remains the most widely accepted. Some steps towards the formulation of a new system on polythetic principles have been taken by EYDE & TSENG (1971: 221) who make a fundamental distinction based on

basic leaf-organization (either pinnate or palmate) and recognize the heterogeneity of HARMS' *Aralieae*; however, this system was deliberately not completely developed.

Generic delimitation. Generic limits within the *Araliaceae* have long been unstable. As in the *Umbelliferae*, the flower conforms to a simple and relatively uniform pattern throughout most of the family and systematists have resorted to small technical differences to delimit genera. HARMS recognized 51 genera, while VIGUIER, little more than a decade later, recognized 80; HUTCHINSON distinguished 84 genera but with criteria very differently weighted as compared with VIGUIER. Nevertheless, in Malesia as elsewhere there are several distinctive and very natural genera, including *Harmsioplanax*, *Aralidium*, *Osmoxylon*, *Anakasia*, *Mackinlaya*, *Arthrophyllum*, *Delarbrea*, and *Trevesia*. Many other genera in the family, including those Malesian ones not noted above, are mutually less distinctive and delimitation is based on various combinations of a number of attributes which have been subject to many different standards of weighting and interpretation. These include: petals valvate or imbricate; pedicel articulated or not; leaves digitately compound, pinnate, or simple; stamen and locule number and the relationship of these numbers; style free or connate; endosperm ruminant or not; and thorns present or not.

The present treatment is characterized by a number of generic reductions or exclusions; only one genus described since 1900 has been retained (*Anakasia*). *Hederopsis* is united with *Macropanax*, a genus with a very similar facies and (in part) overlapping range and which was separated merely on the number of cells in the ovary and variations in inflorescence structure. *Wardenia* has been united with *Brassaiopsis* because apart from its simple palmately veined leaves there are no differences; better material collected in recent years has provided evidence that the ovary is in fact 2-locular, but that one ovule aborts and the fruit is as a result 1-seeded. *Acanthophora* differs from *Aralia* only in habit (VAN STEENIS, 1948). PHILIPSON (1951) already regarded *Anomopanax* as insufficiently distinct from the older *Mackinlaya*, a union retained here. The same author (1973) combined *Boerlagiodendron* with the earlier described *Osmoxylon* as a number of species intermediate between the two genera had come to light. The Malesian species formerly included in *Tetraplasandra* as well as *Peekelioplanax* were likewise by PHILIPSON (1970a) reduced to two species of *Gastonia*; but it should be noted that in Malesia as on the SW. Indian Ocean islands this genus is very close to *Polyscias*, particularly the very similarly ranging *sect. Eupteron* (*P. nodosa*, *P. ledermannii*, etc.).

The two largest Malesian genera are herein both treated in a wider sense. *Polyscias* includes as its type section a distinctive Melanesian/Micronesian group of species which in the wild state extends into eastern Malesia and the Philippines, and in cultivation further west. The remainder of the genus as represented in Malesia comprises some rather distinctive species, several of which have been given generic rank (*Eupteron*, *Kissodendron*, and *Palmervandenbroekia*). If the name *Polyscias* were to be confined to the type-section of the genus it would be necessary to recognize a considerable number of small genera. Retention of a wide concept for the genus therefore appears to be preferable.

Schefflera, by far the largest genus of the family in Malesia, is likewise more broadly conceived than in the past, although in our region only a small number of species from segregate genera are involved (i.e. those formerly in *Brassaia*, *Plerandra*, *Scheffleropsis*, and *Tupidanthus*). On a world-wide basis, FRODIN (1975) recommended the reduction of 12 segregate genera; improved knowledge of the genus required that, as in *Polyscias*, this step be taken or have the genus split into a number of differently organized smaller genera with more serious nomenclatural consequences. A broad concept of *Schefflera* has therefore been adopted. It may be noted here that the flowers in both the former genera *Plerandra* and *Tupidanthus*, characterized by numerous stamens, are thought by FRODIN to represent a secondary development related to bat pollination, and the large fruits for dispersal by bats or larger birds; this is supported by the position of the inflorescences, which are beneath the leafy rosettes as a result of retarded development although the axes remain sympodial and the shoot units mostly orthotropic. As divisions of the larger genus *Schefflera*, they are not at all closely related, conforming to the views of TSENG (1974) on the pollen morphology and contrasting with the views of HARMS (1898) and EYDE & TSENG (1971), who regarded them (as genera) as of close affinity and relatively primitive within the family. In fact, rather different levels of specialization are represented overall by the two taxa, not just in the pollen morphology (TSENG, *l.c.*).

Specific delimitation. This has offered many problems, but fortunately the very abundant material now available from many areas has revealed that many of the species described up to 1951 are in fact conspecific. Especially was the great plasticity in vegetative and inflorescence development not sufficiently appreciated in the past, partly due to imperfect field knowledge of the plants. This has led to considerable reductions in *Arthrophyllum*, *Aralia*, *Osmoxylon*, *Gastonia*, and parts of *Schefflera* and *Polyscias*. Other species have been reduced through a regional approach to the genera. However, in *Osmoxylon* and *Schefflera*, many species from the Philippines, Celebes, western New Guinea, and to a lesser extent Borneo and Sumatra are still known only from very few or even only a single collection; this has meant a rather tentative treatment in many cases. The same applies in a more limited way in some of the other genera. Certain species are rather polymorphic, and at least in *Schefflera* several 'species-complexes' have been discerned.

References: BAUMANN-BODENHEIM, Bull. Soc. Bot. Suisse 56 (1946) 13–112; BORCHERT, Amer. J. Bot. 56 (1969) 1033–1041; CORNER, Ways. Trees Malaya (1940) 153; EYDE, Amer. Sci. 63 (1975) 430–437; EYDE & TSENG, Science 166 (1969) 506–508; J. Arn. Arb. 52 (1971) 205–239; FRODIN, The complex of *Cephaloschefflera* in *Schefflera* (*Araliaceae*), Thesis, Cambridge, U.K. (1970); J. Arn. Arb. 56 (1975) 427–448; HALLÉ, OLDEMAN & TOMLINSON, Tropical trees and forests: an architectural analysis, Berlin (1978); HALLIER *f.* New Phytol. 4 (1905) 151–162; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1898) 1–62; HLADIK, Adansonia 10 (1970) 383–407; HUTCHINSON, Gen. Fl. Pl. 2 (1967) 52–81; PHILIPSON, Bull. Brit. Mus. Nat. Hist. Bot. 1 (1951) 3–20; New Zeal. J. Bot. 5 (1967) 134–165; Blumea 18 (1970a) 490–495; *ibid.* 18 (1970b) 497–505; *ibid.* 21 (1973) 81–89; in Tomlinson & Zimmermann (eds.), Tropical trees as living systems (1978) 269–284; RODRIGUEZ, Univ. Calif. Publ. Bot. 29 (1957) 145–318; in Heywood (ed.), The biology and chemistry of the *Umbelliferae* (1971) 63–91; SEEMANN, Revision of the natural order of *Hederaceae*, repr. from J. Bot. London (1868); VAN STEENIS, Bull. Bot. Gard. Btzg III, 17 (1948) 390–391; THORNE, Aliso 6 (1968) 57–66; Notes R. Bot. Gard. Edinb. 32 (1973) 161–165; TSENG, Amer. J. Bot. 61 (1974) 717–721; VIGUIER, Ann. Sci. Nat. Bot. IX, 4 (1906) 1–209.

Uses. A variety of minor local uses are reported by BURKILL (1966), HEYNE (1927), and OCHSE & BAKHUIZEN VAN DEN BRINK (1931) as well as in the notes under individual species in this Flora. The only species that form articles of trade are the taxa of *Polyscias sect. Polyscias* popularly grown as foliage and hedge plants; however, many other species in a variety of genera are of actual or potential ornamental worth, with *Schefflera actinophylla* (ENDL.) HARMS and *S. longifolia* (BL.) VIG. being particularly widely used. In Papua New Guinea, *Gastonia spectabilis* is cut for timber and the wood used for light carpentry, boxes, etc.

Monkeys are fond of the flush of some aromatic species of *Schefflera*, as observed in West Java and North Sumatra.

References: BURKILL, Dict. rev. ed. (1966); HEYNE, Nutt. Pl. (1927); OCHSE & BAKHUIZEN VAN DEN BRINK, Veget. D.E.I. (1931).

Notes. *Nomina nuda* and invalidly published names have only been quoted if they have been cited in Index Kewensis.

Notes for collectors. Many araliads present problems to collectors because of the size of their leaves and inflorescences. It is often advisable to select leaves of medium size, but the maximum size of leaves should be recorded on the label. It is important to preserve the junction of leaf and stem and also sufficient of the leaf to allow reconstruction of the whole. Likewise, with inflorescences the base, main axis and some primary branches should be preserved so that the whole can be visualized — ultimate branches alone are insufficient. Fruiting material is as useful as a flowering specimen. Collectors should be alert to note the existence of vegetative heteroblasty and floral dimorphism and document these with specimens and notes; the form in immature plants is important. Rapid drying is essential or all parts will disarticulate and very fragmentary specimens result.

KEY TO THE GENERA

1. Petals imbricate. Tribe ARALIEAE.

2. Leaves simple, palmately or pinnately lobed, or entire.

3. Leaves palmately lobed, tomentose 1. Harmsioplanax

3. Leaves pinnately lobed or entire, glabrous 2. Aralidium

2. Leaves pinnately compound (or bi- or tripinnate).
4. Leaves twice (or more) pinnate 3. *Aralia*
4. Leaves once pinnate.
5. Leaflets many 4. *Delarabrea*
5. Leaflets 5 or fewer 5. *Pentapanax*
1. Petals valvate.
6. Petals with a narrow base, or claw. Tribe MACKINLAYEAE 6. *Mackinlaya*
6. Petals with a broad base. Tribe SCHEFFLEREAE.
7. Inflorescence rays trifid: central branch shorter with 'false fruits', the two lateral longer with normal flowers 7. *Osmoxylon*
7. Inflorescence branches not as above.
8. Ovary with one cell 8. *Arthrophyllum*
8. Ovary with more than one cell.
9. Leaves pinnate.
10. Pedicel not articulated below the flower. 9. *Gastonia*
10. Pedicel articulated below the flower 10. *Polyscias*
9. Leaves not pinnate.
11. Pedicel articulated below the flower.
12. Leaves digitately compound (or rarely unifoliolate) (Malay Peninsula, Sumatra, Java)
11. *Macropanax*
12. Leaves simple, not articulated with the petiole (West New Guinea) 12. *Anakasia*
11. Pedicel not articulated below the flower.
13. Leaf simple (or unifoliolate) or palmately lobed.
14. Leaf palmately lobed.
15. Ovary 2-celled 13. *Brassaiopsis*
15. Ovary 10- or more-celled 14. *Trevesia*
14. Leaf simple (or unifoliolate).
16. Articulation present between petiole and blade *Schefflera*
16. No articulation between petiole and blade.
17. Ovary 2-celled 13. *Brassaiopsis*
17. Ovary 4- or more-celled 15. *Dendropanax*
13. Leaf digitately compound.
18. Petiolules joined together by a web of tissue. 14. *Trevesia*
18. No such web of tissue present.
19. Styles or stigmas 2.
20. Style bifid 16. *Acanthopanax*
20. Styles united into a column 13. *Brassaiopsis*
19. Styles or stigmas more than 2 *Schefflera*

1. HARMSIOPANAX

WARB. in E. & P. Nat. Pfl. Fam. Nachtr. 1 (1897) 166; HARMS, Bot. Jahrb. 56 (1921) 413; HUTCH. Gen. Fl. Pl. 2 (1967) 62; PHILIPSON, Blumea 21 (1973) 81. — *Schubertia* BL. Bijdr. (1826) 884, *nom. illeg., non* MIRB. 1812. — *Horsfieldia* BL. ex DC. Prod. 4 (1830) 87, *non* WILLD. 1805; BTH. in B. & H. Gen. Pl. 1 (1865) 937; BOERL. Handl. 1 (1890) 633; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 60. — Fig. 1-3.

Sparingly branched or single-trunked often monocarpic trees, up to 18 m. *Stems* stout, bearing terminal clusters of large, palmately lobed, often peltate, exstipulate leaves. Trunk, petioles, and sometimes the blades spiny. *Flowers* in very large, repeatedly branched, terminal panicles which develop after the leaves have fallen. *Umbellules* arranged racemosely on the ultimate branchlets, sessile or peduncled, each consisting of a few to many pedicelled flowers. Pedicels not jointed, subtended by a bract and bearing two subulate bracteoles. Flowers hermaphrodite or with hermaphrodite flowers on terminal and male flowers on basal branches. *Calyx* a



Fig. 1. *Harmsioplanax ingens* PHILIPSON ssp. *ingens*. a. Leaf, $\times \frac{4}{5}$, b. part of inflorescence, $\times \frac{1}{3}$, c. umbelule, $\times 4$, d. developing fruit, $\times 12$ (a NGF 36901, b-d PHILIPSON 3483).

minute rim. *Petals* 5, free, valvate with a broad base. *Stamens* 5, dorsifixed, versatile, introrse. *Ovary* inferior, narrowly obconic, densely bristly; cells 2; disk conical, deeply cleft between the two subulate styles. *Fruit* consisting of 2 dry mericarps, each 3-ribbed and bearing a persistent slightly hooked style.

Distr. *Malesia*: 3 spp. from Java, the Lesser Sunda Is., Celebes, and New Guinea.

Ecol. Montane and mossy forest and in regrowth on grassy hillsides.

Notes. *Harmsioplanax* is a small structurally isolated genus confined to Malesia. The three species are uniform both in their vegetative and their reproductive features. It has long been recognized that some of the characters of this genus are anomalous within *Araliaceae* and a return to its earlier position within *Umbelliferae* would have something in its favour. The monocarpic habit is unknown elsewhere in *Araliaceae*, but is not uncommon in *Umbelliferae*. The character of the fruit, which splits into two dry mericarps, closely approaches the fruit structure of *Umbelliferae*, and the vascularization of the gynoeceum is also characteristic of that family. However, the structure of the leaf-base, the woody habit, and the shape of the petals all incline towards *Araliaceae*.

KEY TO THE SPECIES

1. Upper surface of leaves uniformly setulose.
 2. Umbellules sessile. 1. *H. aculeatus*
 2. Umbellules peduncled 2. *H. harmsii*
1. Upper surface of leaves with many (or rarely few) larger spines among the setulose hairs 3. *H. ingens*

1. *Harmsioplanax aculeatus* (BL.) WARB. ex BOERL. Handl. 3 (1900) 88; KOORD. Exk. Fl. Java 2 (1912) 719; Atlas 4 (1916) f. 668 & 669; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1946) fam. 159, p. 19; BACK. & BAKH. f. Fl. Java 2 (1965) 171; STEEN. Mt. Fl. Java (1972) pl. 3-2; PHILIPSON, Blumea 21 (1973) 82. — *Schubertia aculeata* BL. Bijdr. (1826) 885. — *Horsfieldia aculeata* (BL.) DC. Prod. 4 (1830) 87; BENN. Pl. Jav. Rar. (1840) 123, t. 26; K. & V. Bijdr. 7 (1900) 57; BOERL. Handl. 1 (1890) 647. — *Horsfieldia peltata* BTH. in B. & H. Gen. Pl. 1 (1862) 937. — Fig. 2.

Tree up to 4 m, with a slender spiny trunk. Young stems covered more or less densely with woolly hairs, bristles, and spines with bulbous bases, the spines enlarging on older stems. *Leaves* rounded, variable in size, often 60 cm or more in \varnothing , deeply palmately lobed, usually peltate in mature leaves, sinuses between the lobes broad or narrow, lobes 7-10, usually sharply and irregularly incised and toothed, apex acute, upper surface rather sparsely covered with evenly-spaced, appressed, sometimes branched hairs (denser on the main veins), underside densely clothed with a soft, woolly tomentum, often with some bristles on the main veins; petiole c. 60 cm, 1 cm \varnothing at base, terete with clasping base, densely covered with woolly hairs, bristles, and some spines. *Inflorescence* up to c. 70 cm long, main branches rather sparsely covered with a short tomentum and, when young, bearing numerous bracts similar to the leaves but smaller, not peltate, and often 3-lobed or entire; ultimate branchlets slender and often woolly-tomentose, bearing minute linear bracts which subtend the sessile umbellules. Umbellules

about 4 mm \varnothing in flower, the broadly ovate outer bracts forming a more or less distinct involucre. *Flowers* hermaphrodite or male, either mixed in an inflorescence, or separate, c. 10-15 per umbellule, each subtended by a lanceolate receptacular bract c. 2 mm long. Pedicel c. $\frac{1}{2}$ mm long. Calyx rim fringed. Petals strap-shaped, c. $1\frac{1}{2}$ mm long at anthesis. Filaments c. 2 mm; anthers c. 0.3 mm long, orbicular. Ovary covered with cilia which lengthen as the fruit ripens. *Mericarps* long-ciliate, crowned with the divergent styles.

Distr. *Malesia*: Java, Lesser Sunda Is. (Bali, Lombok, Sumbawa, Flores, Timor), southern half of Celebes. There is a single KORTHALS sheet in L, ticketed from Central Sumatra, but this is presumably wrongly localized.

Ecol. Usually in rather dry, open localities, but also in forest, in secondary forest, also pioneering on rocks, in grasslands and on lava-streams, 300-1800 m. *Fl. fr.* April-Nov. SCHMUTZ found it in Flores flowering in October, but leaves had fallen.

Vern. Java: *djankurang*, *d. tjutjuk*, *djoglorangrang*, *S, gabus, garang, g. lanang, gungrang, udulan laki, J.*

Note. In this species lateral shoots usually appear below the infructescences so that the trees are not normally monocarpic.

2. *Harmsioplanax harmsii* K. SCH. in K. Sch. & Laut. Nachtr. (1905) 329; HARMS, Bot. Jahrb. 56 (1921) 413.

Tree up to 7 m, with a slender trunk. Young stem covered with bristles, hairs, and spines, older stems with smooth bark with small rounded lenticels and numerous spines. Monocarpic. *Leaves*



Fig. 2. Habit of *Harmsioplanax aculeatus* (BL.) WARB. ex BOERL. Coarse shrub on old lava-streams in E. Java (Mt Idjen) at c. 900 m altitude (Photogr. VAN STEENIS).

rounded, up to 30 by 40 cm, deeply palmately lobed, cordate at base, lobes 5-9 with broad sinuses between them, margin unevenly and sharply dentate, apex acute, upper surface densely covered with evenly spaced bristles of varying size (larger on the main veins), appressed and directed towards the leaf margin, often with woolly hairs inserted on their enlarged bases, the underside very densely woolly and with many bristles, usually bearing crisped hairs on their enlarged bases; petiole

50 cm, $\frac{1}{2}$ cm \varnothing at base, terete with clasping base, densely covered with bristles, woolly hairs, and spines. *Panicle* at first with numerous leaf-like bracts, the principal branches with some spines, rather sparsely covered with bristles and hairs, ultimate branches slender and tomentose, bearing linear bracts c. 4 mm long subtending peduncled umbellules; peduncles up to 5 mm, slender, tomentose, bearing 2 minute bracts. Umbellules spherical, c. 4-5 mm \varnothing in flower, outer bracts not form-

ing a distinct involucre. *Flowers* hermaphrodite, maturing in basipetal succession, the lower bracts of a branch either with sterile umbellules or lacking flowers; up to 60 in an umbellule, each subtended by a lanceolate ciliolate bract *c.* 1 mm long, and borne on a glabrous pedicel *c.* 1¼ mm long. Calyx rim fringed with many lacerate filaments. Petals ovate, *c.* 1 mm long. Filaments *c.* 1 mm; anthers *c.* ½ mm long. Ovary covered with cilia which lengthen as the fruit ripens. *Mericarps* with rounded ribs, long-ciliate, crowned by the divergent styles.

Distr. *Malesia*: Papua New Guinea (Madang Distr., Western Highlands, Morobe Distr. & Central Distr.).

Ecol. Forested hills, grassy slopes, and roadsides, 100–1800 m.

Vern. *Opme*, Ganja, Mt Hagen, *mafiong*, Sattelberg, Morobe Distr.

Note. Information about the habit is inadequate. The stalked spherical umbellules are very distinctive.

3. *Harmsioplanax ingens* PHILIPSON, *Blumea* 21 (1973) 84.

ssp. ingens. — Fig. 1, 3.

Unbranched tree up to 18 m with a thick or sometimes slender trunk densely covered, except towards the base of mature specimens, with long, sharp, upwardly directed spines and marked with leaf-scars. Monocarpic. *Leaves* usually peltate, rounded, up to 1 m Ø, deeply palmately lobed, lobes usually with minor lobes and coarsely dentate, apex acute, upper surface bearing few to many long spines, especially on the midrib and principal veins between which the surface is often rugose and glabrous except for the remains of a tomentum of branched hairs, or with many bristles often with woolly hairs on their bases, the under-surface also with few to many long spines and usually clothed with a fawn or greyish woolly tomentum of branched hairs, or densely furnished with bristles usually with woolly hairs on their bases, or occasionally glabrous between the spines



Fig. 3. *Harmsioplanax ingens* PHILIPSON. Left: apex of leafy stem; right: the large inflorescence (Photogr. FRODIN, Murrumbidgee Pass, 1971).

except for a few bristles; petiole up to 1 m and 3 cm \varnothing , terete with clasping base, covered with woolly hairs and bearing many spines. *Panicle* up to 5 m long and 5 m wide, leafless or with lobed bracts c. 10–20 cm long, principal branches spiny especially below, ultimate branches slender, tomentose, bearing linear bracts c. 1 cm long subtending peduncled or sessile umbellules; peduncles elongating as the fruit ripens, up to 4 mm, rather stout, tomentose, bearing 1 or 2 minute bracts. Umbellules bowl-shaped, c. 6–10 mm \varnothing in flower, enlarging slightly in fruit, with an involucre of about 8 ovate bracts, 2–4 mm long and ciliate distally. *Flowers* hermaphrodite, maturing in basipetal succession, terminal branches bearing maturing fruit while lower branches bear flowers or unopened buds; usually c. 12–16 (8–20) in an umbellule each subtended by an involucre bract or a narrower receptacular bract and borne on a glabrous pedicel 1–2 mm long. Calyx rim fringed with many lacerate filaments. Petals ovate, 1–2 mm long. Filaments 2–3 $\frac{1}{2}$ mm; anthers $\frac{1}{2}$ – $\frac{3}{4}$ mm long. Ovary covered with cilia which lengthen as the fruit ripens. *Mericarps* with rounded ribs, long-ciliate, crowned by the divergent styles.

Distr. *Malesia*: New Guinea (NW. Irian and extending along the central mountains from the Orion Mts to the Owen Stanley Range, Murray Pass).

Ecol. Montane and mossy forest and second-growth forest, 2000–3600 m, occasionally rather lower.

Vern. Papua: *mauku*, Huli; Mandated Terr.: Sepik Distr., *kamul*, Hindenburg Ra.; Western Highlands: *murri*, Hagen, *tolsan*, Minj, *mauri*, Melpa, *mai*, Mendi, *kinogore*, *makua*, *makw*, Enga; Eastern Highlands: *kimu*, Ka, *ollu*, Chimbu.

Notes. A striking, single-trunked, monocarpic tree bearing immense inflorescences. The bark is described as grey brown and the wood white with a wide pith. The inflorescence has the appearance of bearing female flowers above and male flowers below, but this is evidently due to a basipetal sequence of anthesis. The terminal flowers have

stamens when freshly opened and all those on lower branches bear styles. Apparently, the female organs of the lower branches are functional because branches from mature inflorescences bear fruit uniformly. Nevertheless, herbarium specimens cannot adequately represent such a large inflorescence so that the possibility remains that some female-sterile flowers occur in this species.

Variation occurs in both tomentum and inflorescence characters. For example, most specimens from West Irian have small umbellules and fewer leaf-spines. In the eastern part of the Eastern Highlands District a number of gatherings display a series of variations: the under-leaves give the appearance of being glabrous between bristles, the inflorescence branches bear small leafy bracts, the umbellules are sessile, with rather numerous (c. 18–21) small flowers subtended by rather broad bracts. Specimens from Mt Otto show all these features combined, but other specimens from this region diverge from the typical state in only some of these characters. No specimens of this subspecies are known from the Finisterre Range and only one from the Owen Stanley Range.

ssp. moniliformis PHILIPSON, *Blumea* 21 (1973) 86.

Umbellules disposed irregularly along the branches, singly or in small groups, with bare spaces intervening, sessile; flowers usually c. 20–30 per umbellule, floral parts smaller than in *ssp. ingens*; fruiting heads rather small (c. 5 mm \varnothing).

Distr. *Malesia*: Papua New Guinea (districts bordering on the Huon Gulf).

Vern. Morobe Distr.: *mobian*, Finschhafen.

Note. This subspecies occurs at lower altitudes than is usual for *ssp. ingens* (1500–2000 m). No specimens of either subspecies have been collected from higher altitudes in the mountains north of the Markham River and the Huon Gulf. At higher altitudes in the Owen Stanley Range *ssp. ingens* is known from one gathering. The most south-easterly gathering at present known (CARR 13603) has a distinctive appearance due to the straight rigid inflorescence branches with small sessile umbellules.

2. ARALIDIUM

MIQ. *Pl. Jungh.* 3 (1855) 423; *Fl. Ind. Bat.* 1, 1 (1856) 762, t. 13; *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 25; *Bth. in B. & H. Gen. Pl.* 1 (1865) 936; *HEMSL. in Hook. Ic. Pl.* 16 (1886) t. 1549; *BOERL. Handl.* 1 (1890) 631; *HARMS in E. & P. Nat. Pfl. Fam.* 3, 8 (1894) 60; *HUTCH. Gen. Fl. Pl.* 2 (1967) 59. — **Fig. 4.**

Unarmed tree or shrub with simple, exstipulate pinnately lobed, irregularly incised, or entire leaves. *Inflorescence* a large panicle, with cymules of small flowers arranged racemously on the branches. Pedicels articulated below the ovary. Dioecious. *Male flowers*: calyx 5; petals 5, imbricate; stamens 5, anthers dorsifixed. *Female flowers*: calyx and corolla similar to male; staminodes 5; ovary with 3



Fig. 4. *Aralidium pinnatifidum* (JUNGH. & DE VRIESE) MIQ. a. Habit, $\times \frac{2}{3}$, b. ♂ flower and bud, c. ♀ flower and bud, both $\times 8$, d. fruit, seed, and CS, slightly enlarged (a VAN BALGOOY 2185, b COCKBURN FRI 8376, c SINCLAIR 9884, d fresh material). Drawn by W. R. PHILIPSON.

locules (2 abortive) and 1 ovule, styles 3–4, tapering from broad bases, stigmas terminal. *Fruit* drupe-like. *Seed* solitary, pendulous from a thickened funicle, 4–5-grooved; endosperm deeply ruminant.

Distr. Monotypic. Peninsular Thailand and *Malesia*: Malay Peninsula, Sumatra, and Borneo.

The record from Java by MIQUEL (Ann. Mus. Bot. Lugd.-Bat. 1, 1863, 25) is erroneous (see K. & V. Bijdr. 7, 1900, 2).

Ecol. Primary and secondary forest, from sea-level to c. 1250 m.

Notes. The single species forms a genus with several unique features, namely the large, simple, characteristically pinnately lobed leaves, the absence of resin ducts, the diffuse panicles of male or female flowers, the 3-carpellate ovary with a single surviving loculus resulting in a single-seeded fruit, the dorsal raphe, the deeply ruminant endosperm, and the enlarged funicle.

The genus is treated here as a member of the *Araliaceae* mainly as a matter of convenience. Sometimes it has been placed in the *Cornaceae* (e.g. RIDL. Fl. Mal. Pen. 1, 1922, 894, and VIGUIER, Ann. Sc. Nat. Bot. 4, 1906, 171), and on full investigation it may well prove to be better placed in that family. The absence of resin ducts and the dorsal raphe strongly support a relationship with the *Cornaceae* and its immediate allies, though the absence of borders to the pits of the xylary fibres is characteristic of *Araliaceae*.

Several genera formerly placed in the *Cornaceae* have now been elevated to the rank of family. If this course is followed then *Aralidium* should also be segregated. Many of the features of *Aralidium* approach those of *Griselinia* (segregated as *Griselinaceae*) and possibly these two genera should be united as a single family.

1. *Aralidium pinnatifidum* (JUNGH. & DE VRIESE) MIQ. Fl. Ind. Bat. 1, 1 (1856) 763; HEMSL. in Hook. Ic. Pl. 16 (1886) t. 1549; BOERL. Handl. 1 (1890) 631; RIDL. Fl. Mal. Pen. 1 (1922) 895; PHILIPSON, J. Bot. 78 (1940) 118. — *Aralia pinnatifida* JUNGH. & DE VRIESE, Ned. Kruidk. Arch. 1 (1846) 15; Ann. Sc. Nat. III, 6 (1846) 115. — *A. dentatum* MIQ. Sum. (1861) 340. — *A. integrifolium* HEINE in Fedde, Rep. 54 (1951) 245. — Fig. 4.

Shrub or small tree up to c. 10 m, rarely reaching 20 m and 25 cm \varnothing , glabrous in its vegetative parts; buds enclosed in long sheathing leaf-bases. *Leaves* spaced with distinct internodes, usually c. 30 by 22 cm or more, \pm regularly pinnately incised, frequently as deep as the midrib, lobes oblong-acuminate and decurrent on the midrib, c. 2 $\frac{1}{2}$ cm wide or more, the lobing sometimes irregular, and occasionally the blade entire and broadly ovate (up to 25 by 20 cm) or rarely lanceolate, leaf margin either entire or coarsely dentate, especially on the terminal lobe; petioles 5–12 cm, broadly channelled above, clasping the stem with a slightly dilated base, exstipulate. *Panicles* terminal, or occasionally in the upper axils, to 50 cm long, pendulous, puberulous; main bracts caducous, but the minute bracteoles often persisting until anthesis. *Flowers* numerous, small (buds c. 2 $\frac{1}{2}$ mm long), fragrant, creamy or red-tinged, ovary, calyx lobes and petals densely covered in a minute but coarse puberulence. *Male flowers* with the corolla persistent during anthesis, petals c. 1 $\frac{1}{2}$ mm long, strap-shaped, spreading, stamens c. 1 mm with flattened filaments and round anthers; stylopodium a succulent disk with a concave centre; styles absent, the ovary 1 $\frac{1}{2}$ mm long, narrowly turbinate,

without a loculus. *Female flowers* with the corolla caducous at anthesis together with the staminodes, styles divergent from their gibbous bases, ovary ovate with a single loculus (two abort early); ovule pendulous. *Fruit* usually obliquely ellipsoid, tapering to the apex and c. 3–4 $\frac{1}{2}$ cm long, but rarely subspherical, white when immature, ripening to purplish or black, juicy; exocarp fleshy, endocarp chartaceous. *Seed* broadly ellipsoid, 2–2 $\frac{1}{2}$ cm long, with the surface patterned with deep ruminations.

Distr. Peninsular Thailand; in *Malesia*: Malay Peninsula (from Kedah southwards common; Singapore), throughout Sumatra (also in Simalur I.), Anambas Is. (Siantan) and throughout Borneo.

Ecol. Frequent in evergreen primary rain-forest, also in open bamboo forest and secondary growths, from sea-level to c. 1250 m, in Borneo up to 1500–1800 m. *Fl. fr.* Jan.–Dec.

Uses. The only use, once mentioned, is from Brunei, as “leaves make good ghost medicine”.

Vern. Malay Peninsula: *lěmpědu buaya*, (*poko balai*, *pungar*, *sahalat*, *sěbalai tingal*, *sibilai*, *těbalai*, M; Sumatra: (*kayu*) *attarodan*, Asahan, Batak lang., *sěgěntut*, Gajo, *mědung*, M, *maněl silai*, *mannel dotan*, *sukun dotan*, M, Simalur; Anambas Is.: *ballok*, M, Siantan; Borneo: *daun tutchol antu*, Brunei, Iban lang.

Note. Entire leaves are not infrequent throughout the range of the species, so that the recognition of a second species using this character is not justified. Coarsely dentate leaf-margins were also employed as a specific character but are merely a minor variation. Some specimens from Mt Kinabalu have rather small globose fruits, but the typical form of fruit also occurs on that mountain.

3. ARALIA

LINNÉ, Gen. Pl. ed. 5 (1754) 134; Sp. Pl. (1753) 273; DC. Prod. 4 (1830) 257; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 6; BTH. in B. & H. Gen. Pl. 1 (1865) 936; BOERL. Handl. 1 (1890) 629; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 56; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 391; HUTCH. Gen. Fl. Pl. 2 (1967) 63; STONE, Gard. Bull. Sing. 30 (1977) 134; PHILIPSON, *l.c.* 97. — *Acanthophora* MERR. Philip. J. Sc. 13 (1918) Bot. 316, *non* LAMOUREUX, 1813 (*Algae*); STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 390. — Fig. 5, 6.

Sparingly branched shrubs or small trees, or climbing, rarely (*extra-Mal.*) herbaceous, glabrous or hairy, often prickly. *Leaves* pinnate to tripinnate, usually with leaflets at the insertion of the lateral pinnae; leaflets serrate; petiole with a sheathing base. *Inflorescence* a terminal panicle; flowers sessile or pedicelled, with an articulation below the flower; calyx with 5–6 teeth; petals 5–6, imbricate; ovary 2–6-celled; styles 2–6 free or shortly connate below. *Fruit* a fleshy drupe; pyrenes cartilaginous, compressed; endosperm uniform.

Distr. More than 30 *spp.* in North America (S. to Mexico) and East Asia, 6 *spp.* in *Malesia*: Sumatra, Malay Peninsula, Java, Lesser Sunda Is. (Sumba), Borneo, Celebes, Philippines, and West New Guinea.

Ecol. Usually on scrubby hillsides and in secondary growth, often in ravines or near streams, or in thickets near or above the limit of tree-growth, at low altitude (100 m), but usually in the montane zone, up to 3000 m.

Note. For a discussion of specific distinctions see VAN STEENIS, *l.c.* 391. HUI-LIN LI in *Sargentia* 2 (1942) 101, treated some species that extend into *Malesia*. MERRILL considered that the climbing habit and recurved spines of *Acanthophora* justified its separation as a distinct genus, but more recent authors have not agreed.

KEY TO THE SPECIES

1. Flowers sessile (capitate) or very shortly pedicelled.
2. Flowers sessile, underside of leaf \pm densely tomentose, hairs of the branches and inflorescence \pm appressed and felted, bracts around the capitula enveloped in hairs 1. *A. dasyphylla*
2. Flowers short-pedicelled, underside of leaf sparsely tomentose, hairs of the branches and inflorescence \pm patent, bracts around the capitula less densely tomentose 2. *A. javanica*
1. Flowers $\frac{1}{2}$ – $1\frac{1}{2}$ cm pedicelled (umbellate).
3. Climbing or scrambling liana, spines curved 3. *A. scandens*
3. Erect shrubs or small trees, spines straight.
4. Leaflets glaucous beneath, margins with few crenations. Fruit small (*c.* 3 mm long) 4. *A. bipinnata*
4. Leaflets green (or with fawn pubescence) beneath, margins serrate. Fruit rather larger (4–6 mm long).
5. Young parts and undersurface of leaves glabrous (but with small spines) 5. *A. ferox*
5. Young parts and undersurface of leaves pubescent 6. *A. montana*

1. *Aralia dasyphylla* MIQ. Fl. Ind. Bat. 1, 1 (1856) 751; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9, *incl. var. strigosa* MIQ. *et var. latifolia* MIQ.; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 53; KOORD. Exk. Fl. Java 2 (1912) 718; Atlas 4 (1916) f. 673 A–K; HUI-LIN LI, *Sargentia* 2 (1942) 20; BAKH. f. *Blumea* 6 (1947) 367, *incl. var. urticifolia* (Bl. ex MIQ.) BAKH. f.; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159,

p. 18; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 391; NGOC-SANH BUI, *Adansonia* 4 (1964) 464; BACK. & BAKH. f. Fl. Java 2 (1965) 170; STEEN. Mt. Fl. Java (1972) pl. 3–1; PHILIPSON, Gard. Bull. Sing. 30 (1977) 98; Y.-R. LING, *Acta Phytotax. Sin.* 15 (1977) 86. — *A. chinensis* (*non* L.) BL. Bijdr. (1826) 870. — *A. urticifolia* Bl. ex MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 55; KOORD. Atlas 4



Fig. 5. *Aralia bipinnata* BLANCO. a. Upper branches of inflorescence, b. pinna, c. base of petiole, all $\times 2/5$, d. flower bud, e. fruit, both $\times 3$ (JACOBS 7017). Drawn by W. R. PHILIPSON.

(1916) f. 673 L-N. — *A. beccarii* RIDL. J. Mal. Br. R. As. Soc. 1 (1923) 64. — Fig. 6.

Prickly shrub or small tree, often unbranched, to c. 5 m; young parts densely brown pubescent. *Leaves* forming large rosettes at the summit of the stems, c. 1 m long (or more), bi- or tripinnate, with a pair of leaflets (occasionally pinnate) at each division of the rachis, the petiole, rachis and lateral rachides prickly or unarmed, densely pubescent; leaflets subsessile or petiolule c. 5 mm long (or longer), usually densely pubescent on the lower surface, less dense above, ovate to oblong-ovate, c. 5–14(–18) by 3–5(–10) cm, base rounded to subcordate, apex acuminate, margin finely or sometimes coarsely serrulate; petiole c. 40 cm, with an elongated sheathing base and a small ligule. *Inflorescence* a large terminal panicle, 70 cm or more long, densely brown pubescent, rachis bearing several secondary branches c. 30–40 cm long, with ultimate branches arranged racemously, bracts ligulate, ending in heads of several sessile flowers, surrounded by an involucre of small usually densely pubescent bracts. *Calyx* with 5 usually obtuse teeth; petals 5, c. 1½ mm long, glabrous; stamens 5; ovary c. 2 mm long, glabrous, 5-celled; styles 5, slightly connate below. *Fruit* globose, c. 3½ mm Ø, ribbed when dry.

Distr. Northwards to southern China; in *Malesia*: Sumatra, Malay Peninsula, West and Central Java.

Ecol. Primary forest and secondary growths in deep ravines or open hillsides, from low altitude (c. 100 m) to 2500 m.

Vern. Sumatra: *kaju burle lasët, k. sèpak-sipang, k. si marsuga-suga, k. sipang-sipang, samimpadan, M.*; Java: *gorang, osangsing, J, pangang tjutjuk, S.*

Note. The capitulate flowers are characteristic (see also under *A. javanica*). The presence of this species in the Malay Peninsula has often been overlooked, though it extends into southern China. Its variability was discussed by VAN STEENIS (1948, l.c.).

2. *Aralia javanica* MIQ. Pl. Jungh. 3 (1855) 420; Fl. Ind. Bat. 1, 1 (1856) 749; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 55; KOORD. Exk. Fl. Java 2 (1912) 718; Atlas 4 (1916) f. 670; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 17; BACK. & BAKH. f. Fl. Java 2 (1965) 170; PHILIPSON, Gard. Bull. Sing. 30 (1977) 98.

A shrub or small tree, often unbranched, young parts covered with brown pubescence which persists on the stems and rachides of the inflorescence as ± patent hairs. *Leaves* tufted at the ends of the branches, bipinnate with a pair of leaflets at the divisions of the rachis; leaflets variable in size, subsessile or the petiolules up to c. 2 cm, blade ovate to elliptic, up to 18 by 8 cm (usually smaller),

both surfaces with sparse, short, appressed, bristly hairs, base cuneate to truncate, apex acuminate, margin finely and unevenly serrulate; petiole 20–30 cm. *Inflorescence* a large terminal panicle, rachis bearing several secondary branches c. 30–40 cm long, with the ultimate branches bearing heads (or subumbellules) of c. 10 flowers, surrounded by an involucre of small linear bracts. *Calyx* with 5 small teeth; petals 5; stamens 5; ovary c. 2 mm long, glabrous, 5-celled; styles erect at anthesis. *Fruit* ovoid, c. 5 mm long, ribbed when dry, with the persistent styles recurved.

Distr. *Malesia*: West and Central Java (Mts Papandayan, Malabar, Diëng, Surakarta).

Ecol. Mountain forests, 2000–3000 m.

Note. This imperfectly known species may prove to be a form of the widespread *A. dasyphylla*, from which it appears to differ in the shortly pedicelled flowers, the sparser leaf-tomentum, the more patent hairs on the inflorescence branches and the bracts of the umbellules less thickly enveloped in hairs.

3. *Aralia scandens* (MERR.) HA, Nov. Sist. Vyssh. Rast. 11 (1974) 229; STONE, Gard. Bull. Sing. 30 (1977) 276, f. 1; PHILIPSON, l.c. 99. — *Acanthopora scandens* MERR. Philip. J. Sc. 13 (1918) Bot. 316; En. Philip. 3 (1923) 236; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 390. — *A. ferox* (MIQ.) KING, J. As. Soc. Beng. 67, ii (1898) 45; KOORD. Minah. (1898) 498; MERR. En. Born. (1921) 458; RIDL. Fl. Mal. Pen. 1 (1922) 872; MASAM. En. Phan. Born. (1942) 564.

Prickly scandent shrub, glabrous, reaching a height of 10 m or more, stems c. 2½ cm Ø. *Leaves* dispersed (c. 30 cm apart), up to 1½ m long, tri- or quadripinnate with a pair of leaflets at each division of the rachis, prickly on the petiole, rachides, and sometimes on the leaf veins; leaflets ovate to elliptic-ovate or ovate-lanceolate, petiolules 3–10 mm, blade 5–14 by 2½–5 cm, base rounded or subcordate, apex acuminate, margins finely spinulose-denticulate; petiole to 35 cm, with an elongated sheathing base and a small ligule. *Inflorescence* a large terminal spiny panicle, the main rachis to c. 60 cm, bearing secondary branches singly or in whorls, up to 50 cm; ultimate branches 1–4 cm, subtended by lanceolate bracts, racemously arranged, ending in umbellules; umbellules c. 10–20-flowered, pedicels slender, 10–12 mm, with lanceolate bracts 2–3 mm long, articulated below the flower. *Calyx* with 5–6 short acute teeth; petals 5–6, with a broad base, imbricate; stamens 5–6, filaments c. 4 mm long, anthers c. 1 mm long; ovary turbinate c. 2½ mm long, 5–6-celled, styles 5–6, free or only slightly connate below, at first erect. *Fruit* ellipsoidal, c. 5 mm long, purple to blue-black, deeply furrowed when dry, crowned by the persistent radiating styles.

Distr. *Malesia*: Malay Peninsula (Perak, Selangor, Pahang), Sabah (Mt Kinabalu), Philippines



Fig. 6. *Aralia dasyphylla* Miq. Habit, Tjibodas, on slope of Mt Gedeh, W. Java, c. 1400 m altitude (Photogr. PHILIPSON, 1973).

(Luzon, Panay, Catanduanes, Mindanao), Celebes (Menado, Buton I., S. Celebes).

Ecol. Thickets on slopes and mountainsides, often near streams, or among secondary growths, 180–1550 m.

Uses. In Mindanao is reported that scrapings of the bark are applied to wounds and a decoction of the boiled bark is drunk to relieve internal pain.

Vern. Philippines: *awangayan*, Mindanao, *simbar*, Bag.

Note. The only species with the habit of a liana, with spaced leaves, and recurved spines. The flowers are whitish or yellowish, and slightly fragrant and are visited by numerous small bees. The fruit is purple and fleshy.

4. *Aralia bipinnata* BLANCO, Fl. Filip. (1837) 222; MERR. Sp. Blanc. (1918) 294; En. Philip. 3 (1923) 235; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 392, *incl. f. inermis* STEEN.; PHILIPSON, Gard. Bull. Sing. 30 (1977) 99. — *A. hypoleuca* PRESL, Epim. (1851) 250; MIQ. Fl. Ind. Bat. 1, 1 (1856) 751; F.-VILL. Nov. App. (1880) 101; VIDAL, Phan. Cuming. Philip. (1885) 117; Rev. Pl. Vasc. Filip. (1886) 144; HARMS, Bot. Jahrb. 23 (1896) 18; MERR. Philip. J. Sc. 5 (1910) Bot. 369; En. Philip. 3 (1923) 235. — *A. javanica* (non MIQ.) F.-VILL. Nov. App. (1880) 101. — *A. glauca* MERR. Philip. J. Sc. 2 (1907) Bot. 291; En. Philip. 3 (1923) 236. — *A. apoensis* ELMER, Leaf. Philip. Bot. 7 (1914) 2325; MERR. En Philip. 3 (1923) 235. — Fig. 5.

A shrub or small, sparsely branched tree to 7 m, with prickly stems. *Leaves* to 1½ m or more long, forming large crowns at the ends of the branches, bipinnate, with a pair of pinnae at each division of the rachis, with some prickles, especially on the petiole or unarmed, the rachis swollen and articulated at the nodes; leaflets sessile or with a short petiolule, ovate to lanceolate, usually 4–5 by 2–2½ cm, but variable in size, apex acute or acuminate, base rounded to cordate, usually markedly oblique in lateral leaflets, margin conspicuously crenate, upper surface green, glabrous, lower surface glaucous, pubescent along the veins and sometimes sparingly on the mesophyll, sometimes only in the angles of the lower veins, or almost glabrous throughout, primary and secondary veins conspicuous; petiole to 30 cm, base long sheathing and slightly ligulate. *Inflorescence* a large terminal panicle 30–70 cm long (or more), peduncle and also usually the main branches prickly, the whole either almost glabrous or pubescent; peduncle 5–18 cm long, stout; main rays c. 5–10, mostly clustered at the apex of the rachis, 25–65 cm long, bearing many short tertiary branches along their length; tertiary branches usually 5–10 cm long, ending in umbellules, and bearing a small number of lateral umbellules, or branches, minute lanceolate bracts subtending the branches of the third or higher orders; umbellules with c. 20–30 radiating

pedicels; pedicels 5–10 mm. *Calyx* lobes 5, rounded, ½ mm long; petals 5, 1½ mm long; stamens 5; ovary 5-celled, styles subulate, free. *Fruit* spheroidal, c. 3 by 4 mm, strongly 5-ribbed when dry, persistent styles spreading.

Distr. Taiwan; in *Malesia*: Philippines (Luzon, Leyte, Negros, Mindoro, Mindanao) and West New Guinea (Vogelkop Peninsula, possibly also in Swart Valley).

Ecol. In rather open forests, ravines, and in thickets and secondary growths, (700–)1000–2450 m.

Vern. Philippines: *badbaranai*, C.Bis., *dasanat*, Neg., *karugi*, Buk., *magkasau*, Bis., *mara-bauya*, Bag., *papang*, Bon., *sugsuga*, Ig.

Note. VAN STEENIS *l.c.* discussed the variability in pubescence and the development of spines.

5. *Aralia ferox* MIQ. Fl. Ind. Bat. 1, 1 (1856) 750; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9; BOERL. Handl. 1 (1890) 629; K. & V. Bijdr. 7 (1900) 49; KOORD. Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 671; Fl. Tjib. 2 (1923) 229; BAKH. *f.* & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 18; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 394; BACK. & BAKH. *f.* Fl. Java 2 (1965) 170; PHILIPSON, Gard. Bull. Sing. 30 (1977) 99. — *A. filicifolia* RIDL. J. Fed. Mal. St. Mus. 8 (1917) 42, *non* C. MOORE, 1876.

Spiny shrub or small tree, usually unbranched, to c. 10 m. *Leaves* forming a large rosette at the summit of the stem, up to c. 1 m long, or shorter below the inflorescence, bi- or tripinnate, with a pair of leaflets (often pinnate) at each division of the rachis, prickly on the petiole, main rachis, and often on the lateral rachides; leaflets sessile or petiolules to c. 5 mm, ovate or ovate-oblong, usually c. 3 by 1¾ cm, but variable in size, base truncate to rounded or cuneate, apex acute acuminate, margin sharply serrate, both surfaces with small bristle-like spines, especially on the veins, sometimes with small spines on the underside of the midrib; petiole to c. 25 cm, with an elongated sheathing base and a small ligule. *Inflorescence* a large terminal panicle, 25–50 cm long, glabrous, the main rachis rather short, bearing a few lateral or a terminal cluster of branches c. 15–25 cm long; tertiary branches disposed singly or in subverticils, ending in umbellules and bearing a variable number of lateral umbellules. *Flowers* c. 10–12 per umbellule; pedicels c. 5–6 mm, articulated below the ovary; calyx a rim bearing 5 narrow or triangular teeth; petals and stamens 5; ovary turbinate c. 2 mm long; styles 5, erect at first, soon spreading, scarcely united at the base. *Fruit* spheroidal, c. 6 by 5 mm, deeply furrowed when dry, the persistent styles radiating.

Distr. *Malesia*: Central W. Sumatra (Mt Kerintji), W. Java (Mts Gedeh, Patuha and Tangkuban Prahur).

Ecol. In montane scrub and among scattered trees, 1900–2900 m.

Vern. *Pabong, pangang njirvan, panggang-jermé, S.*

forma nana STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 394, f. 1.

Smaller, probably $\frac{1}{2}$ –1 m, leaves tripinnate, 30 cm long, spiny all over; leaflets 4–13 by 2–7 mm, rachides of the ultimate pinnae winged.

Distr. *Malesia*: Central W. Sumatra (Mt Talang).

Ecol. Growing about 2500 m.

Note. VAN STEENIS considered this interesting dwarf form to represent the extreme of a series in size variability.

6. *Aralia montana* BL. Bijdr. (1826) 870; MIQ. Fl. Ind. Bat. 1, 1 (1856) 750; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9, *incl. var. acutata* MIQ.; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 51; KOORD. Exk. Fl. Java 2 (1912) 718; Atlas 4 (1916) f. 672; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 391; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 17; BAKH. f. Blumea 6 (1950) 367, *incl. var. crassifolia* BAKH. f.; BACK. & BAKH. f. Fl. Java 2 (1965) 170; PHILIPSON, Gard. Bull. Sing. 30 (1977) 100. — *A. bipinnata* REINW. ex BL. Cat. (1823) 43, *nomen*; ex DE VRIESE, Pl. Ind. Bat. Or. (1857) 84, *nomen in synon.* — *Panax armatum* WALL. [Cat. (1832) n. 4933, *nomen*] ex G. DON, Gen. Syst. 3 (1834) 386. — *A. decomposita* REINW. ex DE VRIESE, Pl. Ind. Bat. Or. (1857) 84, *nom. illeg. altern.* — *A. armata* (WALL.) SEEM. J. Bot. 6 (1868) 134; CLARKE, Fl. Br. Ind. 2 (1879) 723; KING, J. As. Soc. Beng. 67, ii (1898) 44; RIDL. Fl. Mal. Pen. 1 (1922) 873; HUI-LIN LI, Sargentia 2 (1942) 106. — *A. thomsonii* SEEM. J. Bot. 6 (1868) 134; CLARKE, Fl. Br. Ind. 2 (1879) 723; KING, J. As. Soc. Beng. 67, ii (1898) 44; RIDL. Fl. Mal. Pen. 1 (1922) 873; HUI-LIN LI, Sargentia 2 (1942) 112.

Shrub or small tree, frequently unbranched, with prickly stems, occasionally attaining a height of 12 m. *Leaves* to 1 m or more long, forming large crowns at the ends of the branches, bipinnate, with a pair of simple or occasionally pinnate leaflets at each division of the rachis, usually with some prickles, especially on the petiole, or unarmed, the rachis constricted at the joints; leaflets sessile or with a short petiolule, ovate, up to 14 by 7 cm, apex acute to acuminate, base truncate or rounded, oblique in lateral leaflets, margin sharply serrate, upper surface with the remains of a strigose tomentum, often \pm rugose, lower surface often with a \pm velvety tomentum, or with more harsh hairs \pm confined to the veins; petiole to 30 cm, its base sheathing and ligulate. *Inflorescence* a large terminal panicle, peduncle and branches tomentose, prickles, if any, confined to the peduncle and main

rachis, small usually persistent linear or ovate bracts c. $1\frac{1}{2}$ cm long subtending the branches and also spaced along the peduncle; bracts of tertiary branches similar but smaller; secondary branches at intervals along the main rachis, c. 35 cm long, bearing numerous tertiary branches along their length; tertiary branches usually c. 6 cm long, ending in umbellules, and often bearing a number of lateral umbellules; umbellules with c. 20–30 radiating pedicels; pedicels usually 12–15 mm, occasionally shorter, pubescent. *Flowers* hermaphrodite; calyx lobes 5, triangular or rounded; petals 5, c. 2 mm long; stamens 5; ovary 5-celled, glabrous; styles subulate, connate below, free and spreading above. *Fruit* spheroidal, up to c. 4 by 4 mm, strongly 5-ribbed when dry, surmounted by the reflexed styles.

Distr. *Malesia*: Malay Peninsula, Sumatra, Java, Borneo (Sarawak, Sabah), Celebes, Lesser Sunda Is. (Sumba).

Ecol. Primary and secondary forest, bamboo forest and low-lying moist ground, from near sea-level to 2600 m.

Vern. *Gorang, panggang tjutjuk, S*; Malay Peninsula: *poko dulang-dulang*; Sarawak: *tepa paluk*.

Notes. This species is considered to include all West Malesian examples with pedicelled flowers and pubescent leaves. This broad concept is contrary to former treatments which have recognized several species (*A. thomsonii*, *A. armata*). The alliance with *A. chinensis* L. and *A. decaisneana* HANCE is also very close. The application of names to this and other Javanese species has been very confused. The position is ably discussed by VALETON (in K. & V. Bijdr.) and by VAN STEENIS (*l.c.*). In most specimens the lower leaf surface and the pedicels are densely tomentose, but there are specimens in which the leaf is only sparsely hairy and the pedicels may be glabrous. *A. armata* appears to be within the range of variation of the complex although this plant is very spiny, its leaves and inflorescences always being provided with numerous short spines. The leaflets also are thinner and smoother and, like the pedicels, are less densely pubescent (see NGOC-SANH BUI, Adansonia 9, 1969, 461). However, *A. armata* (if distinct) has been collected only very rarely in the Malay Peninsula and only in the extreme north. The most aberrant specimens are those with glabrous umbellules which are mostly from Sumatra but also from Java: they may indicate that *A. foliolosa* SEEM. should also be included in this complex.

Excluded

Aralia capitulata JUNGH. & DE VRIESE, Ned. Kruidk. Arch. 1 (1846) 17; Ann. Sc. Nat. III, 7 (1846) 116 is, *cf.* SLEUMER, Fl. Males. I, 7 (1971) 24 = *Gomphandra capitulata* (JUNGH. & DE VRIESE) BECC. (*Icacinaeae*).



Fig. 7. *Delarbrea collina* VIEILL. a. Habit, $\times \frac{2}{5}$, b. flower bud, c. flower and ditto in LS, d. petal, e. stamen, f. flower after anthesis, $\times 13$, g. fruit and ditto in CS, $\times 3$ (a-e, g RIDSDALE NGF 36736, f SOEKMA s.n.).
 Drawn by HÉLÈNE MULDER.

4. DELARBREA

VIEILL. Bull. Soc. Linn. Norm. 9 (1865) 342, 393; BTH. in B. & H. Gen. Pl. 1 (1865) 935; BRITTEN in Forbes, Nat. Wand. (1885) 506 (see also p. 354); HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 61; in K. Sch. & Laut. Fl. Schutzgeb. (1900) 485; HUTCH. Gen. Fl. Pl. 2 (1967) 63. — Fig. 7.

Glabrous unarmed shrubs or small trees. *Leaves* large, imparipinnate, with a stipular sheath; leaflets alternate or opposite, entire or indistinctly dentate. *Flowers* in umbellules grouped in large terminal panicles; pedicels articulated below the flower. Calyx lobes 5. Petals 5, imbricate, obovate, narrowed towards the base. *Stamens* 5, filaments stout, anthers dorsifixed. Ovary inferior, 2-celled, disk fleshy, obconic, crowned by two erect styles with clavate stigmas. *Fruit* ovoid, crowned by the small calyx lobes and the recurved style arms (which eventually fall); exocarp thin, fleshy, with peripheral oil vesicles; endocarp papery; endosperm with shallow longitudinal grooves not ruminant.

Distr. Queensland, Melanesia and East Malesia, 3 or 4 *sp.*, from the Lesser Sunda Is. eastwards to New Guinea (also New Britain), Queensland, Solomons, New Caledonia, and New Hebrides. In *Malesia* 1 *sp.*

Ecol. Lowland to montane forest.

Note. The corolla is distinctive, the petals being strongly imbricate and narrowed towards their insertion. The fruit also has a characteristic appearance, since the calyx and stylopodium, although persistent, do not enlarge as in most other araliads. The fruit, therefore, is a smooth ellipsoid berry without a prominent rim around the apex.

1. *Delarbrea collina* VIEILL. Bull. Soc. Bot. Norm. 9 (1865) 342; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 18. — *D. sp.* HEMSLEY, Rep. Challenger, Bot. 1, pt 3 (1885) 155. — *D. paradoxa* (non VIEILL.) BRITTEN in Forbes, Nat. Wand. (1885) 506. — *D. lauterbachii* HARMS in K. Sch. & Laut. Fl. Schutzgeb. (1900) 485.

Sparingly branched shrub to 5 m high, with the multijugate leaves clustered at the ends of the branches. *Leaves* c. 70–100 by 30–40 cm; rachis not articulated; leaflets alternate or in pairs, c. 7 on each side; petiolules c. 1 cm long; lamina c. 17–20 by 4–6½ cm, lanceolate, ovate, oblong or elliptic, gradually tapered to an acute apex, base truncate, rounded or cuneate, usually oblique, margin entire; petiole c. 17–20 cm, terete, lenticellate, with a heavily lenticellate clasping base with membranous margins. *Inflorescence* a terminal panicle of umbellules, rachis up to 60 cm long, bearing well-spaced secondary branches 6–25 cm long, bracts caducous; tertiary branches c. 2–8 cm long, terminating in a cirlet of broadly ovate bracts (mostly caducous) surrounding the umbellules, sometimes with smaller (male) lateral umbellules; umbellules c. 2 cm \varnothing at anthesis, with c. 30–40 flowers. Pedicels c. 5 mm (elongating to 10–15 mm in fruit), pustulate. *Calyx* lobes 5, obtuse, united below into a tube. Petals 5, c. 1½ by ¾ mm, keeled within. Stamens 5, 1 mm long. Ovary sometimes prominently ribbed when dry, c. 2 mm long; disk

and styles c. 1 mm high at anthesis. *Fruit* 16 by 10 mm, purplish black when mature.

Distr. Solomon Is. to New Caledonia and Queensland; in *Malesia*: Lesser Sunda Is. (Timor, Wetar, Babar), Moluccas (Tenimber Is., Banda), New Guinea (Aru Is., Kar Kar Is., Madang, New Britain). Fig. 8.

Ecol. Rain-forest, from sea-level to 1000 m.

Vern. *Don*, Madang.

Notes. The most wide-ranging of any Malesian araliad. It was collected in Malesia by FORBES in

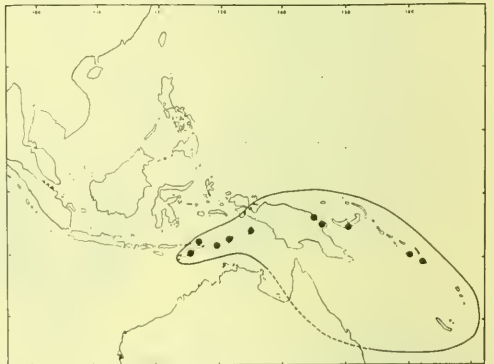


Fig. 8. Range of *Delarbrea collina* VIEILL., localities in Malesia dotted.

Timor in 1882, when it was incorrectly identified as the New Caledonian species *D. paradoxa* VIEILL. Eight years earlier it had been collected in the Aru Is. during the Challenger Expedition (HEMSLEY, *l.c.*) and also been referred as close to *D. paradoxa*. Nearly twenty years later LAUTERBACH collected it in the Moluccas, when HARMS described it as a new species. The statement by HARMS that the genus was known previously only from New Caledonia cannot be reconciled with his note in the Pflanzenfamilien in which he recorded

BRITTEN's report of it in Timor. Solomon Islands collections were identified as *D. collina* VIEILL. by PHILIPSON in 1951. The arrangement of the umbellules differs in the panicles of *D. collina* and *D. paradoxa*. All the material from Malesia conforms to the characters of *D. collina*. The plant is evidently rare, few collections having been made in spite of its wide distribution.

It was formerly cultivated in the Botanic Garden at Bogor until about 1958, having been introduced from Banda.

5. PENTAPANAX

SEEM. J. Bot. 2 (1868) 294; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 55; KOORD. Bull. Jard. Bot. Btzg III, 1 (1919) 181; HUTCH. Gen. Fl. Pl. 2 (1967) 63; NGOC-SANH BUI, Adansonia 9 (1969) 389; PHILIPSON, Austrobaileya 1 (1977) 23. — Fig. 9.

Trees or shrubs, often scandent, unarmed. *Leaves* imparipinnate, exstipulate, glabrous. *Flowers* in racemes or umbels, which are arranged in panicles or compound umbels, pedicels articulated below the ovary. *Calyx* 5. *Petals* 5, imbricate in the bud. *Stamens* 5. *Ovary* inferior, 5-celled, disk \pm conical, surmounted by the styles which are united their whole length or become free down to half their length. *Fruit* globose; exocarp leathery, enclosing crustaceous pyrenes. Seeds compressed, endosperm smooth.

Distr. About 14 *spp.* in India, Thailand, Vietnam, Ceylon, Burma, southern China, Taiwan, in *Malesia*: 1 *sp.* locally in E. Java.

South American species formerly included are best excluded, and the 2 Queensland *spp.* are now referred to *Polyscias*.

Ecol. Forest and scrub.

1. *Pentapanax elegans* KOORD. Bull. Jard. Bot. Btzg III, 1 (1919) 182, pl. 16 & 17; BAKH. *f.* & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 17; BACK. & BAKH. *f.* Fl. Java 2 (1965) 169. — Fig. 9.

var. elegans.

Epiphytic scrambler or terrestrial shrub up to 10 m, with unarmed branches, leaf and flower buds separate, enclosed in \pm persistent imbricated cataphylls. *Leaves* disposed along the branches; petiole *c.* 6–10 cm, flattened above, base scarcely dilated, and sometimes minutely fimbriated, articulated with the rachis, and the rachis articulated with the petiolules, articulations minutely fimbriate, rachis to 5 cm, petiolules of lateral leaflets up to 5 mm, of terminal leaflet to 20 mm, leaflets 5 or fewer, ovate to oblong-elliptic, the lateral sometimes oblique, up to 10 by 7 cm, usually *c.* 5 by 2½ cm, apex acute, base rounded or cuneate, margin entire or with subulate teeth, glaucous beneath. *Inflorescence* terminal with persistent cataphylls at the base of the main axis, umbels solitary or 1–4 smaller (apparently male) lateral

umbels arising from the axils of minute bracts on the rachis; rachis 8–16 cm, slender, glabrous; terminal umbel 3–6 cm \varnothing , many-flowered; pedicels 1½–3 cm, filiform, glabrous, with minute bracteoles surrounding the articulation below the flower. *Calyx* lobes ligulate, obtuse, *c.* 1 mm long; petals triangular to ligulate *c.* 2 mm long; filaments yellow, 3 mm, anthers purple, ½ mm long. *Ovary* broadly obconic, surmounted by a stylar column, 2 mm long. *Fruit* globose, 3–4 mm \varnothing , disk broadly conical, crowned by the persistent calyx lobes and an awl-shaped stylar column which may divide at apex.

Distr. Malesia: E. Java (Mts Ardjuno and Tengger), the variety in Thailand.

Ecol. Uncommon, in light forest or scrub, including *Casuarina junghuhniana* forest, 1700–2600 m.

Note. A remarkably isolated species of a genus otherwise unrepresented in Malesia.

var. pubescens KOORD. Bull. Jard. Bot. Btzg III, 1 (1919) 183 (as *var. puberula* in *f.* 17); NGOC-SANH BUI, Adansonia 9 (1969) 389.



Fig. 9. *Pentapanax elegans* KOORD. a. Habit, $\times \frac{1}{2}$, b. flower bud, c. flower in anthesis, d. ovary in CS, enlarged (VAN STEENIS 10879). Drawn by P. PRENDERGAST.

Peduncle and pedicels tomentose.

Distr. Thailand; in *Malesia*: E. Java (Mt Jang).

Ecol. In *Casuarina junghuhniana* forest, scattered, 1900–2300 m.

Note. Since all specimens from Mts Tengger and Ardjuno lack pubescence, the retention of the variety appears justified. However, more collections are required from all localities.

6. MACKINLAYA

F.v.M. Fragm. 4 (1864) 119; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 62; Bot. Jahrb. 56 (1921) 413; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 3; HUTCH. Gen. Fl. Pl. 2 (1967) 65. — *Anomopanax* HARMS [in Dalla Torre & Harms, Gen. Siph. (1903) 364, *nomen*;] Ann. Jard. Bot. Btzg 19 (1904) 13; in K. Sch. & Laut. Nachtr. (1905) 332; in E. & P. Nat. Pfl. Fam. Nachtr. 3 (1908) 255; Bot. Jahrb. 56 (1921) 414; HUTCH. Gen. Fl. Pl. 2 (1967) 59. — **Fig. 10.**

Glabrous unarmed shrubs, often unbranched (sympodial). *Leaves* with a petiole having a dilated sheath encircling the stem and (in dried material) a constriction at the apex, and with a leaf-blade either unifoliolate or digitately compound, the central leaflet, or the three central leaflets, sometimes digitately lobed or compound. *Inflorescence* terminal (but sympodium often continued by axillary branching), the peduncle bearing umbellately arranged branches which terminate either in umbellules or in cymes. *Flowers* male or hermaphrodite, the male flowers either in distinct inflorescences or towards the periphery of mixed inflorescences. Pedicel articulated below the flower. *Calyx* lobes 5–6, triangular or lanceolate. *Petals* 5–6, narrowed below into a distinct claw, and above into a long incurved process. *Stamens* 5–6; anthers subglobose. *Ovary* inferior, with two uni-ovulate cells. *Disk* prominent, with a crenulate margin. *Styles* 2, subulate, free, recurved in fruit. *Fruit* strongly compressed, 2-seeded (or one aborted), with a longitudinal furrow between the seeds; exocarp leathery, endocarp cartilaginous. Endosperm smooth.

Distr. 5 spp., Solomon Is., Queensland, and in *Malesia* (3 spp.): Philippines, Celebes and throughout New Guinea.

Ecol. Understorey of rain-forest and montane forest, or epiphytic. Also in secondary growth.

Notes. The leaves are palmately divided or they may be reduced to a single leaflet, especially on the upper branches of *M. schlechteri*. The central leaflet, or the three central leaflets, are either lobed or compound, a character rarely found in other genera of this family. Another foliar character rare in the family is the insertion of the leaf-sheath round the whole circumference of the stem. This character occurs also in a section of *Polyscias*, but is more typical of *Umbelliferae*. The narrow base of the petal is also very rare in the family, but is characteristic of *Umbelliferae*. The constantly 2-celled ovary is also typical of *Umbelliferae*, but other characters of the fruit appear to justify the retention of these plants in the *Araliaceae*. Reasons for regarding *Anomopanax* as congeneric with *Mackinlaya* are given by PHILIPSON (*l.c.*).

KEY TO THE SPECIES

1. Ultimate branches of the inflorescence in irregular cymes 1. *M. celebica*
1. Ultimate branches of the inflorescence in umbellules.
 2. Primary rays of the inflorescence many (30–50) 2. *M. radiata*
 2. Primary rays of the inflorescence c. 15 or fewer 3. *M. schlechteri*

1. *Mackinlaya celebica* (HARMS) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 8. — *Anomopanax celebicus* HARMS, Ann. Jard. Bot. Btzg 19 (1904) 14; Ic. Bog. 2 (1906) t. 176 & 177. — *Anomopanax philippinensis* HARMS, Ann. Jard. Bot. Btzg 19 (1904) 15. — *Anomopanax warburgii* HARMS, *l.c.* 15. — *M. amplifolia* HEMSL. Kew Bull. (1909) 260; HARMS, Bot. Jahrb. 56 (1920) 413. — *Anomopanax arfakensis* GIBBS, Arfak (1917) 163. — *Anomopanax digitata* MERR. Philip. J. Sc. 17



Fig. 10. *Mackinlaya celebica* (HARMS) PHILIPSON. a. Part of inflorescence, $\times \frac{2}{5}$, b. leaf, c. leaflet, $\times \frac{2}{3}$, d. flower cluster, e. flower, $\times 7$, f. petal, $\times 13$, g. fruit, $\times \frac{5}{6}$ (BRASS 28056). Drawn by HELENE MULDER.

(1920) 301. — *Polyscias cibaria* WHITE & FRANCIS ex LANE-POOLE, For. Res. (1925) 129, *descr. angl. minim.* — *Anomopanax variifolius* C. T. WHITE, J. Arn. Arb. 10 (1929) 256. — *M. digitata* (MERR.) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 7. — *M. warburgii* (HARMS) PHILIPSON, l.c. 8. — Fig. 10.

Shrub or small sparsely branched tree to 6 m. *Leaves* very variable in size and complexity; petiole up to 52 cm, 1¼ cm wide, terete, striate, with a membranous base ensheathing the stem; leaflets 5 (rarely 3) or the central petiolule (or the central 3 petiolules) frequently dividing to bear three, or more rarely 5 leaflets; lateral petioles short (c. 1–2 cm), the three central longer (up to 12 cm); lamina elliptic or ovate, up to 48 by 22 cm, base abruptly attenuated into the petiolule or subcordate, apex acuminate or gradually narrowed, acute, margin entire, denticulate or coarsely serrate, especially towards the apex, membranous, lamina of the terminal leaflet (and less frequently of the central three leaflets) sometimes deeply 3-lobed or with 3–5 separate leaflets, of which the lateral are markedly oblique at the base. *Inflorescence* a terminal compound umbel, very variable in size, either entirely of male flowers or with male and hermaphrodite flowers, often overtopped by sympodial growth; peduncle terete, striate, stout, up to 30(–45) cm, ¾ cm Ø, bearing lanceolate bracts below the rays; primary rays c. 9–18, 10–20 cm, striate, with distal small linear bracts; secondary rays about 5–10, 3–6 cm, dividing again (often repeatedly) either umbellately or in an irregular cymose manner, the central ray frequently more strongly developed. *Calyx* lobes 5, triangular, c. 1 mm long. *Petals* 5, obovate, c. 1½ mm long. *Filaments* c. 1½ mm, anthers small. *Ovary* obconic, 1–2 mm long, narrowly turbinate in male flowers, ovoid and quickly swelling in female flowers. *Fruit* up to 2½ by 3 cm, compressed, rotund, constricted in the mid-axis, the two halves frequently unevenly developed.

Distr. Solomon Is.; in *Malesia*: New Guinea (incl. New Britain and Aru Is.), Celebes, and Central & S. Philippines.

Ecol. Rain-forest, open hill forest, and montane forest, also in secondary growths, from sea-level to 1450 m.

Uses. LANE-POOLE (*l.c.*) recorded that at Mt Obree leaves and flowers are cooked with coconut oil and put in armllets in dances.

Vern. Philippines: *binlaon*, C.Bis., *pararau*, Bag., *tagima*, Sub., *lumot-lumot*, Mindanao; New Guinea: *bugini*, *wale*, *yam bonga*, Sepik Distr., *lak-lak*, W. Highlands, *po'undo*, S. Highlands, Papua, *nere*, Central Distr., Papua, *narona*, New Britain.

Notes. The leaves have a strong parsley-like odour. The flowers are creamy white, and the fruits blue to purple with a glaucous bloom. Salt is said to be obtained from the ashes of the leaves.

Although collected frequently in the Philippines and New Guinea, this species is unrecorded for the Moluccas. There is considerable variation in the size of the leaves and of the inflorescence. A few New Guinea specimens are intermediate in character between this and the equally common *M. schlechteri*, and are interpreted as hybrids.

2. *Mackinlaya radiata* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 6.

Slender shrub to 5 m. *Petiole* c. 20 cm, terete and finely striate, base ensheathing the stem, membranous. *Leaflets* 5, or the central petiolule bearing three leaflets, the two lateral petiolules short (1–1½ cm), the three central longer (6–8 cm, or the midpetiolule to 11 cm); lamina of the lateral leaflets elliptic or ovate, up to 20 by 12 cm, base abruptly attenuated into the petiolule, apex gradually narrowed, acute, margin entire or minutely denticulate towards the apex, membranous; lamina of the central leaflet similar or deeply 3-lobed or with 3 separate leaflets of which the lateral are strongly oblique at the base. *Inflorescence* a terminal compound umbel; peduncle terete, striate, stout, from 20 cm to considerably longer, 4–6 mm Ø, bearing lanceolate bracts below the rays; primary rays numerous (c. 30–50), 9–18 cm, slender, striate, with distal minute, linear, caducous bracts; secondary rays (pedicels) numerous (35–130), filiform, 1–2 cm; outer flowers male, central hermaphrodite. *Calyx* lobes 5, narrowly triangular, c. ½ mm long. *Petals* 5, obovate, c. 1 mm long. *Ovary* narrowly obconic in male flowers, ovoid in hermaphrodite flowers, c. 0.7 mm long. *Fruit* (immature) ovate, compressed.

Distr. Malesia: New Guinea (NW. Irian; Sepik Distr.).

Ecol. Montane rain-forest and mossy forest, 900–1200 m.

Vern. Apiyetimber, Sepik Distr.

Note. Flowers creamy white.

3. *Mackinlaya schlechteri* (HARMS) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 7. — *Anomopanax schlechteri* HARMS in K. Sch. & Laut. Nachtr. (1905) 332, t. 13. — *Anomopanax versteegii* HARMS, Nova Guinea 8 (1910) 276. — *M. versteegii* (HARMS) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 7. — *M. brassii* PHILIPSON, l.c. 6. — *M. klossii* PHILIPSON, l.c. 6. — *M. subulata* PHILIPSON, l.c. 7.

Slender shrub to 6 m. *Leaves* 1–3(–rarely 4-)foliolate. *Petiole* usually less than 10 cm, but occasionally longer (to 20 cm), especially in compound leaves, terete and finely striate, base ensheathing the stem, membranous. *Lamina* elliptic obovate, or oblong, occasionally irregularly lobed, up to 28 by 12 cm but usually considerably smaller, base cuneate or truncate (of lateral leaflets often

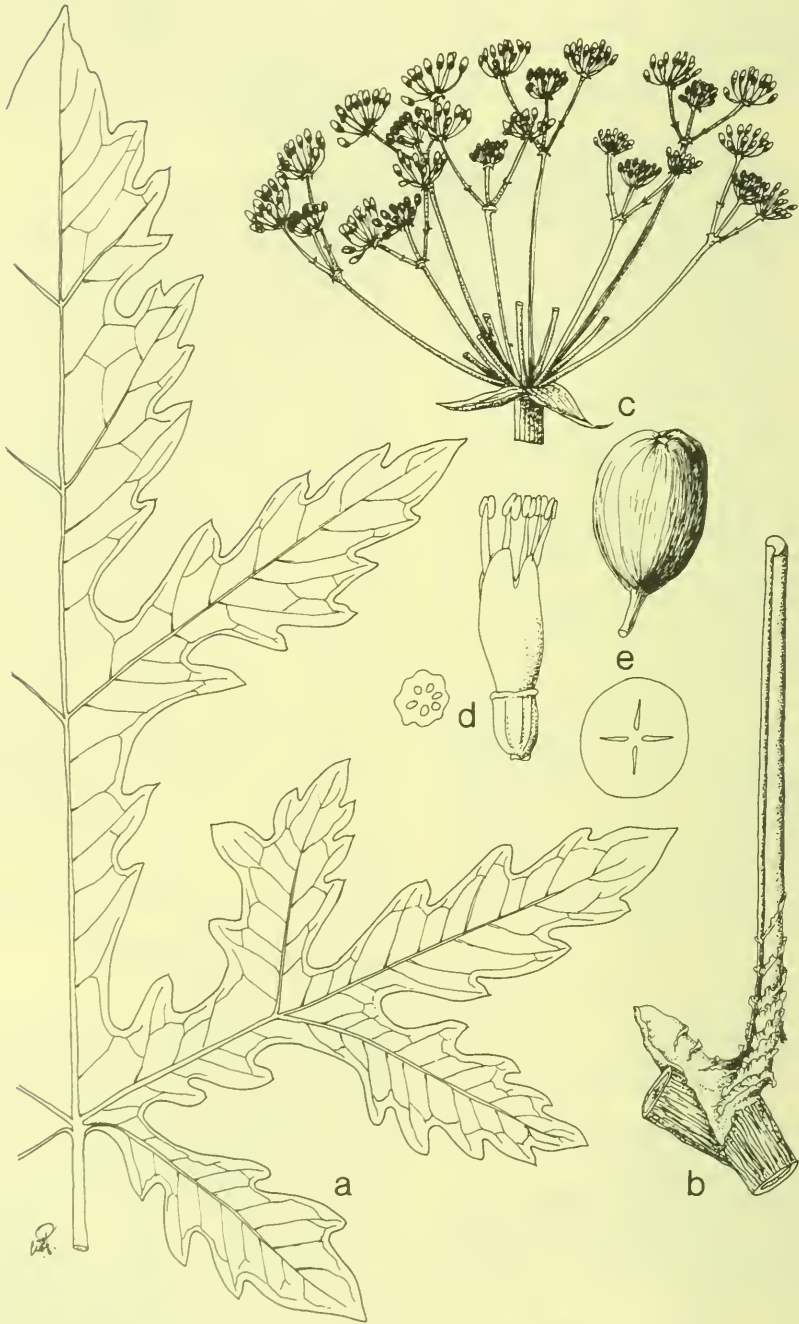


Fig. 11. *Osmoxylon novoguineense* (SCHEFF.) BECC. a. Leaf half, b. base of petiole, both $\times \frac{2}{5}$, c. inflorescence, $\times \frac{4}{5}$, d. flower and CS of ovary, $\times 4$, e. false fruit and ditto in CS (CRAVEN & SCHODDE 789).
 Drawn by W. R. PHILIPSON.

oblique), apex shortly acuminate, acute, margin entire or dentate towards the apex, membranous or chartaceous. *Inflorescence* a terminal compound umbel, often overtopped by a lateral branch at its base; peduncle terete, striate, c. 10–20 cm, bearing small lanceolate bracts below the rays; primary rays 6–15, c. 4–7 cm, striate, with minute distal caducous bracts; secondary rays (pedicels) c. 10–20, filiform or rather rigid, usually 5–12 mm; male flowers towards the outside of the umbellules. *Calyx* lobes 5, triangular to subulate, $\frac{1}{2}$ –1 mm long. Petals 5, obovate. Ovary narrowly turbinate, in male flowers obconic or ovoid, c. $\frac{3}{4}$ mm long in hermaphrodite. *Fruit* large, 15 by 22 mm, compressed, rotund, constricted above and below on the central axis; styles persistent, recurved.

Distr. Malesia: New Guinea (along the Central Ranges, from the Star Mts east to Meymya), also in New Britain.

Ecol. Rain-forest and montane forest, 600–2300 m.

Uses. The cut stem exudes a viscous sap which is an irritant. The leaves are aromatic. The plant is reported to be poisonous and to have a number of medicinal uses. The boiled leaves are eaten to

reduce fever and to relieve 'korima'. Pieces of leaf placed in a cavity relieve toothache. The leaves are wrapped around taro at planting to encourage growth.

Vern. *Dako*, Wissel Lakes, *kolobang*, *kulbang*, Sepik Distr., *auke*, *kenata*, *muklofo*, E. Highlands, *narona*, New Britain.

Notes. The flowers are white and the ripe fruit mauve to purple with a glaucous bloom.

A large number of collections made in recent years throughout New Guinea all have regularly compound umbels with the flowers borne on branches of the third degree in the form of strict umbels. In two of the earliest gatherings (SCHLECHTER 14365 and VERSTEEG 1419) the third degree branches frequently divide again either umbellately or cymosely. These two specimens were described as species by HARMS. PHILIPSON later (1951) kept the forms with regular umbellules separate (describing three species). All these five entities are now considered conspecific, the SCHLECHTER and VERSTEEG specimens being regarded as rare anomalies in a widespread and abundant species. It is possible that the VERSTEEG plant is a hybrid with *M. celebica*.

7. OSMOXYLON

MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 5; BTH. in B. & H. Gen. Pl. 1 (1865) 944; BECC. Malesia 1 (1878) 193; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 123; O. K. Rev. Gen. Pl. 1 (1891) 645; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32; Bot. Jahrb. 56 (1920) 384; HUTCH. Gen. Fl. Pl. 2 (1967) 73; PHILIPSON, Blumea 23 (1976) 99. — *Eschweilera* ZIPP. ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 112, non *Eschweilera* MART. 1828; Handl. 1 (1890) 640. — *Pseudosandalum* O. K. Rev. Gen. Pl. 1 (1891) 271 ('*Pseudosantalum*'), nom. illeg. — *Boerlagiodendron* HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 31; in K. Sch. & Laut. Fl. Schutzgeb. (1900) 484; Bot. Jahrb. 56 (1920) 377; HUTCH. Gen. Fl. Pl. 2 (1967) 72. — Fig. 11, 13–16.

Unarmed, glabrous or tomentose shrubs or trees. *Leaves* palmately lobed or simple, rarely digitately compound; stipules forming a ligule, and the base of the petiole furnished with one to several spiral or transversal crests or collars (very rarely absent). *Inflorescence* a terminal compound umbel; peduncle short; primary rays each terminating into three branches; the central branch bearing a head or umbellule of almost always sterile bacciform flowers ('pseudo-fruits'); the two lateral branches each bearing a head or umbellule of hermaphrodite flowers. *Calyx* an obsolete rim or 0. Corolla with few to many lobes above, tubular below. *Stamens* 4–30, filaments thick, anthers oblong, exserted. Ovary inferior, not articulated with the pedicel, cells 1–many; disk flat with a central raised boss bearing the pustulate stigmas. *Fruit* subglobose (ribbed when dry); exocarp fleshy, endocarp crustaceous. *Seeds* compressed, endosperm smooth or wrinkled.

Distr. About 50 spp., of which 40 occur in *Malesia*, extending from Borneo and the Philippines eastwards through Celebes and Moluccas to New Guinea, the remainder lying further north and east in Taiwan, Micronesia, Melanesia and the New Hebrides. Fig. 12.

Ecol. Mainly understory trees in primary rain-forest, also in second growth forest, usually at low altitudes, especially in shaded situations and near rivers, 15. *O. borneense* a characteristic rheophyte.

Notes. The foliage, inflorescence and flowers of this genus are all unique within the family. The base of the petiole often bears a spiral crest, or this may form a simple collar; the blade varies from simple to elaborately compound; the inflorescence is composed of trifid rays, the central branch bearing sterile bacciform flowers; the corolla is tubular.

The central bacciform flowers (pseudo-fruits) are sterile, except in 12. *O. yatesii*, in which apparently mature seed was once found.

By exception a specimen of 40. *O. luzoniense* had apparently fertile flowers on the central branches of the inflorescence.

KEY TO THE SPECIES

1. Leaves simple, without lobes.
 2. Petiole base without crests (New Guinea) 1. *O. miquelii*
 2. Petiole base with 1 or more crests.
 3. Petiole base with several crests (Philippines) 8. *O. oblongifolium*
 3. Petiole base with a single collar-like crest.
 4. Fertile flowers pedicelled (Philippines).
 5. Leaf obovate to oblanceolate, petiole 3 cm or less 2. *O. dinagatense*
 5. Leaf elliptic, petiole 5 cm or more 3. *O. simplicifolium*
 4. Fertile flowers sessile (or subsessile).
 6. Leaf broadly obovate (Solomons) 4. *O. spathipedunculatum*
 6. Leaf lanceolate or narrowly obovate.
 7. Pseudo-fruits pedicelled (Moluccas) 5. *O. articulatum*
 7. Pseudo-fruits sessile.
 8. Inflorescence c. 60 cm \varnothing (Moluccas) 6. *O. umbelliferum*
 8. Inflorescence c. 30 cm \varnothing (New Ireland) 7. *O. lanceolatum*
 1. Leaves lobed or digitately compound.
 9. Leaves digitately compound.
 10. Ovary 10–16-celled (New Guinea) 13. *O. geelvinkianum*
 10. Ovary 4–5-celled.
 11. Leaflets lobed (Philippines).
 12. Primary rays of inflorescence c. 10 or fewer 9. *O. catanduanense*
 12. Primary rays of inflorescence more than 20.
 13. Inflorescence c. 16–20 cm \varnothing 10. *O. caudatum*
 13. Inflorescence c. 5–6 cm \varnothing 11. *O. heterophyllum*
 11. Leaflets entire.
 14. Leaflets elliptic-oblong to ovate (Philippines) 12. *O. yatesii*
 14. Leaflets linear-lanceolate.
 15. Leaflets 4–7, petiole 4–6 cm (Philippines) 14. *O. lineare*
 15. Leaflets 9 or more, petiole longer than 10 cm (Borneo) 15. *O. borneense*
 9. Leaves lobed (sometimes smaller simple leaves below inflorescence).
 16. Pseudo-fruits sessile.
 17. Petiolar crests long-pectinate. Bracts of the peduncle heavily setose (Philippines) 16. *O. pulcherrimum*
 17. Petiolar crests fimbriate or undulate. Bracts of the peduncle not setose (Moluccas).
 18. Lateral inflorescence branches with opposite, persistent bracts close to the base 17. *O. soelaense*
 18. Lateral inflorescence branches with scars of opposite caducous bracts near the middle 18. *O. globulare*
 16. Pseudo-fruits pedicelled.
 19. Lateral inflorescence branches without an articulation.
 20. Petiolar base with a single collar-like crest (Borneo) 19. *O. kostermansii*
 20. Petiolar base with several crests.
 21. Petiolar crests long-pectinate.
 22. Fertile flowers pedicelled. Stamens at least 7 (Key Is.) 20. *O. barbatum*
 22. Fertile flowers sessile (or subsessile). Stamens 5 (Bismarck Arch.) 21. *O. pfeilii*
 21. Petiolar crests fimbriate or undulate.
 23. Stamens and ovary cells more than 5. Flowers usually pedicelled (Moluccas) 22. *O. palmatum*
 23. Stamens and ovary cells 4. Flowers sessile or subsessile (Philippines). 23. *O. ramosii*

24. Fertile flowers pedicelled.
 25. Pedicels of fertile flowers longer than 7 mm (New Guinea) 24. *O. novoguineense*
 25. Pedicels of fertile flowers 5 mm or shorter.
 26. Ovary cells 7 or more.
 27. Leaf lobes elliptic (Celebes) 25. *O. teysmannii*
 27. Leaf lobes pinnatilobed (Batjan) 41. *O. insigne*
 26. Ovary cells 4–5.
 28. Petiolar crests ± entire (Philippines) 26. *O. humile*
 28. Petiolar crests with long setae.
 29. Leaves coriaceous, margin thickened, teeth obtuse (Philippines) 27. *O. pectinatum*
 29. Leaves membranaceous, margin not thickened, teeth setulose (Celebes) 28. *O. masarangense*
24. Fertile flowers sessile (or if subsessile bracteoles longer than the very short pedicels).
 30. Ovary cells 10 or more (New Guinea).
 31. Flower buds large (c. 9–12 mm long). Primary rays of inflorescence very strong 29. *O. insidiator*
 31. Flower buds smaller (c. 4–6 mm long). Primary rays of inflorescence more tenuous.
 32. Heads of fertile flowers ± discoid at anthesis 30. *O. boerlagei*
 32. Heads of fertile flowers globose 31. *O. sessiliflorum*
30. Ovary cells 6 or fewer.
 33. Leaf lobes lanceolate.
 34. Leaf lobes 4–7; petiole 4–6 cm (Philippines) 14. *O. lineare*
 34. Leaf lobes 9 or more; petiole longer than 10 cm (Borneo) 15. *O. borneense*
33. Leaf lobes broader.
 35. Leaf surfaces retaining some trace of setulose tomentum. Umbellules of pseudo-fruits small (8 mm \varnothing or less) (New Guinea) 38. *O. micranthum*
 35. Leaf surfaces glabrous at maturity. Umbellules of pseudo-fruits larger (1 cm \varnothing or more).
 36. Ovary cells 3 (Philippines).
 37. Petiolar crests ± entire 32. *O. camiguinense*
 37. Petiolar crests long-pectinate 33. *O. fenicis*
36. Ovary cells 4 or more.
 38. Umbellules of pseudo-fruits large (3–5 cm \varnothing) (Philippines).
 39. Primary rays of the inflorescence 9–12 cm long. Leaves with strong radiating veins, usually more than 11 34. *O. eminens*
 39. Primary rays of the inflorescence 4–5 cm long. Leaf-veins less strongly developed, usually fewer than 11 35. *O. serratifolium*
38. Umbellules of pseudo-fruits smaller ($2\frac{1}{2}$ cm \varnothing or less).
 40. Leaf with a small triangular lobe below the middle of each side of the blade (not strictly palmately lobed) (Philippines) 8. *O. oblongifolium*
 40. Leaf palmately lobed.
 41. Petiolar crests long-pectinate (Celebes) 36. *O. celebicum*
 41. Petiolar crests fimbriate, entire, or undulate.
 42. Articulation of lateral branches of umbels close to the base (Talaud Is.) 37. *O. talaudense*
42. Articulation of lateral branches of umbels near the middle.
 43. Inflorescence over 20 cm \varnothing (New Guinea) 31. *O. sessiliflorum*
 43. Inflorescence under 20 cm \varnothing (Philippines).
 44. Leaf usually 3-lobed. Inflorescence rays delicate, indistinctly setose to glabrous 39. *O. trilobatum*
 44. Leaf usually 5–7-lobed. Inflorescence rays sturdy, markedly setose 40. *O. luzoniense*

1. *Osmoxylon miquelii* BOERL. Ann. Jard. Bot. Btzg 6 (1887) 125, t. 16; HARMS, Bot. Jahrb. 56 (1920) 384; PHILIPSON, Blumea 23 (1976) 103. — *O. amboinense* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 6, p.p.; BECC. Malesia 1 (1878) 194, p.p. — *Gastonia simplicifolia* ZIPP. ex SEEM. J. Bot. 3 (1865) 75, nomen in synon.; ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 125, nom. inval. in synon. — *Pseudosandalum miquelii* (BOERL.) O. K. Rev. Gen. Pl. 1 (1891) 271.

Sparsely branched tree, 15 m. *Leaves* glabrous, simple, subcoriaceous; stipules small forming a bicuspid ligule; petioles long (to 19 cm), swollen distally; blade oblong-elliptic, 22–36 by 9–12 cm, subrounded at base and apex or mucronulate, midrib prominent below, secondary veins arched-ascending and uniting, c. 1–2 cm apart, margin entire to undulate. *Umbel* terminal, sessile, with many (28–32) radiating rigid, angular, trifid branches c. 7 cm long to first joint. Central



Fig. 12. Species density of *Osmoxylon* MIQ. in Malesia; above the hyphen the number of endemic species, below it the non-endemics.

branches unknown. Lateral branches *c.* 5 cm long, articulate near the base. Flowers 20–30, sessile on the expanded ends of the inflorescence branches. Corolla and stamens unknown. Drupes crowded, subrotund, *c.* 4 mm \varnothing (dry), *c.* 8–10 ribbed when dry, crowned by a semiglobose entire stigma, 8–10-celled. Seeds with slightly ruminant endosperm.

Distr. *Malesia*: West New Guinea. Only known from the type (coll. ZIPPELIUS).

2. *Osmoxylon dinagatense* (MERR.) PHILIPSON, *Blumea* 23 (1976) 103. — *Boerlagiodendron dinagatense* MERR. Philip. J. Sc. 17 (1920) 301; MERR. En. Philip. 3 (1923) 222.

Glabrous shrub, *c.* 2 m. Leaves crowded at the ends of the branches; petiole 2–3 cm, channelled above, with a small triangular base, bearing a short stipular ligule (2–3 mm long) and extending around the base of the petiole as a single narrow collar; blade obovate to oblanceolate, to 23 by 8½ cm; base narrowed into the petiole, apex rounded with a very short apiculum, margin slightly revolute, entire to obscurely undulate with minute teeth, coriaceous. Inflorescence a terminal compound umbel; peduncle *c.* 1½ cm, with 1–few bracts (reduced leaf-bases) with small triangular bracts (3 mm long) among the primary rays; primary rays about 15, 8–10 mm long, flattened, bearing opposite bracts (2 mm long) at the apex, each bearing three branches; central branch *c.* 4 mm long, bearing a head of sessile, bacciform flowers *c.* 2½ mm \varnothing ; lateral branches 1½–2 cm long with two opposite small bracts about the middle and ending in an involucre of minute rounded bracts around a terminal umbellule of *c.* 7–10 flowers; pedicels 1½–2½ mm long. Calyx a minute rim. Corolla and stamens unknown. Ovary 3–4-celled. Ripe fruit unknown.

Distr. *Malesia*: Philippines (Dinagat I.).

Note. A species clearly demonstrating the congenerity of *Osmoxylon* and *Boerlagiodendron*.

3. *Osmoxylon simplicifolium* (ELMER) PHILIPSON, *Blumea* 23 (1976) 103. — *Boerlagiodendron simplicifolia* ELMER, Leaf. Philip. Bot. 7 (1914) 2329; MERR. En. Philip. 3 (1923) 224.

Glabrous shrub, to 5 m, with numerous leaves clustered near the ends of the branches; petiole 5–7 cm, 2 mm wide, terete, with a small clasping base, an inconspicuous stipular ligule, and a single broad disk-like crest around the lower part of the petiole; blade simple, elliptic, base broadly cuneate, apex acute to apiculate, to 20 by 6½ cm, coriaceous, margin thickened, coarsely dentate, midrib prominent, principal nerves *c.* 8–10 mm apart. Inflorescence a terminal compound umbel, spherical, *c.* 7 cm \varnothing ; peduncle 1½–2 cm; primary rays *c.* 25–30, *c.* 1 cm long with two small obtuse bracts at the apex, ending in three branches; the central branch *c.* 6 mm long, bearing a subglobose umbel of *c.* 10–12 sterile bacciform flowers (2 mm \varnothing), 3–4 mm pedicelled; lateral branches *c.* 2–2½ cm long, articulated about the middle, terminating in an umbel of *c.* 10–20 flowers; pedicels *c.* 2½ mm. Calyx rim obsolete. Corolla 3–4-lobed, tubular below, 2 mm long. Stamens 3–4, exserted, 3 mm long. Ovary subcylindric, 2–4-celled, 1 mm long. Drupe spherical, *c.* 5 mm \varnothing (dry), 2–4-ribbed when dry; surface of endosperm shallowly wrinkled.

Distr. *Malesia*: Philippines (Mindanao: Agusan Prov., Cabadbaran).

Ecol. On wind-swept ridge at 1750 m, on moss-covered soil with stones.

Vern. *Bolauanon*, Mbo.

Note. A wide-spreading shrub. Bark thick, yellowish, becoming grey. Wood soft, yellowish. Twigs repeatedly branched, the leafy portion suberect, leaves mostly ascending, rigidly coriaceous. Inflorescence branches green. Flowers orange, odourless. Berries becoming purple-black.

4. *Osmoxylon spathipedunculatum* (PHILIPSON) PHILIPSON, *Blumea* 23 (1976) 103. — *Meryta spathipedunculata* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 12.

Glabrous tree, to 20 m, with spreading branches. Leaves crowded at the ends of the branches; petiole to 14 cm with a small clasping base bearing a stipular ligule and a rim-like collar around the base of the petiole; blade obovate 17–30 by 10–15 cm, attenuate at the base, apex obtuse, margin entire, midrib prominent, secondary veins arched and uniting, 1½–2 cm apart. Inflorescence a terminal compound umbel; primary rays *c.* 12, stout, compressed 9–17 cm long, bearing three branches at the apex; central branches and sterile flowers unknown; the two lateral branches 9–14 cm long with an articulation *c.* 1–2 cm from base, bearing helmet-shaped bracts which fall to reveal the terminal head of *c.* 12 flowers sessile on an expanded receptacle with an involucre rim *c.* 1 cm \varnothing . Calyx rim 0. Corolla split into 5 lobes above, tubular below. Stamens 5. Ovary subcylindric, \pm

9-celled; disk raised in the centre to the pustulate stigmas. Drupes in a spherical head, globose, c. 12 mm \varnothing , c. 9-ribbed when dry, crowned by the prominent, persistent, confluent stigmas.

Distr. Solomon Islands (Bougainville and Guadalcanal).

Ecol. Rain-forest, 800–1200 m.

5. *Osmoxylon articulatum* PHILIPSON, Blumea 23 (1976) 103.

Tree with stout branches, glabrous. *Leaves* well spaced towards the ends of the branches; petiole 10–13 cm, 2 mm broad, narrowly channelled above, with a small triangular base, bearing a short stipular ligule (c. 2 mm long) and extending around the base of the petiole as a collar; blade obovate, to 27 by 9 cm, base narrowly cuneate, apex rounded or acute and shortly apiculate, margin thickened, remotely dentate towards the apex, midrib prominent, principal lateral veins c. $1\frac{1}{4}$ – $1\frac{1}{2}$ cm apart. *Inflorescence* a terminal compound umbel, almost sessile, saucer-shaped bracts caducous; primary rays c. 24, 8–11 cm long, flattened, c. 4 mm broad, bearing three branches at the apex; central branch 4– $6\frac{1}{2}$ cm long, the apex expanded and bearing an umbel of c. 10 sterile bacciform flowers c. 6 by 6 mm (when dry) apparently 1-celled, c. 9–14 mm pedicelled; the two lateral branches c. 7 cm long at anthesis with an articulation c. 8–10 mm above the base, bearing helmet-shaped bracts which fall to reveal the terminal head of c. 15–18 flowers, sessile on an expanded receptacle with an involucre rim c. 6 mm \varnothing . *Calyx* rim 0. *Corolla* split into c. 4 lobes above, tubular below, c. $2\frac{1}{2}$ mm long. *Stamens* 5, exerted. *Ovary* subcylindric, c. $1\frac{1}{2}$ cm long, 7–8-celled, disk with a pustulate central stigmatic boss. *Drupes* in a spherical head c. 2 cm \varnothing (when dry), strongly 7–8-ribbed (when dry), c. 8 mm \varnothing ; stigmas persistent, prominent.

Distr. *Malesia*: Moluccas (Halmaheira: Ake Mumar to upper reaches of the Kakatua-matawe). *Fr.* Sept.

Note. This plant is evidently similar to *O. umbelliferum* described by RUMPHIUS. However, a number of differences make it unlikely that it is the same species. The diameter of the inflorescence of the Halmaheira plant is only about half that given by RUMPHIUS; the lateral rays of the inflorescence are distinctly articulated near the base, a feature now shown in RUMPHIUS' figure; and the sterile bacciform flowers are long-pedicelled, whereas RUMPHIUS described and figured his as borne in capitula.

6. *Osmoxylon umbelliferum* (LAMK) MERR. *Int. Rumph.* (1917) 406; PHILIPSON, *Blumea* 23 (1976) 104. — *Pseudo-Sandalum amboinense* RUMPH. *Herb. Amb.* 2: 54, t. 12. — *Aralia umbellifera* LAMK, *Encycl.* 1 (1783) 225. — *Hedera umbelliferum* (LAMK) DC. *Prod.* 4 (1830) 262. — *Gilibertia saururoides* DC. *l.c.* 256. — *Gastonia saururoides*

ROXB. [*Hort. Beng.* (1814) 90, *nomen*;] *Fl. Ind.* ed. Carey 2 (1832) 408 ('*sasuroides*'). — *O. amboinense* MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 6, *p.p.* — *Pseudosandalum umbelliferum* (LAMK) O. K. *Rev. Gen. Pl.* 1 (1891) 271.

According to RUMPHIUS: Tree with stout trunk, the branches marked with prominent round leaf-scars. *Leaves* clustered at the ends of the branches, glabrous; petioles long; blades simple, lanceolate (30–36 by 10–12 cm), base rounded, apex acute, margin dentate. *Flowers* in large spreading umbels, the radiating branches tripartite, c. 30 cm long, each ending in a capitulum.

Distr. *Malesia*: Moluccas. Infrequent on Ambon, but said to be more numerous in Ceram and the Sula Islands. Only known from RUMPHIUS' excellent plate and description; not yet re-collected in Ambon.

Ecol. Evidently in forest in the hills of Ambon, and also planted at the time of RUMPHIUS.

Vern. *Sasuru*, Leytimor, *tonokuku*, Hitu.

Notes. Valued for the perfume of its wood and foliage.

Since this plant is known only from a description and a figure, some uncertainties remain as to its specific characters. In the description it is stated that the young leaves possess a few small teeth of which some signs remain on the older leaves. It is not clear whether the teeth are best developed on distinctive juvenile foliage, or whether the newly expanded normal foliage is intended. The leaves in the figure have prominent teeth, but as they are not shown associated with the inflorescence, they may be from a juvenile shoot. The description of the size of the flower buds is confusing, and it seems likely that sterile pseudo-fruits were mistaken for flower buds. Nevertheless, most characters of the plant are adequately portrayed and there can be no doubt that this species is distinct from the other simple-leaved species with a single, collar-like, petiolar crest.

7. *Osmoxylon lanceolatum* PHILIPSON, Blumea 23 (1976) 104. — Fig. 13.

Small tree with few branches, up to 16 m, glabrous. Many *leaves* clustered towards the ends of the branches; petiole 8–15 cm, terete, with a small triangular base, bearing a short stipular ligule (c. 2 mm long) and extending around the base of the petiole as a collar; blade oblanceolate, to 33 by $7\frac{1}{2}$ cm, base narrowly cuneate, apex acute or slightly apiculate, margin entire, midrib prominent, lateral veins arched ascending, c. 2–3 cm apart. *Inflorescence* a terminal compound umbel, almost sessile, saucer-shaped; bracts caducous; primary rays c. 15, c. 10 cm long, flattened, c. 4–5 mm broad, bearing three branches at the apex; central branch 5–6 cm long, the apex expanded and bearing a spherical head of c. 8–12 sessile, sterile, bacciform flowers c. 5 by 5 mm (when dry), 1–2-celled; the two lateral branches

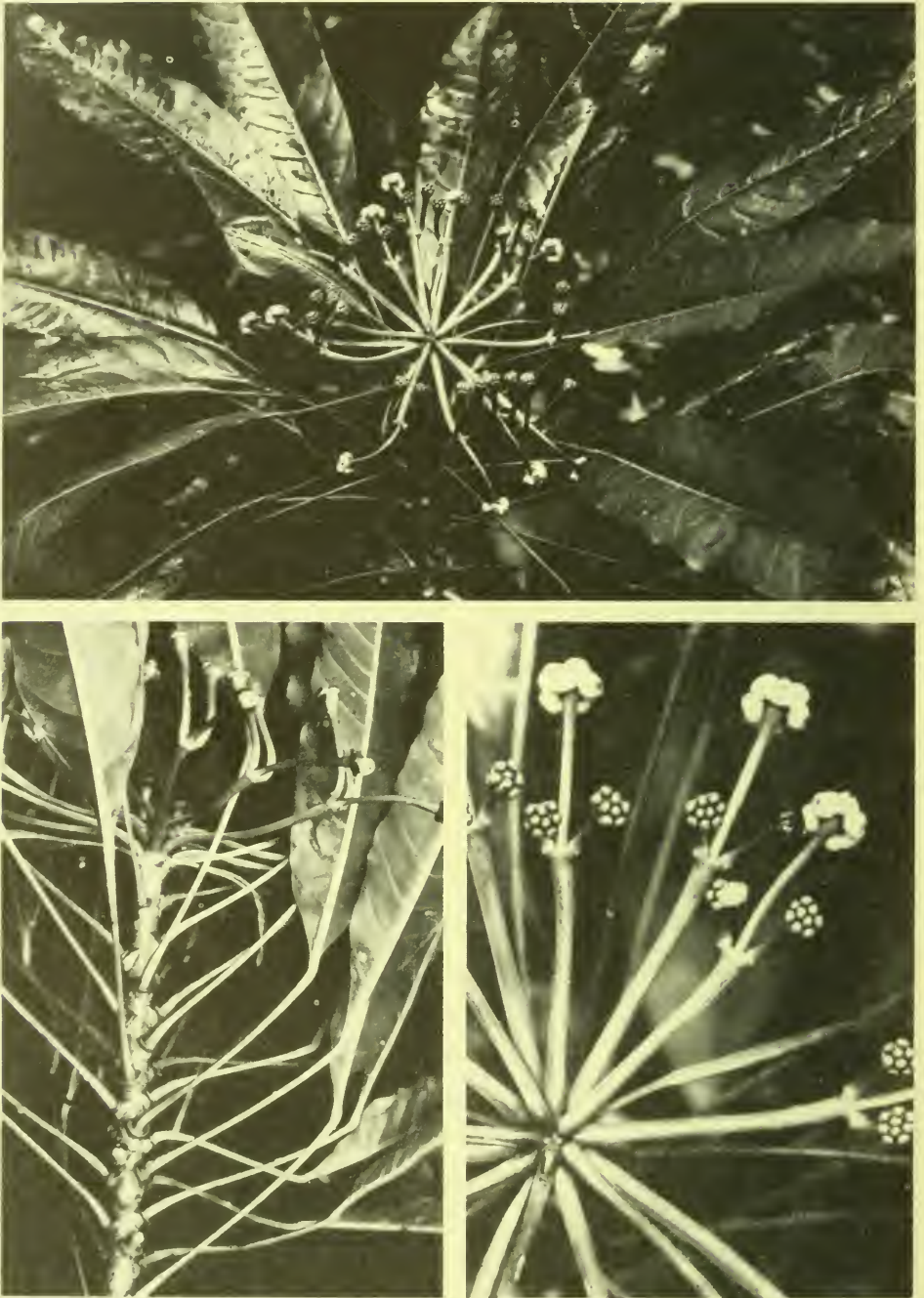


Fig. 13. *Osmoxylon lanceolatum* PHILIPSON. Above: habit of inflorescence and leaves; below, left: twig showing collar-like crests at the base of the petioles; below, right: the trifid branches of the inflorescence (New Ireland, SANDS 795).

c. 5 cm long at anthesis, with an articulation immediately above the base, bearing two helmet-shaped bracts which fall to reveal the terminal head of *c.* 8–10 flowers, sessile on an expanded receptacle with an involucre rim *c.* 7 mm \varnothing . *Calyx* rim 0. Corolla known only in bud, *c.* 2½ mm long. Stamens *c.* 5. Ovary gibbous, *c.* 1½ mm high, 4-celled. Fruit unknown.

Distr. *Malesia*: New Ireland (Namatanai Subdistr., Danfu R. area, inland from Manga).

Ecol. Understorey tree in ridge top forest on limestone, 750–850 m.

Note. The bark is pale grey, \pm smooth with fine cracks. The twigs and cut branches are strongly aromatic. The wood is soft and dark straw-coloured. The central branches of the inflorescence rays are held \pm horizontally or depressed and come to maturity before the lateral branches which are held erect.

8. *Osmoxylon oblongifolium* PHILIPSON, Blumea 23 (1976) 105.

Shrub *c.* 2 m, glabrous when mature, setulose on young parts. *Leaves* clustered at the ends of the branches; petiole to 16 cm, channelled above, 4 mm broad, with a clasping base prolonged upwards as a stipular ligule 1½–2 cm long, and with entire or fimbriate crests encircling the lower part of the petiole; blade simple, oblong-ovate, occasionally with a small triangular lobe on each side below the middle, to 46 by 17(–24) cm, base rounded to truncate, apex shortly acuminate, margin serrate, midrib prominent, principal lateral veins *c.* 3–4 cm apart (at broadest part of leaf). *Inflorescence* a terminal compound umbel, hemispherical, *c.* 13 cm \varnothing ; peduncle 3–4 cm, *c.* 6 mm wide, bearing fimbriate, lanceolate bracts (to 2 cm long) along its length and around and among the primary rays; primary rays *c.* 20, rather short and stout (16–20 by 3–4 mm) with small opposite caducous bracts at apex, each ray ending in three branches; the central branch *c.* 4 mm long; sterile flowers unknown; the two lateral branches 3½–4 cm long, articulated below the middle, terminating in a head of *c.* 20–30 sessile or subsessile flowers. Flowers unknown. *Fruits* crowded in a spherical head, drupes *c.* 5 mm \varnothing (when dry) on pedicels *c.* 1 mm, 4-ribbed, pyrenes 4, cartilaginous; endosperm with faint reticulate ridging.

Distr. *Malesia*: Philippines (Samar).

Ecol. In dipterocarp forest, along creek bank, at 200 m.

9. *Osmoxylon catanduanense* (MERR.) PHILIPSON, Blumea 23 (1976) 105. — *Boerlagiodendron catanduanense* MERR. Philip. J. Sc. 13 (1918) Bot. 318; En. Philip. 3 (1923) 222.

Shrub *c.* 1 m, glabrous except for parts of the inflorescence. *Leaves* clustered at the ends of the branches; petiole *c.* 30 cm, terete, 3 mm wide, base with a short ligule, and inconspicuous

recurved crests; blade digitately compound, leaflets 7, chartaceous to subcoriaceous; petiolules 4–5 cm, the lateral shorter; leaflets lanceolate, mid-leaflet to 26 cm long, base cuneate, apex \pm caudate; irregularly lyrate lobed, the sinuses reaching to within *c.* 8 mm of the midrib, lobes 2–4 cm long, patent, margin slightly thickened, entire or obscurely dentate. *Inflorescence* a terminal compound umbel, *c.* 10 cm \varnothing , peduncle stout, bearing ovate bracts *c.* 1 mm long; primary rays *c.* 7–10, 2–2½ cm long, to 2 mm wide, minutely pubescent, with 2 broadly ovate bracts 4–5 mm long at apex; central branch 3 mm or less, bearing a head of sterile flowers; lateral branches 2½ cm long, bearing 2 broad bracts near the middle, and ending in a spherical head of *c.* 15 sessile flowers. *Calyx* an obsolete rim. Petals and stamens unknown. Ovary 4-celled. *Fruit* ovoid, 4-ribbed when dry, 7 by 5 mm.

Distr. *Malesia*: Philippines (Catanduanes).

Ecol. On forested slopes, at *c.* 350 m.

Note. Together with 10. *O. caudatum* and 11. *O. heterophyllum* this species forms a small group with leaves composed of lyrate leaflets. Although the foliage is similar (though not identical), the inflorescences are distinctive. In *O. heterophyllum* the rays are short, resulting in a compact compound umbel; in *O. caudatum* there are few rays (10 or fewer); in *O. catanduanense* there are many, relatively long rays, resulting in a large, diffuse compound umbel. Since *O. catanduanense* and *O. caudatum* are known only from the type collections, the range of variation of these species is not known, but the inflorescence differences justify the retention of all three species.

10. *Osmoxylon caudatum* (MERR.) PHILIPSON, Blumea 23 (1976) 105. — *Boerlagiodendron caudatum* MERR. Philip. J. Sc. 14 (1919) 440; En. Philip. 3 (1923) 222.

Erect shrub, *c.* 2 m, becoming glabrous. *Leaves* clustered towards the ends of the branches; petiole *c.* 45 cm, terete, striate, 4–5 mm wide, base with a stipular ligule *c.* 1½ cm long, and 2–3 fimbriate or pectinate crests; blade digitately compound, leaflets 5–9, subcoriaceous; petiolules of the central leaflets to 5 cm long, lateral leaflets \pm sessile; leaflets elliptic-lanceolate, mid-leaflet to *c.* 25 cm long, base decurrent on the slightly winged petiole, apex caudate-acuminate, the larger leaflets with 1–3 pairs of lyrate lobes reaching almost to the midrib, lobes ascending, margin slightly revolute with often prominent usually incurved teeth. *Inflorescence* a terminal compound umbel, *c.* 18 cm \varnothing ; peduncle stout, *c.* 2 cm, bearing few ligulate bracts *c.* 1½–2 cm long, rough, with short setae on the back; primary rays *c.* 25, *c.* 4–5 cm long, glabrous and striate, subtended by ligulate bracts, similar opposite bracts at the apex, *c.* 1 cm long; central branch 1–1½ cm long, glabrous, ending in a whorl of obtuse rough coriaceous bracts

c. 3 mm long and a head (c. 1 cm \varnothing) of sterile bacciform flowers c. 3 mm \varnothing , on pedicels 3–8 mm; lateral branches 4–5 cm long, with opposite fimbriate bracts near the middle, bearing an ellipsoid head of c. 20 sessile flowers, each flower subtended and \pm enclosed by an ovate fimbriate bract 3–4 mm long. *Calyx* an obsolete rim. Petals and stamens unknown. Ovary 2–2 $\frac{1}{2}$ mm long, turbinate, obscurely angled, 4-celled. Fruit unknown.

Distr. *Malesia*: Philippines (Luzon: Ilocos Norte Prov., Mt Palimlin).

Ecol. On forested slopes near the summit, at c. 1000 m.

Note. Apparently never re-collected. For a discussion of distinctive features see under 9. *O. catanduanense*.

11. *Osmoxylon heterophyllum* (MERR.) PHILIPSON, Blumea 23 (1976) 106. — *Boerlagiodendron heterophyllum* MERR. Philip. J. Sc. 9 (1914) Bot. 329; En. Philip. 3 (1923) 223.

Erect tree, c. 5 m, glabrous. *Leaves* clustered at the ends of the branches; petiole to 25 cm, base clasping, prolonged as a stipular ligule to 2 $\frac{1}{2}$ cm long, and bearing several pectinate crests (becoming recurved when the bristles may be obscured or shed); blade to 35 cm long, digitately compound (or some leaflets imperfectly separated); leaflets 3–7, unequal in size, oblong-ovate to broadly oblong-oblancoolate, acuminate, lyrate-lobed and irregularly dentate, the base gradually narrowed to the petiolule; petiolule up to 7 cm. *Inflorescence* a dense terminal compound umbel; peduncle stout, c. 2 cm, bearing many lanceolate bracts 2–3 cm long; primary rays c. 30, 10–15 mm long, subtended by lanceolate c. 2 $\frac{1}{2}$ cm long bracts, sometimes with bristles on the back, and bearing similar opposite terminal bracts 8–10 mm long, each ending in three branches; central branch short (not seen fully developed) terminating in an umbellule of c. 15 sterile bacciform flowers (c. 3 mm long), pedicels 3–4 mm; lateral branches 8–10 mm long (? fully developed), articulation present ending in heads (c. 1 cm \varnothing) of numerous flowers. *Calyx* rim obsolete. Corolla lobes 4, 2 mm long. Stamens 4. Ovary 4-celled. Fruit unknown.

Distr. *Malesia*: Philippines (Samar, Biliran and Mindanao).

Ecol. Primary forest, under shade near creek, 100–550 m.

Vern. *Arañas*, Bis., *kayuang*, Mbo, *magusayag*, C.Bis.

Note. The description is partially based on the original publication as I have seen only immature inflorescences. For a discussion of distinctive features, see under 9. *O. catanduanense*.

12. *Osmoxylon yatesii* (MERR.) PHILIPSON, Blumea 23 (1976) 106. — *Boerlagiodendron yatesii* MERR.

Philip. J. Sc. 13 (1918) Bot. 44; En. Philip. 3 (1923) 225.

Shrub, 1 m, glabrous, except for the inflorescence. *Leaves* clustered towards the ends of the stout branches; petiole to 38 cm, channelled above, 5 mm \varnothing , base with a stipular ligule 1 cm long, and 1–2 inconspicuous non-fimbriate crests around the back of the petiole; blade digitately compound, leaflets 5–7; petiolule 2–7 cm (the lateral shorter); blade elliptic-oblong to ovate, mid-leaflet to 23 by 8 cm, base gradually tapered, apex acuminate-caudate, margin dentate or somewhat undulate. *Inflorescence* a terminal compound umbel, subsessile or peduncle stout 1–3 cm, bearing few ovate bracts 1 cm long; primary rays 5–10, tomentose, c. 3 cm long and 3 mm wide, subtended by ovate bracts 6 mm long, similar opposite bracts at apex; central branch 2–3 mm long, pubescent, ending in a whorl of blunt bracts (3 mm long) and an umbellule of c. 10 sterile flowers 4 mm \varnothing , 2–4-celled, pedicels 3–8 mm; lateral branches 2–2 $\frac{1}{2}$ cm long, pubescent, with small opposite bracts about the middle, bearing a head of 10–15 sessile flowers, subtended by ovate ciliate bracts. *Calyx* rim obsolete, sometimes fimbriate. Corolla 4–5-lobed, tubular below, 1 $\frac{1}{2}$ mm long in bud. Stamens 4–5. Ovary 4-celled. Young fruit (MERRILL, l.c.) shortly pedicelled (2–3 mm).

Distr. *Malesia*: Philippines (Luzon and Catanduanes).

Ecol. In rain-forest and mossy forest, from low altitude to 1250 m.

Vern. *Magalayag*, Dinagat.

Note. The leaves are unlike any other *Osmoxylon*, resembling those of *Macropanax* or *Schefflera*. The flowers are described as yellow, and the fruit black. The only instance of a pseudo-fruit containing apparently normal seeds occurred in this species.

13. *Osmoxylon geelvinkianum* BECC. Malesia 1 (1878) 196; PHILIPSON, Blumea 23 (1976) 106. — *Eschweilera geelvinkiana* (BECC.) BOERL. Ann. Jard. Bot. Btzg 6 (1886) 120. — *Trevesia geelvinkiana* (BECC.) O. K. Rev. Gen. Pl. 1 (1891) 272. — *Boerlagiodendron geelvinkianum* (BECC.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32. — *Eschweilera (i) a elegans* RIDL. Trans. Linn. Soc. II, 9 (1916) 63. — *Boerlagiodendron elegans* (RIDL.) HARMS, Bot. Jahrb. 56 (1920) 380. — *Boerlagiodendron stenolobum* HARMS, l.c. 382, f. 1 k–t.

Glabrous shrub with few slender branches, up to 3 m high. *Leaves* clustered near the ends of the branches; petiole up to 22 cm, usually shorter, 2–3 $\frac{1}{2}$ mm wide, narrowly channelled above, with a sheathing base prolonged as a membranous stipular ligule up to 4 cm or longer and with fimbriate or \pm entire crests encircling the lower part of the petiole; blade up to 30 cm \varnothing (usually 20 cm or less) very deeply 5–11-lobed, or with distinct digitately arranged leaflets, the lobes or

leaflets linear-lanceolate to lanceolate-obovate, entire or irregularly pinnatifid with narrow finely-tapering lobes, base gradually narrowed, apex narrowly caudate, margin serrate; leaves below the inflorescence sometimes reduced to a single leaflet.

Inflorescence terminal hemispherical, c. 12–20 cm \varnothing ; peduncle 1 cm or less, with caducous lanceolate bracts mostly clustered below the primary rays, 1–2 cm long; primary rays rather few, spaced, 2 $\frac{1}{2}$ –6 cm long, slender, bearing two caducous lanceolate bracts at the apex, up to 1 $\frac{1}{2}$ cm long, each ray ending in three branches; the central branch c. 4–6 mm long bearing a whorl of lanceolate caducous bracts and an umbel of c. 7–12 sterile, globose or ovoid bacciform flowers (c. 7 mm \varnothing when dry) with pedicels c. 5 mm long and 6–9-celled; the two lateral branches c. 3–4 cm long at anthesis, articulated about the middle, terminating in a small head of 10–20 sessile or subsessile flowers. *Calyx* rim obsolete; corolla splitting into c. 4 irregular lobes above, tubular below, c. 2 $\frac{1}{2}$ mm long. Stamens 10–14, exserted, 3 mm long, anthers small. Ovary cylindrical, c. 2 mm long, 10–16-celled; disk with a central raised boss formed by the pustulate stigmas. *Fruit* globose, fleshy (ribbed when dry), c. 10 mm \varnothing .

Distr. *Malesia*: New Guinea (Irian Jaya, to Sepik and Fly R. areas).

Ecol. Primary forest, along creeks and river banks, flood-resistant, from near sea-level to 850 m.

Vern. *Amamutapu*, Kamora, *korinki*, Orne, *ida'pforporsami*, Kutubu.

Note. The narrow leaf segments, almost or quite separated at their bases, are characteristic, even though variable in outline. The flowers are described as orange or reddish, and the soft fleshy fruits as dark purple, dark blue, or black.

14. *Osmoxylon lineare* (MERR.) PHILIPSON, *Blumea* 23 (1976) 106. — *Boerlagiodendron lineare* MERR. *Philip. J. Sc.* 3 (1908) Bot. 253; *En. Philip.* 3 (1923) 223.

Glabrous, erect shrub, c. 3 m. *Leaves* crowded near the ends of the branches; petiole 4–6 cm, the base with a small stipular ligule (5 mm long) and a few fimbriate crests; blade to 20 cm \varnothing , digitately compound with 4–7 leaflets (or very deeply divided into as many lobes); leaflets linear-lanceolate, c. 1–1 $\frac{1}{2}$ cm wide, the base decurrent on the winged petiolule, apex attenuated, margin thickened, denticulate especially above. *Inflorescence* a terminal compound umbel; peduncle short (c. 1 cm), bracteate; primary rays c. 10, 2–2 $\frac{3}{4}$ cm long, each ending in three branches; the central branch 4–5 mm long bearing a spherical head of numerous fimbriate bracts (sterile flowers fallen); the lateral branches 3–3 $\frac{1}{2}$ cm long with a pair of minute fimbriate bracts about the middle, ending in a capitulum of c. 20 sessile flowers subtended by small fimbriate bracts, c. 7 mm \varnothing . *Calyx* rim minute. Corolla and stamens unknown. Ovary

5-celled. Fruit ovoid c. 3 mm long, 5-ridged (when dry).

Distr. *Malesia*: Philippines (Luzon).

Note. Apparently never re-collected. The original specimen is without field information. The foliage is similar to that of 15. *O. borneense* but with shorter petioles and fewer leaflets.

15. *Osmoxylon borneense* SEEM. *J. Bot.* 6 (1868) 141; PHILIPSON, *Blumea* 23 (1976) 107. — *O. helleborinum* BECC. *Malesia* 1 (1878) 198. — *Eschweilera helleborina* (BECC.) BOERL. *Ann. Jard. Bot. Btzg* 6 (1887) t. 13. — *Trevesia helleborina* (BECC.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Boerlagiodendron helleborinum* (BECC.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31. — *Boerlagiodendron borneense* (SEEM.) MERR. *En. Born.* (1921) 456.

Glabrous, spreading shrub, up to 3 m. *Leaves* clustered near the ends of the branches; petiole up to 24 cm, narrowly channelled above, 2–3 (or 5) mm wide, with a sheathing base prolonged as a membranous stipular ligule up to 2 $\frac{1}{2}$ cm long, and usually with fimbriate, \pm entire, or more rarely long-setose crests encircling the lower part of the petiole; blade up to 20 cm \varnothing digitately compound (or the bases of the leaflets joined by a very short web of tissue); leaflets 9–13, linear-lanceolate to lanceolate, gradually narrowed to the base and apex, up to 20 by 3 cm, usually much narrower, margin serrate, principle veins numerous, c. 5–10 mm apart. *Inflorescence* terminal, hemispherical, c. 6–13 cm \varnothing ; peduncle 1–2 cm or shorter, with caducous lanceolate-ovate entire or fimbriate bracts mostly clustered below the primary rays, 1–1 $\frac{1}{2}$ cm long; primary rays rather few (5–12), 2 $\frac{1}{2}$ –4 cm long, with 2 ovate bracts at the apex, c. 8 mm long, each ray ending in three branches; central branch c. 5–12 mm, bearing an umbel of c. 6–16 sterile, globose, bacciform flowers, c. 3–5 mm \varnothing (when dry) with pedicels 4–5 mm long and 5-celled; the two lateral branches 1 $\frac{1}{2}$ –3 cm long at anthesis, articulated about the middle, terminating in a small head of c. 20–25 sessile flowers with minute rounded bracts. *Calyx* rim obsolete; corolla splitting into few irregular lobes above, tubular below, c. 1 $\frac{1}{2}$ –2 mm long; stamens 5–6, slightly exserted; ovary turbinate, angled, c. 1 mm long, 5-celled, disk with a central raised boss formed by the pustulate stigmas. *Fruit* globose, fleshy (ribbed when dry) c. 5 mm \varnothing .

Distr. *Malesia*: Borneo (Sarawak, Sabah and Kalimantan).

Ecol. Characteristic of rocky river banks, not beyond flood-level, often in deep shade, from near sea-level to 950 m.

Vern. *Medong*, Kayan, *empasia abor*, Iban, *kayan*, Tamang, *koung*, Kinabalu, *bungor*, Murut Bokan, *salimpangaya*, Murut Kalabakai.

Notes. The leaves of some specimens of 13. *O. geelvinkianum* (New Guinea) resemble this

species closely. This species can be distinguished by the more compact and smaller fertile flowers, and by its leaflets being uniformly unlobed.

Both species are characteristic of river banks, and *O. borneense* has a low spreading habit, with the branches often rooting, resulting in extensive patches of this low shrub. It is a characteristic rheophyte confined to below flood-level.

The flowers are described as greenish white or cream and the inflorescence branches are frequently dark purple.

16. *Osmoxylon pulcherrimum* VIDAL ex F.-VILL. Nov. App. (1880) 102; Sinopsis Atlas (1883) 28, t. 55, f. B; PHILIPSON, Blumea 23 (1976) 107. — *Eschweilera pulcherrima* (VIDAL) BOERL. Ann. Jard. Bot. Btzg 6 (1887) 123. — *Trevesia pulcherrima* (VIDAL) O. K. Rev. Gen. Pl. I (1891) 272. — *Boerlagiodendron pulcherrimum* (VIDAL) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32; MERR. Philip. J. Sc. 3 (1908) Bot. 254; En. Philip. 3 (1923) 224. — *Boerlagiodendron sibuyanense* ELMER, Leaf. Philip. Bot. 7 (1914) 2328; MERR. En. Philip. 3 (1923) 224.

Erect, sparsely branched tree, up to 10 m, glabrous when mature, except for the inflorescence. Leaves crowded at the ends of the branches; petiole to 1 m, channelled above, clasping base heavily lenticellate, prolonged as a broad stipular ligule c. 2 cm long, usually with strong bristles on the back, and with strong long-pectinate crests encircling the base of the petiole; blade coriaceous, fan-shaped, c. 40 cm long, base broadly cuneate to truncate, palmately 7–11-lobed, lobes extending to within c. 12 cm from the base, lanceolate, coarsely serrate, sometimes irregularly lobulate, slightly narrowed towards the base, apex acute, sinuses rounded. *Inflorescence* a terminal compound umbel, c. 18 cm \varnothing ; peduncle very short, bearing heavily setose bracts; primary rays 15–20, c. 3–4 cm long, 3–4 mm broad, setulose, at the apex bearing opposite, ovate-lanceolate bracts 10–15 mm long, each ending in three branches; central branch c. 15–20 mm long, terminating in a globular head (c. 12 mm \varnothing) of c. 20–30, sessile, sterile, bacciform flowers (3–4 mm \varnothing) 3-celled, subtended by small ovate-lanceolate bracts; lateral branches c. 5 $\frac{1}{2}$ cm long (7 $\frac{1}{2}$ cm in fruit), with opposite bracts (c. 3–4 mm long) near the middle, terminating in a globose head of c. 40–50 sessile flowers, bracts between the flowers very small, setulose. *Calyx* rim obsolete. Corolla 4-lobed, tubular below, 2 mm long in bud. Stamens 4. Ovary 4-celled. *Fruit* globose c. 6–8 mm long, 4-ribbed (dry).

Distr. *Malesia*: Philippines (Luzon, Mindoro and Sibuyan), recorded also from Formosa and Micronesia (Palau), cf. KANEHIRA, En. Micron. Pl. (1935) 384.

Ecol. Damp primary forests, 225–800 m.

Vern. Cf. MERRILL: *paladukai*, Bik., *salapak*, Neg.; cf. ELMER: *palad-amok*, Vis.

Notes. The fan-shaped leaves with several narrow lobes and prominent main veins resemble those of *O. eminens* but are less strikingly developed. The inflorescence is considerably smaller with the pseudo-fruits forming a compact head borne on a comparatively long peduncle. The heads of true flowers, and of the fruits, are considerably smaller than those of *O. eminens*.

Although VIDAL's material is no longer available, the figure and description relate well to later collections.

The specimens on which ELMER based his *Boerlagiodendron sibuyanense* have the lobes of the leaf rather simpler in outline than is usual, but the fragments of young inflorescence are quite typical of the taxon and the name is reduced to synonymy.

17. *Osmoxylon soelaense* PHILIPSON, Blumea 23 (1976) 108.

A glabrous shrub or small tree. *Petiole* c. 32 cm, broadly channelled above, clasping base prolonged as a stipular ligule 1 $\frac{1}{2}$ cm long, and bearing c. 3 fimbriate crests; blade c. 40 cm long, broadly cuneate at the base, palmately 7-lobed to within c. 12 cm from the base, lobes narrowly ovate to oblong-elliptic, slightly narrowed towards the rounded sinuses, apiculate, margin denticulate. *Inflorescence* a terminal compound umbel; peduncle c. 2 cm, bearing lanceolate bracts c. 2 cm long (similar smaller bracts subtend the primary rays); primary rays c. 1 $\frac{1}{2}$ cm long, 5 mm wide, flattened, bearing opposite, terminal, persistent bracts 10–12 mm long, with lenticels and branched bristles on the back, ending in three branches; central branch c. 10 mm long terminating in a head 1 cm \varnothing of 10–15 sessile sterile bacciform flowers (4 by 3 mm when dry; 3-celled) surrounded by an involucre of ovate bracts (3 mm long) and with minute bracts interspersed; lateral branches 4 $\frac{1}{2}$ –5 cm long, bearing opposite ovate bracts (4 mm long) c. 8 mm above the base, terminating in a dense head c. 1 cm \varnothing of 25–30 sessile flowers interspersed with inconspicuous obtuse fimbriate bracts. *Calyx* rim obsolete. Corolla 5-lobed above, tubular below. Stamens 5. Ovary 4–5-celled. Fruit unknown.

Distr. *Malesia*: Moluccas (Sula Is.: Taliabu and Sulabesi).

Note. For a discussion of the distinctive features, see under 31. *O. sessiliflorum*.

18. *Osmoxylon globulare* PHILIPSON, Blumea 23 (1976) 108.

Shrub to 4 m, furfuraceous on the young parts. *Petiole* to 55 cm long, broadly channelled above, c. 1 cm wide, clasping base heavily lenticellate, prolonged as a stipular ligule 4 cm long sometimes scaly on the back, and bearing numerous irregular undulate crests on the base of the petiole often continued up the petiole, as rough fascicles of bristles as far as the blade; blade 45 cm long, base

cordate or emarginate, with some bristles underneath, palmately 7-lobed to within c. 10–15 cm from the base, lobes narrowly ovate to oblong-elliptic, slightly narrowed towards the broadly rounded sinuses, apex acute, margin serrate.

Inflorescence a terminal compound umbel, spherical, c. 15 cm \varnothing ; peduncle stout, 2–3 cm, bracts together with those among the primary rays caducous; primary rays 30–40, rigid only slightly flattened (subterete), 2–4 cm long, 2–2½ mm wide, bearing opposite bract-scars at the apex, ending in three branches; central branch 8–10 mm long, terminating in a head c. 13 mm \varnothing of c. 20 subsessile sterile bacciform flowers (5 by 4 mm when dry, 2–3-celled); pedicels to 2 mm interspersed with minute bracts; lateral branches 3–4½ cm long, with the scars of opposite bracts near the middle, terminating in a dense head 1–1½ cm \varnothing (in bud) of 20–30 sessile flowers interspersed with inconspicuous bracts. *Calyx* rim obsolete. *Corolla* 6–8-lobed above, tubular below, 2½ mm long (in bud). *Stamens* 6–8. *Ovary* turbinate, obscurely ribbed, 5–8-celled (varying on the same plant). *Fruit* unknown.

Distr. Malesia: Moluccas (Halmahera, Morotai).

Ecol. In forest from sea-level to 800 m. Said to be rare in Halmahera but common in Morotai.

Vern. Bungan-gutu, saha-sasate, Djailolo.

Note. For a discussion of the distinctive features see under 31. *O. sessiliflorum*.

19. *Osmoxylon kostermansii* PHILIPSON, *Blumea* 23 (1976) 108.

Glabrous, small tree, 8 m. *Leaves* clustered near the ends of the branches; petiole up to 35 cm, narrowly channelled above, c. 3 mm broad, with a sheathing base prolonged as a stipular ligule c. 2 cm long, continued around the back of the leaf-base as a single wide crest with an entire recurved margin; blade up to 30 cm \varnothing , base cordate, deeply 5–7-lobed, lobes elliptic, slightly narrowed towards the sinuses and with a short acute apiculum, margin minutely serrate and sometimes with small sub-lobes, sinuses rounded. *Inflorescence* a terminal compound umbel, hemispherical, c. 14 cm \varnothing at anthesis; peduncle c. 1 cm long, bearing small lanceolate bracts (c. 3 mm long) below and among the numerous (c. 20–24) primary rays; primary rays 4–5 cm long and 1 mm broad, with opposite bracts (2 mm long) at the apex, each ending in three branches; the central branch 5–6 mm long, bearing a spherical umbel of c. 20 small, sterile, bacciform flowers (2 mm \varnothing) on pedicels c. 5–7 mm long, 2-celled; the two lateral branches c. 3½–4 cm long, with no articulation or bracts except for a minute involucre around the terminal umbellule of c. 10–14 flowers; pedicels c. 2–3 mm. *Calyx* rim obsolete; *corolla* 4-lobed, 2 mm long in bud; *stamens* 4; *ovary* subcylindric, angled, c. 1 mm long, 5–7-celled, disk with a central stylar boss.

Fruit spherical, c. 6 mm long, strongly ribbed when dry.

Distr. Malesia: Borneo (Kalimantan: Sangkulirang Distr., Mt Medadam).

Ecol. On limestone at 450 m.

Note. The foliage is similar to that of 22. *O. palmatum*, except for the distinctive petiolar crest. The inflorescence is also similar to *O. palmatum*, especially in the lack of an articulation on the rays below the umbellules.

20. *Osmoxylon barbatum* BECC. *Malesia* 1 (1878) 197; PHILIPSON, *Blumea* 23 (1976) 109. — *Eschweilera barbata* (BECC.) BOERL. *Ann. Jard. Bot. Btzg* 6 (1886) 117. — *Trevesia barbata* (BECC.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Boerlagiodendron barbatum* (BECC.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31.

Small, glabrous tree. *Leaves* clustered near the ends of the branches; petiole to 32 cm, channelled above, 4–5 mm broad, with a sheathing base prolonged as a stipular ligule 2–3 cm long, and with several long setose crests encircling the lower part of the petiole; blade up to 43 cm \varnothing , base cordate to truncate; deeply 5–7-lobed; lobes elliptic-lanceolate, narrowed towards the sinuses and tapered to an acuminate apex, margin minutely serrate, sinuses broadly rounded. *Inflorescence* a terminal compound umbel, hemispherical, to 12 cm \varnothing ; peduncle 1–2 cm; primary rays c. 20, 3–5 cm long, with three branches at the apex; the central branch c. 1 cm long, bearing a subglobose umbel of c. 15–20, sterile, bacciform flowers (3–4 mm \varnothing) on pedicels 5–7 mm long, 2–4-celled; the two lateral branches about 4 cm long with no clear articulation but 1 or 2 obsolescent bracts, terminating in an umbellule of c. 15–20 flowers; pedicels c. 3–4 mm. *Calyx* rim obsolete; *corolla* 4-lobed above, tubular below, c. 4 mm long; *stamens* 7 or more, rarely fewer, exserted; *ovary* subcylindric c. 3 mm long, angled, 7-celled; disk with a central stigmatic boss. *Fruit* unknown.

Distr. Malesia: SE. Moluccas (Key Is.).

Note. Distinguished from the closely related 22. *O. palmatum* by the long-setose petiolar crests. For discrimination from 21. *O. pfeilii* see that species.

21. *Osmoxylon pfeilii* (WARB.) PHILIPSON, *Blumea* 23 (1976) 109. — *Eschweilera pfeilii* WARB. *Bot. Jahrb.* 13 (1891) 396. — *Boerlagiodendron pfeilii* (WARB.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 32.

A tree developing a crown when mature, up to 16 m, glabrous when mature, young parts slightly setulose. *Leaves* in terminal clusters; petiole up to 60 cm, channelled above, c. 6 mm broad, with a sheathing base prolonged as a membranous stipular ligule 2–4 cm long, and with many pronounced, long-setose crests encircling the lower part of the petiole; blade up to 75 cm \varnothing , deeply

7–11-lobed, base cordate or emarginate; lobes lanceolate to narrowly elliptic-oblong, narrowed towards the sinuses and tapered to an attenuate apex, margin sharply and remotely serrate, sinuses broadly rounded. *Inflorescence* a terminal compound umbel, hemispherical, to 20 cm \varnothing ; peduncle short (2–3 cm); primary rays numerous (c. 30–40), 4–5 cm long, glabrous, with obsolete bracts at the apex, each ending in three branches; central branch c. 10 mm long, bearing a subglobose umbel of c. 20, small, sterile, bacciform flowers (1–1½ mm \varnothing) on pedicels c. 3–4 mm long, 2–5-celled; the two lateral branches c. 3–4 cm long, with no clear articulation but 1 or 2 obsolescent bracts, terminating in a head of c. 12–16 subsessile flowers (pedicel c. 1 mm, becoming longer in fruit) surrounded by an inconspicuous involucre. *Calyx* rim obsolete; corolla 5-lobed, 1½ mm long in bud; stamens 5; ovary subcylindric, angled, 1½ mm long at anthesis, 5–16-celled, disk with a central boss formed by the united pustulate stigmas. *Fruit* spherical, fleshy, c. 8 mm \varnothing , ribbed when dry, the stigmatic boss persistent and prominent; pyrenes cartilaginous.

Distr. *Malesia*: Bismarck Archipelago (New Britain, Duke of York Group and New Ireland).

Ecol. Primary rain-forest, from near sea-level to 600 m.

Vern. *Sare, sasare, sare a lauvolau*, New Britain, Pomio; *a ibalur*, New Ireland.

Notes. The bark is grey-brown and pustular, the wood straw-coloured and soft. The flowers are orange, and the ripe fruit dark red-violet.

In the original description the ovary is recorded to possess 10–14 cells. However, some other specimens have as few as 5 cells in the ovary, but in other respects agree with specimens with the large number of seeds. Since the inflorescence, leaf-shape, and especially the nature of the petiolar crests, as well as the distribution, are all highly distinctive within the genus, all the specimens can be accepted as examples of one species with a highly variable number of carpels.

This species is very close to 20. *O. barbatum* of the Key Islands. The original diagnostic character of the number of cells in the ovary has been found to be unreliable. However, since the primary rays in the inflorescence are more numerous and the pedicels of the fertile and sterile flowers are shorter this geographically distinct species is maintained.

22. *Osmoxylon palmatum* (LAMK) PHILIPSON, *comb. nov.* — *Folium polypi mas (et femina?)* RUMPH. Herb. Amb. 4: 101, t. 43. — *Aralia palmata* LAMK, Encycl. 1 (1783) 224, type, *non* LOUR. 1790, *nec* R. & S. 1820. — *Trevesia moluccana* MIQ. Fl. Ind. Bat. 1, 1 (1856) 748; Bonplandia 4 (1856) 137. — *Trevesia zippeliana* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 11. — *Unjala bifida* REINW. ex DE VRIESE, Pl. Ind. Or. (1867) 83, *nomen in synon.*; ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 166, in

synon. — *O. moluccanum* (MIQ.) BECC. Malesia 1 (1878) 195; PHILIPSON, Blumea 23 (1976) 109. — *O. zippelianum* (MIQ.) BECC. Malesia 1 (1878) 195. — *Eschweilera palmata* ZIPP. ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 116, t. 14. — *Boerlagiodendron palmatum* (ZIPP. ex BOERL.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 31; MERR. Int. Rumph. (1917) 407. — *Boerlagiodendron moluccanum* (MIQ.) BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 3; Blumea 6 (1950) 367; BACK. & BAKH. f. Fl. Java 2 (1965) 163.

Small, glabrous tree to 15 m. *Leaves* clustered near the ends of the branches; petiole up to 40 cm, channelled above, 4–5 mm broad, with a sheathing base prolonged as a stipular ligule up to 5 cm long, and with several fimbriate crests encircling the lower part of the petiole; blade up to 45 cm \varnothing , base cordate, deeply 5–9-lobed, lobes elliptic, slightly narrower towards the sinuses, acuminate, margin serrate and sometimes with small sub-lobes, sinuses rounded. *Inflorescence* a terminal, compound umbel, subspherical, to c. 20 cm \varnothing at anthesis; peduncle c. 1–2 cm, with small caducous bracts below and among the numerous (20–60) primary rays; primary rays 3–5 cm long, 2–3 mm broad, with two opposite caducous bracts at the apex, each ending in three branches; central branch 6–10 mm long, bearing a spherical umbel of c. 20–30 small, sterile, bacciform, flowers (2–4 mm \varnothing) on pedicels 4–6 mm long, 4–7-celled; two lateral branches c. 2½–5 cm long, rigid and straight, with no articulation (indistinct scars of bracts may occur below the involucre), bearing a minute involucre around the terminal umbellule of c. 12–20 flowers; pedicels to c. 5 mm (occasionally flowers subsessile). *Calyx* rim obsolete. Corolla irregularly 4–5-lobed above, tubular below, c. 5 mm long. Stamens 6–9, exerted, filaments stout. Ovary subcylindric, angled, c. 2 mm long, 6–9-celled, disk with a raised central stigmatic boss. *Fruit* globose, fleshy, c. 10 mm \varnothing , strongly ribbed when dry.

Distr. *Malesia*: Celebes (once, not localized) and Moluccas (Buru, Ceram, Ambon, Banda, Tenimber Is.).

Also cultivated in the Bogor Botanic Garden.

Ecol. An understory tree in primary rain-forest.

Uses. The leaves are used for culinary and medicinal purposes (against gonorrhoea).

Vern. *Daun gurita, pelenda darat, saha-saha*, Moluccas, *fumala-alas*, Tenimber Is.

Note. The spherical inflorescence is characteristic, having straight rigid rays with no articulation on the secondary branches, and the pseudo-fruits are well separated from the true flowers. MIQUEL distinguished *Trevesia zippeliana* because the collector noted that its ovary was 4-celled. Possibly this number related to the sterile flowers. In two gatherings from Ambon (Waai, TEYSMANN; G. Salhutu, BOERLAGE 179) the fertile flowers are

subsessile in heads, but otherwise conform to the characters of this species. The only record of this genus from the Tenimber Is. consists of leaves only, but their characters conform to this species.

23. *Osmoxylon ramosii* (MERR.) PHILIPSON, *Blumea* 23 (1976) 110. — *Boerlagiodendron ramosii* MERR. *Philip. J. Sc.* 11 (1916) Bot. 27; MERR. *En. Philip.* 3 (1923) 224.

Erect, unbranched, or sparingly branched, 4 m high shrub, becoming glabrous. *Petiole* to 40 cm, the clasping base prolonged as a stipular ligule *c.* 2 cm long, and with few to several prominent recurved, obscurely fimbriate, crests surrounding the lower part of the petiole; blade to 30 cm long, base emarginate, palmately 3–7-lobed, lobes extending to within 3–8 cm from the base, oblong-ovate, margin serrate, sometimes lyrate lobulate, apex acuminate, sinuses broadly rounded. *Inflorescence* a terminal compound umbel, 10–15 cm \varnothing ; peduncle stout, with lanceolate bristle-bearing bracts; primary rays *c.* 15, 2–3 cm long, 2–3 mm wide, flattened, subtended by lanceolate bracts *c.* 2 cm long, with bristles on the back and bearing similar opposite terminal bracts *c.* 1 cm long, each terminating in three branches; central branch *c.* 4 mm long, slightly pubescent, terminating in an umbellule (*c.* 1½ cm \varnothing) of *c.* 10–15 sterile, bacciform flowers 4–5 mm \varnothing , 2-celled, pedicels 5–8 mm long, subtended by caducous bracts; lateral branches 2½ cm long (slightly longer as fruits

form), without any articulation or bracts except for a caducous small involucre around the terminal head of *c.* 25–35 sessile or very short-pedicelled flowers, *c.* 1 cm \varnothing , bracts among the flowers obscure. *Calyx* rim obsolete. *Corolla* 4-lobed above, tubular below. *Stamens* 4, exserted, filaments broad. *Ovary* subcylindric, obscurely angled, 4-celled. *Fruit* spherical 9 mm \varnothing , 4-ribbed when dry.

Distr. Malesia: Philippines (Luzon).

Ecol. On low-lying, wet ground, in forest, or on forested slopes, 700–800 m.

Notes. The flat-topped inflorescence is *c.* 15 cm \varnothing with much-reduced leaves below it. The inflorescence rays are dark purplish and the flowers orange-yellow. The bark is grey and the wood soft.

This is the only species in the Philippines without opposite bracts on the lateral branches of the inflorescence rays. In this respect it resembles 22. *O. palmatum* and a few other species.

24. *Osmoxylon novoguineense* (SCHEFF.) BECC. *Malesia* 1 (1878) 197; PHILIPSON, *Blumea* 23 (1976) 110. — *Trevesia novo-guineensis* SCHEFF. *Ann. Jard. Bot. Btzg* 1 (1876) 26. — *Eschweilera novoguineensis* (SCHEFF.) BOERL. *ibid.* 6 (1886) 118. — *Boerlagiodendron novoguineense* (SCHEFF.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31; BACK. & BAKH. *f. Fl. Java* 2 (1965) 163. — *Boerlagiodendron lauterbachii* HARMS in K. Sch. & Laut. *Fl. Schutzgeb.* (1900) 484. — Fig. 11, 14.

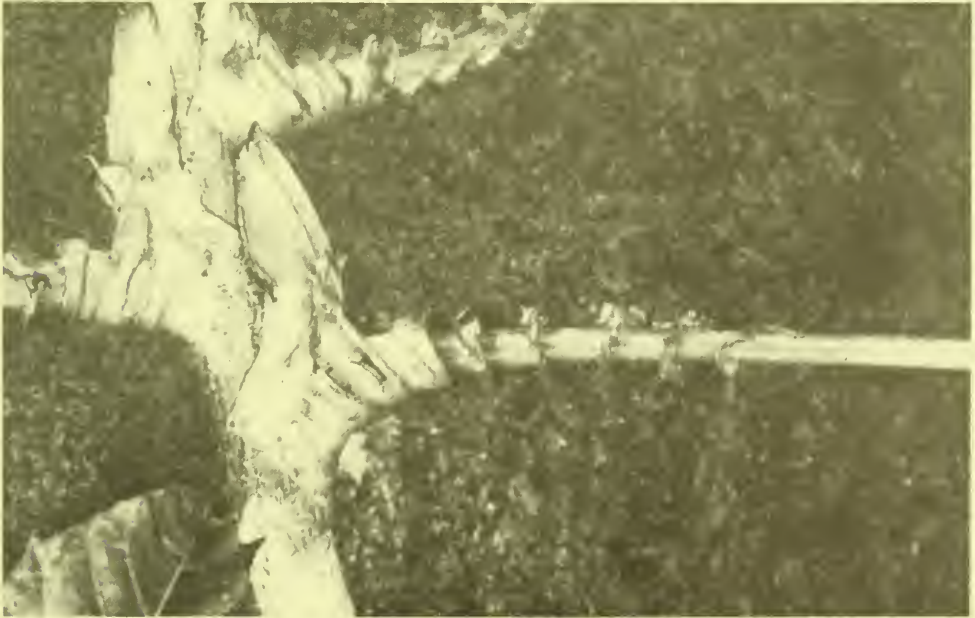


Fig. 14. *Osmoxylon novoguineense* (SCHEFF.) BECC. Petiolar base with ligule and collar-like crests (Photogr. PHILIPSON, Wantoat, 1968).

Tree or shrub, unbranched or sparingly branched, up to 16 m, the young parts rufous-furfuraceous, glabrescent. Large leaves forming terminal crowns; petiole up to 1 m, stout (1–2 cm broad), flattened above, with a sheathing base prolonged as a strong stipular ligule up to 7 cm long, and with fimbriate crests encircling the lower part of the petiole; blade up to 1.20 m \varnothing , with 5–7 strong ribs radiating from the top of the petiole, deeply lobed almost to the base of these ribs, the lobes in turn deeply lobed and incised, the central lobes especially being strongly pinnatisect or digitately tripartite, apices acute, margins serrate; upper leaves associated with inflorescences may be smaller, more simply lobed, or entire. *Inflorescence* terminal, a large compound umbel, bowl-shaped, up to 35 cm \varnothing ; peduncle up to 10 cm, stout, with lanceolate caducous bracts (c. 4 cm long) below and among the numerous (c. 50–70) primary rays; primary rays c. 12–15 cm long at anthesis, c. 3 mm \varnothing , bearing two caducous bracts (1 cm long) at the apex, each ray ending in three branches; central branch c. 2 cm long, bearing an umbel of c. 20–40, sterile, bacciform flowers (c. 6 mm \varnothing when dry) on pedicels c. 10 mm, and 2–6-celled; the two lateral branches c. 4–6 cm, with two opposite or sub-opposite bracts about the middle, terminating in a subspherical umbel $2\frac{1}{2}$ –3 cm \varnothing of 30–50 flowers on pedicels c. 8–10 mm long. *Calyx* rim obsolete, undulate. Petals with irregular erect lobes, tubular below. Stamens 6–10 exerted. Ovary turbinate somewhat angled; glabrous, 6–14-celled; disk flat with a central double row of pustulate stigmas. *Fruits* on stiff radiating pedicels, ovoid or spherical, fleshy, ribbed when dry.

Distr. Solomon Is.; in *Malesia*: throughout New Guinea and in the Bismarck Archipelago.

Ecol. Primary and second-growth forest, from sea-level to 1600 m.

Vern. *Lebe*, Mooi, *teresakui*, Manikiong, *akriek*, Biak, *hoppung*, Hottam, *uger*, Wagu, *faliifalii*, Tifal, *ap gan dandam*, *aimaini*, Mamig, *ida'pfpoforsami*, Kutubu, *pulaka*, Gazelle Peninsula.

Notes. The foliage is similar to that of 30. *O. boerlagei*, but the pedicelled flowers of *O. novoguineense* distinguish it readily from that species. The ripe fruits are usually ovoid, but in the Solomon Is. they are characteristically spheroidal, and this feature recurs in some specimens from the Bismarck Archipelago and the adjacent coast of New Guinea.

The fawn bark is pustulate with many lenticels. An orange exudate flows from the cut stems. The wood is soft and straw-coloured. The inflorescence branches are dark purple, the corolla and stamens usually deep red, and the ripe fruit shining purple or blue-black.

25. *Osmoxylon teysmannii* (BOERL.) PHILIPSON, *Blumea* 23 (1976) 111. — *Eschweilera teysmannii* BOERL. *Ann. Jard. Bot. Btzg* 6 (1887) 119. —

Trevesia teysmannii (BOERL.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Boerlagiodendron teysmannii* (BOERL.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31.

A small, glabrous tree, 6 m. *Leaves* clustered at the ends of the branches; petiole to 40 cm, channelled above, 4 mm broad, with a sheathing base prolonged as a stipular ligule 2–2 $\frac{1}{2}$ cm long, and with several fimbriate or entire crests on the lower part of the petiole; blade c. 30 cm \varnothing , membranous, cordate at the base, deeply 7-lobed, lobes elliptic, slightly narrowed to the broadly rounded sinuses, narrowed to a fine apiculum at the apex, margin finely serrulate. *Inflorescence* a terminal compound umbel, c. 10 cm \varnothing ; peduncle c. 1 cm, bearing ovate bracts (ligules of reduced leaves) and terminating in a cluster of bracts (c. 10 mm long) below and among the primary rays; primary rays c. 12–15, c. 3–4 cm long, with a pair of lanceolate bracts at the apex (c. 1 cm long); central branch c. 1 cm long, terminating in an umbellule of c. 5–8 sterile bacciform flowers (c. 4 mm \varnothing when dry) on pedicels 6–9 mm long interspersed with linear bracts 5 mm long; two lateral branches c. 3 $\frac{1}{2}$ cm long, articulated about the middle, terminating in an umbellule surrounded by caducous linear bracts (leaving a rim-like involucre); flowers c. 8–12, pedicels c. 2–3 mm. *Calyx* rim obsolete. Corolla 3 mm long, with 7–8 lobes above, tubular below. Stamens 7–8, filaments stout, anthers exerted. Ovary subcylindric, angled, c. 1 $\frac{1}{2}$ mm long, 7–8-celled; disk flat, with a central stigmatic boss. Fruit unknown.

Distr. *Malesia*: SW. Celebes (Tjamba, Kosali-Porema) and NW. Central Celebes (Palu-Parigi and Mt Nokilalaki).

Ecol. In rain-forest, 800–1000 m.

26. *Osmoxylon humile* (ELMER) PHILIPSON, *Blumea* 23 (1976) 111. — *Boerlagiodendron humilis* ELMER, *Leaf. Philip. Bot.* 7 (1914) 2327; MERR. *En. Philip.* 3 (1923) 223.

Erect, small, sparsely branched shrub, up to 1 $\frac{1}{2}$ m. *Leaves* clustered at the ends of the branches; petiole to 25 cm, terete, base prolonged as a stipular ligule c. 1 cm long, and with c. 3 entire crests at the base; blade palmately 5-lobed, 24 cm long, base truncate or cordate, lobes reaching to within 3–6 cm from the base, elliptic, 4–6 cm wide, narrowed towards the broadly rounded sinuses, tapered to an acute apiculum, margin serrate in the upper part, the outer lobes with a lobule on the lower edge. *Inflorescence* a terminal compound umbel, 9 cm \varnothing , subtended by a few foliaceous bracts; peduncle stout, 2–3 cm, with furfuraceous, oblong bracts; primary branches crowded, numerous, 2 $\frac{1}{2}$ cm, furfuraceous, flattened, striate with opposite minute bracts at the apex; central branch c. 3 mm, bearing an umbellule of sterile, bacciform flowers 3 $\frac{1}{2}$ mm \varnothing , pedicels 4 $\frac{1}{2}$ mm; lateral branches 3–3 $\frac{1}{2}$ cm, articulated about the middle, terminating in an umbellule of c. 15 flowers, bracts

inconspicuous, fimbriate, pedicels $1\frac{1}{2}$ –2 mm. *Calyx* an obsolete rim. Corolla and stamens not known. Ovary $1\frac{1}{2}$ –2 mm, 4-celled, with a flat disk and a raised central stigmatic boss, 4-celled. *Fruit* 6 by 4 mm (dry) 4-ribbed; pyrenes crustaceous; endosperm rugose.

Distr. *Malesia*: Philippines (Mindanao).

Ecol. Damp fertile ground in dense forest, on south side of Baruring R., at 1000 m.

Vern. *Sarâng-ka-máno*, Bag.

27. *Osmoxylon pectinatum* (MERR.) PHILIPSON, *Blumea* 23 (1976) 111. — *Boerlagiodendron pectinatum* MERR. *Philip. J. Sc.* 3 (1908) Bot. 253, 424; *En. Philip.* 3 (1923) 224; KANEHIRA, *Form. Trees rev. ed.* (1936) 520, f. 480; HUT-LIN LI, *Woody Fl. Taiwan* (1963) 666, f. 273.

Shrub or small glabrous tree up to 8 m. *Leaves* clustered at the ends of the branches; petiole to 18 cm, with a clasping base prolonged as a short acute stipular ligule, and with several basal crests fringed with 1–2 cm long bristles; blade to 25 cm \varnothing , base truncate to broadly cuneate, palmately 5–7-lobed, lobes reaching to about the middle of the lamina, sinuses narrow-rounded, lobes oblong-elliptic, usually slightly narrowed below, obtuse to acute, margin thickened, coarsely dentate, coriaceous. *Inflorescence* a terminal compound umbel; peduncle *c.* 1 cm, with small bracts (3 mm) below and among the primary rays; primary rays *c.* 25–35, *c.* 2–3 cm long, with opposite ovate caducous bracts at the apex, each terminating in three branches; central branch *c.* 8–11 mm long, ending in an involucre of minute bracts (1 mm) surrounding an umbellule of *c.* 15–20 ovoid sterile flowers (*c.* 3 mm long, 3-celled), pedicels 5–6 mm long; lateral branches *c.* $2\frac{1}{2}$ cm long at anthesis, with an articulation about the middle, ending in an umbellule *c.* 1 cm \varnothing with minute fimbriate bracts; flowers *c.* 30, pedicels *c.* $1\frac{1}{2}$ mm (elongating slightly in fruit). *Calyx* rim obsolete. Corolla lobes 4–5, tubular below, 2 mm long. Stamens 4–5. Ovary turbinate, $1\frac{1}{2}$ mm long, 4–6-celled. *Fruits* globose, 5 by 5 mm (dry), 4–6-ribbed when dry.

Distr. Taiwan (Botel Tobago and Lutao I., east off Taiwan proper); in *Malesia*: N. Philippines (Batan I.).

Ecol. Forested slopes at 650 m.

Vern. *Narapan*, Iv.

28. *Osmoxylon masarangense* PHILIPSON, *Blumea* 23 (1976) 111.

Small tree, 5 m, the young parts setulose, becoming \pm glabrous. *Leaves* in terminal clusters; petiole *c.* 17 cm, rather narrow ($1\frac{1}{2}$ –2 mm \varnothing), channelled above, with a small clasping base, prolonged as a stipular ligule, 1– $1\frac{1}{2}$ cm long, setulose on the back, and with a number of long-setulose crests encircling the lower part of the petiole; blade *c.* 18 by 22 cm, deeply 3–5-lobed (or below the inflorescence sometimes simple), the

base truncate or emarginate, lobes oblong or elliptic, slightly narrowed to the broadly rounded sinuses, apex with a short apiculum, membranous, margin finely setulose-serrate, sinuses *c.* 6 cm from base of the blade. *Inflorescence* a terminal sessile compound umbel; primary rays *c.* 10, setulose, $1\frac{3}{4}$ –2 cm long, each ray ending in three branches; central branch 4–5 mm long, ending in an umbellule, pedicels 6 mm, sterile flowers not known; two lateral branches $2\text{--}2\frac{1}{2}$ cm long, 1 mm broad, with two bract scars about the middle but usually not opposite, terminating in an umbellule with *c.* 10 pedicels 3–5 mm long (in fruit). Flowers unknown. *Fruit* (when dry) ovoid, 6 by 4 mm, 5-seeded.

Distr. *Malesia*: N. Celebes (Minahasa, Tomohon, Mt Masarang).

Ecol. Secondary forest at edge of crater lake, at 1200 m.

Note. This species is similar in aspect to the Philippine 39. *O. trilobatum*, but the petiolar crests are distinctive.

29. *Osmoxylon insidiator* BECC. *Malesia* 1 (1878) 195; PHILIPSON, *Blumea* 23 (1976) 112. — *O. carpophagum* BECC. *Malesia* 1 (1878) 196. — *Eschweilera insidiatrix* (BECC.) BOERL. *Ann. Jard. Bot. Btzg* 6 (1886) 120. — *Eschweilera carpophagum* (BECC.) BOERL. *l.c.* 121, t. 15. — *Trevesia insidiator* (BECC.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Trevesia carpophagum* (BECC.) O. K. *l.c.* — *Boerlagiodendron insidiator* (BECC.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 32. — *Boerlagiodendron carpophagum* (BECC.) HARMS, *l.c.* — *Boerlagiodendron pachycephalum* HARMS, *Nova Guinea* 8 (1910) 271.

Small tree to 12 m, young parts with uniform scurfy tomentum. Large *leaves* forming terminal crowns; petiole up to 80 cm, stout (1–2 cm \varnothing), broadly channelled above, with a sheathing base prolonged as a strong stipular ligule *c.* 9 cm long, and with moderately developed irregular (not fimbriate) crests encircling the lower part of the petiole; blade up to 85 cm \varnothing , with 5–7 strong ribs radiating from the top of the petiole, deeply lobed almost to the base of these ribs, lobes in turn deeply lobed and incised, the median often digitately tripartite, apices long acuminate, margin irregularly and remotely serrate, subglabrous when mature or showing remnants of the tomentum. *Inflorescence* a terminal hemispherical compound umbel, *c.* 15 cm high by 30 cm wide; peduncle short, stout ($1\frac{1}{2}$ –2 cm \varnothing), with lanceolate bracts 4–6 cm long below and among the numerous (15–20) primary rays; primary rays 6–10 cm long, *c.* 5–12 mm wide, rigid, bearing 2 lanceolate bracts (2–3 cm long) at the apex, each ray ending in three branches; central branch *c.* $1\frac{1}{2}$ cm long, bearing an umbel of *c.* 30 sterile bacciform flowers (*c.* 5–12 mm \varnothing when dry), the pseudo-fruits and their pedicels \pm rufous tomentose, pedicels 10–12 mm,

and 6-celled, surrounded by an involucre of short ovate bracts (3–8 mm long); two lateral branches c. 6 cm at anthesis, rigid, slightly flattened, to 8 mm broad, bearing a pair of bracts (c. 1½ cm long) about the middle, terminating in a subglobose head 3½–4 cm \varnothing of c. 30–40 sessile flowers, and surrounded by an involucre of ovate bracts c. 10–14 mm long. *Calyx* rim fimbriate. Petals irregularly 4–5-lobed, 7–8 mm long, connate below to form a fleshy tube, pubescent on the outer surface. Stamens c. 15–26, filaments strap-like, projecting beyond the corolla, anthers c. 4 mm long. Ovary shortly turbinate, 2–4 mm long, angled, furfuraceous, c. 13–25-celled; disk flat, with a central boss formed of the pustulate stigmas. *Fruits* in a compact spherical head, the individual drupes angled by mutual pressure, and bearing the persistent stigmas on the exposed face, c. 10–14 mm long, the numerous pyrenes compressed and flat; cartilaginous.

Distr. *Malesia*: throughout New Guinea, but local; also Waigeo I.

Ecol. Primary rain-forest and regrowths, frequently beside streams, from sea-level to 350 m.

Vern. *Angit*, *kangit*, Waigeo, *pennifogo*, Orakawa, Papua.

Notes. The bark is greyish brown, slightly fissured with many lenticels. The wood is soft and

white. The flowers are reddish-brown or purple, with orange-red filaments and the fruit purple.

BECCARI provided a detailed description of the living plant, and noted that the fruits are eaten by various species of pigeon.

Boerlagiodendron pachycephalum HARMS has very strongly developed umbels and leaves, but apart from size, it does not differ from this species. Since a range in stature is shown by the several gatherings now available, the whole is best regarded as a single species.

Similarly, the very short pedicels of *O. carpopagarum*, which BECCARI used to distinguish it from *O. insidiator*, can in fact be matched on several specimens of that species.

30. *Osmoxylon boerlagei* (WARB.) PHILIPSON, *Blumea* 23 (1976) 112. — *Eschweilera boerlagei* WARB. *Bot. Jahrb.* 13 (1891) 395. — *Boerlagiodendron warburgii* HARMS in *E. & P. Nat. Pfl. Fam.* 3, 8 (1894) 32, *nom. illeg. superfl.*; in *K. Sch. & Laut. Fl. Schutzgeb.* (1900) 484. — *Boerlagiodendron boerlagei* (WARB.) HARMS, *Bot. Jahrb.* 56 (1920) 382. — Fig. 15.

Small to fairly large tree, unbranched or sparingly branched, up to 24 m, glabrous, at least when mature. Large leaves forming terminal crowns; petiole up to 1 m, stout (1–2 cm \varnothing),



Fig. 15. *Osmoxylon boerlagei* (WARB.) PHILIPSON. Showing that each ray ends into a central umbel of bacciform flowers and two lateral umbels with normal flowers (Photogr. PHILIPSON, Kassam Pass, E. New Guinea, 1968).

broadly channelled above, with a sheathing, heavily lenticellate base prolonged as a strong stipular ligule up to 7 cm long, and with lacerate crests encircling the lower part of the petiole; blade up to 1.15 m \varnothing , with 5–7 strong ribs radiating from the top of the petiole, deeply lobed almost to the base of these ribs, lobes in turn deeply lobed and incised, the central lobes especially being strongly pinnatisect or digitately tripartite, apices acute, margin undulate or indistinctly serrate. *Inflorescence* terminal (or overtopped by a lateral leafy branch), a large compound umbel, bowl-shaped with a slightly convex top, up to 60 cm \varnothing ; peduncle c. 10 cm, stout, with lanceolate bracts below and among the very numerous radiating primary rays; outer primary rays c. 20 cm long at anthesis (elongating in fruit), inner rather shorter, woody, bearing two caducous bracts at the apex, each ray ending in three branches; central branch c. 4 cm, bearing an umbel of c. 20 sterile bacciform flowers (c. 8 mm \varnothing when dry) with rigid pedicels c. 1½ cm long, and 5–6-celled; two lateral branches c. 9 cm long at anthesis, articulated about the middle, terminating in a button-like head of c. 20–30 sessile flowers and surrounded by ovate bracts which soon fall leaving a bowl-shaped involucre, c. 1½ cm \varnothing . *Calyx* rim obsolete. *Petals* c. 13, bud flat-topped, angled, minutely pubescent, apparently falling as a calyptra. *Stamens* 8–13. *Ovary* shortly turbinate, angled, glabrous, 10–14-celled; disk flat, with a central double row (or ellipse) of pustulate stigmas. *Fruits* spreading to form a \pm spherical head obscuring the involucre, each c. 9 by 7 mm (when dry) with prominent persistent stigmas.

Distr. Malesia: throughout New Guinea.

Ecol. Primary forest, and secondary growths on old cultivations, from near sea-level to 1800 m.

Vern. *Eunya*, *Gimi*, *apiatambay*, *Washkuk*, *ma-korr-korr*, *Jal*, *teresahui*, *Manikiong*.

Note. Bark yellow grey with shallow fissures and many pale corky pustules; wood straw-coloured, fibrous. The large terminal inflorescence is shallowly convex on top and is surrounded by several large leaves. Flowers reddish brown. Fruit purplish black and succulent.

31. *Osmoxylon sessiliflorum* (LAUT.) PHILIPSON, *Blumea* 23 (1976) 113. — *Boerlagiodendron sessiliflorum* LAUT. *Nova Guinea* 8 (1910) 272.

Small tree, up to 18 m, glabrous when mature, or tomentum persistent on the inflorescence. *Leaves* crowded at the ends of the branches; petiole to 60 cm, with the clasping base prolonged as a stipular ligule up to 6 cm long, and with few to several strong or weak crests around the base of the petiole, margin undulate or fimbriate; blade to 50 cm long, base cordate, palmately 5–9-lobed, lobes extending to near the base, elliptic, coarsely serrate, often irregularly lobulate, apex acute, sinuses rounded. *Inflorescence* a terminal compound umbel;

peduncle to c. 4 cm, bearing lanceolate bracts to 2½ cm long, caducous or persistent, occasionally with some bristles on the back, primary rays c. 20–30, c. 9 cm long, \pm pubescent, bearing opposite caducous or rarely persistent bracts at the apex; central branch variable in length (2–18 mm), bearing an umbellule or head 1–2½ cm \varnothing of sterile bacciform flowers (4–5 mm \varnothing), 4–8-celled, subtended by minute bracts, pedicels variable in length (5–18 mm); lateral branches 3–7 cm, articulated near the middle, terminating in a globose head of c. 20–30 sessile flowers (or pedicels 1½ mm long), bracts between the flowers very small. *Calyx* rim obsolete. *Corolla* few- to many-lobed, tubular below, 1½–4 mm long in bud. *Stamens* 6–17. *Ovary* 5–18-celled. *Fruit* a globose head of drupes; drupes c. 10 by 6 mm, obovoid, ribbed when dry.

Distr. Malesia: throughout New Guinea.

Ecol. Rain-forest, especially along the muddy banks of rivers, from sea-level to 100 m.

Vern. *Akriek*, *Biak*, *korinki*, *Orne*, *kwita-kwita*, *Milne Bay*, *sapi-ai*, *Jense*, *terrasahui*, *Manikiong*.

Notes. Unbranched or sparsely branched with crowns of large leaves. The bark is light brown and the wood cream. The inflorescence branches are purple, the flowers red, and the succulent ripe fruits black.

The variation in the numbers of floral parts is considerable. Most specimens have more than 10 stamens and the same number of cells in the ovary, or more. Three gatherings have from 5–7 stamens and cells. These may possibly require to be segregated as a distinct species, but other evidence to support this course is lacking. An even more distinctive gathering has central branches to 3 cm long with the pseudo-fruits on short pedicels (less than 5 mm) and flowers with 17 stamens and 25 cells in the ovary. These characters have not been included in the specific description as this specimen is only very tentatively referred to this species.

This species forms an eastward extension of a complex of species, represented in the Moluccas by 37. *O. talaudense*, 17. *O. soelaense* and 18. *O. globulare*. Several similar species occur in the Philippines. They are characterized by dense spherical heads of flowers.

Osmoxylon talaudense resembles some specimens of *O. sessiliflorum* rather closely, and the difficulty of preserving the characters of these large-leaved plants in an herbarium probably obscures several good diagnostic features. The most reliable character to distinguish these two species is the position of the articulation on the lateral branches of the inflorescence rays. In specimens from the Talaud Is. this is close to the base (below the apex of the central umbellule of pseudo-fruits) and the bracts are persistent, whereas in the New Guinea material it is near (or above) the middle, and is usually marked by two inconspicuous scars which frequently are not opposite. In both species the pseudo-fruits are pedicelled, whereas in the other

two Moluccan species the pseudo-fruits are sessile or subsessile forming spherical heads. In *O. globulare* (from Morotai and Halmaheira) the lateral branches are rigid and only slightly flattened with the articulation near the middle and the bracts caducous. In *O. soelaense* the articulation is much nearer the base, the bracts are persistent, and the branches are broader and much flattened.

32. *Osmoxylon camiguinense* (MERR.) PHILIPSON, *Blumea* 23 (1976) 113. — *Boerlagiodendron camiguinense* MERR. *Philip. J. Sc.* 3 (1908) Bot. 252; *En. Philip.* 3 (1923) 222.

Shrub to 2 m, glabrous except for the inflorescence. *Leaves* clustered at the ends of the branches; petiole to 18 cm, with a sheathing base prolonged as a stipular ligule 1 cm long, and with several entire crests encircling the lower part of the petiole; blade 20 by 22 cm, base truncate, 3–5-lobed to about the middle, lobes oblong, scarcely narrowed towards the base, apex acuminate, sinuses broad, rounded, margin dentate, coriaceous. *Inflorescence* a terminal compound umbel; primary rays *c.* 2–2½ cm, pubescent with opposite lanceolate bracts (*c.* 12 mm long) at the apex; central branch *c.* 4 mm long, bearing a globose umbellule (*c.* 12 mm \varnothing) of sterile bacciform flowers (*c.* 2 mm \varnothing), pedicels *c.* 3 mm, subtended by numerous ligulate bracts; lateral branches *c.* 3 cm long, with opposite lanceolate bracts 4 mm long, ending in a head of *c.* 20–30 sessile flowers. Corolla and stamens not seen, described by MERRILL as 3-merous. *Fruit* globose 6 mm \varnothing (dry), 3-seeded.

Distr. Malesia: Philippines (Babuyan Is.: Camiguin I.).

Ecol. On slopes in forest, at 500 m.

33. *Osmoxylon fenicis* (MERR.) PHILIPSON, *Blumea* 23 (1976) 114. — *Boerlagiodendron fenicis* MERR. *Philip. J. Sc.* 13 (1918) Bot. 44; *En. Philip.* 3 (1923) 223. — *Boerlagiodendron tayabense* MERR. *Philip. J. Sc.* 13 (1918) Bot. 45; *En. Philip.* 3 (1923) 224.

Erect shrub or treelet a few m high, glabrous except for the inflorescence. *Petiole* to 45 cm, clasping base prolonged as a broad stipular ligule, 1½–3 cm long, several prominent long pectinate petiolar crests extending up the petiole as oblique groups of bristles; blade to 30 cm long, base cordate or truncate, deeply palmately 3–7-lobed, lobes extending to within *c.* 7 cm of the base, broadly elliptic to oblong, entire or with subsidiary lobes, somewhat narrowed towards the sinuses, apex abruptly apiculate, margin remotely denticulate or serrate, sinuses very broadly rounded. *Inflorescence* a terminal, compound, furfuraceous umbel, hemispherical, *c.* 10–12 cm \varnothing ; peduncle 2–3 cm, densely enclosed in broadly ovate bracts *c.* 2 cm long, bearing dense fascicles of strong bristles on their blades; primary rays 15–30, *c.* 2½–3 cm long, 2½ mm wide, pubescent, subtended by large bristly bracts *c.* 1½ cm long,

bearing opposite terminal usually bristly bracts 6–15 mm long, each ending in 3 branches; central branch *c.* 4–10 mm, pubescent, bearing a terminal umbellule of *c.* 10–20 sterile bacciform flowers 2–3 mm \varnothing , 2-celled, pedicels 3–4 mm tomentose sometimes with a ruff of hairs around the pseudo-fruits, subtended by early-caducous small fimbriate bracts; lateral branches 2½–3 cm long, with two opposite bracts (2–3 mm) about the middle, bearing a terminal head (8 mm \varnothing without corollas) of *c.* 15–30 sessile flowers, subtended by inconspicuous ovate tomentose bracts. *Calyx* an obsolete rim. Corolla in bud *c.* 1 mm long. Stamens 3. Ovary 3-celled. *Fruiting head* 10–12 mm \varnothing ; drupes *c.* 6 mm long, crowded, sessile, 3-angled; seeds 3.

Distr. Malesia: Philippines (Luzon).

Ecol. In primary dipterocarp forest, on rocky slopes near streams, 300–400 m.

Note. Closely allied to 40. *O. luzoniense* and 27. *O. pectinatum*, but the combination of long-fringed petiolar crests, pubescent inflorescence branches, excessively bristly bracts and 3-merous flowers is distinctive.

34. *Osmoxylon eminens* (BULL.) PHILIPSON, *Blumea* 23 (1976) 114. — *Trevesia eminens* BULL., *Cat. New Plants* (1884) 17; *Retail List* (1885) 64, fig. — *Boerlagiodendron mindanaense* MERR. *Philip. J. Sc.* 3 (1908) Bot. 154. — *Boerlagiodendron eminens* (BULL.) MERR. *En. Philip.* 3 (1923) 223.

Small tree, up to 10 m, with few stout branches. *Leaves* large, forming terminal crowns, glabrous when mature, young inflorescence densely furfuraceous; petiole to 1 m, stout (to 2 cm \varnothing), flattened above, base clasping the stem, heavily lenticellate, prolonged as a stipular ligule 2 cm long, bicuspid, often with scales or bristles on the back, and bearing few to several entire, fimbriate or occasionally long setose crests; blade to 60 cm long, palmately 10–19-lobed, base cordate, lobes reaching to near the base, lanceolate to oblong, up to 15 cm wide, in outline either strap-shaped or irregularly pinnatisect, or the central lobe occasionally distinctly tripartite, margin coarsely and irregularly dentate, apex acuminate. *Inflorescence* a terminal compound umbel *c.* 40 cm \varnothing ; peduncle stout *c.* 6 cm, 1½ cm wide, bearing many lanceolate scaly bracts 3–6 cm long; primary rays numerous, rigid, flattened, 9–12 cm long, 6–10 mm broad, bearing opposite oblong scaly bracts (2–3 cm long) at the apex, each ending in three branches; central branch ½–1 cm long, terminating in an umbellule (3–5 cm \varnothing) of *c.* 20–40 sterile bacciform flowers, 7 mm \varnothing , 2–3-celled, pedicels 1–2 cm long, surrounded by an involucre of small bracts (to 8 mm long); lateral branches *c.* 12 cm long, with opposite bracts (6–10 mm long) near the middle, terminating in a head of *c.* 50–60 sessile flowers, 1½–2 cm \varnothing (with corollas), heads spherical at anthesis, ovoid after corollas absciss;

bracts between the flowers very small. *Calyx* rim obsolete. Corolla 5–6-lobed, tubular below, 4–5 mm long. Stamens 4–6, filaments 7 mm long, anthers $1\frac{1}{2}$ mm long. Ovary 2–3 mm long (at anthesis), 5–6-celled. *Fruits* crowded in dense ovoid heads 3–4 by $2\frac{1}{2}$ –3 cm, drupes c. 9 by 5 mm, 5–6-angled by mutual pressure, narrowed to the base, crowned by the persistent stigmatic boss; pyrenes crustaceous; endosperm wrinkled.

Distr. Micronesia: Carolines; in *Malesia*: throughout the Philippines.

Ecol. In primary forest from low altitude (100 m) to ridge forest and mossy forest at 950 m, often in shady ravines.

Vern. Cf. MERRILL: *apalong* or *apulong*, Bis., *bunglui-babae*, *piña-piña*, Sul., *mangunpulun*, Bag., *palad-ulot*, S.L.Bis., *ulo-ulo*, C.Bis.; in addition: *lolobongan*, Lan.

Notes. This is the most widespread and most frequently collected species in the Philippines. It is also the most striking. Its large, many-lobed, fan-shaped leaves and the strong inflorescences, with globular flower-heads and large clusters of pseudo-fruits are distinctive. Only 16. *O. pulcherrimum* resembles it somewhat in its leaf characters, but the central branches of the inflorescence rays of that species are much longer and its pseudo-fruits are sessile.

The inflorescence branches are described as dull reddish brown, the flowers as light orange, and the fruits as indigo-black.

35. *Osmoxylon serratifolium* (ELMER) PHILIPSON, *Blumea* 23 (1976) 114. — *Boerlagiodendron serratifolium* ELMER, *Leafl. Philip. Bot.* 2 (1908) 505; MERR. *En. Philip.* 3 (1923) 224.

Sparingly branched shrub to 5 m. *Petiole* to 50 cm long, channelled above, clasping base prolonged as an obtuse stipular ligule, and with few narrow \pm fimbriate crests around the base of the petiole; blade to 50 cm long, base cordate, palmately lobed (up to 11 lobes), lobes extending to within about $\frac{1}{3}$ from the base, narrowly elliptic, margin serrate (or slightly lobulate), apex acuminate, sinuses narrowly rounded. *Inflorescence* a terminal compound umbel c. 30 cm \varnothing ; peduncle stout, bracteate; primary rays 20–30, 4–5 cm long, 5–6 mm wide, flattened, subtended by lanceolate bracts 3–5 cm long, sometimes with bristles on the back, and bearing similar opposite terminal bracts $2\frac{1}{2}$ cm long, each terminating in three branches; central branch 12–15 mm long, terminating in an umbellule (3–4 cm \varnothing) of c. 20–25 sterile bacciform flowers 5–6 mm \varnothing , 3–4-celled, pedicels to 10 mm, interspersed with persistent small bracts; lateral branches c. 9 cm long, with opposite bracts (c. 6 mm long) 2–3 cm from the base, terminating in a spherical head of c. 30 sessile flowers c. $1\frac{1}{2}$ cm \varnothing (in bud), bracts between the flowers very small, obtuse, fimbriate. *Calyx* rim obsolete. Corolla 5–7-lobed above, tubular below, 5 mm long.

Stamens 5–6, exerted, filaments 7 mm long, anthers 2 mm long. Ovary 3 mm long, 5-celled. Fruit unknown.

Distr. *Malesia*: Philippines (Leyte, Camiguin, Panay).

Ecol. ELMER noted that this species was rare in the low hills of Leyte.

Notes. The flowers are orange-yellow (salmon), the fruits dark purple.

The inflorescence is very similar to that of 34. *O. eminens*, but the leaves lack the many strong fan-like ribs of that species.

36. *Osmoxylon celebicum* PHILIPSON, *Blumea* 23 (1976) 115. — *Boerlagiodendron celebicum* HARMES *ex* KOORD. *Minah.* (1898) 489, *nomen*.

A small, sparsely branched tree, 6 m high. Large leaves forming terminal crowns; petiole 50 cm by 8 mm, flattened above, with a sheathing base prolonged as a strong stipular ligule 3 cm long with branched fibrous setae on the outer surface, and with several crests bearing similar setae on the lower part of the petiole; blade 50 cm \varnothing , base emarginate, deeply 9-lobed, lobes narrowly elliptic to lanceolate, narrowed towards the sinuses, apex broadly cuneate, margin minutely and remotely serrate, sinuses broadly rounded. *Inflorescence* a terminal compound subspherical umbel c. 20 cm \varnothing ; peduncle short, stout (15 mm wide) with large setose bracts (c. 4 cm long) below and among the primary rays; primary rays c. 15, c. 6 cm long, 5 mm broad, with a pair of large setose bracts (22 by 10 mm) at the apex, each ending in three branches; central branch c. 6 by 2 mm, terminating in an involucre of setose ovate bracts (c. 4 mm long) and an umbel of c. 20–30 sterile bacciform flowers (c. 3 mm \varnothing when dry, 2–3-celled, on pedicels 6–10 mm long) interspersed with bracts covered with crisp reddish-brown setulae; the two lateral branches c. 2 cm long, with opposite setulose bracts (c. 1 cm long) below the middle, terminating in a spherical head of c. 30–40 sessile flowers each subtended by a reddish brown setulose cymbiform bract. *Calyx* rim obsolete. Corolla c. $2\frac{1}{2}$ mm long in bud (not seen in open condition). Stamens 5. Ovary subcylindric, c. 1 mm long in bud, 5-celled; disk with a central stigmatic boss. Fruit unknown.

Distr. *Malesia*: Celebes (Minahasa, Manado).

Ecol. On rich volcanic sand, at 10 m.

Vern. *Sinomaha*.

Note. The flower buds are orange and the fruits deep purple.

37. *Osmoxylon talaudense* PHILIPSON, *Blumea* 23 (1976) 115.

Shrub or small tree, to 6 m, glabrous. Leaves at the ends of the stout branches; petiole to 60 cm, broadly channelled above, clasping base prolonged as a stipular ligule c. 2 cm long, and bearing 2–3 fimbriate crests; blade c. 50 cm long truncate to cordate at the base, palmately 7–11-lobed to within



Fig. 16. *Osmoxylon micranthum* (HARMS) PHILIPSON. a. Habit, $\times \frac{1}{2}$, b. flower, c. false fruit and ditto in CS, $\times 15$, d. CS of fruit, $\times 6$ (a-c KANIS 1384, d PULLEN 428). Drawn by W. R. PHILIPSON.

$\pm \frac{1}{4}$ of the base, lobes elliptic oblong slightly narrowed towards the rounded sinuses, apiculate, margin denticulate to undulate. *Inflorescence* a terminal compound umbel, peduncle 1–2 cm, bearing broad ovate bracts 2–3 cm long, with bristles on the back, (similar persistent bracts subtend the primary rays); primary rays *c.* 15, *c.* 3–4 cm long, 4 mm wide, flattened, bearing opposite terminal persistent bracts $1\frac{1}{2}$ –2 cm long, sometimes with a few bristles on the back, ending in three branches; central branch 8–10 mm long, terminating in an umbellule 2 cm \varnothing of 15–20 sterile bacciform flowers (4 mm \varnothing , 2-celled) surrounded by an involucre of obtuse bracts 1–2 mm long, pedicels 5–7 mm; lateral branches $4\frac{1}{2}$ –5 cm long, bearing opposite ovate persistent bracts (3–7 mm long) *c.* 5–10 mm above the base, terminating in a dense head *c.* 1 cm \varnothing of 30–40 sessile flowers interspersed with inconspicuous obtuse bracts. *Calyx* rim obsolete. Corolla 5-lobed. Stamens 5. Ovary turbinate, $1\frac{1}{4}$ mm long, 5-celled. Fruit in spherical heads 2 cm \varnothing (when dry); drupes *c.* 9 by 6 mm, obovoid, 5-ribbed.

Distr. *Malesia*: N. Moluccas (Talaud Is.: Karekelong and Salebabu).

Ecol. Common in forest, besides streams, from near sea-level to 100 m.

Vern. *Laripatu*, Talaud.

Note. The flower is yellow-orange and the fruit dark purple. For a discussion of the distinctive features, see under 31. *O. sessiliflorum*.

38. *Osmoxylon micranthum* (HARMS) PHILIPSON, *Blumea* 23 (1976) 115. — *Boerlagiodendron micranthum* HARMS, *Bot. Jahrb.* 56 (1920) 379. — *Boerlagiodendron sayeri* HARMS, *l.c.* 379, f. 1 a–j. — *Eschweilera gawadensis* BAKER f. *J. Bot.* 61 (1923) 22. — *Boerlagiodendron tricolor* PHILIPSON, *Bull. Br. Mus. Nat. Hist. Bot.* 1 (1951) 11. — Fig. 16.

A sparsely branched shrub to 8 m, sometimes trailing or semi-scandent, young parts uniformly setulose, buds without cataphylls. *Leaves* in terminal clusters; petiole up to 30 cm, rather narrow (2–4 mm \varnothing), becoming sparsely setulose, channelled above, with a sheathing base prolonged as a membranous stipular ligule up to 3 cm long, and with a number of lacerate crests encircling the lower part of the petiole; blade deeply 3–5- or more rarely 7-lobed, or below the inflorescence sometimes simple, base cordate or emarginate, the central lobe up to 30 cm long, the lobes oblong, lanceolate or broadly elliptic, entire or irregularly lobed or incised, or with small sub-lobes, apices long cuspidate, acute, margin serrate, sinuses between the lobes broad and rounded, surfaces become sparsely setulose to subglabrous. *Inflorescence* a terminal compound umbel, often appearing subterminal by growth of a leafy branch at the base of the peduncle; peduncle short (1–2 cm), heavily setulose, occasionally with a flowering ray arising from the axils of bracts on or below the

peduncle, bearing distally many lanceolate bracts 5–10 mm long; primary rays 12–18, 10–20 mm long, setulose, with two lanceolate bracts at the apex, each ray ending in three branches; the central branch very short (2–3 mm) bearing a subglobose umbel of many (*c.* 40) small sterile bacciform flowers (*c.* $1\frac{1}{2}$ by 1 mm) with filamentous pedicels *c.* 2 mm long, and 1–2 cells each with 1 abortive ovule; the two lateral branches *c.* 2 cm long, with two minute bracts about their middle, setulose, terminating in a head of *c.* 20 sessile flowers surrounded by an involucre of small rounded bracts. *Calyx* rim obsolete. Corolla 4(–5)-lobed, united below, *c.* 2 mm long. Stamens 4(–5), filaments ribbon-like elongating beyond the corolla tube at anthesis, 3–4 mm, anthers small. Ovary shortly subcylindric, *c.* 1 mm high, faintly angled, glabrous, 1–5-, usually 4-celled, disk fleshy, rising slightly to the central stigmas. *Fruit* an ellipsoid drupe with 1–5 cartilaginous pyrenes; seeds with smooth endosperm.

Distr. *Malesia*: New Guinea (Irian Jaya: Idenburg R. to Milne Bay Distr.).

Ecol. In primary forest from the foothills to the montane mossy forest, often in swampy or deeply shaded situations, 700–2400 m.

Vern. *Diande*, Chimbu, *kenata*, Okapa.

Note. The inflorescence branches are often red or purple, and the flowers either orange or reddish with yellow anthers. The ripe fruits are deep purple or black. The shape and size of the leaf can vary greatly, even on the same plant. The ovary usually has 4 cells, but plants with 3, 2 and 1 occur. Since these are alike in other respects they have been treated as a single species. Although the type of *Boerlagiodendron tricolor* has an ovary with 5 cells and is from much further west than other gatherings, it is not considered to be specifically distinct.

39. *Osmoxylon trilobatum* (MERR.) PHILIPSON, *Blumea* 23 (1976) 116. — *O. cumingii* SEEM. *J. Bot.* 6 (1868) 141, *nomen*. — *Boerlagiodendron trilobatum* MERR. *Philip. J. Sc.* 2 (1907) Bot. 289; *En. Philip.* 3 (1923) 224.

Slender shrub or small tree up to 5 m, becoming glabrous except for slight pubescence on the inflorescence. *Leaves* clustered near the ends of the branches; petioles to 25 cm, *c.* 3 mm wide, clasping base prolonged as a broad stipular ligule *c.* 1 cm long, and with 2–3 entire, or obscurely fimbriate, often recurved crests surrounding the base of the petiole; blade 3- or occasionally 5-lobed (leaves below the inflorescence sometimes simple), to 30 by 28 cm, base broadly cuneate, rounded or truncate (emarginate in 5-lobed leaves), lobes about $\frac{1}{2}$ – $\frac{2}{3}$ of the blade, narrowly or broadly oblong, often slightly narrowed below and sharply acuminate to caudate, margin serrate. *Inflorescence* a terminal compound spherical umbel, 7–15 cm \varnothing , either rather compact or branches lax; peduncle 2–3 cm with broad ovate bracts; primary rays 8–20

or more, slightly pubescent, $1\frac{1}{2}$ –4 cm long, subtended by ovate bracts 5–10 mm long, opposite ovate bracts at the apex, 1–3 mm long; central branch $1\frac{1}{2}$ –6 mm long, pubescent, bearing an umbel (1– $1\frac{1}{2}$ cm \varnothing) of sterile bacciform flowers up to 5 mm \varnothing , 1–4-celled, pedicels 2–6 mm long, subtended by ovate bracts 1–3 mm long; lateral branches $1\frac{1}{2}$ –3 cm with opposite small bracts about the middle, bearing a terminal head, c. 1 cm \varnothing of c. 8–20 flowers, surrounded by an involucre of small rounded pubescent bracts, pedicels c. 1 mm or less (up to 3 mm in fruit). *Calyx* rim obsolete. Corolla 4–5-lobed above, tubular below, 2–3 mm long. Stamens 4–5, exerted. Ovary subcylindric, 4–5-celled. Fruit a spherical drupe (when dry 4–5-ribbed, 7 by 5 mm).

Distr. *Malesia*: widespread in the Philippines (Luzon to Mindanao).

Ecol. In primary forest, frequently beside streams in damp ravines, from the lowland at 75 m to 750 m.

Vern. *Kamay-kamay*, Tag., *ayum*, C.Bis.

Note. Sparingly branched but wide-spreading slender shrub, with yellowish bark, at first heavily dotted with brown lenticels. The flowers are white and the ripe fruit smooth and purple.

40. *Osmoxylon luzoniense* (MERR.) PHILIPSON, *Blumea* 23 (1976) 116. — *Boerlagiodendron luzoniense* MERR. *Philip. J. Sc.* 3 (1908) Bot. 252; *En. Philip.* 3 (1923) 223. — *Boerlagiodendron clementis* MERR. *Philip. J. Sc.* 3 (1908) Bot. 155; *En. Philip.* 3 (1923) 222. — *Boerlagiodendron agusanense* ELMER, *Leaf. Philip. Bot.* 7 (1914) 2330; MERR. *En. Philip.* 3 (1923) 222. — *Boerlagiodendron diversifolium* MERR. *Philip. J. Sc.* 10 (1915) Bot. 333; *En. Philip.* 3 (1923) 223.

Erect, unbranched or sparsely branched shrub or tree to 8 m, becoming glabrous except for the inflorescence. *Leaves* clustered at the ends of the branches; petiole to 40 cm, with a clasping base prolonged as a short stipular ligule, and with several basal entire or shortly fimbriate crests; blade to 33 cm \varnothing , base truncate or cordate, deeply palmately 3–7-lobed, sinuses broad, rounded, lobes elliptic, usually narrowed below, entire or with subsidiary lobes (the central lobe especially often narrow below and strongly pinnately lobed), apex acute, margin coarsely serrate, coriaceous; uppermost leaves often reduced and simple. *Inflorescence* a terminal compound, subsessile umbel 10–15 cm \varnothing ; primary rays c. 20–30, 2–3 cm long, subtended by lanceolate furfuraceous and \pm fimbriate bracts, furfuraceous villose or \pm hirsute, with opposite rounded or lanceolate hirsute bracts at the apex, each ending in three branches; central branch c. 2–8 mm long, hirsute, ending in an involucre of minute bracts (1 mm) surrounding a globose (2 cm \varnothing) umbellule of c. 15–20 sterile flowers (c. 6 by 6 mm, 2–3-celled), pedicels 2–3 mm, hirsute; lateral branches c. $2\frac{1}{2}$ – $3\frac{1}{2}$ cm long at anthesis,

with an articulation about the middle, \pm hirsute, ending in a globose head, 2 cm \varnothing (with open corollas), with ovate tomentose obtuse bracts, c. 2 mm long; flowers 30–40, \pm sessile (rarely pedicels to 2 mm). *Calyx* rim obsolete. Corolla 4–5-lobed above, tubular below, $3\frac{1}{2}$ –4 mm long. Stamens 4–5, exerted, filament stout, 5 mm, anther 1 mm long. Ovary 4–5-celled. *Fruit* 6 by 5 mm (dry), strongly 4–5-ribbed.

Distr. *Malesia*: widespread in the Philippines (Luzon to Mindanao), also in N. Celebes.

Ecol. In forests, often by streams and on ridge in mossy forest, 280–1650 m.

Vern. Philippines: *bolwang hi inalahan*, If., *iyangnok*, Mbo, *malakapayas*, S.L.Bis., *molonpolon*, Buk., *tañgan-tañgan-batu*, Buk., *tachung*, *vañgang*, Ig.

Notes. Inflorescence yellow to red (salmon), fruits blue-black or purple.

MERRILL did not liken his *Boerlagiodendron diversifolium* (from Mindanao) to this species, no doubt because he gave importance to the occurrence of variable leaves and the 5-merous flowers. However, specimens from Luzon may possess simple leaves below the umbel, and both 4- and 5-merous flowers occur in both Luzon and Mindanao. The greater range of material now available establishes the identity of the two species. Similarly, no features seem to distinguish *Boerlagiodendron clementis*, and *B. agusanense* though a greater range of collections would be desirable.

The species is treated here in a broad sense. The inflorescence characters of most specimens are uniform, being hirsute and with the bracts at the apex of the primary rays obtuse and short. Some specimens (CURRAN 5088, ELMER 16762) have longer lanceolate bracts with some bristles on the back. The northernmost specimen, from Ilocos Norte, has finer and less hairy inflorescence rays (recalling 39. *O. trilobatum*), but the foliage agrees with this species. Leaf-shape is more variable, even on the same specimen. Other species which resemble *O. luzoniense* in some respects are: 32. *O. camiguinense* with broader, shallower lobing, a more delicate inflorescence, and tri-merous flowers; 27. *O. pectinatum* with glabrous inflorescence branches and long-pectinate petiolar crests; and 26. *O. humile* with pedicelled flowers forming less dense heads.

A specimen from Surigao Province (BS 83562) has a most interesting abnormal structure. The central branches of the inflorescence rays bear heads of apparently fertile flowers, with lobed corollas and exerted stamens.

41. *Osmoxylon insigne* (MIQ.) BECC. *Malesia* 1 (1878) 195; PHILIPSON, *Blumea* 23 (1976) 117. — *Trevesia insignis* MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 222. — *Trevesia palmata* var. *insignis* CLARKE, *Fl. Br. Ind.* 2 (1879) 732, *pro nomen*. — *Eschweilera insignis* (MIQ.) BOERL. *Ann. Jard. Bot.*

Btżg 6 (1887) 122. — *Boerlagiendron insigne* (Miq.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 31.

A glabrous tree. *Leaves* large, palmately lobed; petiole to 45 cm, 8–10 mm wide, flattened above, with a sheathing base prolonged as a stipular ligule, numerous fimbriate crests around the base of the petiole, and irregular tufts of bristles along the whole length of the petiole; blade to 55 cm \varnothing , deeply 5–7-lobed, the sinuses broadly rounded and c. 4–5 cm from the base of the blade, lobes pinnatifid, with a narrow base and an attenuated apex, margins serrate. *Inflorescence* a terminal compound umbel c. 16 cm \varnothing ; peduncle stout, with lanceolate bracts ($1\frac{1}{2}$ –2 cm long) subtending the primary rays; primary rays 25–30, c. 4 cm long, bearing 2 caducous lanceolate bracts (c. 1 cm long) at the apex, each ray ending in 3 branches; central branch c. 12–16 mm long, bearing an umbel (c. 2 cm \varnothing) of c. 20 sterile ovoid bacciform flowers (c. 4 mm long when dry) with pedicels c. 4–6 mm long, and 3-celled; two lateral branches c. $3\frac{1}{2}$ cm long, with an articulation about the middle, terminating in an umbellule (c. 2 cm \varnothing) of c. 10–15 flowers on short stout pedicels c. 2 mm long, umbellules surrounded by a receptacular rim after caducous bracts have abscised. *Calyx* rim minute. Petals c. $3\frac{1}{4}$ mm long in bud (when dry), with 8–9 lobes above, tubular below. Stamens 8–9, with stout filaments. Ovary cylindrical, 8–9-celled; disk with a central double row of pustulate stigmas. Fruit unknown.

Distr. *Malesia*: Moluccas (Batjan).

Note. Tufts of bristles along the entire length of

the petiole together with the pinnatifid lobes of the leaf are distinctive. SEEMANN (J. Bot. 4, 1866, 353) referred to 5-flowered umbels with 5-angled drupes, but this probably relates to the New Guinea specimen which he included under this name.

Insufficiently known

Boerlagiendron ledermannii HARMS, Bot. Jahrb. 56 (1920) 383; PHILIPSON, Blumea 23 (1976) 117. — Type: LEDERMANN 12293.

HARMS compared this species with *Boerlagiendron geelvinkianum*. The size of the foliage and flowers prevents it from being included within that species. If it represents a local species, it has not been re-collected since the original gathering of LEDERMANN in 1912. The type specimen, which was incomplete, was destroyed during the war.

Boerlagiendron monticola HARMS in K. Sch. & Laut. Fl. Schutzgeb. Nachtr. (1905) 330; PHILIPSON, Blumea 23 (1976) 117. — Type: SCHLECHTER 14471.

The incomplete type specimen, gathered by SCHLECHTER, was destroyed during the war. This species was evidently similar to 38. *Osmoxylon micranthum*, but the ovary was possibly 10-celled. I have tentatively identified ROBBINS 1644 as this species: it is close to *O. micranthum* but its ovary, with 8 cells, is outside the range of variation of that species and the pedicels are longer (in fruit). Its distribution (foothills of Adalbert Range) is not dissimilar to that of *Boerlagiendron monticola* (Torricelli Mts).

8. ARTHROPHYLLUM

BL. Bijdr. (1826) 878; DC. Prod. 4 (1830) 266; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27; BTH. in B. & H. Gen. Pl. 1 (1865) 944; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 54; KOORD. Atlas 4 (1916) f. 675 & 676; HUTCH. Gen. Fl. Pl. 2 (1967) 80; STONE, Gard. Bull. Sing. 30 (1977) 276; PHILIPSON, *l.c.* 299, f. 1–16; *Adansonia* 17 (1978) 329. — *Mormoraphis* JACK *ex* WALL. Cat. (1831) n. 4931, *nomen*. — *Eremopanax* BAILL. *Adansonia* 12 (1878) 158. — Fig. 17, 19–23.

Unarmed, sparingly branched trees or shrubs. *Leaves* on vegetative shoots and lower leaves spirally arranged, imparipinnate, often crowded at the end of the branches, those on flowering branches often opposite, smaller, or reduced to a single leaflet; petiole terete; rachis articulated at the insertion of the pinnae and leaflets; leaflets entire; stipular sheath clasping, small, ligule a mere rim. *Inflorescence* consisting of compound umbels, either solitary and terminal or more commonly borne on a cluster of specialized leafy branches arising from the axils of the uppermost leaves; pedicels not articulated. *Flowers* bisexual. Calyx an undulate rim, sometimes with indistinct teeth, persistent. Petals 4–6, valvate in bud. *Stamens* 4–6, anthers curved, basifixed. Ovary turbinate, 1-celled; disk

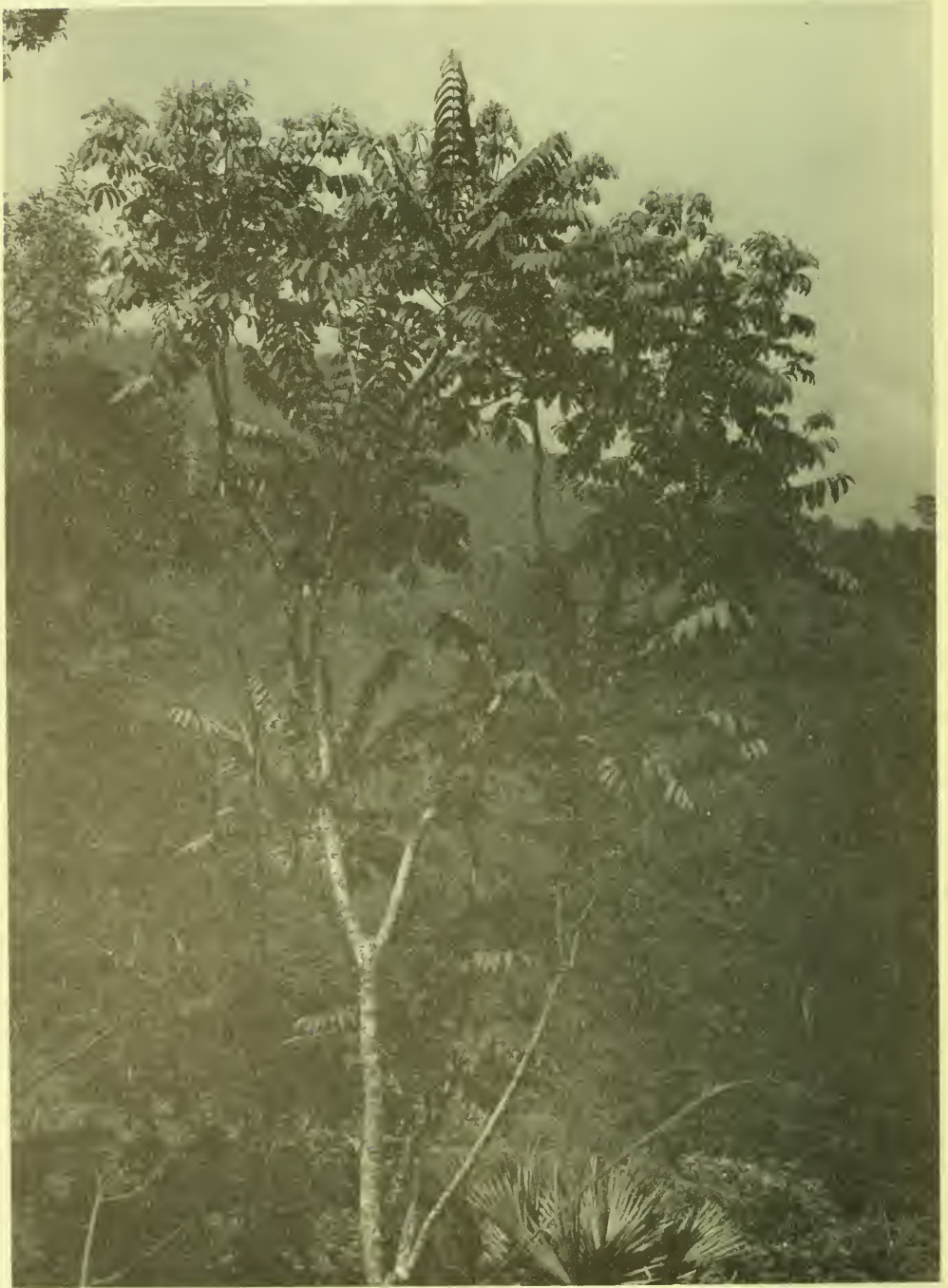


Fig. 17. Habit of *Arthrophyllum diversifolium* BL. (Photogr. HOOGLAND, Bogor).

fleshy, rising in the centre to the \pm sessile capitate stigma. *Fruit* ovoid or spheroidal, often oblique; exocarp leathery; endocarp cartilaginous. *Seed* solitary, pendulous; endosperm deeply transversely ruminant.

Distr. About 31 *spp.* (17 in Malesia) extending from the Nicobar Is. and Indo-China to the Philippines, New Guinea and New Caledonia. Fig. 18.

Notes. The principal distinctive characters of this isolated genus are the single-celled ovary and the arrangement of the umbels on specialized lateral branches in the majority of the species.

The present treatment, following that which I gave in 1977, *l.c.*, remains tentative until widespread field studies can be undertaken.

KEY TO THE SPECIES

1. Inflorescence becoming paniculate by the successive development of branches below the umbellules. Fig. 19a 1. *A. proliferum*
1. Inflorescence a compound umbel.
 2. Inflorescence with four orders of branching.
 3. Leaflets lanceolate.
 4. Leaflets c. 4–7 cm long. Fig. 20f 2. *A. ashtonii*
 4. Leaflets much longer 3. *A. angustifolium*
 3. Leaflets broader.
 5. Pedicels (at early anthesis) c. 10 mm long.
 6. Peduncles of umbellules with bracts or their scars. Fig. 21a 4. *A. ahernianum*
 6. Peduncles of umbellules without bracts or their scars. Fig. 21b. 5. *A. engganoense*
 5. Pedicels (at early anthesis) c. 5 mm long, or shorter.
 7. Leaves associated with the umbels rotund. Fig. 21e. 6. *A. collinum*
 7. Leaves (or leaflets) associated with the umbels ovate or elliptic.
 8. Leaves associated with the umbels ovate, \pm fleshy, with the lower surface smooth (lateral veins obscure). Fig. 21f 7. *A. crassum*
 8. Leaves (or leaflets) associated with the umbels \pm elliptic, coriaceous or chartaceous, veins visible.
 9. Young parts glabrous 8. *A. pacificum*
 9. Young parts with rufous tomentum.
 10. Umbels at anthesis with numerous filamentous pedicels. Fig. 21c. 9. *A. diversifolium*
 10. Umbels at anthesis with fewer stout pedicels. Fig. 21d 10. *A. macranthum*
 2. Inflorescence with three (or fewer) degrees of branching.
 11. Leaflets membranaceous or chartaceous.
 12. Mid-leaflets c. 16 cm long. 11. *A. papyraceum*
 12. Mid-leaflets c. 8 cm long or shorter.
 13. Leaflets usually 5–7 (Fig. 20a). Primary inflorescence branches usually short (c. 3–6 cm) and without articulations 12. *A. maingayi*
 13. Leaflets more numerous (Fig. 20d). Primary inflorescence branches longer (10–20 cm), with one or more leafy nodes 13. *A. kjellbergii*
 11. Leaflets coriaceous.
 14. Leaflets c. 5 14. *A. cenabrei*
 14. Leaflets more numerous.
 15. Petals and stamens 6 15. *A. pulgarensis*
 15. Petals and stamens 4 or 5.
 16. Leaflets 6 cm long, or longer. Fig. 20b 16. *A. montanum*
 16. Leaflets shorter. Fig. 20c 17. *A. alternifolium*

1. *Arthrophyllum proliferum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 302, f. 3–4. — Fig. 19a–b.

Medium-sized, glabrous tree. *Leaves* multijugate, up to 90 by 24 cm, of the flowering branches smaller with fewer pinnae or usually simple; petioles up to 28 cm, 5 mm \varnothing ; petiolules 1–1½ cm; leaflets obovate-oblong, c. 16 by 7 cm, chartaceous, margin slightly revolute, base broadly cuneate to truncate,

sometimes oblique, apex acute. *Inflorescences* terminating specialized plagiotropic shoots, bearing axillary flowering branches and ending in umbellules of a few flowers below which pairs or whorls of branches continue the growth of the inflorescence to produce an elongated panicle of umbellules; pedicels 7–8 mm (slightly longer in fruit). *Calyx* often with 5 indistinct teeth. Petals 5,



Fig. 18. Species density of *Arthrophyllum* BL. in Malesia; above the hyphen the number of endemic species, below it the non-endemics. Complete range of genus encircled; 17 of the total of 31 spp. occur in Malesia.

$3\frac{1}{2}$ mm long, narrowly triangular. Stamens 5, filaments c. 2 mm, anthers reniform, c. $\frac{1}{2}$ mm long. Ovary obconical, c. 2 mm long; disk fleshy, cushion-like; stigma capitate \pm sessile. *Fruit* ovoid, fleshy, capped by the calyx and the enlarged beak-like stylopodium, c. 10 by 5 mm when dry.

Distr. *Malesia*: E. New Guinea (Morobe Distr.).

Ecol. Mid-mountain rain-forest, reaching the canopy, on steep slopes, 300–1200 m.

Notes. The thick outer bark is grey-brown, fissured, and peeling in small flakes. Wood straw-coloured. Cut stems exude brown latex. The thick petals are yellow-green.

The flower and fruit are typical of this well-defined genus, but the branching of the inflorescence is unlike that found in all other species.

2. *Arthrophyllum ashtonii* PHILIPSON, Gard. Bull. Sing. 30 (1977) 303, f. 12. — Fig. 20f.

Slender small tree, to 5 m, with the leaves dispersed for some distance from the apex of the branches, young parts with brown scurfy tomentum which persists on the umbellules. *Leaves* multijugate, to c. 30 cm long; of the flower-bearing branches smaller with fewer pinnae, or simple; petioles slender, c. 7–9 cm; petiolules c. 4–7 mm; leaflets lanceolate to broadly lanceolate, 3–7 $\frac{1}{2}$ by 1–2 cm, thinly coriaceous, margin revolute, base broadly cuneate, apex tapered to subcaudate, veins channelled above, visible beneath. *Inflorescence* a terminal cluster of specialized leafy branches; main rays variable in length in the same inflorescence, the longest from c. 16–25 cm long with a pair of opposite simple leaves about the middle (with flowering branches in their axils) and ending in a whorl of secondary rays subtended by simple leaves; secondary rays 4–12 cm long, bearing simple leaves, usually in an opposite pair and terminating in compound umbels; umbellules with c. 8–10 flowers; pedicels 4–10 mm, furfuraceous. *Flower buds* c. 2 mm long, calyx a furfuraceous rim. Petals 5, broadly triangular. Stamens 5, anthers

curved, basifixed. Ovary glabrous, obconical, c. 1 mm long; stigma on a raised stylopodium at the centre of a flat disk. *Fruit* spheroidal, with a persistent stylopodium, c. 6 mm long when dry.

Distr. *Malesia*: Borneo (Sarawak and Brunei).

Ecol. Mossy forest on sandstone ridge, and in kerangas forest, 1000–1550 m.

Note. The small narrow leaflets are very distinctive. No other species with small leaflets has inflorescences which branch to the fourth degree.

3. *Arthrophyllum angustifolium* RIDL, J. Fed. Mal. St. Mus. 10 (1920) 136; Fl. Mal. Pen. 1 (1922) 885; PHILIPSON, Gard. Bull. Sing. 30 (1977) 304.

Shrub or small tree, up to 5 m, young parts rufous-tomentose, glabrescent. Lower *leaves* multijugate, rachis dilated, c. 70–90 by 30–40 cm; petioles c. 15–22 cm, 3–5 mm wide, ligule a rim c. 2 mm long; petiolules c. 7–10 mm long; leaflets coriaceous, lanceolate, c. 15–22 by 1 $\frac{1}{2}$ –2 $\frac{1}{2}$ cm, tapering to an acute or obtuse apex, base cuneate, margin slightly revolute; upper leaves reduced, mostly unifoliolate, opposite, broader, with petioles 2–4 cm long. *Inflorescence* a terminal cluster of specialized leafy branches; main rays 30 cm (or more) long, bearing simple leaves in opposite pairs with small flowering branches in their axils, ending in a whorl of c. 10–12 secondary rays subtended by simple leaves; secondary rays 8–12 cm long, bearing pairs of simple leaves, and terminating in an umbel of 5–12 tertiary rays c. 2–3 cm long, with bract scars about the middle, and ending in an umbellule of c. 8–12 flowers, pedicels c. 5 mm. Petals 5, 2–3 mm long in bud. Stamens 4. Ovary turbinate, inconspicuous at anthesis; disk fleshy; stigma \pm sessile. *Fruit* spheroidal, c. 5 by 5 mm when dry, calyx and stylopodium small.

Distr. *Malesia*: Malay Peninsula (Perak) and Borneo (Brunei).

Ecol. Forest and old regenerated forest on peat swamp at low altitude or on ridges.

Note. The lanceolate leaflets are unlike those of any other species. The grey bark is minutely fissured and bears many small orange lenticels. The wood is soft and white. The Malayan and Bornean specimens are similar, except that the flower buds are larger in the Brunei plant.

4. *Arthrophyllum ahernianum* MERR. Philip. J. Sc. 1 (1906) Suppl. 109; En. Philip. 3 (1923) 235; PHILIPSON, Gard. Bull. Sing. 30 (1977) 304, f. 13. — *A. pinnatum* (non CLARKE) F.-VILL. Nov. App. (1880) 103; VIDAL, Sinopsis Atlas (1883) 28, t. 55 f. c. — *Macropanax* sp. VIDAL, Rev. Pl. Vasc. Filip. (1886) 145. — *A. sablanense* ELMER, Leaf. Philip. Bot. 1 (1908) 331. — *A. borneense* MERR. Pl. Elm. Born. (1929) 231, non BAKER, 1896. — *A. elmeri* MERR. Webbia 7 (1950) 319. — *A. merrilliana* FURTADO, Gard. Bull. Sing. 19 (1962) 185. — Fig. 21a.



Fig. 19. *Arthrophyllum proliferum* PHILIPSON. a. Part of inflorescence in fruiting state, $\times \frac{1}{2}$, b. ditto, showing detail of ultimate branches in flowering stage, nat. size. — *A. maingayi* PHILIPSON. c. Terminal inflorescence, $\times \frac{1}{2}$. — *A. montanum* RIDL. d. Single flowering shoot, $\times \frac{1}{3}$ (Courtesy Gard. Bull. Sing. 30, 1977).

Tree up to 15 m, young parts with rufous tomentum. *Leaves* clustered at the ends of the branches, multijugate, up to 200 by 60 cm; of the flower-bearing branches smaller with fewer pinnae, or simple; petiole stout, up to 35 cm; petiolules 5–20 mm; leaflets ovate-oblong, occasionally oblong-lanceolate, up to 35 by 12 cm, membranaceous or chartaceous, margin revolute, base cuneate to rounded, usually oblique, apex short acuminate. *Inflorescence* a whorl of specialized leafy branches forming a terminal crown; main rays up to 150 cm (or more), bearing pinnate leaves usually in 1–2 opposite pairs, and with flowering

branches in the upper axils, ending in a whorl of secondary rays subtended by pinnate or more rarely simple leaves; secondary rays up to 30 cm bearing simple or pinnate leaves in opposite pairs, and terminating in compound umbellules; umbellules with c. 10–20 flowers c. 3 cm \varnothing ; peduncles with 1–2 pairs of small simple, often caducous leaves; pedicels c. 1 cm (at anthesis) subtended by minute caducous bracts. Petals 5, 4 mm long. Stamens 5, anthers curved. Ovary turbinate; disk fleshy; stigma \pm sessile. *Fruit* c. 10 by 7 mm, ellipsoidal, calyx and stylopodium forming a prominent beak.

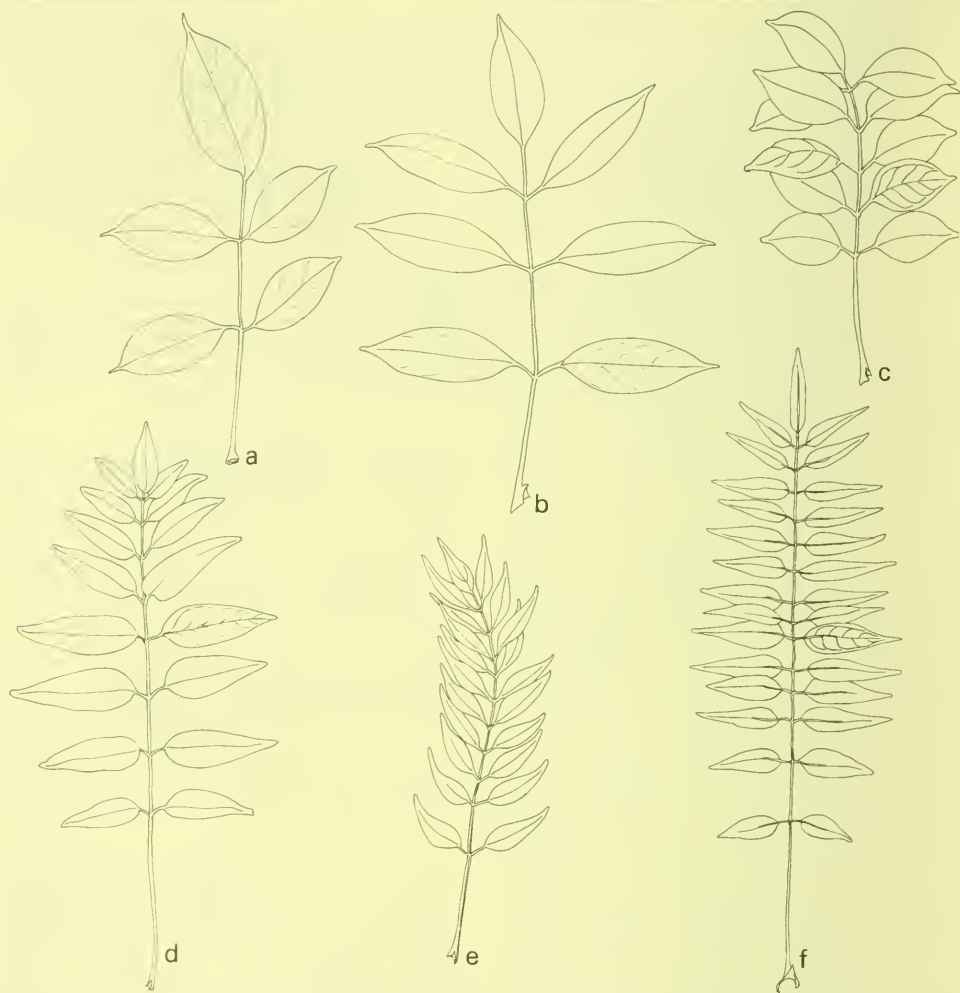


Fig. 20. Foliage leaves of *Arthrophyllum* spp. a. *A. maingayi* PHILIPSON, b. *A. montanum* RIDL., c. *A. pulgarense* ELMER, d. *A. kjellbergii* PHILIPSON, e. *A. alternifolium* MAINGAY ex RIDL., f. *A. ashtonii* PHILIPSON. All $\times \frac{1}{3}$ (Courtesy Gard. Bull. Sing. 30, 1977).

Distr. *Malesia*: N. Borneo and throughout the Philippines to the northern Moluccas (Talaud, Ternate).

Ecol. Primary and second-growth forest, from the lowlands to 1000 m.

Vern. Philippines, cf. MERRILL: *alabihig*, *dokloi*, P.Bis., *binaláyon*, C.Bis., *danipo*, Ig., *higin*, Mang., *malapáya*, *puyga-puygahan*, Tag., *pamalatángen-a-purau*, Ilk. Additional names: Philippines: *lulpo*, Luzon, *mayari*, Mindoro, *bungyo*, Palawan; Moluccas: *langator'a*, Talaud.

Notes. This species replaces the more westerly *A. diversifolium* which it closely resembles. It is

characteristically larger in all its parts, particularly in the size of the individual flowers and the length of their pedicels. There are fewer flowers in an umbellule.

The distinction between these two species is not always easy to make, especially when the material is fragmentary; PHILIPSON, l.c. A few specimens from the Philippines appear very similar to *A. diversifolium*, and it is possible that this species extends beyond Borneo. I have regarded them as part of the range of variation of *A. ahernianum*. Similarly, at least one specimen from S. Borneo approaches *A. ahernianum* in appearance.

5. *Arthrophyllum engganoense* PHILIPSON, Gard. Bull. Sing. 30 (1977) 305, f. 14. — Fig. 21b.

Tree to 21 m high, becoming glabrous. Lower leaves imparipinnate, multijugate, 60 cm long or more; petiole 24 cm, 6 mm wide, rachis articulated at the insertion of the leaflets; petiolules 10–18 mm; leaflets broadly elliptic to elliptic-oblong, *c.* 12–15 by 6–7 cm, base rounded with a short asymmetrical cuneate centre, apex shortly apiculate, margin entire, often undulate chartaceous. Flowering branches *c.* 40 cm; leaves opposite, simple, or unifoliolate, petiolules *c.* 5–7 cm, leaflets ovate, *c.* 13 by 6 cm, with inflorescence branches in their axils; ending in a whorl of simple leaves surrounding a compound umbel to 30 cm \varnothing ; secondary rays *c.* 8, *c.* 10–15 cm long at flowering, slender (2 mm \varnothing) and striate, each bearing a pair of small leaves about the middle (sometimes with inflorescences in their axils) and ending in an umbel; tertiary rays *c.* 8, slender, *c.* 20–40 mm long, without bracts; tertiary rays pedicels *c.* 5–10 per umbellule, *c.* 10–15 mm at anthesis. Calyx an undulate rim. Petals 5, *c.* 2 mm long in bud. Stamens 5, anthers curved. Ovary turbinate, obscurely ribbed, *c.* 2½ mm long at anthesis. Fruit ellipsoid, *c.* 10 by 7 mm, with a rather small persistent calyx and stylopodium.

Distr. *Malesia*: S. Sumatra (Enggano I.), two collections.

Ecol. Forest at low altitude, up to *c.* 100 m.

Vern. *Langkapu utan kaauh*, Enggano.

Note. The two known collections of this species are very similar and contrast with the widespread 9. *A. diversifolium* because of the few-flowered umbellules with long, spreading pedicels.

6. *Arthrophyllum collinum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 305, f. 17. — Fig. 21e.

Sparingly branched shrub or small tree up to 12 m, all young parts with dense, rufous tomentum which persists on flowers and inflorescences. Leaves multijugate, up to 60 (or more) by 32 cm; of the flowering branches smaller with fewer pinnae or more frequently unifoliolate, leaflets more rotund and with longer petioles; petiole up to 20 cm; petiolules *c.* 1 cm; leaflets oblong, broadly elliptic or rotund, up to 16 by 7 cm, coriaceous, margin slightly revolute, base truncate to rounded, unequal, apex rounded, obtuse, or shortly and bluntly apiculate, midrib prominent, lateral veins usually clearly visible below, upper surface frequently rugose. Inflorescence a cluster of specialized leafy branches forming a terminal crown; main rays up to 60 cm long, bearing one or more, rarely two, opposite pairs of usually unifoliolate rotund leaves often with flowering branches in their axils, and ending in a whorl of secondary rays, subtended by usually unifoliolate leaves; secondary rays up to 17 cm, bearing a pair of unifoliolate leaves with flowering branches in their axils, and terminating in compound umbellules; tertiary rays *c.* 5–10,

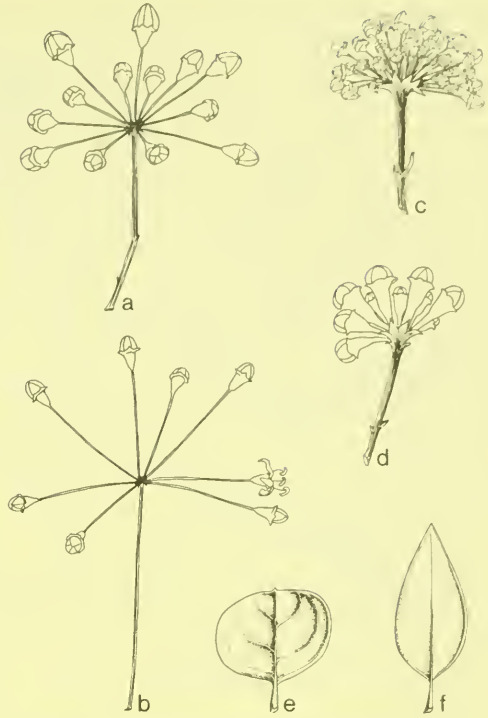


Fig. 21. Umbellules of some *Arthrophyllum* spp. a. *A. ahernianum* MERR., b. *A. engganoense* PHILIPSON, c. *A. diversifolium* BL., d. *A. macranthum* PHILIPSON. All nat. size. — Bracts of two *Arthrophyllum* spp. e. *A. collinum* PHILIPSON, f. *A. crassum* PHILIPSON. Both $\times \frac{1}{3}$ (Courtesy Gard. Bull. Sing. 30, 1977).

c. 3–6 cm long, articulated near the middle; pedicels *c.* 10, *c.* 2–3 mm long, rufous tomentose. Petals 5, broadly triangular, *c.* 2 mm long. Stamens 5, anthers curved. Ovary turbinate, rufous-tomentose, *c.* 1½ mm long at anthesis; disk fleshy, stigma sessile. Fruit ellipsoidal, *c.* 9 by 5 mm (when dry), the calyx and stylopodium prominent.

Distr. *Malesia*: Borneo (Sarawak and Sabah).

Ecol. Forest and scrub, sometimes growing as an epiphyte in the crowns of trees, 600–2700 m.

Notes. The bark is grey and smooth, the wood pale and soft, and the cut stems exude a yellowish or orange latex.

This species is characterized by the rotund, coriaceous leaves on the flowering branches.

7. *Arthrophyllum crassum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 305, f. 18. — Fig. 21f.

Sparingly branched shrub or small tree up to 8 m, occasionally epiphytic, all young parts with dense, rufous tomentum which persists on the

flowers and inflorescence. *Leaves* multijugate, up to 100 (or more) by 50 cm, occasionally with 4 leaflets inserted at some of the lower articulations; of the flowering branches smaller with fewer pinnae or more frequently unifoliolate; petiole up to 25 cm; petiolules 10–20 mm; leaflets elliptic, oblong or lanceolate, up to 24 by 7½ cm, coriaceous, margin strongly revolute, base cuneate to rounded, often oblique, apex narrowed to an acute often caudate apiculum, midrib prominent, lateral veins faint to obscure. *Inflorescence* a cluster of specialized leafy branches forming a terminal crown; main rays up to 70 cm, bearing an opposite pair (or rarely more pairs) of unifoliolate or (less frequently) pinnate leaves, often with flowering branches in their axils, and ending in a whorl of secondary rays, subtended by usually unifoliolate leaves; secondary rays up to 25 cm, bearing a pair of usually unifoliolate leaves with flowering branches in their axils, and terminating in compound umbellules; tertiary rays c. 10, c. 2–3 cm long, articulated near the middle; pedicels c. 12–14, c. 3–4 mm long, rufous-tomentose. Petals 5, broadly triangular, c. 2 mm long. Stamens 5, anthers curved. Ovary turbinate, rufous-tomentose, c. 1½ mm long at anthesis; disk fleshy, stigma sessile. *Fruit* spheroidal, c. 6 by 5 mm (when dry), calyx and stylopodium prominent.

Distr. Malesia: Borneo (Sarawak and Kalimantan).

Ecol. Swampy peat forest and heath woodland, both primary and disturbed, from sea-level to c. 150 m. Some fragmentary collections from higher altitude (1000 m) further inland may belong to this species.

Note. The leaves associated with the inflorescence are distinctively fleshy, have a strongly revolute margin and a smooth lower surface with indistinct lateral veins, and are ovate with rather acute apex. The leaflets of the pinnate leaves on the vegetative shoots are also rather leathery with indistinct lateral venation.

8. *Arthrophyllum pacificum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 306.

A slender, glabrous tree to 14 m. *Leaves* multijugate, c. 60 by 24 cm; of the flower-bearing branches smaller with fewer pinnae or simple; petioles c. 22 cm, 3–4 mm Ø; petiolules c. 1 cm; leaflets elliptic, oblong or ovate, c. 8–10 by 4–5 cm, rather membranaceous, margin entire, very slightly revolute, base abruptly cuneate, often oblique, apex obtuse, acute, or slightly apiculate (in a specimen from Morotai attenuated). *Inflorescence* a whorl of specialized leafy branches forming a terminal crown to the vegetative shoots; main rays 35 cm, bearing small pinnate leaves in opposite pairs and with flowering branches in the axils, ending in a whorl of secondary rays, subtended by a whorl of simple leaves (bracts); secondary rays 10–24 cm long, bearing simple or trifoliolate leaves

usually in opposite pairs, and terminating in umbellules; umbellules c. 7–12-flowered; pedicels c. 5 mm at anthesis, slightly elongating in fruit, minute bracts caducous. *Petals* 5, broadly triangular, 2½–3 mm long. Stamens 5, anthers reniform. Ovary obconical, 1½ mm long; disk fleshy, furrowed when dry; stigma ± sessile. *Fruit* ellipsoidal, fleshy, somewhat oblique, conical beak with calyx and stigma, c. 9 by 5 mm when dry.

Distr. E. Malesia: Moluccas (Morotai) to the Bismarck Archipelago.

Ecol. Primary forest on mountain slopes, attaining *Nothofagus* mossy forest, 500–2000 m. Reported as common in most localities.

Vern. Kainsoka, Ambai, Japen I.

Notes. All specimens from islands to the north of New Guinea are similar, in having more delicate foliage than 10. *A. macranthum* from the mainland of New Guinea. The specimens from Morotai are sterile, and have narrower more tapering leaflets.

The bark is light brown and the cut branches exude a clear latex. The flowers are light green with yellow anthers, and the fruit is black.

9. *Arthrophyllum diversifolium* BL. Bijdr. (1826) 879; DC. Prod. 3 (1830) 266; MIQ. Fl. Ind. Bat. 1, 1 (1856) 767; Sum. (1861) 340, incl. var. *lanceolata* MIQ.; CLARKE, Fl. Br. Ind. 2 (1879) 733; K. & V. Bijdr. 7 (1900) 46; KOORD. Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 675 & 676; BACK. & BAKH. f. Fl. Java 2 (1965) 169; STONE, Gard. Bull. Sing. 30 (1977) 135; PHILIPSON, l.c. 306, f. 15. — *A. javanicum* BL. Bijdr. (1826) 879; DC. Prod. 4 (1830) 266; BACK. & BAKH. f. Fl. Java 2 (1965) 169. — *A. ellipticum* BL. Bijdr. (1826) 879; DC. Prod. 3 (1830) 266. — *Mormorphis sumatrana* JACK ex WALL. Cat. (1831) n. 4931, nomen. — *A. blumeianum* Z. & M. Syst. Verz. (1846) 41, nom. illeg.; MIQ. Fl. Ind. Bat. 1, 1 (1856) 768; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27, incl. var. *oblongatum* MIQ., var. *ellipticum* (BL.) MIQ. et var. *ovalifolium* (JUNGH. & DE VRIESE) MIQ. — *A. ovalifolium* JUNGH. & DE VRIESE, Ned. Kruidk. Arch. 1 (1846) 19; Ann. Sc. Nat. Paris III, 6 (1846) 117; MIQ. Fl. Ind. Bat. 1, 1 (1856) 768, t. 14 ('*ovalifolium*'); RIDL. Fl. Mal. Pen. 1 (1922) 885; STONE, Gard. Bull. Sing. 30 (1977) 136, f. 2. — *A. dilatatum* MIQ. Fl. Ind. Bat. 1, 1 (1856) 768. — *A. borneense* BAKER, Kew Bull. (1896) 23; MERR. En. Born. (1921) 457. — *A. congestum* RIDL. J. Fed. Mal. St. Mus. 10 (1920) 137; Fl. Mal. Pen. 1 (1922) 887; STONE, Gard. Bull. Sing. 30 (1977) 136. — *A. havilandii* RIDL. Kew Bull. (1933) 494. — *A. rufosepalum* RIDL. Kew Bull. (1946) 40. — *A. rubiginosum* RIDL. l.c. 41. — Fig. 17, 21c, 22, 23.

Small tree, up to 14 m, young parts with rufous tomentum. *Leaves* clustered at the ends of the branches, imparipinnate or bipinnate (rarely tripinnate) with leaflets at the insertion of the lateral rachides, multijugate, 150 by 45 cm (wider in bipinnate leaves); usually in opposite pairs on



Fig. 22. *Arthrophyllum diversifolium* BL. Diagrammatic sketch of habit, showing vegetative and flowering branches, $\times \frac{1}{30}$ (Courtesy Gard. Bull. Sing. 30, 1977).

the inflorescence-bearing branches and smaller with fewer pinnae or unifoliolate; petiole up to 40 cm; petiolules $\frac{1}{2}$ – $1\frac{1}{2}$ cm; leaflets ovate-oblong or elliptic, up to 24 by 11 cm (leaflets of bipinnate leaves usually c. 10 by 5 cm), \pm coriaceous or (especially in bipinnate leaves) somewhat membranaceous, margin slightly revolute, base truncate, rounded, or cuneate, often oblique, apex shortly acuminate, veins usually 5–7 pairs. *Inflorescence* a cluster of specialized leafy branches forming a terminal crown which abscises after fruiting; main rays up to 150 cm, bearing pinnate (or more

rarely unifoliolate) leaves mostly in opposite pairs and usually with flowering branches in the axils of the upper leaves, ending in an umbel of secondary rays subtended by a whorl of pinnate or unifoliolate leaves; secondary rays up to c. 30 cm, bearing mainly simple leaves in opposite pairs with flowering branches in their axils and terminating in compound umbellules each subtended by a whorl of often caducous bracts; tertiary rays (peduncles) c. 5 cm, articulated about the middle; umbellules with c. 30–40 flowers, c. 17–20 mm \varnothing ; pedicels c. 20, c. 5 mm at anthesis (longer in fruit),



Fig. 23. *Arthrophyllum diversifolium* BL. Schematic drawing of a single flowering shoot, with four degrees of branching, $\times \frac{1}{5}$ (Courtesy Gard. Bull. Sing. 30, 1977).

with an involucre of minute caducous bracts. Petals 5, c. 2 mm long. Stamens 5, anthers curved. Ovary turbinate, often inconspicuous at anthesis; disk fleshy, rising in the centre to a sessile stigma. *Fruit* ellipsoidal, c. 9 by 7 mm; calyx and stylopodium forming a conspicuous beak.

Distr. *Malesia*: Sumatra, Malay Peninsula, Java, Borneo, Celebes.

Ecol. In a wide variety of habitats, on dry sandy soil to swampy humus, in primary lowland and montane rain-forest and also in secondary forest, heath-forest and waste land, from sea-level to 1600 m.

Uses. Concoctions of the root and bark are reported to have medicinal properties, including a remedy for syphilis, and the plant has stupifying and poisonous properties.

Vern. Sumatra: *antjaneudeung uding, bidju, bolu bolu, bulu, (kayu) abang-abang, k. attu turut, lëgung*, Riouw Arch., *mapang, miu, obang, potah, silanta, tënjam dakan, Banka, tocrak*. Malay Peninsula: *chindangan utan, jolok hantu, lupa dahan, (pokok) restong, sëgan budahan, susun këlapa, tum bong ninyor, tusum perpah*. Java: *dajo, dëlahan, dëleg, dëlek, djangkorrang, gombong, (kayu) gompang, këdrja, kidjangkurang, kingompang, ki ompong, klënjang, krëpang, langitj, malas bërдахan, pongporang, putjangan*. Borneo: *merjemeh, Sarawak, karadjungjung*, Kalimantan. Celebes: *kambabah, susangkalan*.

Notes. The very widespread *A. diversifolium* is variable in many characters, and may comprise a number of geographic subspecies, but no basis for this is apparent at present. Most individuals have the lower leaves simply imparipinnate, whereas others have bipinnate, or rarely tripinnate, leaves. The flowers and inflorescences of these forms appear to be identical, though rapid changes in the umbellules after flowering produce a deceptively distinctive appearance in specimens at different stages of development. Field experience over the whole range of the species will be required to understand this interesting leaf-polymorphism. In treating all forms as one species I am partly influenced by the fact that most authors who have been familiar with the plants in Java (where both forms occur) have regarded the complex as a single species (the fact that some authors have recognized the variant from Mt Salak as a distinct species does not affect the problem of leaf-polymorphism).

Apart from the strikingly different leaf forms just discussed, certain local variants may eventually be shown to justify specific rank. A form growing on Mt Salak (near Bogor) has often been regarded as distinct (see, for example, HOCHREUTNER, *Candollea* 2, 1925, 481, and BACKER & BAKHUIZEN VAN DEN BRINK *f. Fl. Java* 2, 1965, 169). Indeed this form is the basis of the name *A. diversifolium*. I retain this name in preference to the other two names published simultaneously by BLUME because it has been most consistently adopted since

it was first used in this comprehensive sense by CLARKE, *l.c.* On the evidence available I do not consider the Salak plants any more distinctive than many other local variants.

It might be considered that 5. *A. engganoense* is also no more than another such variant, but its facies is so marked that specific rank appears justified.

It is possible that RIDLEY was correct in distinguishing *A. congestum*, but the material is not good and appears inadequate to confirm specific status.

Five collections from Brunei and a neighbouring district of Sarawak are all very alike and sufficiently distinct from both *A. diversifolium* and 7. *A. crassum* to suggest that they represent a separate taxon, but for the present they are tentatively retained as a form of *A. diversifolium*.

Similarly, the two collections described by RIDLEY as *A. rubiginosum* and *A. rufosepalum* are based on collections which are not altogether typical of *A. diversifolium*, but which come closest to that species. In the absence of more supporting material, it is advisable not to retain them as species. The first of these names (*A. rubiginosum*) has been widely used in identifications of Bornean specimens, but the specimens concerned are either typical *A. diversifolium* or belong to the distinctive 7. *A. crassum*.

Specimens from Mt Kinabalu described by RIDLEY as *A. havilandii* have bipinnate leaves, and appear to conform well with *A. diversifolium*. This form was again collected on Mt Kinabalu by CLEMENS and is also known from Sarawak.

The smooth bark is whitish to greyish brown with pustulate lenticels; the wood is cream, with a colourless aromatic exudate. The flowers are yellowish with a sickly sweet scent. Seedlings have simple and trifoliate leaves.

10. *Arthrophyllum macranthum* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 18; Gard. Bull. Sing. 30 (1977) 308, f. 16. — *A. diversifolium* (non BL.) HARMS, Bot. Jahrb. 56 (1920) 413. — Fig. 21d.

Tree up to 25 m, sparsely branched with leaves crowded at the ends of the branches, all young parts with dense rufous tomentum which may persist on the flowers and inflorescence. *Leaves* multijugate, up to 100 by 30 cm; of the flower-bearing branches smaller with fewer pinnae, or simple; petioles stout, up to 40 cm, clasping base heavily lenticellate; petiolules $\frac{1}{2}$ –2 cm; leaflets ovate to oblong, up to 16 by 8 cm, coriaceous, margin revolute, base rounded, truncate, or cordate, very rarely cuneate, often oblique, apex obtuse or bluntly apiculate, principal veins arched-ascending, reticulations visible especially beneath (pinnae of leaves on the flowering branches usually elliptic with a cuneate base). *Inflorescence* a whorl of specialized leafy branches forming a terminal crown; main rays up to 60 cm, bearing pinnate leaves often in opposite pairs and with flowering

branches in the upper axils, and ending in a whorl of secondary rays subtended by a whorl of usually simple leaves (bracts); the secondary rays c. 10–20 cm, bearing simple leaves, usually in opposite pairs, and terminating in compound umbels; umbellules (c. 2 cm) with c. 10–15 flowers; pedicels stout, 3–5 mm to 10 mm or more in fruit, subtended by minute bracts. *Flower buds* 5 mm or more long; calyx a rim or with 5 indistinct teeth. Petals 5, triangular, c. 4 mm long, fleshy. Stamens 5. Ovary obconical, c. 2½ mm long; disk fleshy (hemispherical in living material, conical and furrowed when dry); stigma capitate, ± sessile. *Fruit* ellipsoid, sometimes slightly oblique, c. 12 by 8 mm, the stylopodium forming a conical beak with the persistent stigma; exocarp fleshy, endocarp cartilaginous.

Distr. *Malesia*: New Guinea (from Irian Jaya to Milne Bay Distr. and the Bismarck Archipelago).

Ecol. Usually a sub-canopy tree of rain-forest ranging from the lower montane zone to mossy subalpine woodland and scrubland, occasionally in second growth, usually above 1000 m (up to 2700 m), but occurring also on the coastal scarps of the Astrolabe Range.

Vern. *Maguva*, W. Sepik, *agagwa*, *agare*, *agugwa*, *alolo*, *angga*, *engga*, *pooli*, *tipilan*, W. Highlands, *arua*, *hagegoa*, *wonkurumeh*, E. Highlands, *kolom*, S. Highlands.

Note. Trees become very different in appearance when in flower or fruit: the spiral pinnate foliage leaves are surmounted by tufts of branches which end in inflorescences and bear much smaller leaves. The foliage leaves are fleshy, leathery and glossy. The ripe fruit is purple and shining. The bark is grey, at first smooth with many leaf-scars and lenticels, but small longitudinal fissures develop. The cut branches exude a brown latex and a scent of celery. The soft wood is white or straw-coloured.

11. *Arthrophyllum papyraceum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 308.

Shrub, rufous-tomentose on the young parts. *Leaves* alternate, imparipinnate; petiole 15–20 cm; leaflets c. 7, membranaceous, elliptic, c. 12–24 by 5–10 cm, base broadly cuneate, apex finely acuminate, margin slightly revolute. *Inflorescence* a terminal compound umbel; primary rays few (2), 2–3 cm long, 2 mm wide, without bracts (caducous), secondary rays few (3), c. 13–18 mm long, articulated about the middle, ending in an umbellule of c. 10–12 flowers; pedicels 2–3 mm, slightly furfuraceous. Petals 5, c. 2 mm long in bud. Stamens 5, anthers curved. Ovary turbinate, glabrous, obscurely ribbed. Fruit unknown.

Distr. *Malesia*: E. Sumatra (East Coast Res. near Aek Sordang), one collection.

Ecol. Primary rain-forest.

Note. Known from a single collection (with no duplicates) this species resembles 12. *A. maingayi* in its simple inflorescence, and the few pinnae of its

foliage leaves. However, the large size of the leaflets precludes its inclusion in that species.

12. *Arthrophyllum maingayi* PHILIPSON, Gard. Bull. Sing. 30 (1977) 309, f. 7. — *A. pinnatum* CLARKE, Fl. Br. Ind. 2 (1879) 734, excluding synonyms [see also SEEM. J. Bot. 4 (1866) 294]; RIDL. Fl. Mal. Pen. 1 (1922) 886. — Fig. 19c, 20a.

Low shrub or slender tree, rarely as high as 10 m, rufous-tomentose on the very young parts, soon becoming glabrous. *Leaves* tufted at the ends of the branches, usually with 5–7 leaflets (but up to 15), up to 30 by 18 cm; petiole to 12 cm (usually shorter), 2 mm Ø; petiolules c. 0–10 mm; leaflets elliptic or elliptic-lanceolate (occasionally the lowermost pair of leaflets is replaced by pinnate leaf segments), c. 8 by 3½ cm, rather thin, base cuneate or rounded, apex apiculate or caudate, margin slightly revolute, lateral veins faint and obscure; leaves below the flowering branches sometimes reduced to 3 or 1 leaflet(s). *Inflorescence* consisting of a number of primary branches radiating from the end of a leafy shoot (which forms a longer or shorter peduncle); primary branches, often rather few, usually 3–6 cm long and devoid of leaves except for a few terminal simple or trifoliolate leaves around the compound umbels, occasionally the branches bear pairs of opposite leaves when they may be up to 30 cm long; secondary rays c. 2–3 cm long; pedicels 4–10 cm. Petals 5, 1½–2 mm long in bud. Stamens 5. Ovary turbinate, disk fleshy. *Fruit* spheroidal, c. 8 by 6 mm, calyx and stylopodium rather inconspicuous.

Distr. *Malesia*: Central W. Sumatra (Mt Kerintji), throughout the Malay Peninsula (incl. Penang) and Borneo.

Vern. *Poko minta anak*, Kedah, *karon baru*, Sumatra.

Notes. The name '*A. pinnatum*', misapplied by CLARKE, *l.c.*, has been in general use for this species. However, this name was based on *Panax pinnatum* LAMK, which in turn was based on the Rumphian name '*Scutellaria secunda*'; this is quite a distinct plant (see under 6. *Polyscias cumingiana*).

The three species *A. maingayi*, 16. *A. montanum* and 17. *A. alternifolium* are similar in having simpler inflorescences than 9. *A. diversifolium*.

A. montanum can be distinguished from *A. maingayi* by its more leathery leaves with more prominent nervation, and by the more woody and leafy flower-bearing primary branches of the inflorescence.

A. alternifolium is distinguished from both these species by its small, coriaceous leaflets with inconspicuous nervation.

Most specimens can be readily distinguished, but a few can be assigned to a species only doubtfully, usually because the material is inadequate. This is usually due to the junction between the vegetative (spiral phyllotactic) shoots and the flower-bearing branches being omitted.

13. *Arthropphyllum kjellbergii* PHILIPSON, Gard. Bull. Sing. 30 (1977) 309, f. 10. — Fig. 20d.

Small tree, 10 m, branches c. 1 cm \varnothing , young parts covered by rufous tomentum. *Leaves* clustered towards the ends of the branches, multijugate, 25–30 by 16 cm; petioles c. 8 cm, 2 mm wide; petiolules c. 3–8 mm; leaflets elliptic or ovate-oblong, up to 8 by 3 $\frac{1}{4}$ cm, chartaceous, margin minutely revolute, base rounded to cuneate often oblique, apex tapered to a blunt apiculum, or rounded and mucronate. *Inflorescence* a terminal cluster of c. 5–10 specialized branches (primary rays); primary rays c. 15–20 cm, 1 $\frac{1}{2}$ –2 mm wide, bearing near the middle an opposite pair of simple leaves or sometimes trifoliolate leaves with short flowering branches in their axils, and sometimes with a second pair higher up, and 2–3 similar leaves below the terminal cluster of secondary rays; secondary rays c. 12, c. 2 $\frac{1}{2}$ –3 $\frac{1}{2}$ cm long, each subtended by a small bract and bearing opposite caducous bracts near the middle, terminating in an umbellule of c. 12 flowers surrounded by an involucre of caducous bracts (1 mm long). *Flowers* known only in young bud. *Fruit* spheroidal, c. 5 by 4 mm, calyx and stylopodium prominent; pedicel 5–6 mm.

Distr. *Malesia*: SE. Celebes (Kendari).

Ecol. Primary rain-forest, 50–150 m.

Note. The small leaves and relatively simple inflorescences are distinctive.

14. *Arthropphyllum cenabrei* MERR. Philip. J. Sc. 20 (1922) 417; En. Philip. 3 (1923) 235; PHILIPSON, Gard. Bull. Sing. 30 (1977) 309.

Glabrous tree, c. 10 m, ultimate branches c. 5 mm \varnothing . Upper *leaves* pinnate, up to 10 cm long, leaflets mostly 5, sometimes 3, or the uppermost reduced to simple leaflets, the rachis and petiole c. 4 cm; leaflets mostly elliptic, 4 $\frac{1}{2}$ –6 by 2 $\frac{1}{2}$ –3 $\frac{1}{2}$ cm, chartaceous to subcoriaceous, very shortly and obtusely acuminate, base acute, brownish olivaceous and slightly shining when dry, nerves 3–4 pairs, slender; petiolules 5–10 mm. Peduncles c. 4 cm, umbellately arranged at the tops of the branchlets, usually however with solitary inflorescences in the axils of the uppermost leaves, thus forming a somewhat leafy inflorescence. *Fruits* 5–8 in each umbel, ovoid, c. 7 mm \varnothing ; pedicels 8–10 mm.

Distr. *Malesia*: Philippines (Cebu; FB 28343, type, not seen).

Ecol. On slopes at 600 m.

Vern. *Bingliu*, C.Bis.

Note. No specimen of this species has been located. The above description is taken from MERRILL's original account. In placing this species in the key, it has been assumed that the inflorescence branching is relatively simple.

15. *Arthropphyllum pulgarens* ELMER, Leaf. Philip. Bot. 7 (1915) 2551; MERR. En. Philip. 3 (1923) 235;

PHILIPSON, Gard. Bull. Sing. 30 (1977) 311, f. 9. — Fig. 20c.

Small tree, branches c. 1 cm \varnothing , young parts with red tomentum, becoming glabrous except on the ovaries. *Leaves* clustered towards the ends of the branches, leaflets c. 6 pairs, c. 22 by 8 cm; petioles c. 6 cm, 3 mm \varnothing ; petiolules 5–6 mm; leaflets elliptic to rotund, c. 4 by 2 $\frac{3}{4}$ cm, coriaceous, margin revolute, rounded to broadly cuneate, apex rounded or abruptly tapered to a short obtuse apiculum. *Inflorescence* a terminal cluster of specialized branches (primary rays); primary rays c. 6–10 cm, 3–4 mm \varnothing , bearing near the middle an opposite pair of simple rotund leaves, sometimes with flowering branches in their axils, and with a whorl of similar leaves below the terminal cluster of secondary rays; secondary rays c. 6–8, 2–4 cm long, articulated about the middle with scars of bracts or bearing a pair of small simple leaves terminating in an umbellule of c. 8–12 flowers; bracts caducous. *Calyx* with indistinct teeth. *Petals* 6, 2 $\frac{1}{2}$ mm long (in bud). *Stamens* 6, anthers curved. *Ovary* obconical, 2 mm long, furfuraceous. *Fruit* ellipsoid, c. 8 by 5 mm, the stylopodium forming a beak with stigma and calyx; exocarp fleshy.

Distr. *Malesia*: Philippines (Palawan: Mt Pulgar).

Ecol. Common in montane forest on Mt Pulgar.

Note. The coriaceous, small, often rotund leaflets are characteristic.

16. *Arthropphyllum montanum* RIDL. J. Fed. Mal. St. Mus. 4 (1909) 24; Fl. Mal. Pen. 1 (1922) 886; PHILIPSON, Gard. Bull. Sing. 30 (1977) 311, f. 8. — *A. nitidum* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 42; Fl. Mal. Pen. 1 (1922) 886. — *A. ovatum* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 42; Fl. Mal. Pen. 1 (1922) 886. — Fig. 19d, 20b.

Shrub or small tree to 6 m, unbranched or sparingly branched, rufous-tomentose on the young parts, becoming glabrous. *Leaves* tufted at the ends of the branches, multijugate, c. 30–55 by 12–22 cm; petiole 9–21 cm, 3 mm \varnothing ; petiolules c. 10–15 mm; leaflets elliptic or oblong, 6–10 by 2 $\frac{1}{2}$ –4 cm, coriaceous or chartaceous, base cuneate, apex with a short blunt apiculum, margin entire, revolute, the few principal lateral veins usually rather prominent; the leaves associated with the umbels usually unifoliolate, broadly elliptic to rotund, with a petiole to 4 $\frac{1}{2}$ cm. *Inflorescences* on specialized leafy branches either in terminal clusters or axillary in the upper leaves; branches 10–30 cm, leaves mostly simple in opposite pairs, usually without flowering branches in their axils, branches ending in a whorl of simple leaves surrounding a compound umbel; primary rays c. 5–15 (–20), 2–6 cm, with scars of caducous bracts; pedicels 4–8 mm. *Petals* (4–)5, 2 mm long in bud. *Stamens* (4–)5. *Ovary* turbinate; disk fleshy, stigma \pm sessile. *Fruit* spheroidal, c. 8 by



Fig. 24. *Gastonia serratifolia* (MIQ.) PHILIPSON. a. Habit, $\times \frac{1}{3}$, b. lower bud, c. flower, d. fruit, both $\times 5$ (a-c SCHMUTZ 3612, d VAN ROYEN 4090). Drawn by HELÈNE MULDER.

5 mm, calyx and stylopodium rather prominent.

Distr. *Malesia*: Malay Peninsula (Kedah to Selangor).

Ecol. Primary forest ascending to the montane zone, and in second-growth, 250–1500 m.

Note. Similar to 12. *A. maingayi* but distinguished by the more leathery leaves and by the leafy inflorescence branches which are usually absent in *A. maingayi*.

17. *Arthrophyllum alternifolium* MAINGAY *ex* RIDL. Fl. Mal. Pen. 1 (1922) 886; PHILIPSON, Gard. Bull. Sing. 30 (1977) 311, f. 11. — *A. pinnatum* CLARKE, Fl. Br. Ind. 2 (1879) 734, *p.p.*, *excl. basionym*; KING, J. As. Soc. Beng. 67, ii (1898) 59, *p.p.* — *A. alternifolium* MAINGAY *ex* CLARKE, Fl. Br. Ind. 2 (1879) 734, *nomen in synonym*. — Fig. 20e.

Slender, sparingly branched shrub to 2 m, rufous-tomentose on the young parts, becoming glabrous. *Leaves* tufted at the ends of the branches, multijugate, *c.* 20–25(–30) by 9–12(–15) cm; petiole terete, *c.* 3–6(–9) cm, 2–3 mm \varnothing ; petiolules *c.* 2 mm; leaflets ovate, elliptic or lanceolate, 3 $\frac{1}{2}$ –4(–6) by 1–2(–2 $\frac{1}{4}$) cm, coriaceous, base cuneate, apex acuminate to caudate, obtuse, margin revolute, veins obscure; leaves associated with the umbels (if any) reduced, with fewer leaflets or unifoliate, sometimes broadly ovate. *Inflorescence* usually a terminal compound umbel, occasionally a whorl of leafy branches (5–14 cm long) (leaves usually simple in opposite pairs), each

ending in a compound umbel; peduncle 1 $\frac{1}{2}$ –4 $\frac{1}{2}$ cm, with one or more usually caducous simple (or trifoliate) leaves at the apex; primary rays *c.* 5, 3–4 $\frac{1}{2}$ cm, with scars of caducous leaves about the middle, each ending in an umbellule of *c.* 12–25 flowers, pedicels 5–8 mm. *Calyx* a rim or minutely 4–5-dentate. Petals 4–5, 2 mm long in bud. Stamens 4–5. Ovary turbinate; disk fleshy, stigma \pm sessile. *Fruit* spheroidal, *c.* 5 by 5 mm when dry, calyx and stylopodium small.

Distr. *Malesia*: Malay Peninsula (Johore: Mt Ophir; Pahang, Selangor, and Malacca).

Ecol. In shady montane forest, with *Rhododendron* and *Dacrydium*, 900 m and above.

Note. The small, coriaceous, often apiculate leaflets are characteristic. Although collected most frequently on Mt Ophir it occurs on other high ridges in southern Malaya.

Excluded

Arthrophyllum ceylanicum MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27 (type in L), is according to VAN STEENIS, Rec. Trav. Bot. Néerl. 24 (1927) 819 = *Oroxylum indicum* (L.) KURZ (*Bignoniaceae*).

Arthrophyllum reticulatum BL. *ex* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27 (type in L), is according to MIQUEL (*l.c.* 318) and VAN STEENIS (*vide supra*) = *Oroxylum indicum* (L.) KURZ (*Bignoniaceae*).

9. GASTONIA

COMM. *ex* LAMK, Encycl. 2 (1786) 610; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 5; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 43; HUTCH. Gen. Fl. Pl. 2 (1967) 68; PHILIPSON, Blumea 18 (1970) 491, 497, f. 1–10. — *Tetraplasandra* (*non* A. GRAY) MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 4; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 29, *p.p.*; Nachtr. 2 (1900) 253. — *Indokingia* HEMSL. in Hook. Ic. Pl. (1906) t. 2805. — *Peekeliopanax* HARMS, Notizbl. Berl.-Dahl. 9 (1926) 478, fig. — Fig. 24, 26, 27.

Trees unarmed with thick branches, glabrous or tomentose. *Leaves* large, imparipinnate, exstipulate; rachis articulated; leaflets in pairs entire or crenate; petiole terete, with clasping base. *Flowers* in umbellules which are arranged racemously, or in verticils, on strong inflorescence branches; pedicels not articulated below the ovary. *Calyx* forming a continuous rim with an entire or indistinctly denticulate margin. Corolla of 5–13 free petals or calyptrate, fleshy, valvate. *Stamens* either equal in number to the petals or up to several times as many; filaments usually rather short and thick; anthers large, often irregularly lobed, dorsifixed. Ovary inferior, broadly obconic, cells 7–22; disk fleshy with stylar processes equal in number to the cells arising from its centre. *Fruit* a spherical berry (strongly ribbed when dry), with an indistinct calyx rim, a flattened disk, and a

prominent stylopodium bearing a ring of radiating stigmatic arms; exocarp fleshy, endocarp crustaceous. Endosperm with smooth surface.

Distr. About 10 *spp.* in East Africa, Madagascar, the Seychelles and Mascarenes, *Malesia*, and the Solomon Is.

Ecol. Primary and second-growth forest, or in open country, from sea-level to lower montane zone.

Taxon. I have amply analyzed and discussed the affinities of *Gastonia* (Blumea 18, 1970, 497). I have come to the conclusion that within its alliances *Gastonia* is the only genus west of Samoa; in Polynesia there are three other closely allied genera.

KEY TO THE SPECIES

1. Corolla with free petals. Ovary cells and style arms 6–9(–12). Whole plant glabrous. Leaflets usually entire or sparsely crenate. Main inflorescence branches borne along an elongated axis with caducous bracts; peduncles of the umbellules mostly aggregated into pseudo-whorls **1. *G. serratifolia***
1. Corolla calyprate. Ovary cells and style arms 12–18(–22). Young parts with scurfy tomentum, persisting on the ovary and bracts. Leaflets strongly crenate. Main inflorescence branches borne subumbellately on a short axis with persistent bracts; peduncles of the umbellules scattered **2. *G. spectabilis***

1. *Gastonia serratifolia* (MIQ.) PHILIPSON, *comb. nov.* — *Arthrophyllum serratifolium* MIQ. Sum. (1861) 341, type from Sibolga, leg. TEYSMANN (in U). — *G. papuana* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 5; HARMS, Bot. Jahrb. 56 (1921) 408; PHILIPSON, Blumea 18 (1970) 492, 500 f. 3. — *Tetraplasandra paucidens* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 4; KOORD. Minäh. (1898) 488. — *G. eupteronoides* T. & B. Nat. Tijds. N. I. 25 (1863) 416. — *Polyscias papuana* (MIQ.) SEEM. J. Bot. 3 (1865) 181. — *Tetraplasandra koordersii* HARMS, Ann. Jard. Bot. Btzg 19 (1904) 12; Ic. Bog. 2 (1906) t. 178. — *Tetraplasandra philippinensis* MERR. Philip. J. Sc. 1 (1906) Suppl. 219; En. Philip. 3 (1923) 222. — *G. winkleri* HARMS in Fedde, Rep. 15 (1917) 20. — *Tetraplasandra solomonensis* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 11. — Fig. 24.

Shrub or small tree, sometimes epiphytic, up to 27 m, with clear bole to 15 m, dbh 34 cm, crown sparsely branched with leaves crowded at the ends of the branches, glabrous. *Leaves* up to 80 by 20 cm; petiole *c.* 13 cm; leaflets *c.* 10 pairs, petiolules up to 1 cm; blade oblong, ovate or lanceolate, middle leaflets 8–14(–18) by 2½–3½(–8) cm, chartaceous, entire and subrevolute, or with a few obscure, more rarely several prominent crenations, apex rounded and bluntly apiculate or tapering and acute, base broadly cuneate, midrib prominent. *Inflorescence* terminal, glabrous, with a stout primary axis 15–25 cm long, bearing scattered or clustered branches along its length and ending in an umbel of *c.* 10 branches; bracts caducous; secondary branches 30–40 cm, bearing numerous subverticillate peduncles along their length and ending in an umbel; peduncles *c.* 3 cm, somewhat longer in fruit; pedicels 1–2½ cm, forming umbellules of *c.* 10 flowers. Flower buds (when dry) *c.* 7 by 3 mm. *Calyx* rim

undulate. Petals 5–9, slightly fleshy, fully separated. Stamens variable in number, (7–)14–55; filaments short; anthers broad and irregularly lobed, variable in size. Ovary glabrous, smoothly rounded below, slightly constricted below the calyx; cells 6–12, usually *c.* 9, disk with a prominent rim and, at anthesis, a central boss formed by closely appressed subulate style arms equal in number to the ovary cells. *Fruit* *c.* 9 by 7 mm (without stylopodium), the flattened stylopodium ending in a ring or double row of radiating subulate stigmatic arms, black when ripe, the fleshy exocarp enclosing compressed crustaceous pyrenes.

Distr. Solomon Is.; in *Malesia*: Central W. Sumatra (Sibolga, Enggano I.), Malay Peninsula (Johore), Sunda Straits (islet Dwars in den Weg), West Java, Lesser Sunda Is. (Sumba, Timor, Wetar, Flores), W. Borneo (east of Pontianak, Karimata), N. Borneo (Sabah), Philippines

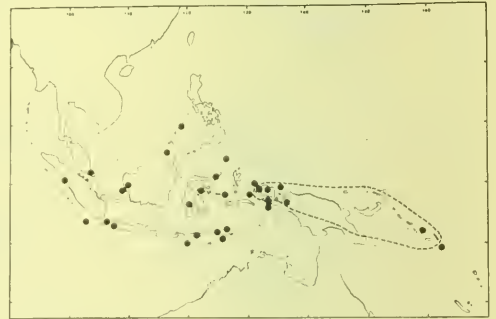


Fig. 25. Distribution of *Gastonia* in Malesia. Known localities of *G. serratifolia* (MIQ.) PHILIPSON: black dots; range of *G. spectabilis* (HARMS) PHILIPSON: broken line.



Fig. 26. *Gastonia spectabilis* (HARMS) PHILIPSON, two inflorescences visible below the leaves (Photogr. PHILIPSON, Kassam Pass, E. New Guinea, 1968).

(Palawan, Balabac), Celebes (Lepo-Lepo, Luwuk, Minahassa), N. Moluccas (Talaud Is.), New Guinea (Vogelkop, NW. & SW. Irian, Schouten I., Waigeu I.). Fig. 25.

Ecol. Primary and secondary forest, or in open country, usually at low altitude and often on the shore or sea-cliffs, but ascending to 1000 m. EYMA noted it to be a characteristic tree on Mt Tambunan, Luwuk, E. Celebes.

Vern. *Bajur talang èkoaho*, M, Enggano, *jarum*, Sabah, *raka*, Sumba, *kre*, *wangka*, Flores, *lampo paã*, *bungku*, Celebes, *buñgio*, Palawan, *lantora*, Talaud Is., *mansongoree*, *mantisenongor*, Schouten I., *raauwrack*, *ara-orach*, Vogelkop, Maibrat.

Note. The entire or serrate nature of the leaf margins, the number of ovary cells, and especially the number of stamens are variable characters but show no discernable geographical segregation. The outer bark is described as light brown, with small oblong brittle scales. Inner bark, leaves and inflorescences with copious sticky juice. Wood soft white. The petals are variously described as purple, light green, and white.

2. *Gastonia spectabilis* (HARMS) PHILIPSON, *Blumea* 18 (1970) 494, pl. 1. — *Peekeliopanax spectabilis* HARMS, *Notizbl. Berl.-Dahl.* 9 (1926) 478, fig.; PHILIPSON, *Blumea* 18 (1970) 500 f. 2. — *G. bori-diana* HARMS, *Bot. Jahrb.* 69 (1938) 282. — Fig. 26, 27.

Tree up to 40 m high, clear bole to 28 m, dbh 1.75 m, crown sparsely branched with the branches whorled or regularly forked and the leaves crowded at the ends of the branches, all young parts with scurfy indumentum more evident in dried material. *Leaves* up to 80 by 30 cm; petiole c. 15 cm, with some tomentum remaining at the joints; leaflets c. 11 pairs on petiolules c. 2–8 mm, oblong or elliptic, middle leaflets 10–15 by 4–6 cm, chartaceous when dry, prominently crenate, apex narrowed to a short blunt apiculus, base rounded or truncate. *Inflorescence* in forks well below the leaves, when in bud covered with large scurfy cataphylls, and when mature with radiating branches forming clusters c. 130 cm Ø. *Primary axis* short (5–10 cm) with persistent bracts; secondary branches numerous, radiating, up to 65 cm, bearing small, persistent, scurfy bracts and peduncles scattered along their length and clustered in a terminal umbel; peduncles c. 1½–5 cm; pedicels ½–1½ cm, forming umbellules of c. 5–12 flowers. Flower buds c. 8 by 5 mm when dry (fresh c. 12 by 8 mm). *Calyx* rim straight. Petals 6–12, very fleshy, incompletely separated (often splitting into c. 5 lobes). Stamens 25–66, often c. 35, filaments short; anthers broad and irregularly lobed, variable in size. Ovary with a short dense indumentum, smoothly rounded below, cells usually c. 16, very rarely fewer than 10, as many as 22; disk at anthesis with a prominent rim and a central boss formed by closely appressed subulate



Fig. 27. *Gastonia spectabilis* (HARMS) PHILIPSON. Young tree, free bole 19 m, 47 cm Ø, crown 10 m, longest leaves 2 m, not yet flowering (Photogr. G. PEEKEL, New Ireland, Uguna, 1940).

styles equal in number to the cells. *Fruit* c. 8 by 10 mm (dry and without stylopodium), the flattened disk with a prominent stylopodium ending in an elliptical ring of radiating subulate stigmatic arms; the fleshy exocarp enclosing compressed crustaceous pyrenes.

Distr. Solomon Is.; in *Malesia*: New Guinea (Vogelkop, NW. Irian, Papua New Guinea), Bismarcks, and New Ireland. Fig. 25.

Ecol. Primary and secondary rain-forest, and in cultivated areas, 200–2000 m.

Vern. *Amoriga*, *bekuak*, *djak*, *ntjier*, *tuju*, Vogelkop, *bohko*, *boinga*, *gabiel*, *jamwa*, *mestic*, *sikoto*, *tubat*, *tumbala*, Madang Distr., *waki*, W. Highlands, *aita*, E. Highlands, *kuhuh*, Papua.

Note. Possibly the largest araliad known. The regular habit of branching results from the vegeta-

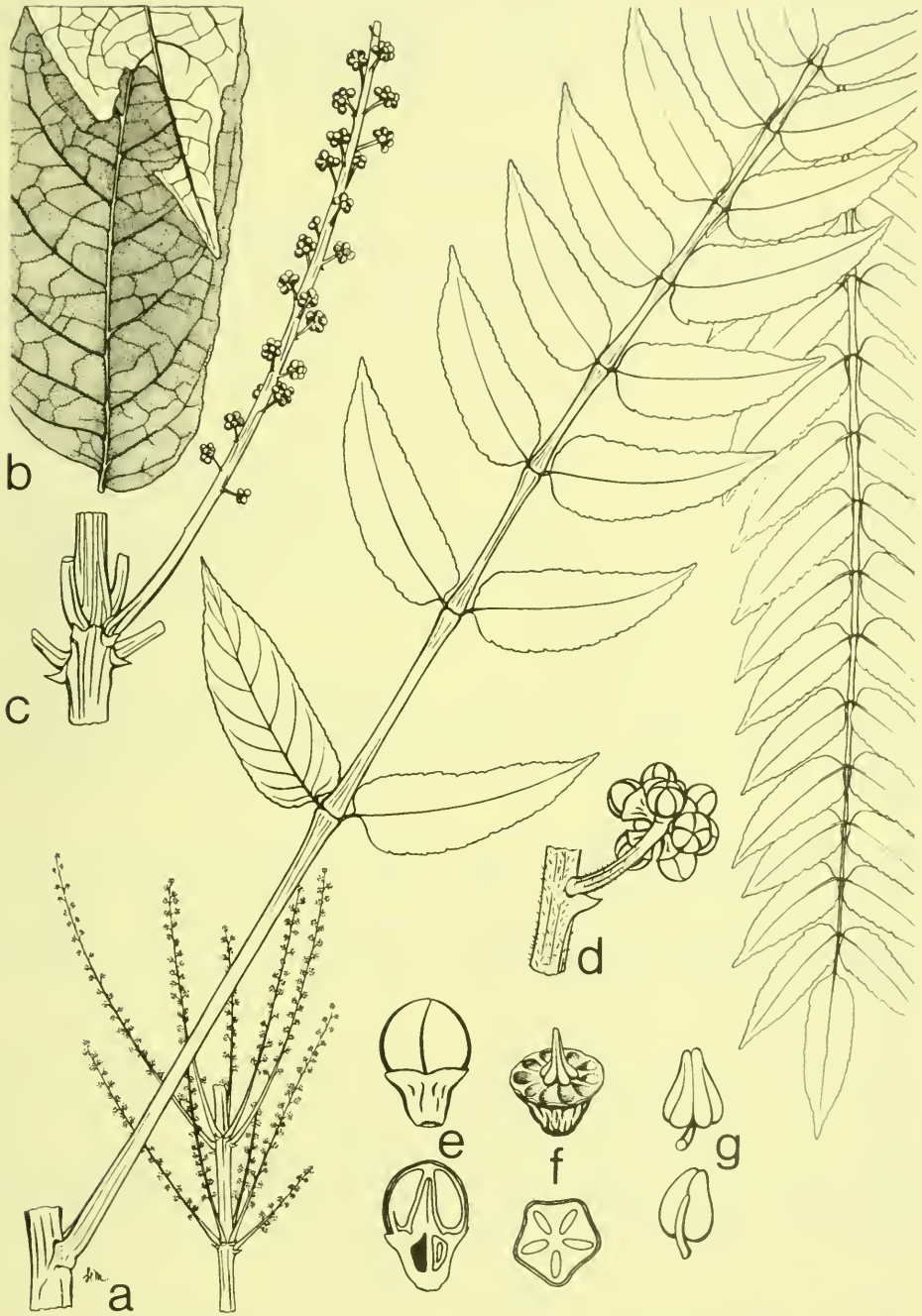


Fig. 28. *Polyscias nodosa* (BL.) SEEM. a. Leaf and part of inflorescence, $\times \frac{1}{3}$, b. leaflet, $\times \frac{2}{3}$, c. branch of inflorescence, $\times \frac{2}{3}$, d. umbellule, e. flower bud and ditto in LS, $\times 8$, f. ovary and ditto in CS, $\times 8$, g. stamens (VERSTEEGH BW 3868). Drawn by HELÈNE MULDER.

tive shoots springing in pairs or whorls from below terminal inflorescence buds. Several flushes of growth occur as an inflorescence bud matures, so that at anthesis the inflorescences are situated in forks well below the leafy crown, with a succession of younger inflorescence buds in higher forks.

Bole without buttresses or with buttresses 1 m high and 2 m wide. Outer bark brown with prominent pustular lenticels and small shallow fissures. Exudate from cuts abundant, clear and aromatic. Wood soft. Flowers cream, stamens yellow. Ripe fruit dark red-brown.

10. POLYSCIAS

J. R. & G. FORSTER, Char. Gen. (1776) 63, t. 32; DC. Prod. 4 (1830) 257; SEEM. J. Bot. 3 (1865) 179; BTH. in B. & H. Gen. Pl. 1 (1876) 941; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 43; KOORD. Atlas 4 (1916) f. 677–680; MERR. Int. Rumph. (1917) 408; HARMS, Bot. Jahrb. 56 (1921) 409; MERR. En. Philip. 3 (1923) 233; HUTCH. Gen. Fl. Pl. 2 (1967) 75; BERNARDI, Candollea 26 (1971) 13; PHILIPSON, Blumea 24 (1978) 169. — *Eupteron* MIQ. Pl. Jungh. 3 (1855) 423; Fl. Ind. Bat. 1, 1 (1856) 762; HUTCH. Gen. Fl. Pl. 2 (1967) 68. — *Nothopanax* MIQ. Pl. Jungh. 3 (1855) 425; Bonplandia 4 (1856) 139; Fl. Ind. Bat. 1, 1 (1856) 765; SEEM. Fl. Vit. (1866) 114; MERR. Int. Rumph. (1917) 409; En. Philip. 3 (1923) 233. — *Irvingia* F.v.M. Fragm. 5 (1865) 17, non HOOK. f. 1860. — *Kissodendron* SEEM. J. Bot. 3 (1865) 201; *ibid.* 6 (1868) 129; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; Bot. Jahrb. 56 (1921) 412; HUTCH. Gen. Fl. Pl. 2 (1967) 75. — *Palmervandenbroekia* GIBBS, Arfak (1917) 162; HUTCH. Gen. Fl. Pl. 2 (1967) 75. — *Gelibia* HUTCH. Gen. Fl. Pl. 2 (1967) 57. — **Fig. 28, 30.**

Unarmed shrubs or trees, glabrous or furfuraceous. *Leaves* imparipinnate or 2–3-pinnate (rarely unifoliolate) with an elongated or short sheathing base; rachis articulated; petiole terete; leaflets in pairs, entire, crenate or dentate. *Inflorescence* terminal, often large, a panicle, corymb, or compound rarely simple umbel. *Flowers* in umbellules, capitula, or racemose; pedicels articulated below the ovary. *Calyx* a rim with an undulate or dentate margin. Petals 4–5(–8 or more), valvate. *Stamens* equal in number to the petals; anthers dorsifixed. Ovary inferior, 4–5(–8 or more)-celled; disk fleshy; styles either free and recurved (at least in fruit) or joined to form a beak-like stylopodium. *Fruit* a spherical or ovoid drupe, crowned by the persistent calyx rim and the styles or stylopodium; exocarp fleshy, endocarp chartaceous. Endosperm with an uneven surface, fissured, or rarely smooth.

Distr. About 100 *spp.* throughout the tropics of the Old World (incl. Australia), and the Pacific Islands; in *Malesia* 23 *spp.* of which 3 adventive: rare in West (none native in Sumatra and Malaya), more common in East, the majority in New Guinea. Fig. 29.

Ecol. Primary or second-growth forest, from sea-level to 2650 m.

Note. Araliads with pinnate leaves and an articulated pedicel are here regarded as forming one genus, divided into several sections. These sections have formerly been segregated as genera, but I follow BERNARDI, *l.c.*, in uniting them. The most distinctive is *sect. Polyscias*, characterized by an elongated leaf-sheath. Several of the species of this section are cultivated and have a number of cultivars.

KEY TO THE SECTIONS

1. Leaf-sheath elongated, extending along the petiole for about $\frac{1}{4}$ of its length (*Spp.* 1–7)

1. *Sect. Polyscias*

1. Leaf-sheath short or obsolete, restricted to the base of the petiole.
2. Style arms spreading, at least in fruit.

3. Flowers arranged racemously (*Sp.* 8) 2. *Sect. Gelibia*
 3. Flowers arranged in umbellules or capitula (*Spp.* 9–14) 3. *Sect. Eupteron*
 2. Style arms erect, fused, forming a beak in fruit.
 4. Inflorescence large, \pm as long as the leaves (*Spp.* 15–19) 4. *Sect. Kissodendron*
 4. Inflorescence much shorter than the leaves (*Spp.* 20–23). 5. *Sect. Palmervandenbroekia*

1. Section Polyscias

PHILIPSON, *Blumea* 24 (1978) 169.

Aromatic, glabrous shrubs or small trees, often cultivated. Leaf-sheath elongated along the petiole for $1/3$ – $1/4$ of its length. Styles spreading, at least in the fruit.

Distr. Polynesia, Queensland, *Malesia*, and SE. Asia.

KEY TO THE SPECIES

1. Leaves 2–3-pinnate. 1. *P. fruticosa*
 1. Leaves imparipinnate, or unifoliolate.
 2. Ovary 2-celled (or predominantly so).
 3. Main inflorescence branches diffusely branched 2. *P. macgillivrayi*
 3. Main inflorescence branches with verticils of short branches 3. *P. verticillata*
 2. Ovary variable, but many flowers with more than 2 cells.
 4. Leaflets orbicular or reniform. Leaves unifoliolate or trifoliolate 4. *P. scutellaria*
 4. Leaflets ovate, oblong, or elliptic (cultivated forms often laciniate or lanceolate). Leaves with 3 or more pairs of leaflets.
 5. Leaf margin sharply serrate (blade often rhomboidal and variegated with light yellow) 5. *P. guilfoylei*
 5. Leaf margin entire, or obscurely dentate.
 6. Peduncles of the ultimate umbellules bearing 1 or more pairs of small bracts (reduced flowering branches sometimes present in their axils) 6. *P. cumingiana*
 6. Peduncles of the ultimate umbellules either without bracts, or with 1 or more small bracts inserted singly 7. *P. javanica*

1. *Polyscias fruticosa* (L.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; K. & V. Bijdr. 7 (1900) 2; HARMS in K. Sch. & Laut. Fl. Schutzgeb. (1900) 486; KOORD. Exk. Fl. Java 2 (1912) 716; Atlas 4 (1916) f. 680; BAILEY, *Rhodora* 18 (1916) 153, *incl. var. plumata* (Hort.) BAILEY; BACK. & BAKH. f. Fl. Java 2 (1965) 168; PHILIPSON, *Blumea* 24 (1978) 169. — *Scutellaria tertia* RUMPH. Herb. Amb. 4: 78, t. 33. — *Panax fruticosum* LINNÉ, Sp. Pl. ed. 2 (1763) 1513; BL. Bijdr. (1826) 830; DC. Prod. 4 (1830) 254; BLANCO, Fl. Filip. ed. 2 (1845) 156; ed. 3, 1 (1877) 281, t. 78; CLARKE, Fl. Br. Ind. 2 (1879) 725; F.-VILL. Nov. App. (1880) 101; BOERL. Handl. 1 (1890) 647; F.v.M. Descr. Pap. Pl. 9 (1890) 60; WARB. Bot. Jahrb. 13 (1891) 396; KOORD. Minah. (1898) 488; MERR. Philip. J. Sc. 3 (1908) Bot. 84. — *Panax obtusum* BL. Bijdr. (1826) 880; DC. Prod. 4 (1830) 254. — *Aralia tripinnata* BLANCO, Fl. Filip. (1837) 223, *cf.* MERR. Sp. Blanc. (1918) 295. — *Nothopanax fruticosum* (L.) MIQ. Pl. Jungh. 3 (1855) 425; Fl. Ind. Bat. 1, 1 (1856) 765; SEEM. Fl. Vit. (1866) 114, 115; J. Bot. 4 (1866) 363; MERR. Fl. Manila (1912) 358, *incl. var. plumatum* (Hort.) MERR. *et var. victoriae* (Hort.)

MERR.; Int. Rumph. (1917) 410; Sp. Blanc. (1918) 295; HARMS, Bot. Jahrb. 56 (1921) 412; MERR. En. Philip. 3 (1923) 233; HEYNE, Nutt. Pl. (1927) 1209; OCHSE & BAKH. Veg. D.E.I. (1931) 64, f. 37; CORNER, Ways. Trees (1940) 150. — *Nothopanax obtusum* (BL.) MIQ. Fl. Ind. Bat. 1, 1 (1856) 766; SEEM. Fl. Vit. (1866) 114. — *P. obtusa* (BL.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45, *nom. illeg., non* BLANCO, 1837, *quae est Schefflera odorata* (BLANCO) MERR. & ROLFE; KOORD. Exk. Fl. Java 2 (1912) 716; Atlas 4 (1916) t. 679 S; BACK. & BAKH. f. Fl. Java 2 (1965) 168.

Glabrous shrub or small tree, up to 5 m, with branches bearing spirally arranged leaves towards their ends. Leaves tripinnate, variable in size to c. 75 cm long; petiole up to c. 25 cm, with a sheathing base to 5 cm long; pinnae to c. 25 cm long; leaflets shortly petiolate, very variable in shape and size, oblong or linear-lanceolate, or 1–12 by $1/2$ –4 cm, more or less deeply serrate or lobed, or irregularly pinnatisect, apex attenuate, acuminate or rounded, base cuneate, truncate or subcordate, midrib and lateral veins evident. *Inflorescence* a diffuse panicle; primary axis up to c. 60 cm with

secondary branches mostly in verticils at intervals along its length; secondary branches up to 30 cm bearing umbellules in an irregularly branched system towards their extremities; umbellules with 12–20 flowers on pedicels *c.* 3 mm long. *Calyx* a minute rim. Petals 5, 2 mm long. Stamens 5. Ovary turbinate, *c.* 1 mm high, 2–3(–4)-celled; styles at first erect, later spreading. *Fruit* subglobose, fleshy, *c.* 5 mm \varnothing when dry.

Distr. Native country not properly known, cultivated throughout the region, and in other parts of the Indo-Pacific tropics.

Ecol. Grown at low and moderate altitudes (*c.* 1000 m) as an ornamental or hedge shrub and for culinary use.

Vern. (from various sources). Sumatra: *orang aring*, Medan, *kẽdongdong mekka*, Palembang; Malaya: *daun girang*, *siku kluang*, M; Java: *kẽdongdong alus*, *k. batur*, *k. laut*, M, *imba*, *kẽdongdong laki*, *k. tjina*, *randa nunut*, S, *tjakar kutjung*, *t. tjikri*, J, *kadongdung*, *k. laut*, *k. petẽdhan*, Md; Celebes: *boka ula risẽ*, *kẽndẽm rintẽk*, Minahasa, Alfur lang., *bombu*, Makassar; Philippines: *papua*, Tag., Bik., *bani*, *makan*, Bik.; Moluccas: *daun papeda papua*, *pagar pagar*, Ambon, *guarbatì*, *tampusong*, Ternate.

The name *kedongdong* belongs properly to species of the fruit tree genus *Spondias*, but is sometimes also applied to trees of other families with pinnate leaves; *papua* means 'curly'.

Notes. The foliage of this plant is extremely variable in size and form. Typical plants are figured by KOORDERS (1916, *l.c.*) and by OCHSE & BAKHUIZEN VAN DEN BRINK (*l.c.*). These may be readily identified by the intricately compound leaf.

The individual leaflets are characteristically ovate-lanceolate and serrate to deeply pinnatifid. However, broader leaflets with simpler outlines are not uncommon. The more rotund, blunter leaflets of *P. obtusa* are considered here to be an extreme form of this species (the type is bipinnate).



Fig. 29. Species density of *Polyscias* J. R. & G. FORSTER in Malesia; above the hyphen the number of endemic species, below it the non-endemics. Only the native species.

Occasional specimens have leaves so much reduced that they are simply pinnate or unifoliate when they approach forms of 6. *P. cumingiana*.

A number of names have been applied to horticultural forms belonging to this section of the genus (*cf.* BAILEY, *Rhodora* 18, 1916, 153), but the interrelations of these will be understood only after intensive biosystematic study of the many cultivars.

2. *Polyscias macgillivrayi* (SEEM.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 14; Blumea 24 (1978) 169. — *Nothopanax macgillivrayi* SEEM. Fl. Vit. (1866) 114, *nomen*. — *Panax macgillivrayi* (SEEM.) BTH. Fl. Austr. 3 (1866) 382. — *P. grandifolia* VOLKENS, Bot. Jahrb. 31 (1901) 471; KANEHIRA, En. Micron. Pl. (1935) 385. — *Tieghe-mopanax macgillivrayi* VIGUIER, Bull. Soc. Bot. Fr. 52 (1905) 313. — *Polyscias sp.* C. T. WHITE, J. Arn. Arb. 10 (1929) 255.

Glabrous shrub or small tree, up to 15 m, with few branches bearing terminal clusters of large leaves. *Leaves* imparipinnate, up to 1 m (or more) long, uppermost leaves smaller; petiole *c.* 15 cm, with a sheathing base extending for 6–10 cm along the petiole; petiolules *c.* 10–15 mm; lamina oblong often broader near the base (lower and the terminal pinnules more ovate) *c.* 20–25 by 8–10 cm, slightly succulent when fresh, margin entire, revolute or occasionally minutely dentate, apex rounded and shortly apiculate, base rounded, truncate or subcordate, midrib and widely spaced laterals prominent. *Inflorescence* a large panicle; primary axis stout, rather short (*c.* 3–10 cm), often bearing reduced leaves or cataphylls basally, and a few lateral inflorescence branches, terminating in an umbel of long diffusely branched rays; lateral branches and rays *c.* 40–50 cm, with secondary branches *c.* 6–12 cm borne singly or in subverticils along their length; secondary branches with numerous tertiary branches bearing lateral and terminal umbellules (or the branching may be of a high order); umbellules with *c.* 6–12 flowers on delicate pedicels *c.* 3 mm long. *Calyx* a minute rim. Petals 5, 2½ mm long. Stamens 5, anthers oblong 1½ mm long, filaments delicate, 1½ mm long. Ovary turbinate in bud, 1½ mm long, rapidly becoming rotund, compressed with prominent veins, 2-celled; styles 2, divergent. *Fruit* fleshy, black, compressed, *c.* 5 by 6 mm; styles persistent, recurved.

Distr. Micronesia, Solomon Is., Queensland; in Malesia: New Guinea (Papua, Eastern and Milne Bay Distr.; Territory of New Guinea, Morobe Distr., Musi I.), also in the D'Entrecasteaux and Trobriand Is., New Britain, and Louisiades.

Ecol. Strand vegetation and littoral rain-forest, often behind mangrove.

Vern. *Aikove*, Mimifig lang., *ane*, D'Entrecasteaux Is., *gambou*, Musi I., Morobe Distr., *nakaigwoo*, Trobriand Is., *raumonas*, Onjob lang.

3. *Polyscias verticillata* STONE, J. Arn. Arb. 47 (1966) 272, f. 1; PHILIPSON, Blumea 24 (1978) 169.

Glabrous, small tree to 7 m with few branches bearing spirally arranged leaves towards their ends. *Leaves* imparipinnate, up to 1 m long; petiole c. 24–30 cm, terete with a sheathing base c. 6–7 cm long; petiole 5–20 mm, leaflets oblong often broader near the base, c. 16–27 by 5–13 cm, margin entire, slightly revolute or sparsely denticulate, apex acuminate, base subcordate or truncate, often oblique, midrib and lateral veins evident. *Inflorescence* a large panicle; primary axis stout, rather short, with broad cataphylls, bearing several long radiating secondary branches in a sub-umbel; secondary branches c. 50 cm, with numerous tertiary branches borne in well defined verticils and in a terminal umbel, bracts triangular c. 8 mm long, caducous; tertiary branches c. 4–7 cm with small bracts near the middle; umbellules with c. 10–15 flowers, on pedicels 1–4 mm long. *Calyx* a minute rim. Petals 5, 2¹/₂ mm long. Stamens 5, anthers oblong, c. 1–1¹/₂ mm long. Ovary turbinate, c. 1 mm long, 2-celled; styles 2, at first erect, later recurved. *Fruit* globose, fleshy, black, compressed, c. 4 by 7 mm when dry; styles persistent.

Distr. Solomon Is.; in *Malesia*: New Guinea (New Britain, New Ireland, New Hanover, Admiralty Is., and Bagabag I.).

Ecol. Usually near the beach or in lowland forest, to 140 m.

Uses. The young foliage is eaten fresh or boiled.

Vern. *Babagula, valagur*, Kuana dial., *la bara kiku*, Nakanai, *tauwol*, Gasmata, *palu*, Vairamana, *vela vela*, Pomio.

Note. Cut surfaces produce a sweet scented sticky exudate. The petals are violet within, the fruits purple-black.

4. *Polyscias scutellaria* (BURM. f.) FOSB. Un. Hawaii Occ. Pap. 46 (1948) 9; STONE, Taxon 14 (1965) 284; PHILIPSON, Blumea 24 (1978) 169. — *Scutellaria prima* RUMPH. Herb. Amb. 4: 75, t. 31. — *Scutellaria secunda latifolia* RUMPH. l.c. 76. — *Crassula scutellaria* BURM. f. Fl. Ind. (1768) 78. — *Aralia cochleata* LAMK, Encycl. 1 (1783) 224. — *Panax scutellarioides* REINW. ex BL. Bijdr. (1826) 880; SPAN. Linnaea 15 (1841) 208. — *Panax cochleatum* (LAMK) DC. Prod. 4 (1830) 253; BOERL. Handl. 1 (1890) 647. — *Panax conchifolium* ROXB. Fl. Ind. ed. Carey 2 (1832) 77. — *Nothopanax cochleatum* (LAMK) MIQ. Pl. Jungh. 3 (1855) 425; Fl. Ind. Bat. 1, 1 (1856) 766; SEEM. J. Bot. 4 (1866) 296; Fl. Vit. (1866) 116; KOORD. Minah. (1898) 490; Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 697. — *Nothopanax tricochleatum* MIQ. Fl. Ind. Bat. Suppl. (1860) 135, 340; MERR. Int. Rumph. (1917) 409; En. Philip. 3 (1923) 234; OCHSE & BAKH. Veg. D.E.I. (1931) 69, f. 39A. — *Panax rumphii* HASSK. Abh. Naturf. Ges. Halle 9 (1866) 220. — *Nothopanax scutellarium* (BURM. f.) MERR. Int. Rumph. (1917) 409; En. Philip. 3

(1923) 234; HEYNE, Nutt. Pl. (1927) 1209; OCHSE & BAKH. Veg. D.E.I. (1931) 67, f. 39; CORNER, Ways. Trees (1940) 156; BACK. & BAKH. f. Fl. Java 2 (1965) 169. — *P. tricochleata* (MIQ.) FOSB. Phytologia 5 (1955) 290.

Glabrous shrub or small tree, up to 6 m, with branches bearing spirally arranged leaves towards their ends. *Leaves* simple or trifoliolate, variable in size; petiole often c. 6 cm, but as long as 28 cm, with a sheathing base 1–6 cm long; lamina rotund or reniform, often c. 8 cm \varnothing but as wide as 28 cm, margin usually serrate or becoming sub-lobed towards apex, in larger leaves the serrations often inconspicuous, apex rounded, base \pm cuneate, midrib and lateral veins evident. *Inflorescence* a diffuse panicle; primary axis usually long (up to 1 m) with secondary branches (mostly in verticils, at intervals along its length; secondary branches 15–30 cm, bearing umbellules in an irregularly branched system towards their extremities; umbellules with c. 8–16 flowers, on pedicels c. 3 mm long. *Calyx* a minute rim. Petals 4–5, 2 mm long. Stamens 4–5, anthers oblong, 1 mm long. Ovary turbinate, c. 1 mm high, (2–)3–4-celled, styles at first erect, later recurved. *Fruit* subglobose, fleshy, c. 5 mm \varnothing when dry.

Distr. Native country not properly known, possibly *East Malesia*; cultivated throughout the region, extending through the tropical Pacific.

Ecol. Grown at low and moderate altitudes (800 m) as an ornamental or hedge shrub.

Uses. The foliage is aromatic and is used to furnish perfume. Forms with variegated foliage are in cultivation. Used medicinally as a diuretic, against breast cancer, and to prevent baldness (HEYNE, l.c.). Also for culinary purpose (OCHSE & BAKH. l.c. 67).

Vern. Cf. HEYNE: *memangkokan*, (*pohon mangkok*, Mal. (after the dish (= *mangkok*)-shaped leaves which are in the Moluccas sometimes used as dishes); Java: *godong mangkokan*, M, *mama-mėkan*, S, *piring mangkok*, Md; Lesser Sunda Is.: *lanido*, *ndalido*, *ndari*, *ramido*, Roti; Celebes: (*daun*) *mangko*, *tuwo mangku*, M, *bobohang*, *boku ula*, *kėndėm wėwėnė*, *woworan*, Manado, *angko mangko*, Bug. & Mak.; Philippines: *salapiin*, Mindanao; Moluccas: *daun koın*, *d. papėda*, M, Ambon, *ai laun niwėl*, *ai lohoi*, Alf., Ambon, *goma ma tari*, Gal., Halmahera, *sawoko*, Loda, Halmah., *rau paroro*, Ternate.

Note. This species is usually readily distinguished by its simple, orbicular, saucer-shaped leaves, but plants with some or all of their leaves trifoliolate occur. STONE (Micronesica 2, 1965, 51) advanced evidence for uniting these trifoliolate plants with *P. pinnata* (= 6. *P. cumingiana*) while retaining the unifoliolate plants as a distinct species. Possibly all are forms of one polymorphous species complex, but here it is considered convenient to adhere to the view which unites all forms having

orbicular usually bowl-shaped leaves under the concept *P. scutellaria*.

5. *Polyscias guilfoylei* (COGN. & MARCHÉ) L. H. BAILEY, *Rhodora* 18 (1916) 153; STONE, *Micronesica* 2 (1965) 57; PHILIPSON, *Blumea* 24 (1978) 169. — *Aralia guilfoylei* [BULL., *Cat.* (1873)] COGN. & MARCHÉ, *Pl. Ornam.* 2 (1874) t. 58. — *Nothopanax guilfoylei* (COGN. & MARCHÉ) MERR. *Philip. J. Sc.* 7 (1912) Bot. 242; *Fl. Manila* (1912) 357; *En. Philip.* 3 (1923) 234.

Glabrous shrub to 3 m high, with few branches, bearing spirally arranged leaves towards their ends. *Leaves* imparipinnate, with 3–4 pairs of leaflets, c. 60 cm long; petiole c. 18 cm, terete, with a sheathing base 3–4 cm long; petiolules c. 1 $\frac{1}{2}$ –2 $\frac{1}{2}$ cm; leaflets rotund, oblong or rhomboidal, c. 10–14 by 6–7 cm, rather thin and flaccid, sometimes rugose, margin sharply serrate to broadly cuneate (often decurrent on the petiole), often oblique, midrib and lateral veins evident. *Inflorescence* a diffuse panicle; primary axis short (c. 3–4 cm) with one or few lateral flowering branches, terminating in an umbel of long much-branched rays; lateral branches and rays c. 40–50 cm, with secondary branches (c. 5–8 cm) singly or mainly in subverticils along their length and in a terminal umbel; secondary branches with one or more pairs of small bracts and ending in umbellules with a few lateral tertiary branches also ending in umbellules; umbellules with c. 8–12 flowers on pedicels c. 8–10 mm long. *Calyx* a minute rim. *Petals* 5, 2 $\frac{1}{2}$ mm long. *Stamens* 5, anthers oblong, 1 $\frac{1}{2}$ mm long; filaments 2 mm. *Ovary* turbinate, c. 1 mm high, usually 3-celled, styles at first erect, but soon elongating and recurved. *Fruit* fleshy, globose, c. 4 by 5 mm.

Distr. Native country unknown, possibly from *East Malesia*. Cultivated throughout the region, but less commonly than other cultivated species of this section. General throughout the tropical Pacific.

Ecol. Usually grown as a hedge plant. Flowers only when left untrimmed or when growing as an escape from cultivation.

Note. Recognizable by the shape, texture and serrations of the leaflets, which are usually variegated with whitish or yellowish blotches near the margins. The flowers are brown in bud but yellow-green when open.

6. *Polyscias cumingiana* (PRESL) F.-VILL. *Nov. App.* (1880) 102; PHILIPSON, *Blumea* 24 (1978) 169. — *Scutellaria secunda angustifolia* RUMPH. *Herb. Amb.* 4: 76, t. 32. — *Panax pinnatum* LAMK, *Encycl.* 2 (1788) 715, non *P. pinnata* J. R. & G. FORSTER, 1776; DC. *Prod.* 4 (1830) 254; SPAN. *Linnaea* 15 (1841) 208; MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 15; BOERL. *Handl.* 1 (1890) 647; KOORD. *Minah.* (1898) 15. — *Panax secundum* SCHULT. *Syst.* 6 (1820) 215, *nom. superfl. illeg.* —

Panax bandanense ZIPP. ex SPAN. *Linnaea* 15 (1841) 208, *nom. inval. in synon.* — *Paratropia cumingiana* PRESL, *Epim.* (1851) 250. — *Nothopanax pinnatum* (LAMK) MIQ. *Bonplandia* 4 (1856) 139; MIQ. *Fl. Ind. Bat.* 1, 1 (1856) 766; MERR. *Int. Rumph.* (1917) 409; *En. Born.* (1921) 458; HEYNE, *Nutt. Pl.* (1927) 1209; OCHSE & BAKH. *Veg. D.E.I.* (1931) 67, f. 38; CORNER, *Ways. Trees* (1940) 156. — *Nothopanax cumingii* (PRESL) SEEM. *Fl. Vit.* (1865) 114. — *Aralia filicifolia* C. MOORE, *Ill. Hortic.* 23 (1876) 72, t. 240. — *Arthrophyllum pinnatum* (LAMK) CLARKE, *Fl. Br. Ind.* 2 (1879) 734, *pro basionym.* — *Panax cumingiana* (PRESL) ROLFE, *J. Linn. Soc. Bot.* 21 (1884) 310; VIDAL, *Phan. Cuming.* (1885) 117. — ? *Aralia naumannii* E. MARCHAL, *Bot. Jahrb.* 7 (1886) 469. — *Panax crispatum* BULL., *Cat.* (1888) 9. — *Panax ornatum* BULL., *l.c.* — *P. cumingii* (PRESL) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 45. — *P. rumphiana* HARMS, *l.c.* 45; in K. Sch. & Laut. *Fl. Schutzgeb.* (1900) 485; BAKH. *f. & OOSTSTR.* in *Back. Bekn. Fl. Java (em. ed.)* 7 (1948) fam. 159, p. 13; BACK. & BAKH. *f. Fl. Java* 2 (1965) 167. — *Nothopanax crispatum* (BULL) MERR. *Philip. J. Sc.* 7 (1912) Bot. 241. — *Nothopanax ornatum* (BULL) MERR. *l.c.* — *P. filicifolia* (C. MOORE) BAILEY, *Rhodora* 18 (1916) 153. — *P. sorongensis* GIBBS, *Arfak* (1917) 216. — *Anomopanax cumingianus* (PRESL) MERR. *Philip. J. Sc.* 17 (1920) 300; *En. Philip.* 3 (1923) 236.

Glabrous shrub or small tree, to c. 4 m, unbranched or with few branches bearing spirally arranged leaves towards their ends. *Leaves* imparipinnate, up to 100 cm; petiole to 20 cm, with a sheathing base c. 5–6 cm long; petiolules to 3 cm; leaflets ovate-oblong or elliptic, 10–30 by 2–13 cm, apex attenuate or acuminate, base rotund, truncate or broadly cuneate, often oblique, margin entire or minutely and distantly dentate (sometimes pinnatilobed or almost pinnatipartite); midrib and lateral veins evident. *Inflorescence* a large terminal panicle, or with flowering branches also in the axils of the upper leaves; primary axis up to 140 cm with secondary branches mostly in verticils at intervals along its length; secondary branches up to 120 cm, bearing umbellules in an irregularly branched system towards their extremities, peduncles of the umbellules with one or more pairs of small bracts; umbellules with c. 10–20 flowers; pedicels 4–8 mm. *Calyx* a minute rim with 4–5(–6) teeth. *Petals* 4–5(–6), 2 $\frac{1}{2}$ –3 $\frac{1}{2}$ mm long. *Stamens* 4–5(–6), 2 mm long. *Ovary* turbinate, c. 2 mm long, 2–5-celled; styles at first erect, later spreading. *Fruit* subglobose, fleshy, 3–5 mm \varnothing when dry.

Distr. Cultivated throughout the region, and also apparently growing as part of the indigenous vegetation.

Ecol. Rain-forest and secondary growth, usually at low altitude but ascending to 1700 m, native range not very clear.

Uses. A common ornamental shrub, especially

the cultivars with dissected foliage. Also for culinary use.

Vern. (from various sources). Celebes: *dau grisik*, *d. mangko*, *d. papéda pandang*, M, Manado; Philippines: *bani*, Luzon, Albay; Moluccas: *kèndèm*, Ternate, *gurabati*, M; *papua*, Jappen 1.; New Britain: *awalagu*, Gazelle Pen.

OCHSE & BAKHUIZEN VAN DEN BRINK record that the vernacular names applied to *P. fruticosum* also include *P. cumingianum*.

Notes. A complex of forms requiring intensive biosystematic study. I adhere to the view that the Indo-Malayan material is specifically distinct from the Polynesian *Polyscias pinnata* J. R. & G. FORSTER; cf. HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 9, but some cultivated forms included here may have been derived from the Pacific rather than the Indo-Malayan species. Existing herbarium material, though voluminous, is inadequate to determine whether the complex includes species with more limited ranges.

As in 1. *P. fruticosa*, cultivated forms with dissected foliage occur.

See also under 4. *P. scutellaria* for a discussion of the relationship with that species.

I have not seen the type of *Aralia naumannii* MARCHAL which, from the description, I assume to be a synonym.

7. *Polyscias javanica* K. & V. Bijdr. 7 (1900) 13; KOORD. Atlas 4 (1916) f. 679 A-R; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 12; BACK. & BAKH. f. Fl. Java 2 (1965) 167; PHILIPSON, Blumea 24 (1978) 169.

2. Section Gelibia

(HUTCH.) PHILIPSON, Blumea 24 (1978) 169. — *Gelibia* HUTCH. Gen. Fl. Pl. 2 (1967) 57.

Tree with bipinnate leaves. Flowers arranged racemously; style arms free and divergent after anthesis.

Distr. In New South Wales, Queensland, and *Malesia* (New Guinea) 1 *sp.*

8. *Polyscias elegans* (C. MOORE & F.V.M.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; J. Arn. Arb. 20 (1939) 323; PHILIPSON, Blumea 24 (1978) 169. — *Panax elegans* C. MOORE & F.V.M. Trans. Phil. Inst. Vict. 2 (1858) 68; BTH. Fl. Austr. 3 (1866) 383; C. MOORE, Handb. Fl. N.S.W. (1893) 215. — *Nothopanax elegans* (C. MOORE & F.V.M.) SEEM. Fl. Vit. (1866) 114; J. Bot. 4 (1866) 294. — *Tieghemopanax elegans* (C. MOORE & F.V.M.) VIGUIER, Bull. Soc. Bot. Fr. 52 (1905) 308. — *P. branderhorstii* HARMS, Nova Guinea 8 (1910) 274; Bot. Jahrb. 56 (1920) 42; J. Arn. Arb. 20 (1939) 323. — *Gelibia branderhorstii* (HARMS)

Glabrous shrub or sparsely branched small tree, bearing spirally arranged leaves towards the ends of the branches. *Leaves* imparipinnate, c. 70 cm long; petiole c. 17 cm, with a wide membranous sheathing base (c. 7 cm long); petiolules c. 1 cm; leaflets ovate to elliptic-oblong, up to 22 by 8 cm, membranous, apex attenuated, base rounded to broadly cuneate, often oblique, margin entire or minutely distantly dentate, slightly revolute, midrib and lateral veins prominent. *Inflorescence* a panicle; rachis 40 cm, with caducous bracts (reduced leaves or leaf-sheaths), bearing few secondary branches and terminating in a compound umbel; secondary branches with one or more verticils of tertiary branches; peduncles of the umbellules with one obscure bract or none; umbellule of c. 10–20 flowers, pedicels c. 5 mm. *Calyx* an undulate rim, indistinctly 5-dentate. *Petals* 5, 2¹/₂–3 mm long. *Stamens* 5, with very short filaments. *Ovary* turbinate, 1¹/₂ mm high, 5-celled, styles at first erect, later recurved. *Fruit* a globose or obovoid fleshy drupe (prominently 5-ribbed when dry) c. 7 by 5 mm; persistent styles united below, strongly reflexed above.

Distr. *Malesia*: East Java, Lesser Sunda Is. (Lombok, Sumbawa, Sumba).

Ecol. In forest up to 1650 m.

Uses. The root is said to be made into a face powder in Sumbawa.

Vern. Lesser Sunda Is.: *pulosari*, Sumbawa, *amdari*, Sumba.

Note. The vegetative parts are rather similar to those of 6. *P. cumingiana*, but the smaller and simpler inflorescence is distinctive.

HUTCH. Gen. Fl. Pl. 2 (1967) 57. — *Gelibia elegans* (C. MOORE & F.V.M.) HUTCH. l.c. 58

Tree to 20 m high, with a spreading crown of thick branches bearing terminal clusters of large leaves, young parts with fawn to grey scurfy tomentum. *Leaves* bipinnate, becoming glabrous, up to 110 by 50 cm, or larger; petiole c. 13 cm, with a slightly clasping base; petiolules up to c. 1/2 cm; leaflets ovate or elliptic, c. 6 by 3 cm, chartaceous to somewhat leathery, margin entire and slightly revolute, apex with an obtuse apiculum, base cuneate, midrib prominent, lateral veins rather obscure. *Inflorescence* a large panicle,

tomentum persistent especially on the pedicels; primary axis stout, c. 30 cm, bearing secondary axes along its length and in a terminal subumbelate cluster, bracts caducous; secondary axes c. 20–30 cm, bearing tertiary axes (c. 10 cm) along their length; flowers borne racemously along the tertiary axes on pedicels 1–2 mm long. *Calyx* a minute rim. Petals 5, oblong, rather fleshy, spreading at anthesis and soon falling. Stamens 5, 2 mm long on short filaments, soon falling. Ovary scurfy, at first turbinate, globose at anthesis, c. 4 mm high, 2-celled, disk rising to the 2 styles; style arms at first short and pressed together, elongating and diverging after the anthers have fallen. *Fruit* leathery, globose, compressed, c. 5 by 5 mm and irregularly ribbed when dry.

Distr. New South Wales and Queensland; in

Malesia: New Guinea (West Irian, Southern Distr.; Papua, Western & Central Distr.).

Ecol. Gallery and second growth forest in (seasonal) monsoon regions, at low altitudes, up to 300 m.

Notes. The racemose flower arrangement has sometimes been considered sufficiently distinctive to justify the accommodation of this species in a separate genus.

The bark is described as grey or patched grey-brown; the wood as soft and pale; and the cut surfaces having a clear sticky exudate which has a pleasant fragrance. The inflorescence branches are purplish, the petals maroon, the anthers cream to yellow on reddish filaments, and the fruit purplish and smooth.

3. Section *Eupteron*

(MIQ.) PHILIPSON, *Blumea* 24 (1978) 170. — *Eupteron* MIQ. Pl. Jungh. 3 (1855) 420; Fl. Ind. Bat. 1, 1 (1856) 762.

Trees or shrubs with imparipinnate or bipinnate leaves. Flowers in umbellules or capitula; style arms divergent at least in fruit.

Distr. In *Malesia* 6 spp., but the section probably includes the majority of the genus in other parts of the Old World tropics.

Note. With the exception of 14. *P. philipsonii*, the Malesian spp. of sect. *Eupteron* have umbellules or capitula arranged racemously along the main inflorescence branches. The type species of the section (*P. nodosa*) has its flowers in capitula, but this is not considered a sufficient difference to require a separate section.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1. Flowers in capitula | 9. <i>P. nodosa</i> |
| 1. Flowers in umbellules. | |
| 2. Umbellules arranged racemously along the principal rays. | |
| 3. Leaf margins crenate. | |
| 4. Leaflets oblong (Luzon) | 10. <i>P. florosa</i> |
| 4. Leaflets lanceolate (New Guinea) | 11. <i>P. ledermannii</i> |
| 3. Leaf margins entire (rarely with few minute dentations). | |
| 5. Leaflets ovate (Sabah, Palawan) | 12. <i>P. borneensis</i> |
| 5. Leaflets elliptic (New Guinea) | 13. <i>P. belensis</i> |
| 2. Umbellules in a short corymbose compound umbel | 14. <i>P. philipsonii</i> |

9. *Polyscias nodosa* (BL.) SEEM. J. Bot. 3 (1865) 181; F.-VILL. Nov. App. (1880) 102; VIDAL, Phan. Cuming. (1885) 117; Rev. Pl. Vasc. Filip. (1886) 145; BOERL. Handl. 1 (1890) 647; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 44; KOORD. Minah. (1898) 491; K. & V. Bijdr. 7 (1900) 11; MERR. Philip. J. Sc. 1 (1906) Suppl. 110; KOORD. Exk. Fl. Java 2 (1912) 716; Atlas 4 (1916) f. 677 & 678; MERR. Int. Rumph. (1917) 408; Sp. Blanc. (1918) 294; En. Philip. 3 (1923) 233; HEYNE, Nutt. Pl. (1927) 1208; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 12;

BACK. & BAKH. f. Fl. Java 2 (1965) 167; PHILIPSON, *Blumea* 24 (1978) 170. — *Papaya silvestris* RUMPH. Herb. Amb. 1: 149, t. 53 f. 1. — *Aralia nodosa* BL. Bijdr. (1826) 872. — *Paratropia nodosa* (BL.) DC. Prod. 4 (1830) 265; PRESL, Epim. (1851) 250. — *Aralia umbraculifera* ROXB. [Hort. Beng. (1814) 22, nomen;] Fl. Ind. ed. Carey 2 (1832) 108. — *Aralia pendula* BLANCO, Fl. Filip. (1837) 223; ed. 2 (1845) 157; ed. 3, 1 (1877) 283. — *Hedera nodosa* (BL.) HASSK. Tijds. Nat. Gesch. Phys. 10 (1843) 131. — *Eupteron nodosa* (BL.) MIQ. Pl. Jungh. 3 (1855) 420; Fl. Ind. Bat. 1, 1 (1856) 762; Ann.

Mus. Bot. Lugd.-Bat. 1 (1864) 220; HUTCH. Gen. Fl. Pl. 2 (1967) 68. — ? *P. acuminata* VIDAL, Synopsis Atlas (1883) 28, t. 55 f. A, non SEEM. 1865; F.-VILL. Nov. App. (1880) 102. — *P. floribunda* ELMER, Leaflet. Philip. Bot. 10 (1939) 3819, nom. *inv.* in *synon.* — Fig. 28.

Tree to 25 m, unbranched or with few thick branches, bearing tufts of long leaves at their ends, young parts scurfy-tomentose. *Leaves* imparipinnate, multijugate, becoming glabrous or minutely villose on the nerves beneath, up to 2 m (or even 3 m); petiole *c.* 30 cm, to 2 cm \emptyset , with a short sheathing base; leaflets sessile, ovate-oblong commonly 15 by 4 cm, or larger, chartaceous, margin slightly crenate, apex \pm apiculate, base truncate. *Inflorescence* a large panicle (sometimes with additional flowering branches in the axils of the upper leaves), tomentum \pm persistent; primary axis stout, *c.* 1½ m, bearing secondary axes along its length, bracts triangular, *c.* 5 mm long; secondary axes *c.* 20–40 cm; capitula borne racemously along the secondary branches on peduncles *c.* 6–15 mm long. *Flowers* *c.* 8–12 in a capitulum. *Calyx* a minute rim. Petals 5, triangular, 2 mm long. Stamens 5, anthers broadly ovate on short filaments. Ovary turbinate, *c.* 2½ mm high, 5-celled; disk flat, rising to the 5 central erect styles. *Fruit* subglobose (5-ribbed when dry), styles spreading and reflexed.

Distr. Solomon Is. (Bougainville); in *Malesia*: Sunda Straits (Krakatau), Java, Lesser Sunda Is. (Lombok), Celebes, throughout the Philippines and Moluccas (Talaud, Ternate, Sulu Is., Ceram, Ambon, Banda, Tenimber, Aru Is.), New Guinea (eastwards to Milne Bay Distr.).

Recorded doubtfully, on sterile material, from the Andaman Is. by KURZ (Veg. Andam. Is. 1870, 39) but unlikely as it is absent from Sumatra, Malaya, and Borneo.

Ecol. Open thickets and rain-forest, mostly at low altitudes and on small islands, but recorded to 1000 m.

Uses. Used medicinally against purpuric fever and to delay pregnancy (Mindanao). The leaves are used to stupify fish and the wood makes durable fence posts and handles for rice-knives.

Vern. (from various sources). Java: *ki langit*, S, *dëleg*, *djaranan*, *manglé*, *putëngan*, J, *pëngan-pënganan*, Md, *kaju djaran*, *k. lanang*, *rangit*, *tjaliru*, *tua kalap*; Philippines: *bias-bias*, *bingliu*, Tag., Bis., *bungloi*, Bis., *bon liu*, *bungliu*, *goyung-góyung*, Tag., *bungdiu*, Ig., *hagdan-anak*, C.Bis., *mano-máno*, Yak., *malapapáya*, Tag., Bis., Pang., *tukod-lángit*, Tag., Pamp.; Celebes: *kambowa*, *lalusuhan*, *pasusinggala*, (*pohon*) *mamalapa*, *tamalola*, *tundu*; Sulu Is.: *lua*; Moluccas: *kobo-kobo*, Morotai, *bataopus*, Ceram, *papaya utan*, *pata tulan*, *p. tulong*, Ambon, *matanglolan*, Tenimber; West New Guinea: *amorigh*, *laulako*, *sonomdoro*, *totja*.

Note. A widespread, common and noticeable

species. The flowers are described as yellow and as having a fragrant scent. The wood is soft and white.

10. *Polyscias florosa* PHILIPSON, Blumea 24 (1978) 170.

Small tree, up to 10 m, with thick branches bearing terminal clusters of large leaves, glabrescent. *Leaves* imparipinnate, multijugate, up to 2 m; petiole *c.* 25 by 1½ cm, with a short sheathing base; leaflets sessile, oblong, *c.* 22 by 8 cm, chartaceous, margin crenate, apex slightly to long acuminate, base truncate or subcordate. *Inflorescence* a large glabrescent panicle; principal rays over 1 m, up to 3 cm \emptyset , each bearing secondary branches (20–40 cm) along its length; bracts broadly ovate, 1 cm long, caducous; umbellules borne racemously along the secondary branches on peduncles 1–2 cm long (in fruit to *c.* 4 cm). *Flowers* *c.* 6–12 in an umbellule, pedicels 3–5 mm with 2 minute bracts near the middle. *Calyx* an undulate rim. Petals 5, oblong, 3 mm long. Stamens 5. Ovary turbinate, *c.* 2 mm long, 5-celled, disk flat, rising to the 5 central erect styles. *Fruit* subglobose (5-ribbed when dry), 8 by 6 mm, styles spreading and reflexed.

Distr. *Malesia*: Philippines (Luzon; Mt Bulusan, Sorsogon Prov. and Mt Malinao, Albay Prov.).

Ecol. Rarely collected in montane forest, *c.* 560 m.

Note. The leaves are very similar to those of *P. nodosa*, with which this species has often been confused. However the pedicelled flowers are quite distinctive.

11. *Polyscias ledermannii* HARMS, Bot. Jahrb. 56 (1921) 409; PHILIPSON, Blumea 24 (1978) 170. — *Panax murrayi* (non F.v.M.) F.v.M. Descr. Pap. Pl. 7 (1886) 29; BOERL. Handl. 1 (1890) 647. — *P. forbesii* BAKER f. J. Bot. 56 (1923) Suppl. 22. — *P. clemensiana* HARMS, Bot. Jahrb. 69 (1938) 283.

Glabrous tree, to 28 m, with few thick branches bearing terminal clusters of large leaves. *Leaves* imparipinnate, up to 1¼ m; petiole to *c.* 16 cm, base slightly dilated; petiolules *c.* 2–4 mm; leaflets lanceolate or oblong-lanceolate, *c.* 10–20 by 2–4 cm, papyraceous, margin crenulate, apex acuminate, base truncate or rounded, often oblique, midrib prominent, lateral veins numerous, faint. *Inflorescence* a panicle; primary axis stout, *c.* 1.5 cm, bearing crowded secondary axes along its length and in a subumbellate cluster at its apex, bracts triangular, *c.* 3 mm long, caducous; secondary axes 20–30(–40) cm; umbellules borne racemously along the secondary axes (often in subverticils) on peduncles 2–5 cm long, usually bearing 2 minute bracts. *Flowers* *c.* 8–12 in an umbellule, pedicels *c.* 5 mm. *Calyx* a minute rim. Petals 2½ mm long. Stamens 5. Ovary turbinate, 2 mm high, 3–4-celled, disk rising to the central styles. *Fruit*

globose, 4–5 mm high (when dry), 3–4-ribbed, styles 3–4, divergent, persistent.

Distr. *Malesia*: New Guinea (Vogelkop to Milne Bay).

Ecol. In rain-forest, gallery forest and secondary growths, usually above 1500 m (to 3000 m), but occasionally as low as 500 m.

Vern. *Agugwa*, Hagen, *gapin*, Morobe Distr., *gowi*, Efogi lang., *panda panda*, Mendi lang., *puri*, *Kepilan*.

Notes. A common small tree. CARR estimated the height of one specimen as 28 m, but most are considerably smaller. The flowers are described as green. The wood is soft and pale. The plant has a scent resembling celery.

The species closely resembles *P. murrayi* (F.v.M.)

HARMS from Queensland.

12. *Polyscias borneensis* PHILIPSON, J. Bot. 78 (1940) 118; Blumea 24 (1978) 170.

Glabrous shrub or small tree with few thick branches bearing terminal clusters of leaves. *Leaves* imparipinnate, *c.* 50 cm; petiole *c.* 15 cm, base slightly dilated; petiolules *c.* 1 cm; leaflets ovate, up to 10 by 4 cm, coriaceous, margin entire or slightly undulate, apex attenuate, base rounded or broadly cuneate, often asymmetrical, midrib prominent, lateral veins rather obscure. *Inflorescence* a large panicle; primary axis stout, up to *c.* 40 cm, bearing secondary axes along its length and in a subumbellate cluster at its apex, bracts triangular *c.* 5 mm long; secondary axes *c.* 35 cm; umbellules borne racemously along the upper part of the secondary branches on peduncles 2–5 cm long. *Flowers* about 10 in an umbellule, pedicels *c.* 10 mm long. *Calyx* a minute undulate rim. Petals oblong 3 mm long. Stamens 5, oblong *c.* 2½ mm long, filaments 2 mm. Ovary turbinate, 2 mm high, 5-celled, disk rising to the 5 central erect styles. Fruit unknown.

Distr. *Malesia*: N. Borneo (Mt Kinabalu), Philippines (Palawan, Mt Mantalingahan).

Ecol. Montane forest, *c.* 1500 m.

Note. Specimens collected on Palawan by EDAÑO were distributed with the specific epithet '*palawanensis*', but this name was never published.

13. *Polyscias belensis* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 13; Blumea 24 (1978) 170.

Glabrous tree, to 14 m. Branches bearing terminal clusters of large leaves. *Leaves* imparipinnate, up to 80 cm long; petiole *c.* 12–16 cm, base slightly dilated; leaflets subsessile or with a petiolule to 1 cm; leaflets elliptic to narrowly elliptic, *c.* 12 by 3½–6 cm, subcoriaceous, margin entire or sparsely denticulate, slightly revolute, narrowed to an obtuse apex, base cuneate, midrib prominent, lateral veins *c.* 12. *Inflorescence* a panicle; primary axis stout, *c.* 18–22 cm, bearing many secondary branches along its length and in a subumbellate cluster at its apex, bracts caducous; secondary

axes *c.* 22–35 cm, bearing umbellules racemously along their length, bracts triangular *c.* 3 mm long; peduncles *c.* 1½–3 cm. *Flowers c.* 10 per umbellule, pedicels 5–6 mm. *Calyx* a minute rim. Petals 4, oblong. Stamens 4, anthers oblong, 2 mm long, filaments very short. Ovary turbinate, 1½–2 mm high (in anthesis), 4–5-celled, disk flat with 4–5 free styles, at first erect, later divergent. Fruit unknown.

Distr. *Malesia*: New Guinea (West Irian, Bele R. near Lake Habbema; Papua, Morobe Distr., Mt Kaindi and Aseki Patrol area).

Ecol. Infrequent tree in montane forest and regrowth, 1450–2650 m.

Note. The inflorescence is similar to that of 11. *P. ledermannii*, but the shape of the leaflets is distinctive. In the type (from West Irian) the leaf margins are entire, but in the three gatherings from Morobe there are some dentations, and it is possible these are not conspecific. The corolla is maroon (Morobe). The plant has an odour like celery.

14. *Polyscias philipsonii* BERNARDI, Ber. Schweiz. Bot. Ges. 74 (1966) 364; PHILIPSON, Blumea 24 (1978) 170. — *P. fraxinifolia* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 13, non HARMS, 1894.

A sympodial, unbranched, glabrous shrub or epiphyte to 2 m high, with leaves spirally arranged towards the apex, new shoots arising below the inflorescence. *Leaves* imparipinnate, or occasionally 3 leaflets inserted together, or the leaves bipinnate, up to 35 cm long; petiole to 10 cm, with a very short sheathing base; petiolules to 7 mm, leaflets variable in size and shape, broadly or narrowly elliptic, up to 9 by 4½ cm, but usually smaller, narrowed to the apex or apiculate, base cuneate or rounded, margin minutely setose-crenulate, midrib prominent, lateral veins few, arched-ascending. *Inflorescence* a corymb; peduncle short, 1–2 cm, sometimes bearing a reduced leaf or cataphyll distally; primary rays *c.* 5, subequal, *c.* 3–4½ cm, bearing terminal compound umbels (occasionally with a lateral umbel); ultimate umbellules with 6–12 flowers on pedicels *c.* 4 mm long. *Calyx* a minute rim with indistinct teeth. Petals 5, triangular, 2 mm long. Stamens 5, anthers oblong, 1 mm long. Ovary turbinate, *c.* 2 mm high, 5-celled, the fleshy disk rising to the 5 central erect styles. *Fruit* fleshy, globose, 5-ribbed when dry, *c.* 4 by 6 mm, styles persistent, recurved.

Distr. *Malesia*: West New Guinea (Itenburg R.).

Ecol. In mossy forest at 1800 m, and on an exposed slope at 2150 m.

Notes. The short corymbose inflorescence is similar to that in *sect. Palmervandenbroekia*, but the free recurved style arms exclude it from that section.

The shrub is variable in aspect, and may grow as an epiphyte or as an undershrub. The panicle branches are described as purple and the flowers as green.

4. Section *Kissodendron*

(SEEM.) PHILIPSON, *Blumea* 24 (1978) 170. — *Kissodendron* SEEM. *J. Bot.* 3 (1865) 201.

Trees or shrubs with pinnate or bipinnate leaves. Umbellules arranged in diffuse panicles. Style arms fused, forming a beak-like projection on the fruit.

Distr. In *Malesia* (Moluccas and New Guinea) 5 spp., three of which extend to Queensland.

KEY TO THE SPECIES

- | | |
|--|---------------------------|
| 1. Leaves bipinnate. | 15. <i>P. bipinnata</i> |
| 1. Leaves simply imparipinnate. | |
| 2. Leaflets in 3–4(–5) pairs | 16. <i>P. zippeliana</i> |
| 2. Leaflets in more than 5 pairs. | |
| 3. Fruits rotund, c. 8 mm broad | 17. <i>P. royenii</i> |
| 3. Fruits ovoid, c. 4–5 mm broad. | |
| 4. Base of leaflets cuneate | 18. <i>P. schultzei</i> |
| 4. Base of leaflets truncate, subcordate, or rounded | 19. <i>P. australiana</i> |

15. *Polyscias bipinnata* (GIBBS) PHILIPSON, *Blumea* 24 (1978) 170. — *Kissodendron bipinnatum* GIBBS, *Arfak* (1917) 161; HARMS, *Bot. Jahrb.* 56 (1921) 413.

A small tree; branches with spirally arranged leaves towards their ends; young parts brown furfuraceous. *Leaves* bipinnate, 70 by 68 cm; petiole 26 cm, with a short sheathing base; rachis with a pair of leaflets at each articulation; petiolules to 1 $\frac{1}{4}$ cm; leaflets narrowly oblong or ovate, c. 6–12 by 2 $\frac{1}{2}$ –4(–5) cm, apex attenuated, base broadly cuneate or rounded, margin entire, irregularly undulate slightly revolute, midrib prominent. *Inflorescence* a diffuse panicle (sometimes also with flowering branches in the axils of the upper leaves); peduncle c. 6 cm, terminating in few (3) primary rays; primary rays 40–50 cm, bearing verticils of pairs of secondary branches along their length and ending in a compound umbel; umbellules of c. 10–15 flowers on pedicels c. 10 mm long. *Calyx* an undulate rim. Petals 5, 2 $\frac{1}{2}$ mm long. Stamens 5, filaments 1 mm, anthers 1 $\frac{1}{4}$ mm long. Ovary turbinate 2–3-celled, disk with a central stylopodium 1 mm long. Fruit ovoid, fleshy, 5 by 3 mm (when dry) crowned by the calyx rim and the beak-like stylopodium, stigmas minutely capitate.

Distr. *Malesia*: W. New Guinea (Vogelkop: Angi Lakes).

Ecol. Montane forest, at c. 2000 m.

Vern. *Louklouwko*.

Note. The individual leaflets are similar to those of 18. *P. schultzei*, but their bipinnate arrangement is distinctive. The flowers are white.

16. *Polyscias zippeliana* (MIQ.) VALETON, *Bull. Dép. Agr. Ind. Néerl.* 10 (1907) 42; PHILIPSON, *Blumea* 24 (1978) 170. — *Panax zippelianum* MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 15; BOERL.

Handl. 1 (1890) 645; HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 46. — *Nothopanax zippelianum* (MIQ.) SEEM. *Fl. Vit.* (1866) 115. — *Kissodendron australianum* [*non* (F.v.M.) SEEM.] BOERL. *Handl.* 1 (1890) 650. — *P. caroli* HARMS, *Bot. Jahrb.* 56 (1920) 411.

Shrub, 1 $\frac{1}{2}$ –(5) m, with few branches, bearing leaves spirally arranged near their ends, glabrous except a slight rufous tomentum on young parts. *Leaves* imparipinnate, with 3–4 pairs of leaflets, up to c. 60 cm; petiole to 17 cm, with a very short sheathing base; petiolules $\frac{1}{2}$ –1 $\frac{1}{2}$ cm; leaflets oblong, ovate or elliptic, 6–13 by 3 $\frac{1}{2}$ –6 cm, papyraceous, apex attenuate or apiculate, base cuneate, often oblique, margin entire, slightly revolute, midrib and few lateral veins evident. *Inflorescence* a panicle, often appearing lateral by rapid growth of a bud at its base; branches rather fine and wiry, rachis often angled at the nodes, up to c. 60 cm; secondary branches borne singly at wide intervals and in a few rayed terminal umbels, c. 20 cm long, bearing umbellules on side branches and terminally; umbellules with c. 10–15 flowers on pedicels $\frac{1}{2}$ –1 cm long. *Calyx* a minute rim. Petals 5, broadly oblong, 2 mm long. Stamens 5, anthers oblong, 1 mm long, filaments 1 mm. Ovary turbinate, 2 mm high, 2-celled, the fleshy disk rising to the central fused styler column. *Fruit* ovoid, crowned by the prominent stylopodium with a capitate stigma, c. 7 by 4 mm when dry.

Distr. *E. Malesia*: SE. Moluccas (Aru Is.) and New Guinea (S. Irian and southern part of Western Distr. of Papua; also in the Sepik Distr.).

Ecol. In the Aru Is. and S. New Guinea in obviously seasonal savannah country associated with *Acacia* and *Melaleuca* at low altitudes, in the Sepik Distr. in the mountains at c. 1000 m.

Vern. *Mirmur, uwah, perdi-perdi*, W. Irian.



Fig. 30. *Polyscias schultzei* HARMS. a. Habit, $\times \frac{2}{5}$, b. flower and ditto in LS, $\times 10$, c. petal, d. stamens, e. fruit and ditto in CS, $\times 5$ (a-d HOOGLAND & PULLEN 5841, e KALKMAN 4200). Drawn by HELÈNE MULDER.

Notes. The identity of *P. zippeliana* has been discussed by BOERLAGE, VALETON, and HARMS, *l.c.* The short leaf-sheath and the connivent styles place it within *sect. Kissodendron*.

A comparison of the type specimen with the species usually known as *P. caroli* HARMS shows them to be conspecific. The type of *P. caroli* is no longer available but specimens collected by BRASS can be considered authentic as they were identified by HARMS. It should be noted, however, that the type of *P. caroli* is from the Sepik Distr. (probably in rain-forest) at 1000 m, while all other specimens are from the south of the island and from seasonal savannahs at much lower altitudes.

The single gathering from the Aru Is. approaches 19. *P. australiana* having larger leaves with more pairs of leaflets than other gatherings of *P. zippeliana*.

17. Polyscias royenii PHILIPSON, *Blumea* 24 (1978) 170.

Small tree up to 5(–15) m, monocaulous sympodial, persistently rufous-furfuraceous, with leaves spaced along the upper part of the stem. *Leaves* imparipinnate, with *c.* 9 pairs of leaflets, up to 100 cm long or more; petiole to 30 cm, with a short sheathing base; petiolules of mid-leaflets *c.* 8–20 mm; leaflets normally oblong-ovate, broadest near the base, up to 24 by 11 cm, coriaceous, apex attenuated or apiculate, base truncate to subcordate; often oblique, margin entire, irregularly undulate, slightly revolute; midrib prominent, reticulations depressed above (rugose) raised and furfuraceous below. *Inflorescence* a panicle, flowering branches also often present in the axils of the uppermost leaves; rachis up to 60 cm with verticils of secondary branches subtended by caducous unifoliate bracts and a terminal compound umbel; lower secondary branches up to 50 cm, with verticillate tertiary branches and terminal compound umbels; umbellules with 10–20 flowers on furfuraceous pedicels *c.* 8 mm long. *Calyx* a furfuraceous rim, with 5 small teeth. Petals 5, strap-shaped, *c.* 3 mm long, soon falling. Stamens 5. Ovary subcylindric, furfuraceous, *c.* 3 mm long, 2(–3)-celled, the fleshy disk forming a projecting conical stylopodium 2 mm long; stigmas 2, appressed at anthesis. *Fruit* rotund, compressed, with prominent ribs when dry 7–9 by 8–10 mm, crowned by the prominent persistent calyx and a short stout beak-like stylopodium; stigmas short, divergent.

Distr. *Malesia*: New Guinea (Cyclops Mts to the E. Highlands Distr.).

Ecol. Terrestrial or epiphytic in primary or secondary montane forest, 1200–2400 m.

Vern. Irian: *ato*, Kapauku lang.; Papua New Guinea: *habia*, S. Highlands, *magabin*, W. Sepik, *momini*, Mendi lang.

Note. A species readily characterized by the sympodial monocaual habit with thick leathery

leaflets, a large rigid furfuraceous inflorescence, and large, compressed, black fruits with a glaucous bloom.

18. Polyscias schultzei HARMS, *Bot. Jahrb.* 56 (1921) 410; PHILIPSON, *Blumea* 24 (1978) 171. — *P. gjellerupii* HARMS, *Bot. Jahrb.* 56 (1921) 410. — Fig. 30.

Shrub or small tree, often unbranched, 4–20 (–26) m high, young parts densely brown furfuraceous, branches with spirally arranged leaves towards their ends. *Leaves* imparipinnate, to 80 cm long, with *c.* 8–11 pairs of leaflets; petiole up to 35 cm, with a short sheathing base; petiolules *c.* 8 mm; leaflets ovate-lanceolate, oblong or elliptic, up to 14(–17) by 4–5 cm, apex attenuated or acuminate, base broadly cuneate, oblique, margin entire, midrib prominent. *Inflorescence* a diffuse, repeatedly compound umbel, with reduced leaves \pm persistent at the nodes; peduncle usually rather short (*c.* 5 cm) ending in a group of several primary rays (and sometimes with one or more lateral rays); primary rays 50–60 cm, with verticils and a terminal umbel of secondary rays which in turn are branched; umbellules with *c.* 5–10 flowers on fine pedicels *c.* 5–8 mm long (elongating in fruit to 12–15 mm). *Calyx* a minute rim with 4–5 small teeth, usually glabrous but occasionally furfuraceous. Petals 4–5, *c.* 3 mm long. Stamens 4–5, 2 mm long. Ovary \pm cylindric, glabrous or occasionally furfuraceous, *c.* 2 mm long, 2-celled, the fleshy disk forming a blunt stylopodium. *Fruit* ovoid, fleshy, *c.* 5 mm long, crowned by the inconspicuous calyx and the projecting beak-like stylopodium (*c.* 2 mm long); stigmas slightly divergent or capitate.

Distr. Queensland; in *Malesia*: Moluccas (Morotai) and New Guinea (throughout most of the island, from the Vogelkop Peninsula and Japen I. to the Central and Morobe Distr.).

Ecol. Usually in lower and mid-montane rain-forest (with *Castanopsis*, *Nothofagus*, *Lithocarpus*), also in regrowth, usually above 1200 m, ascending to 2400 m, but also descending to near sea-level.

Vern. New Guinea: *atok*, Wissel Lakes, *funim*, Telefomin, *houklouwkô*, Angi Lakes, *paul*, Wabag, *agugwa*, Hagen.

Notes. A widespread and frequently collected species recognized by the multijugate leaves with rather small, thin, attenuate leaflets with cuneate base. The flowers are white to yellowish and the fruits black. The grey bark exudes a small amount of gummy sap; the wood is white.

HARMS recognized that *P. gjellerupii* was very similar and the abundant material now available indicates the variability of this common species.

19. Polyscias australiana (F.v.M.) PHILIPSON, *Blumea* 24 (1978) 171. — *Hedera australiana* F.v.M. *Fragm.* 4 (1864) 120; BTH. *Fl. Austr.* 3 (1866) 384. — *Kissodendron australianum* (F.v.M.)

SEEM. J. Bot. 3 (1865) 201; *ibid.* 6 (1868) 129. — *Irvingia australiana* (F.v.M.) F.v.M. Fragm. 5 (1865) 18.

var. disperma (F.v.M.) PHILIPSON, *Blumea* 24 (1978) 171. — *Kissodendron australianum* (F.v.M.) SEEM. *var. disperma* F.v.M. Descr. Not. Pap. Pl. 5 (1877) 88; HARMES, Bot. Jahrb. 56 (1921) 412.

Small tree, often unbranched, branches with leaves arranged spirally towards their ends, young parts brown furfuraceous. *Leaves* imparipinnate, multijugate, to 1 m long; petiole *c.* 25 cm, with a short sheathing base; petiolules to 1½ cm; leaflets broadly ovate or oblong, broadest near the base, up to 14 by 6 cm, ± coriaceous, apex attenuated to an obtuse apex, or with an obtuse apiculum, base rounded, truncate, or subcordate, oblique, margin entire, slightly revolute, midrib and lateral veins prominent. *Inflorescence* a diffuse panicle (sometimes also with flowering branches in the axis

of the upper leaves); peduncle short, terminating in several primary rays, reduced leaves subtending the principal branches; primary rays *c.* 50 cm, bearing verticils of secondary branches along their length and ending in a compound umbel; umbellules of *c.* 10–15 flowers on pedicels *c.* 8–10 mm long. *Calyx* an undulate rim. Petals 5, *c.* 1½ mm long. Stamens 5, *c.* 1 mm long. Ovary turbinate, 2-celled, a fleshy disk rising to a low conical stylopodium. *Fruit* ovoid, fleshy, 6 by 4 mm (when dry), crowned by the persistent calyx and beak-like stylopodium (2 mm long).

Distr. Malesia: New Guinea (Vogelkop Peninsula and Southern Distr. in Papua).

Ecol. Primary rain-forest at low altitudes and also in lower montane forest at 1750 m.

Note. Distinguished from 18. *P. schultzei* by the leathery leaflets with a truncate base, and from 17. *P. royenii* by the smaller fruits.

5. Section *Palmervandenbroekia*

(GIBBS) PHILIPSON, *Blumea* 24 (1978) 171. — *Palmervandenbroekia* GIBBS, *Arfak* (1917) 162.

Trees or shrubs with imparipinnate leaves. Umbellules arranged in short corymbose compound umbels. Style arms fused, forming a beak-like projection on the fruit.

Distr. Malesia: New Guinea (Vogelkop Peninsula and Cyclops Mts in W. Irian, Western Distr. in Papua).

KEY TO THE SPECIES

1. Pedicels tomentose (at anthesis).
 2. Inflorescence a compact regular compound umbel with rigid rufous branches (Vogelkop and Cyclops Mts) 20. *P. sleumeri*
 2. Inflorescence more open, less regularly branched, with branches becoming ± glabrous (Mt Bosavi, Papua) 21. *P. jacobsii*
1. Pedicels glabrous (at anthesis).
 3. Flower buds lanceolate, stylopodium at anthesis *c.* 2 mm long (Vogelkop, Arfak Mts) 22. *P. palmervandenbroekii*
 3. Flower buds ovoid, stylopodium at anthesis *c.* 1 mm long (Vogelkop, Nettoti Range and Aifat R.) 23. *P. vogelkopensis*

20. *Polyscias sleumeri* PHILIPSON, *Blumea* 24 (1978) 171.

Monocaulous sympodial shrub, 1–1½ m, with leaves spaced along the upper part of the stem; young parts red-furfuraceous. *Leaves* imparipinnate, with 3–4 pairs of leaflets (leaflets occasionally in threes), *c.* 35 cm long; petiole to 9 cm, with a very short sheathing base; petiolules 8–15 mm; leaflets oblong, ovate or elliptic, up to 16 by 6 cm, chartaceous, apex attenuate or apiculate, base rounded or cuneate, margin entire, irregularly undulate, slightly revolute, midrib prominent. *Inflorescence* a compound umbel, red-furfuraceous

(stem growth renewed by a bud between the inflorescence and the uppermost leaf); peduncle 3–6 cm, bearing scars of caducous reduced leaves, occasionally with a lateral umbellule, and ending in an umbel of *c.* 7 primary rays; primary rays 1–2½ cm, sometimes with a minute bract near the middle; umbellule with 10–20 flowers on pedicels 2–3 mm long, densely furfuraceous. *Calyx* a rim with 5 broad teeth. Petals 5, broadly oblong, 3–4 mm long. Stamens 5, anthers 1 mm long, filaments 2 mm. Ovary turbinate, 2 mm high, 2-celled, the fleshy disk forming a projecting conical stylopodium; stigmas 2 appressed at anthesis.

Fruit rotund to ovoid compressed 5–6 by 5 mm crowned by the prominent persistent calyx and the beak-like stylopodium (2–2½ mm long); stigmas not prominent.

Distr. Malesia: New Guinea (Vogelkop Peninsula and Cyclops Mts).

Ecol. Undergrowth in primary forest, 450–1000 m.

Note. The flowers are creamy white, the fruit dark red.

21. *Polyscias jacobii* PHILIPSON, Blumea 24 (1978) 171.

A monocaulous sympodial shrub to 3 m high, with leaves spaced along the upper part of the stem, young parts furfuraceous. *Leaves* imparipinnate, 4–5 pairs of leaflets (leaves of juveniles smaller with fewer leaflets), c. 45 cm long; petiole to 12 cm, with a short sheathing base; petiolules 1–1½ cm; leaflets oblong or elliptic, c. 12 by 4 cm, chartaceous, apex attenuate or caudate, base truncate or cuneate, margin entire, irregularly undulate, slightly revolute, midrib prominent. *Inflorescence* a compound umbel (stem growth renewed by a bud between the inflorescence and the uppermost leaf); peduncle 1–4 cm (sometimes bearing a unifoliolate leaf about the middle with an axillary flowering branch), ending in an umbel of 2–4 primary rays; primary rays sometimes subtended by 1–2 unifoliolate leaves, c. 4 cm long, ending in 2–3 tertiary rays which may branch again before ending in umbellules; umbellules with 6–10 flowers on furfuraceous pedicels c. 8 mm long. *Flower buds* with an apical umbo. *Calyx* a rim with 5 acute teeth. Petals 5, attenuated. Stamens 3 mm long, anthers 1½ mm long. Ovary subcylindric, furfuraceous, 4 mm high, 2-celled, disk forming a projecting conical stylopodium (1½ mm long at anthesis), stigmas 2. *Fruit* rotund, compressed, 8 by 9 mm, crowned by the small calyx and the persistent stylopodium (2 mm long) with subcapitate stigmas.

Distr. Malesia: New Guinea (Papua: Mt Bosavi). Only known from the type.

Ecol. On old well-drained volcanic soil in primary mixed forest, mostly on ridges and upper slopes, 1600–2100 m.

Note. An aromatic, single-stemmed shrub. The flowers are white and the fruit dark purple.

22. *Polyscias palmervandenbroekii* BERNARDI, Candollea 26 (1971) 16; PHILIPSON, Blumea 24 (1978) 171. — *Palmervandenbroekia papuana* GIBBS, Arfak (1917) 162, f. 15, non *P. papuana* SEEM. 1865.

Glabrous shrub, c. 1½ m, sparsely branched, with leaves spaced along the upper parts of the stems. *Leaves* imparipinnate, with 3–5 pairs of leaflets, up to 13 cm long; petiole to 4 cm, slightly channelled above, with a very small sheathing

base; petiolules 0–5 mm; leaflets lanceolate, obovate to elliptic, 1¼–4 by ¾–2 cm, coriaceous or chartaceous, apex attenuated (sometimes emarginate) to apiculate, base cuneate, margin entire, revolute, midrib prominent, lateral veins obscure. *Inflorescence* a simple or compound umbel; peduncle slender, c. 2 cm; primary rays (when present) few, c. 1 cm; umbellules of c. 10 flowers on glabrous pedicels 3–6 mm long. *Flower buds* lanceolate, acute, 3–6 mm. *Calyx* a rim with 5 broad teeth. Petals 5, attenuate, 5–8 mm long. Stamens 5, filaments c. 3 mm, anthers c. 1 mm. Ovary turbinate, striate, 2 mm high, 2-celled, disk projecting as a conical stylopodium (2 mm long). *Fruit* ovoid, compressed, 6 by 5 mm, crowned by the persistent calyx and the beak-like stylopodium; stigmas 2, small, divergent.

Distr. Malesia: New Guinea (Vogelkop: Arfak Mts).

Ecol. In summit heath vegetation (*Tristania-Dacrydium* scrub) and *Nothofagus* forest, 1900–2400 m.

Note. Collections made since the original description show that this interesting plant is quite variable as regards leaf-shape, texture and amount of rolling of the margin, and also in the size of its flowers. The calyx is purplish brown, the petals reddish purple outside and white within. The ripe fruit is purplish black. The thin papery bark is light grey.

23. *Polyscias vogelkopensis* PHILIPSON, Blumea 24 (1978) 171.

An often monocaulous sympodial shrublet usually under 1 m high, with leaves spaced along the upper parts of the stem; young parts slightly furfuraceous, but soon becoming glabrous. *Leaves* imparipinnate, with 3–4 pairs of leaflets (leaflets occasionally in threes) variable in size; petiole 2–7 cm, slightly channelled above with a short inconspicuous sheathing base; petiolules 2–8 mm; leaflets elliptic or ovate, 3–12 by 1¼–4 cm, chartaceous, apex attenuated or apiculate, base broadly to narrowly cuneate, margin entire, irregularly undulate (occasionally with isolated dentations) slightly revolute, midrib prominent. *Inflorescence* a small compound umbel; peduncle up to 8 cm, occasionally with a lateral or basal umbellule, ending in c. 2–3 primary rays (sometimes subtended by a reduced leaf); primary rays 1–2 cm; umbellules with c. 10–15 flowers on glabrous pedicels c. 3–6 mm long. *Flower buds* ovoid, obtuse. *Calyx* a rim with 4–5 broad undulations. Petals 4–5, broadly oblong, 4 mm long. Stamens 4–5, anthers 1 mm, filaments 3 mm. Ovary turbinate, 2 mm high, 2-celled, the fleshy disk rising to a conical stylopodium (1 mm long); stigmas 2, appressed at anthesis. *Fruit* ovoid, compressed, 5 by 4 mm, crowned by the persistent calyx and the prominent beak-like stylopodium; stigmas inconspicuous.

Distr. *Malesia*: New Guinea (Vogelkop and Wandammen Peninsula, Nettoti Range and Aifat R.).

Ecol. Primary submontane forest (*Nothofagus*, *Castanopsis*, and conifers), heath vegetation, or in open places, 1200–2000 m.

Note. A delicate subshrub, often unbranched. The material from Aifat R. has larger leaves than that from the Nettoti Range. The flowers are cream or light yellow, and the fruits orange with black stylopodium.

Insufficiently known

Polyscias disperma BLANCO, Fl. Filip. (1837) 226; MERR. Sp. Blanc. (1918) 384; En. Philip. 3 (1923) 233. — Philippines.

MERRILL (1923, *l.c.*) stated that this name was excluded by BLANCO from his 2nd edition, and that it is unrecognizable from the very short and imperfect description. Possibly a *Rubiaceae*.

Polyscias roemeriana HARMS, Bot. Jahrb. 56 (1921) 411. — New Guinea.

I have seen no authentic specimens of this species. Evidently it is related to *P. palmervandenbroekii* by reason of its connivent styles, its short inflorescence, and its small leaflets. However, bipinnate leaves are not known in that species.

Excluded

Polyscias joskei L. S. GIBBS, J. Linn. Soc. Bot. 39 (1909) 149. — This species was by error ascribed by Index Kewensis to the Philippines; it is from Fiji.

11. MACROPANAX

MIQ. Fl. Ind. Bat. 1, 1 (1856) 764; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 13; BTH. in B. & H. Gen. Pl. 1 (1865) 945; BOERL. Handl. 1 (1890) 643; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 47; HUTCH. Gen. Fl. Pl. 2 (1967) 80. — *Hederopsis* CLARKE, Fl. Br. Ind. 2 (1879) 739; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 56; KING, J. As. Soc. Beng. 67, ii (1898) 62; HUTCH. Gen. Fl. Pl. 2 (1967) 78; STONE, Gard. Bull. Sing. 30 (1977) 141. — **Fig. 31.**

Small, unarmed trees. *Leaves* digitately compound or unifoliolate; petiole terete, with a sheathing base; stipules inconspicuous; leaflets entire or denticulate. *Inflorescence* a terminal panicle of umbellules. Pedicels articulated below the ovary. *Flowers* bisexual or on lower branches male. *Calyx* 5–6-dentate. Petals 5–6, valvate. *Stamens* 5–6, extrorse. Ovary inferior, 2–6-celled. Disk fleshy with the styles united below. *Fruit* ellipsoid or obovate, surmounted by an awl-shaped or conical stylopodium; exocarp fleshy, endocarp crustaceous. Endosperm ruminant.

Distr. 4 *spp.* from India, Burma and southern China to *West Malesia*: 3 *spp.*, Sumatra, Malaya and Java.

Ecol. Lowland and montane rain-forest.

Notes. *Hederopsis* is united with *Macropanax* because the species are very similar in appearance and in their technical characters. The sole difference is the number of cells in the ovary, 2 (or sometimes 3) in *Macropanax* and 5–6 (sometimes 4) in *Hederopsis*. This distinction does not seem adequate to split a few very similar species into distinct genera.

This genus is distinguished from *Pseudopanax* (China, New Caledonia, Tasmania, New Zealand, Chile) by the ruminant endosperm. Cf. PHILIPSON, New Zeal. J. Bot. 3 (1965) 333.

KEY TO THE SPECIES

1. Ovary 2-celled.
2. Ovary broadly campanulate, not ribbed; 'epicalyx' below ovary distinct. Leaf margin usually distinctly serrate. Inflorescence branches usually bearing lateral umbellules. 1. *M. dispermus*
2. Ovary narrowly turbinate, strongly ribbed; 'epicalyx' below the ovary absent. Leaf margin entire or minutely dentate. Inflorescence branches usually without lateral umbellules 2. *M. concinnus*
1. Ovary 5- or 6-celled 3. *M. maingayi*

1. *Macropanax dispermus* (BL.) O. K. Rev. Gen. Pl. 1 (1891) 271; KOORD. Exk. Fl. Java 2 (1912) 716, 717; Atlas 4 (1916) f. 681 & 682 F-P; Fl.

Tjib. 2 (1923) 227; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 14; BACK. & BAKH. f. Fl. Java 2 (1965) 168. — *Aralia*

disperma BL. Bijdr. (1826) 872. — *Hedera disperma* (BL.) DC. Prod. 4 (1830) 265. — *Aralia calyculata* Z. & M. in Mor. Syst. Verz. (1846) 41. — *M. floribunda* MIQ. Fl. Ind. Bat. 1, 1 (1856) 764. — *M. oreophilus* MIQ. l.c. 764; Suppl. (1860) 135; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 13; KURZ, For. Fl. Burma 1 (1877) 541; CLARKE, Fl. Br. Ind. 2 (1879) 738; BOERL. Handl. 1 (1890) 644; K. & V. Bijdr. 7 (1900) 16.

Small tree, up to 18 m. *Leaves* dispersed along the shoots; petiole to 25 cm, striate, with a small basal sheath, the connate stipules forming a small ligule within the petiole; leaflets 5–7, petiolules up to c. 5 cm (the lateral shorter); blade elliptic or oblanceolate, usually c. 10–23 by 2½–9 cm, gradually tapered to an acute apex, base cuneate, rounded or oblique, margin coarsely dentate or sometimes only finely serrate, glabrous when mature. *Inflorescence* a panicle of umbellules, often stellate-furfuraceous, with a stout rachis to 40 cm and lateral (secondary) branches which terminate in umbellules, and which commonly bear tertiary branches. Pedicels c. 5–7 mm, with a distinct involucre ('epicalyx') around the base of the flower. *Calyx* rim undulate or indistinctly dentate, puberulous. Petals 2–3 mm long. Ovary subglobose, c. 2½ mm high. Disk fleshy, surmounted by an awl-shaped stylar column, which bifurcates at apex. *Fruit* ovate, 1 by ½ cm, crowned by the persistent stylar column.

Distr. India, Burma, and southern China; in *Malesia*: Sumatra, Malay Peninsula, and throughout Java.

Ecol. Mountain rain-forests, 1000–2300 m, in Java especially in Central and East Java.

Vern. Java: *panggang puju*, *p. serem*, *p. siju*, *ramo-gentjel*, *tjerem*, *S. pampung*, *sahang*, *tanganan*, *J. konjingal*, *Md.*

2. *Macropanax concinnus* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1864) 220; BOERL. Handl. 1 (1890) 643; K. & V. Bijdr. 7 (1900) 18; KOORD. Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 682 Q–W. — *M. undulatus* (WALL. ex G. DON) SEEM. J. Bot. 2 (1864) 294, *pro specim. malac.*; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 14; BACK. & BAKH. f. Fl. Java 2 (1965) 168.

Small tree, up to 15 m. *Leaves* dispersed along the shoots; petiole slender, to 20 cm, with a small basal sheath, the connate stipules forming a small ligule within the petiole; leaflets 5 or 3, petiolules slender, up to c. 5½ cm (the lateral shorter); blade elliptic, usually c. 7–15 by 2½–5 cm, gradually tapered to a caudate-falcate acuminate apex, base narrowly cuneate, or rarely obtuse, often oblique, margin entire or sometimes a few very fine serrations, glabrous, membranous. *Inflorescence* a panicle of umbellules, minutely stellate-pubescent, with a stout rachis to 30 cm, and lateral (secondary) branches which terminate in umbellules; pedicels c. 6–7 mm, only slightly swollen at the articulation.

Calyx rim undulate or indistinctly dentate. Petals c. 2 mm long. Ovary narrowly turbinate with distinct longitudinal ribs, c. 2 mm high. Disk fleshy, surmounted by an awl-shaped stylar column. *Fruit* ovate, 8 by 4 mm, crowned by the persistent stylar column.

Distr. *Malesia*: widespread in Java, but local and uncommon.

Ecol. Damp mountain forests, descending to lower altitudes (400 m) than the preceding species.

Vern. *Djampang tjerem*, *panggang puju*, *S. tanganan*, *J.*

Notes. This species has sometimes been identified with *M. undulatus* (WALL. ex G. DON) SEEM. from the Himalayan region, but that species differs in the more verticillate inflorescence branches, the large involucre around the umbellule, the hermaphrodite flowers more confined to the terminal umbellules, and the broader less prominently ribbed fruit. A considerable geographical gap separates the two species.

A specimen collected by GRIFFITH labelled 'Malacca' is perhaps *M. undulatus*, but the locality may be incorrect.

3. *Macropanax maingayi* (CLARKE) PHILIPSON, *comb. nov.* — *Hederopsis maingayi* CLARKE, Fl. Br. Ind. 2 (1879) 739; RIDL. Fl. Mal. Pen. 1 (1922) 888; STONE, Gard. Bull. Sing. 30 (1977) 287, f. 7. — *Arthrophyllum trifoliatum* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 42. — *Hederopsis major* RIDL. Kew Bull. (1929) 124. — Fig. 31.

Small tree, up to 15 m. *Leaves* dispersed along the shoots; petiole to 20 cm, striate, with a small basal sheath; leaflets 5, or (below the inflorescence) 3 or 1, petiolule of the central leaflet to 6 cm, of the lateral leaflets much shorter (c. 1 cm); blade elliptic or ovate, up to 20 by 8 cm, base rounded or broadly cuneate, apex acuminate, margin denticulate or nearly entire, membranous or chartaceous. *Inflorescence* a terminal panicle of umbellules, with a stout rachis to 20 cm, terminating in an umbellule and bearing lateral secondary branches (c. 12 cm) which also terminate in umbellules and bear racemously arranged tertiary branches (c. 4 cm) which terminate in umbellules; umbellules terminating the primary and secondary branches with hermaphrodite flowers, those terminating the tertiary branches smaller and apparently mostly functionally male. *Flowers* of small umbellules usually 5-merous, of larger umbellules usually 6–7-merous, pedicels c. 1 cm at anthesis, slightly elongating in fruit. *Calyx* rim obscurely dentate. Petals of terminal flowers c. 3 mm long, fleshy. Ovary subglobose, c. 2 mm high; disk fleshy surmounted by the style arms which become divergent in their upper part at anthesis. *Fruit* enlarging to a drupe 2 by 1 cm with a persistent calyx rim and a prominent conical stylopodium tapering into the stylar column bearing the recurved distal parts of the styles.



Fig. 31. *Macropanax maingayi* (CLARKE) PHILIPSON. *a.* Leaf and upper branches of inflorescence, $\times \frac{2}{5}$, *b.* flower bud and CS of ovary, $\times 2$, *c.* flower, $\times 2$, *d.* fruit, slightly enlarged (Phytochem. Surv. Mal. 2519). Drawn by W. R. PHILIPSON.

Distr. Tonkin; in *Malesia*: Malay Peninsula (from Kedah southwards) and Central Sumatra (East Coast Res. and Mt Kerintji).

Ecol. Uncommon, in forest, up to 1050 m.

Note. The trunk may have small buttresses, the bark is rugose with large lenticels, and produces a watery exudate when cut. The flowers are greenish yellow.

12. ANAKASIA

W. R. PHILIPSON, *Blumea* 21 (1973) 87, fig. on p. 88. — Fig. 32.

Shrub with large, simple, exstipulate leaves. *Inflorescence* axillary; rachis bearing racemously arranged umbellules. Pedicels very short with an articulation below the flower. *Calyx* a short rim with minute lobes. Petals 5 or 6, valvate, triangular. *Stamens* 5 or 6, filaments thick, anthers large, dorsifixed. Ovary inferior, broadly obconic, (4-)5-6-celled. Disk fleshy with (4-)5-6 stylar arms. *Fruit* broadly obovoid, strongly ribbed when dry; exocarp fleshy. Pyrenes compressed, crustaceous; endosperm smooth.

Distr. *Malesia*: West New Guinea. Monotypic.

Note. The large, simple, oblanceolate leaves clustered at the ends of the branches recall *Meryta*, but the flowers do not share the highly distinctive features of that genus. The floral and fruit characters are not unlike those of *Polyscias* (e.g. there is an articulation below the flower, the style arms are free, and the endosperm is smooth), but the general facies is unlike that genus, and this, together with the distinctive inflorescence and leaf, make the plant quite distinct from any species of *Polyscias*.

1. *Anakasia simplicifolia* W. R. PHILIPSON, *Blumea* 21 (1973) 87, fig. on p. 88. — Fig. 32.

Glabrous shrub, 5 m, branches marked with prominent lenticels. *Leaves* crowded at the ends of the branches, sessile or with a very short petiole, lanceolate, up to 135 by 18 cm, narrowed gradually to the base, apex acuminate, margin entire or undulate, midrib prominent, lateral veins arching upwards, reticulation rather indistinct. *Inflorescence* rachis simple or forked, to 70 cm, at maturity 5 mm \varnothing , bearing small lanceolate bracts. Peduncles arising from the axils of all but the lowest bracts, 3-4 mm long, elongating to c. 15 mm in fruit. Umbellules with c. 11 minute bracts. *Flower buds* when dry c. 3 mm long. *Calyx* rim with 5-6 minute teeth. Petals slightly fleshy, 2 mm long. *Stamens* 5-6, filaments broad; anthers 4-celled, $\frac{3}{4}$ mm long. Ovary glabrous. Disk with a central boss formed by closely appressed subulate arms which soon

recurve and spread beyond the calyx. *Fruit* with (4-)5-6 prominent ridges when dry, c. 2 by $1\frac{1}{2}$ cm, with the persistent style arms in a terminal depression.

Distr. *Malesia*: West New Guinea (Vogelkop Peninsula and near Babo).

Ecol. Primary forest near sea-level.

Note. BECCARI described (*in sched.*) the inflorescence branches as erect in flower and reflexed in fruit. He noted that the outer flowers of the umbellules are probably male and those at the centre female, though he could not be certain of this. His observations cannot be confirmed from the material available. Evidently all flowers are structurally hermaphrodite, but all developing fruits seen are attached to central pedicels. The corolla is green and soon falls, the disk yellow, the anthers cream, and the mature fruit blue (azure-violet) and aromatic.

13. BRASSAIOPSIS

DECNE & PLANCH. *Rev. Hort.* IV, 3 (1854) 106; BTH. in B. & H. *Gen. Pl.* 1 (1865) 945; CLARKE, *Fl. Br. Ind.* 2 (1879) 735; BOERL. *Handl.* 1 (1890) 643; HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 42; KING, *J. As. Soc. Beng.* 67, ii (1898) 61; NGOC-SANH BUI, *Adansonia* 6 (1966) 437, pl. 1 (map); HUTCH. *Gen. Fl. Pl.* 2 (1967) 79; STONE, *Gard. Bull. Sing.* 30 (1977) 280. — *Araliopsis* KURZ, *Rep. Andam.* (1870) 39, *nom. inval.*, in *synon.*, non ENGLER, 1896. — *Wardenia* KING, *J. As. Soc. Beng.* 67, ii (1898) 60; HARMS in E. & P. *Nat. Pfl. Fam. Nachtr.* 2

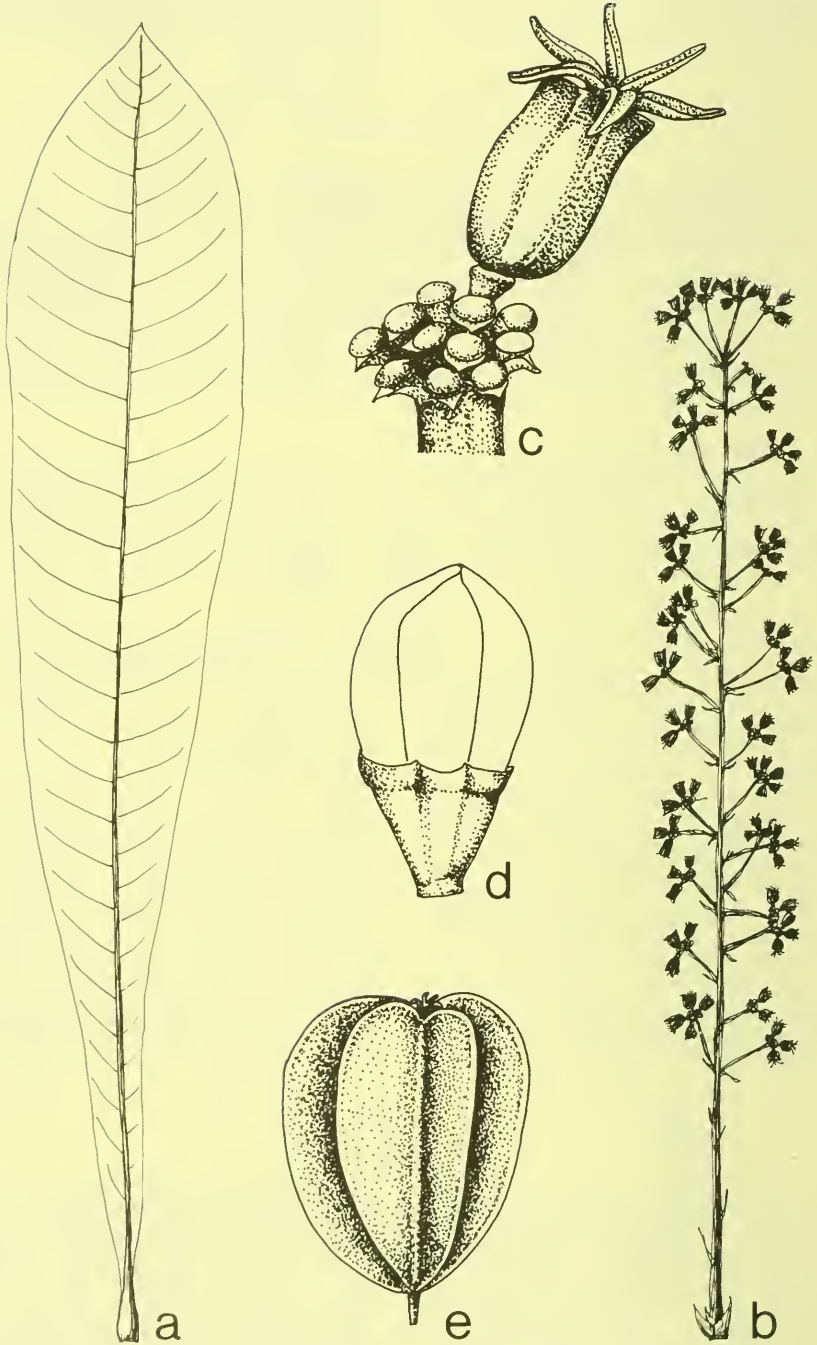


Fig. 32. *Anakasia simplicifolia* PHILIPSON. *a.* Leaf, $\times \frac{1}{7}$, *b.* inflorescence, $\times \frac{1}{3}$, *c.* single umbellule with an immature fruit, *d.* flower bud, $\times 12$, *e.* immature fruit, $\times 2$ (BECCARI PP 282).

(1900) 51; RIDL. Fl. Mal. Pen. 1 (1922) 887; HUTCH. Gen. Fl. Pl. 2 (1967) 81; cf. FRODIN, Misc. Rec. Found. Fl. Males. 3 (1973) 8. — *Euaraliopsis* HUTCH. Gen. Fl. Pl. 2 (1967) 80, 624. — *Pseudobrassaiopsis* BANERJEE, J. Bomb. Nat. Hist. Soc. 72 (1975) 71. — Fig. 33, 34.

Shrubs or trees, usually prickly and tomentose. *Leaves* digitately compound, palmately lobed or simple, with a sheathing base and a usually bicuspid ligule; petiole terete. *Inflorescence* usually a terminal panicle of umbellules, often with persistent small bracts; pedicel not articulated below the ovary. *Calyx* rim 5-dentate. Petals 5, valvate. *Stamens* 5, extrorse. Ovary inferior, 2-celled; disk shallow; styles united into a usually long column. *Fruit* globose, exocarp fleshy, endocarp chartaceous; seed 2, not compressed, endosperm smooth.

Distr. More than 20 *spp.*, extending from India, Tibet and southern China to *West Malesia*: Sumatra, Malay Peninsula and W. Java. In Malesia 6 *spp.*, 1 endemic in Sumatra, 3 endemic in the Malay Peninsula, 2 in Indo-Malaya.

Ecol. Understorey of damp evergreen forest, mostly in mountainous districts, up to 2400 m.

Notes. A genus characterized by the 2-celled ovary, columnar style, and non-articulated pedicel, combined with leaves which may be either entire, palmately lobed, or digitately compound. Possibly close to *Trevesia*, which is similar vegetatively, but which has more massive inflorescences and ovaries with more numerous cells.

In dividing the species into two genera merely on the basis of leaf shape, HUTCHINSON *l.c.* fragmented what appears to be a coherent assemblage.

KEY TO THE SPECIES

1. Inflorescence shorter than the petioles (or at most about equal to them). Leaves palmately lobed, but variable in the variety 1. *B. sumatrana*
1. Inflorescence much longer than the petioles.
 2. Leaves simple, entire, minutely and remotely dentate.
 3. Leaf base subcordate; blade to 35 cm or more long; petioles *c.* 15 cm, 5 mm \varnothing . . . 2. *B. simplex*
 3. Leaf base cuneate or rounded; blade to 25 cm long; petioles *c.* 7 cm, 2 mm \varnothing . . . 3. *B. minor*
 2. Leaves palmately lobed or digitately compound (occasionally some simple).
 4. Leaves palmately lobed 4. *B. polyacantha*
 4. Leaves digitately compound.
 5. Branches of the inflorescence bearing several umbellules racemosely (as well as one at end); umbellules with *c.* 25–35 flowers 5. *B. glomerulata*
 5. Branches of the inflorescence bearing a terminal umbellule only (or occasionally with separate flowers below it); umbellule with *c.* 10–13 flowers 6. *B. elegans*

1. *Brassaiopsis sumatrana* RIDL. J. Fed. Mal. St. Mus. 8, 4 (1917) 43. — *Kalopanax sumatranum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 17, heterotypic; BOERL. Handl. 1 (1890) 647; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 51. — ? *Kalopanax resectum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 18, see note below. — *Euaraliopsis sumatrana* (RIDL.) HUTCH. Gen. Fl. Pl. 2 (1967) 624.

var. sumatrana.

Shrub or small tree, to 15 m, with stout prickly branches, rufous-tomentose in its younger parts. *Leaves* palmately lobed, clustered at the ends of the shoots; petiole *c.* 15–32 cm, striate, sometimes with prickles, with an enlarged basal sheath and a small bicuspid ligule; blade rounded, cordate, *c.* 14–22 by 20–28 cm, palmately 5–7-lobed,

lobes elliptic acuminate, midrib prominent and lateral veins widely spaced and arched-ascending, margin irregularly spinulose-serrate. *Inflorescence* a short, rufous-tomentose panicle, arising below the leaves (actually terminal but overtopped by sympodial innovations); rachis *c.* 4–6 cm, lateral branches ascending, *c.* 2–4 cm, subtended by small linear bracts and sometimes branching to the third degree; umbellules with *c.* 8–20 flowers; pedicels *c.* 1 cm long, subtended by numerous minute bracts. *Calyx* a minute rim with 5 indistinct teeth. Petals 5, triangular, 2½ mm long. Stamens 2 mm long, anthers oblong, 1 mm long. Ovary obconic, *c.* 2 mm high; disk fleshy, cushion-shaped, surmounted by a slender awl-shaped styler column. *Fruit* subglobose, *c.* 8 mm high, with a persistent calyx-rim and styler column.



Fig. 33. *Brassaiopsis elegans* RIDL. a. Habit, $\times \frac{2}{5}$, b. fruit and ditto in CS, $\times 4$ (Kloss 1912). Drawn by P. PRENDERGAST.

Distr. *Malesia*: West Sumatra (Mts Kerintji, Merapi, Singalang).

Ecol. Montane, evergreen forest, 1500–2400 m. Vern. *Semontong*, Karo.

Notes. The foliage is similar to that of 4. *B. polyacantha* and of *Trevesia sundaica*, but the small inflorescence is distinctive. The prickles persist on the older branches and the trunk. The petals and filaments are white, the anthers light purple, and the disk yellow.

Kalopanax resectum MIQ. *l.c.*, described on a KORTHALS collection from Sumatra, possibly belongs here, but the inflorescence may be larger and most leaves are decidedly digitately compound. Possibly it represents a hybrid between *B. sumatrana* and 5. *B. glomerulata*.

var. variaefolia PHILIPSON, *var. nov.* — *B. ovalifolia* RIDL. J. Fed. Mal. St. Mus. 8, 4 (1917) 43.

Frutex var. sumatrana humilior et tenerior, foliis secus ramis dispersis, inermis. Folia minora (10–20 cm longa) forma variantia etiam in eodem ramo, vel simplicia et ovata, vel profunde bi- vel trilobata, vel digitatim composita. — *Typus*: W. MEIJER 7200 (L), Mt Sago near Pajakumbuh, W. Sumatra, 1000–1200 m, 8–VIII–1957.

A smaller, more delicate and unarmed shrub than *var. sumatrana*, with the leaves scattered along the branches. Leaves smaller (10–20 cm long) and variable in shape, even on the same branch, being either simple and ovate, or deeply bi- or trilobed, or digitately compound.

Distr. *Malesia*: Central West Sumatra.

Ecol. Montane, evergreen forest, 1000–1200 m.

Note. It is possible that RIDLEY was correct in regarding this as a distinct species, but the size and shape of the inflorescence links it with *B. sumatrana*, and the variable form of the leaf suggests that it may be no more than an extreme form of *B. sumatrana*. Nevertheless, typical forms of that species, with their stout prickly stems and rather coarse palmately lobed leaves, are very distinct. On the evidence available it is not possible to decide whether this variety consists of shade and/or juvenile forms of *B. sumatrana*, or whether it should constitute a distinct species.

2. *Brassaiopsis simplex* (KING) STONE, Gard. Bull. Sing. 30 (1976) 282, f. 3. — *Wardenia simplex* KING, J. As. Soc. Beng. 67, ii (1898) 60; HARMS in E. & P. Nat. Pfl. Fam. Nachtr. 2 (1900) 51; RIDL. Fl. Mal. Pen. 1 (1922) 887; HUTCH. Gen. Fl. Pl. 2 (1967) 81; PHILIPSON, J. Linn. Soc. Bot. 63, Suppl. (1970) 90.

Shrub, to 5 m high, branches prickly, rufous-tomentose in its younger parts. Leaves large, simple, coriaceous, clustered towards the tips of the branches; petiole *c.* 14–20 cm, stout, striate, with a basal sheath and a short, bicuspid ligule; blade ovate, *c.* 35–40 by 12–18 cm, apex shortly acuminate, base slightly cordate, rufous-stellate

hairs persistent beneath, midrib prominent, lateral veins very widely spaced, arched ascending, margin minutely dentate. *Inflorescence* a panicle of umbellules; rachis *c.* 10–20 cm; lateral branches reflexed, 5–12 cm, subtended by small lanceolate bracts and often bearing 1–2 bracts from which tertiary branches arise; umbellules with *c.* 10–20 flowers; pedicels 1¼–2 cm, slender, subtended by numerous minute bracts. *Calyx* a narrow rim with 5 indistinct teeth. Petals 5, falling as a calyptra. Stamens 2 mm long, anthers oblong. Ovary obconic, *c.* 2 mm high, disk cushion-like, surmounted by an awl-shaped stylar column 1½ mm long. *Fruit* globose, fleshy, *c.* 5 mm \varnothing , with a persistent calyx rim and a stylar column *c.* 2 mm long.

Distr. *Malesia*: Malay Peninsula (Perak, Selangor).

Ecol. In open bamboo forest, 100–800 m.

Note. Originally described as a distinct genus because of its supposedly 1-celled ovary. RIDLEY (1922) did not include this feature in his description. He distinguished *Wardenia* from *Brassaiopsis* because of its simple leaves, but several species of *Brassaiopsis* from further north also have undivided leaves. Both HARMS (1900) and HUTCHINSON (1967) accepted the original statement that the ovary is 1-celled at the time of flowering, but I found the ovary to be 2-celled even in the young state (1970, *l.c.*).

3. *Brassaiopsis minor* STONE, Gard. Bull. Sing. 30 (1976) 282, f. 5.

Small shrub, *c.* 60 cm, with very few small prickles, rufous tomentose on its young parts. Leaves simple, spaced towards the ends of the branches, subcoriaceous; petiole 5–8 cm, *c.* 2 mm \varnothing , with a basal sheath and a small ligule; blade elliptic or ovate 20–26 by 10–12 cm, apex shortly acuminate, base rounded to cuneate, rufous stellate hairs persistent beneath, midrib prominent, lateral veins widely spaced, arched ascending, margin minutely and remotely dentate. *Inflorescence*: peduncle short, bearing lanceolate bracts; umbellules on short lateral branches, with 15–20 flowers on slender pedicels *c.* 1½ cm long, subtended by minute puberulent bracts. *Calyx* with 5 indistinct teeth. Ovary rotund, surmounted by a slender stylar column 1 mm long.

Distr. *Malesia*: Malay Peninsula (Trengganu).

Ecol. Humid situations in lowland to montane forest, to 1100 m.

4. *Brassaiopsis polyacantha* (WALL.) BANERJEE, Ind. For. 93 (1967) 341; STONE, Gard. Bull. Sing. 30 (1977) 282. — *Hedera polyacantha* WALL. Pl. As. Rar. 2 (1831) 82, t. 190. — *Panax palmatum* ROXB. [Hort. Beng. (1814) 21, *nomen*;] Fl. Ind. ed. Carey 2 (1832) 74. — *B. palmata* (ROXB.) KURZ, J. As. Soc. Beng. 39, ii (1870) 77; CLARKE, Fl. Br. Ind. 2 (1879) 735; KING, J. As. Soc. Beng. 67, ii (1898) 61; RIDL. Fl. Mal. Pen. 1 (1922) 887. —



Fig. 34. *Brassaiopsis polyacantha* (WALL.) BANERJEE. In flower at Kuala Lumpur (Photogr. PHILIPSON, 1975).

Euaraliopsis palmata (ROXB.) HUTCH. Gen. Fl. Pl. 2 (1967) 80. — *Pseudobrassaiopsis polyacantha* (WALL.) BANERJEE, J. Bomb. Nat. Hist. Soc. 72 (1975) 72. — Fig. 34.

A small sparsely branched tree with buttresses, to c. 13 m; branches prickly, rufous-tomentose on the younger parts and persisting on the leaves and inflorescence. *Leaves* palmately lobed, clustered at the ends of the shoots; petiole to c. 70 cm, longitudinally grooved, with an enlarged basal sheath and a pair of small stipular processes; blade rounded, cordate, c. 18–30 by 20–40 cm, deeply palmately 5–9-lobed, lobes oblong-elliptic, acuminate, midrib prominent and main lateral veins widely spaced and arched-ascending, margin inconspicuously serrate. *Inflorescence* a large panicle often overtopped by sympodial innovations; rachis c. 40–60 cm, lateral branches c. 8–15 cm, subtended by very small caducous bracts and often bearing a pair of minute bracts near the middle, from which short tertiary branches may arise, branches terminating in spherical umbellules; umbellules with c. 15–25 flowers, subtended by numerous minute bracts; pedicels $\frac{3}{4}$ – $1\frac{1}{4}$ cm.

Calyx of 5 small teeth, rusty tomentose. *Petals* 5, triangular, $2\frac{1}{2}$ mm long. *Stamens* 2 mm long, anthers oblong, 1 mm. *Ovary* obconic, c. 2 mm high; disk fleshy, cushion-shaped, surmounted by an awl-shaped styler column $1\frac{1}{2}$ mm long. *Fruit* globose, 6–8 mm \varnothing , with a persistent calyx rim and styler column.

Distr. Widespread in SE. Asia (India, Nepal, Burma, Andamans); in *Malesia*: Malay Peninsula (from Kedah to Selangor and Pahang).

Ecol. Montane rain-forest, to c. 1800 m.

Note. The inflorescence is similar to that of *B. glomerulata* but the leaves of these two species cannot be confused.

5. *Brassaiopsis glomerulata* (BL.) REGEL, Gartenfl. 12 (1863) 275, t. 411; KOORD. Exk. Fl. Java 2 (1912) 715; Atlas 4 (1916) f. 674; Fl. Tjib. 2 (1923) 226; BACK. & BAKH. f. Fl. Java 2 (1965) 167; NGOC-SANH BUI, Adansonia 6 (1966) 437; STONE, Gard. Bull. Sing. 30 (1977) 282. — *Aralia glomerulata* BL. Bijdr. (1826) 872. — *Hedera glomerulata* (BL.) DC. Prod. 4 (1830) 265; HOOK. Bot. Mag. 80 (1854) t. 4804. — *B. speciosa* DECNE & PLANCH.

Rev. Hort. 4, 3 (1854) 106; BOERL. Handl. 1 (1890) 643; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 43, f. 1 B; K. & V. Bijdr. 7 (1900) 8; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 11. — *Macropanax glomerulatum* (BL.) MIQ. Fl. Ind. Bat. 1, 1 (1856) 764. — *Macropanax cyrtostylum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 13. — *B. cyrtostyla* (MIQ.) SEEM. J. Bot. 2 (1864) 293.

Tree up to 10 m, with stout often sinuous branches prickly in their upper parts, the young parts of the shoots and inflorescences rufous-tomentose. *Leaves* digitately compound, clustered at the ends of the shoots; petiole c. 25–60 cm, with an expanded basal sheath with two aculeate stipules; leaflets 5–9, petiolules c. 8–10 cm (the laterals shorter), blade elliptic-oblong, c. 15–25 by 6–10 cm, apex acuminate, base broadly cuneate to rounded, midrib prominent, lateral veins widely spaced, arched-ascending, margin serrulate. *Inflorescence* a large panicle; rachis 30–60 cm, lateral branches c. 20–30 cm, with umbellules arranged racemously along them on peduncles c. 2–5 cm long, bracts numerous, lanceolate, c. 1/2 cm long, mostly persistent; umbellules with c. 25–35 flowers, pedicels 1–1 1/4 cm, subtended by numerous minute ferruginous bracts. *Calyx* of 5 small teeth. Petals 5, triangular, 3–4 mm long. Filaments 2–2 1/2 mm, anthers oblong, 1 mm. Ovary obconic at anthesis, c. 2 mm high; disk fleshy, cushion-shaped, surmounted by an awl-shaped stylar column. *Fruit* globose, 6–7 mm high, with a persistent calyx rim and a stylar column usually 2 mm long but occasionally much shorter (even in the same inflorescence).

Distr. India to SW. China; in *Malesia*: Malay Peninsula (Pahang, Negri Sembilan), Sumatra, W. Java.

Ecol. Humid, evergreen, montane rain-forest, 1200–2200 m.

Vern. Sumatra: *kayu aro*, M (Kerintji); Java: *panggang*, *p. pujut* (or *puju*), *p. ranti* (or *ranto*), S.

Note. Juvenile plants bear leaves which are simple, irregularly lobed, or with 2, 3 or 5 leaflets. The flowers are pale yellowish cream. The cut stems exude a yellowish sap.

6. *Brassaiopsis elegans* RIDL. J. Linn. Soc. Bot. 41 (1913) 291; Fl. Mal. Pen. 1 (1922) 888; STONE, Gard. Bull. Sing. 30 (1977) 282, f. 4. — Fig. 33.

Shrub, stems with few to many prickles, young parts rufous-tomentose, becoming glabrous. *Leaves* digitately compound, or occasionally simple; petiole c. 14 cm, striate, with a small basal sheath and a short, bicuspid ligule; leaflets 3–5 (or 1), petiolules c. 3 cm (laterals shorter); blade elliptic, c. 12–16 by 4–5 cm, apex long acuminate, base cuneate, midrib prominent, lateral veins widely spaced, arched-ascending, margin minutely denticulate. *Inflorescence* a lax gracefully pendent raceme of umbellules; rachis c. 23 cm, lateral branches c. 5 cm, subtended by small lanceolate bracts and bearing 1–2 minute bracts near the middle, terminating in spherical umbellules and occasionally with separate flowers arising below the apex; umbellules with c. 10–13 flowers, subtended by numerous minute bracts; pedicels at anthesis c. 1/2 cm elongating to c. 1 1/4–1 1/2 cm in fruit. *Calyx* of 5 minute teeth. Petals 5, triangular, 2 1/2 mm long. Stamens 2 mm long, anthers oblong. Ovary obconic, c. 2 mm high; disk fleshy, surmounted by an awl-shaped stylar column. *Fruit* globose, 6 mm high, with a persistent calyx rim and stylar column.

Distr. *Malesia*: Malay Peninsula (Selangor, Pahang), very local.

Ecol. Montane, evergreen rain-forest, 800 m.

14. TREVESIA

VISIANI, Giorn. Tosc. Sc. Med. 1 (1840) 72; Mem. Accad. Torino II, 4 (1842) 262; MIQ. Fl. Ind. Bat. 1, 1 (1856) 747; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 10; BTH. in B. & H. Gen. Pl. 1 (1865) 942, *p.p.*; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 107; Handl. 1 (1890) 639; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32; KING, J. As. Soc. Beng. 67, ii (1898) 57; KOORD. Atlas 4 (1916) f. 664–666; HUTCH. Gen. Fl. Pl. 2 (1967) 71. — *Petasula* NORONHA, Verh. Bat. Gen. 5 (1790) ed. 1, art. 4: 3, *p.p.*, *cf.* STEEN. Regn. Veget. 71 (1970) 376. — Fig. 35, 36.

Shrubs or trees, unarmed or prickly, tomentose at least on young parts; buds enclosed in cataphylls. *Leaves* large, palmately lobed or digitately compound, stipules forming a bicuspid ligule within the terete petiole. *Flowers* in umbellules which are arranged racemously along a rachis or in panicles; pedicels not articulated below the ovary. *Calyx* a small rim. Petals 7–12, valvate, often falling at



Fig. 35. *Trevesia burckii* BOERL. a. Habit, $\times \frac{1}{5}$, b. flower, $\times 2$, c. fruit and ditto in CS, $\times 1\frac{1}{2}$ (a RAHMAT SI TOROES 5048, b YAPP 99, c RAHMAT SI TOROES 5049). Drawn by P. PRENDERGAST.

anthesis as a calyptra. *Stamens* as many as the petals; anthers large ovoid, dorsifixed, introrse, filament strap-like. Ovary inferior, broadly obconic or subglobose, 7–12-celled; disk rising gradually to a central boss formed by the united styles. *Fruit* globose or ovoid, crowned by the disk and prominent styler column; pyrenes coriaceous, compressed, endosperm smooth.

Distr. 6 *spp.* ranging from eastern India and SW. China to Malesia; 5 of the species occur in *W. Malesia*: Sumatra, Malay Peninsula, Java, Borneo, Lesser Sunda Is. (Lombok).

Formerly erroneously credited to the Philippines, *cf.* MERRILL, En. Philip. 3 (1923) 237.

Ecol. Primary rain-forest and second growth, especially in humid, shady localities.

Note. The genus comprises three well known species, each occupying distinct areas, except that the ranges of two overlap in Sumatra. In addition there are three very local and imperfectly known species.

KEY TO THE SPECIES

1. Leaves digitately compound.
 2. Petiolules connected by a web of tissue for most of their length 1. *T. burekii*
 2. Petioles free. Continental SE. Asia. *T. palmata* (DC.) Vis.
1. Leaves palmately lobed.
 3. Inflorescence branches and petioles densely covered with long red setae 2. *T. rufo-setosa*
 3. Inflorescence branches not as above (but sometimes setulose, furfuraceous, pubescent or glabrous).
 4. Flowers sessile or subsessile 3. *T. beccarii*
 4. Flowers pedicelled.
 5. Ovary *c.* 14-celled, pedicels stout, *c.* 4 mm \varnothing 4. *T. sundaica*
 5. Ovary *c.* 8–10-celled, pedicels more slender, 1–2 mm \varnothing 5. *T. arborea*

1. *Trevesia burekii* BOERL. Ann. Jard. Bot. Btzg 6 (1887) 110, pl. 12(–14); Handl. 1 (1890) 649; MERR. En. Born. (1921) 456; MASAMUNE, En. Phan. Born. (1942) 566. — *T. palmata* (DC.) Vis. *var. cheirantha* CLARKE, Fl. Br. Ind. 2 (1879) 732; KING, J. As. Soc. Beng. 67, ii (1898) 58. — *T. cheirantha* (CLARKE) O. K. Rev. Gen. Pl. 1 (1891) 272; RIDL. Fl. Mal. Pen. 1 (1922) 882. — Fig. 35.

Shrub or small, sparsely branched tree up to 10 m, branches stout with small prickles, young parts rufous-furfuraceous, cataphylls prickly. *Leaves* crowded at the ends of the shoots, digitately compound; leaflets usually 7–9; petioles *c.* 60 cm, striate, sometimes with small prickles or bristles, dilated into a clasping base, ligule with two lanceolate lobes; petiolules united for all or most of their length by a foliaceous web; leaflets oblong-lanceolate or elliptic, up to 30 by 10 cm, apex acuminate, base cuneate or rounded, margin finely serrate especially in the upper part, principal veins arched-ascending, prominent. *Inflorescence* a large terminal panicle, often overtopped by lateral shoots; rachis to 60 cm, slightly prickly or not, bearing branches along its length and usually ending an umbel of branches, bracts caducous or persistent; secondary branches (peduncles) *c.* 10–18 cm, sometimes with 1 or few bracts along their length and terminating in spherical umbellules of 40–50 flowers; pedicels *c.* 20–35 mm, slender. *Calyx* an irregular obsolete rim. Corolla hemispherical, *c.* 6 mm high, falling as a calyptra, petals *c.* 7–10. *Stamens c.* 7–10, filament flattened *c.* 2 $\frac{1}{2}$ mm, anthers broadly triangular, *c.* 3 mm

long. Ovary at anthesis broadly obconic, usually rufous-furfuraceous, *c.* 7–10-celled; disk broadly conical surmounted by the connate styles, stigmas slightly swollen. *Fruit* subglobose 1 $\frac{1}{2}$ by 1 $\frac{1}{4}$ cm, surmounted by the stylopodium and connate styles.

Distr. *Malesia*: Sumatra, Malay Peninsula (from Kedah southwards), Borneo (Sarawak).

Ecol. Primary rain-forest, mostly below 500 m, rarely up to 1000 m.

Vern. Sumatra: *tapa arimau, tada lada*, M; Malaya: *kakabu, tapak itek, t. rimau*, M.

Note. The stamens are described as cream on an orange disk. Seedling plants have leaves which are palmately lobed or entire.

2. *Trevesia rufo-setosa* RIDL. J. Str. Br. R. As. Soc. n. 86 (1922) 294; Fl. Mal. Pen. 1 (1922) 883.

A shrub with stout prickly stems, young parts, petioles and inflorescence densely covered with red-brown flat setae. *Leaves* palmately lobed, clustered at the ends of the shoots; petioles *c.* 60 cm, dilated into a clasping base with a bicuspid ligule; blade *c.* 30 by 30 cm, with 7 lobes; lobes *c.* 20 by 9 cm, elliptic, shortly cuspidate, midveins and widely spaced arched-ascending laterals prominent, margin with many upwardly directed spinulose teeth. *Inflorescence* terminal; rachis flexuous, *c.* 20 cm, bearing lateral umbellules, bracts linear *c.* 12 mm; pedicels short. *Flowers* heterosexual. *Calyx* rim obscure. Petals 5, triangular, 6 mm long, setose on the outside, spreading. *Stamens* 5. Ovary in the fertile flowers obconic,



Fig. 36. *Trevesia sundaica* MIQ. in mixed evergreen mountain forest in E. Java at Sarangan, c. 1200 m altitude, with *Quercus* (Photogr. JESWIET, 1925).

setose, 5-celled; disk with cylindrical projecting stylar column. *Fruit* unknown.

Distr. *Malesia*: Malay Peninsula (Selangor: Semangkok Pass).

Ecol. Montane forest, at c. 800 m.

3. *Trevesia beccarii* BOERL. Ann. Jard. Bot. Btzg 6 (1887) 110, pl. 11.

Shrub, c. 3 m, with stout prickled stems. *Leaves* palmately lobed, clustered at the ends of the branches; petiole c. 50 cm, hirsute with short patent bristly hairs when young, some persisting, dilated into a clasping spinulose base with a bicuspid ligule; blade c. 30 by 40 cm, with 7–9 lobes, base cordate, lobes c. 15 by 7 cm, broadly elliptic-oblong, apex rather blunt, rusty stellate-pubescent when young, sometimes persisting, mid-veins and rather numerous arched-ascending lateral veins prominent, margin irregularly serrate. *Inflorescence* when young hirsute like the petioles, sometimes persistent; rachis c. 90 cm, bearing many lateral branches (peduncles) along its length, bracts lanceolate, caducous; peduncles c. 5–15 cm with some caducous, linear bracts along their length and around the base of the umbellules (capitula). Capitula of c. 10–20 sessile (or subsessile) flowers. *Calyx* rim short, undulate. *Corolla* conical in bud, falling as a calyptra. Stamens 10–12, anthers oblong, filaments stout. Ovary obconic, angular from contact with neighbouring flowers, 10–12-celled; disk broadly conical; surmounted by the massive connate styles, stigmas slightly swollen. *Fruit* obconic angular from mutual pressure, c. 10 by 7 mm.

Distr. *Malesia*: West Central Sumatra.

Ecol. Forest, ascending to 1200 m.

Vern. *Likabau*, M.

4. *Trevesia sundaica* MIQ. Pl. Jungh. 3 (1855) 420; Fl. Ind. Bat. 1, 1 (1856) 747; DE VRIESE, Pl. Ind. Or. (1857) 81; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 11; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 111, pl. 12 (16); Handl. 1 (1890) 649; K. & V. Bijdr. 7 (1900) 4, *incl. var. glomerata* K. & V. l.c. 5; KOORD. Exk. Fl. Java 2 (1912) 710; Atlas 4 (1916) f. 664–666; Fl. Tjib. 2 (1923) 222; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 4; BACK. & BAKH. f. Fl. Java 2 (1965) 163. — *Aralia palmata* REINW. ex BL. Cat. Btzg (1823) 43, *nomen*; ex DE VRIESE, Pl. Ind. Or. (1857) 82, *nomen in synonym*; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 111, *in synonym*, non LAMK, 1783, *nec* LOUR. 1790. — *Sciadophyllum palmatum* BL. Bijdr. (1826) 875, *non T. palmata* (ROXB.) VIS. 1842. — *Aralia reinwardtiana* STEUD. Nomencl. 1 (1840) 118, *nomen*. — *Gastonia sundaica* (MIQ.) BAILL. Hist. Pl. 7 (1880) 161, f. 202. — *Actinophyllum palmatum* BL. ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 111, *in synonym*. — Fig. 36.

Shrub or small, sparsely branched tree, up to

8 m; branches stout, with small prickles, young parts stellate-tomentose, becoming glabrous, buds with cataphylls. *Leaves* palmately lobed, clustered at the ends of the branches; petiole striate, c. 50–60 cm, unarmed or with a few prickles near the base, dilated with a clasping, heavily lenticellate base, ligule bicuspid; blade c. 60 by 60 cm, with 7–11 lobes, base cordate, lobes c. 30 by 40 cm, elliptic-oblong, apex acute to acuminate, separated by wide sinuses, mid-veins and widely spaced arched-ascending lateral veins prominent, margin serrate, occasionally irregularly incised. *Inflorescence* arising among or below the leaves, a raceme of umbellules, at first rusty pubescent, glabrescent; rachis up to 60 cm, often much shorter, bearing branches along its length and ending in an umbel, bracts lanceolate, caducous; secondary branches (peduncles) c. 8–16 cm, bearing small bracts along their length and around the umbellules; umbellules of c. 20–35 flowers, pedicels c. 2–5 cm, lateral umbellules sometimes bearing small sterile (male) flowers. *Calyx* rim very short, undulate. *Corolla* hemispherical in bud, c. 6 mm high, falling as a calyptra, petals 8–12. Stamens 8–12, filaments stout, anthers ovate, c. 3 mm long. Ovary at anthesis broadly obconic, rufous-furfuraceous, c. 8–10-celled; disk broadly conical passing into the stylar column. *Fruit* semiglobose, 1 $\frac{1}{4}$ –1 $\frac{1}{2}$ cm \varnothing , surrounded by the stylopodium and connate styles.

Distr. *Malesia*: Sumatra, Java, Lesser Sunda Is. (Lombok).

Ecol. Evergreen rain-forest, especially in ravines, ascending to 1500 m.

Vern. Sumatra: *ahab*, *tapa arimau*, M; Java: *borang*, *djemporang*, *dorang*, *gabus*, *gorang*, *lantanglanting*, *panggang*, *p. lembur*, *p. puju*, *p. tjutjuk*, *papanggangan*, S.

5. *Trevesia arborea* MERR. Contr. Arn. Arb. 8 (1934) 116.

Tree up to 15 m, young parts shortly reddish stellate-tomentose, prickly. *Leaves* palmately lobed, clustered at the ends of the branches; petioles 17–50 cm, shortly rusty tomentose, glabrescent, unarmed, dilated into a sheathing base, ligule bicuspid; blade rotund, 25–40 cm, base cordate, glabrous above, shortly red-pubescent below, coriaceous, usually 9-lobed, sinuses narrow, lobes oblong-elliptic or oblong-oblancheolate, acuminate, margin distantly serrate distally. *Inflorescence* a raceme of umbellules, at first reddish pubescent, glabrescent, sometimes with a few spines below; rachis stout (c. 1 cm \varnothing), c. 35 cm, bearing branches along its length, and ending in an umbel, bracts oblong-ovate, acuminate 1–2 cm long; primary branches (peduncles) few, spreading, stout, without spines, to c. 15 cm; umbellules of c. 8–13 flowers, pedicels 1 $\frac{1}{2}$ –2 $\frac{1}{2}$ cm, stout (3–4 mm \varnothing), reddish tomentose, basal bracts triangular, c. 5 mm long. *Flowers* hermaphrodite. *Calyx* an irregular short



Fig. 37. *Dendropanax borneensis* (PHILIPSON) MERR. a. Habit, $\times \frac{1}{2}$, b. flower, $\times 5$, c. fruit and ditto in CS, $\times 5$, d. bifid leaf with area enlarged to $\times 100$ to show glands (a-b NOOTEBOOM 2258, c CLEMENS 51039, d CLEMENS 28927). Drawn by P. PRENDERGAST.

rim. Corolla hemispherical in bud, c. 6 mm high, 12 mm diam., densely rusty pubescent outside, falling as a calyptra. Stamens c. 13, filaments stout, 4 mm, anthers ovate, c. 4 mm long. Ovary broadly

hemispherical, shortly furfuraceous, 14-celled. Fruit unknown.

Distr. *Malesia*: N. Sumatra (Atjeh).

Ecol. Primary, evergreen forest, 1100 m.

15. DENDROPANAX

DECNE & PLANCH. Rev. Hort. IV, 3 (1854) 107; BTH. in B. & H. Gen. Pl. 1 (1865) 943; CLARKE, Fl. Br. Ind. 2 (1879) 733; MERR. Brittonia 4 (1941) 129; HUI-LIN LI, Sargentia 2 (1942) 38; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 18; HUTCH. Gen. Fl. Pl. 2 (1967) 71; STONE, Gard. Bull. Sing. 30 (1977) 148. — *Gilibertia* RUIZ & PAV. Prod. Fl. Peruv. (1794) 50, non J. F. GMEL. 1791; BTH. in B. & H. Gen. Pl. 1 (1865) 944; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 40 & Nachtr. 2 (1900) 254; PHILIPSON, J. Bot. 78 (1940) 116. — *Textoria* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 12. — Fig. 37.

Unarmed, usually glabrous small trees, or erect or subscaudent shrubs. *Leaves* simple, entire, or sometimes palmately 3–5-lobed, often with pellucid glands, without articulation between blade and petiole; stipular sheath inconspicuous. *Umbels* solitary or compound, or on racemously arranged branches or paniculate; pedicels not articulated below the ovary. *Flowers* sexually dimorphic. *Calyx* on entire rim or 5-dentate. Petals 5, valvate. Stamens 5–8, extrorse. Ovary inferior, 4–8-celled; styles united throughout all or part of their length, or free. Disk fleshy, conical. *Fruit* globose or ellipsoid, usually strongly ribbed when dry; exocarp fleshy; endocarp cartilaginous. Endosperm smooth or rarely weakly ruminant.

Distr. About 30 spp. in tropical America and eastern Asia south to *Malesia* (3 spp.): N. Sumatra, Malay Peninsula, Borneo. Fig. 38.

Ecol. Rain-forest in lowland and montane regions, 300–3100 m.

Note. Distinguished from *Hedera* by the normally erect habit and the smooth (or only weakly ruminant) endosperm.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1. Leaves without pellucid gland-dots. | |
| 2. Inflorescence a compound umbel | 1. <i>D. lancifolius</i> |
| 2. Inflorescence a simple umbel | 2. <i>D. maingayi</i> |
| 1. Leaves with pellucid gland-dots | 3. <i>D. borneensis</i> |

1. *Dendropanax lancifolius* (RIDL.) RIDL. Fl. Mal. Pen. 1 (1922) 884; STONE, Gard. Bull. Sing. 30 (1977) 148, f. 6 C. — *Arthropphyllum lancifolium* RIDL. J. Str. Br. R. As. Soc. n. 75 (1917) 38.

Tree to c. 14 m. *Leaves* dispersed along the shoots; petiole c. 5 cm, slightly dilated at the base and with an obscure ligular rim; blade to c. 15 by 3³/₄ cm, chartaceous, lanceolate, base narrowly cuneate, apex gradually tapered to an acute point, margin entire but undulate, midrib well defined, secondary and tertiary veins delicate. *Umbel* terminal, compound; peduncle c. 2 cm; secondary rays few, 1–2 cm; pedicels 5–10, c. 1–2 cm. *Calyx* a rim with indistinct teeth. Petals triangular, falling as a cap or separating. Ovary 4–5-celled, styles forming an erect column.

Distr. *Malesia*: Malay Peninsula (Perak) and N. Sumatra (Toba Lands).

Ecol. Montane rain-forest, c. 300–1500 m.

Vern. Sumatra: *modang simarla siak*, Batak lang.

2. *Dendropanax maingayi* KING, J. As. Soc. Beng. 67, ii (1898) 48; RIDL. Fl. Mal. Pen. 1 (1922) 884; STONE, Gard. Bull. Sing. 30 (1977) 48, f. 6 B. — *D. parviflorus* [non (CHAMP.) BTH.] CLARKE, Fl. Br. Ind. 2 (1879) 733. — *Gilibertia maingayi* PHILIPSON, J. Bot. 78 (1940) 117.

Slender shrub to c. 1¹/₂ m, with few branches. Buds enclosed in small cataphylls. *Leaves* dispersed along the shoots; petiole 1¹/₂–5 cm, channelled above, slightly dilated at the base and with

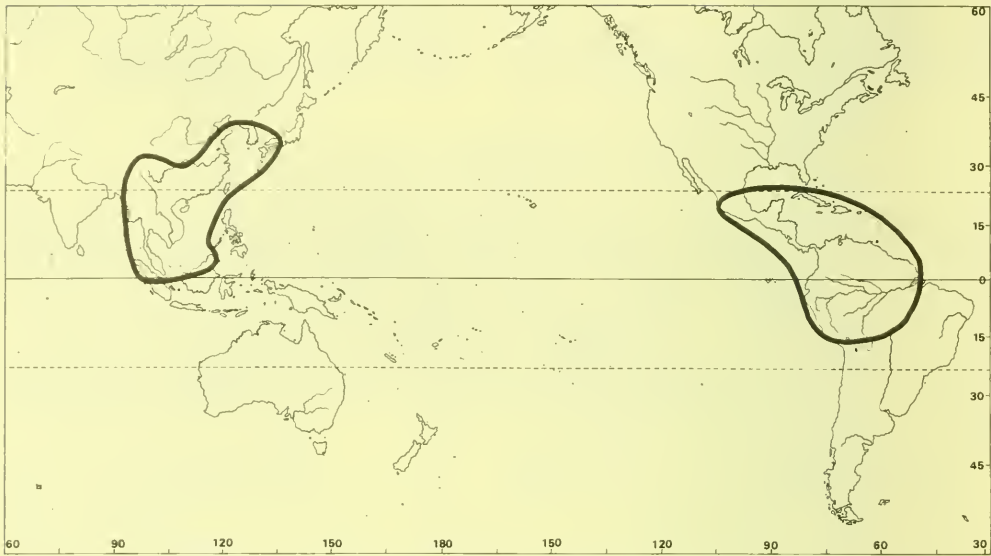


Fig. 38. Range of *Dendropanax* DECNE & PLANCH.

a small to obscure ligule within the petiole; blade 5–15 by 2–5 $\frac{3}{4}$ cm, thinly coriaceous to membranous, ovate, elliptic, oblong or lanceolate, base rounded to narrowly cuneate, apex acute, margin entire, often undulate, midrib prominent, sometimes with three distinct principal veins. *Umbel* terminal, simple, peduncle c. 1–2 cm; pedicels 1–2 cm, slightly elongating in fruit, bracts caducous. *Flowers* sexually dimorphic, males predominate in lateral umbellules. *Calyx* margin minute. Petals triangular, c. 2 $\frac{1}{2}$ mm long. Stamens 5. Ovary 5–6-celled, reduced in male flowers, disk fleshy, conical; styles 5–6, at first erect, but the free upper half spreading in fruit. *Fruit* globose or ellipsoid, succulent, 5–6-ribbed when dry, c. 10 by 8 mm, crowned by the persistent spreading styles.

Distr. Malesia: Malay Peninsula (from Kedah southwards).

Ecol. Montane rain-forest, 1000–2000 m.

Note. Very like the next species in the general appearance of leaf and inflorescence. However, all specimens from the Malay Peninsula lack pellucid glands in the lamina of the leaf, whereas these are present in all specimens from Borneo.

3. *Dendropanax borneensis* (PHILIPSON) MERR. *Brittonia* 4 (1941) 132. — *Gilibertia borneensis* PHILIPSON, *J. Bot.* 78 (1940) 116, fig. — Fig. 37.

Slender shrub or small tree, with few or no branches, occasionally prostrate or scandent, sometimes reaching 5–6 m. Buds enclosed in few broadly ovate cataphylls. *Leaves* dispersed along

the shoots; petiole 4–10 cm, channelled above, slightly dilated at base and with a small to obscure ligule within the petiole; blade 7–15 by 3–7 cm, coriaceous, with pellucid glands, usually ovate, elliptic or oblong, occasionally irregularly lobed, base rounded to broadly cuneate, apex acute, margin entire, often undulate, midrib and lateral veins prominent, frequently with 3 distinct principal veins. *Umbel* terminal, simple, or occasionally compound, single or two borne side by side, with c. 20 flowers; peduncle and secondary rays (if present) usually rather short (1 $\frac{1}{2}$ –3 $\frac{1}{2}$ cm), but occasionally much longer (to 13 cm); pedicels c. 1 $\frac{1}{4}$ –1 $\frac{1}{2}$ cm (occasionally to 3 cm), elongating slightly in fruit, bracts ovate caducous. *Flowers* sexually dimorphic, males predominate in lateral umbellules. *Calyx* margin minute. Petals triangular, c. 2 $\frac{1}{2}$ mm long. Stamens 5. Ovary 4–6-celled, reduced in male flowers; disk fleshy, conical with 4–6 styles, at first erect, but the free upper half spreading in fruit. *Fruit* globose or ellipsoid, succulent, 4–6-ribbed when dry, 5–10 by 6–12 mm, crowned by the persistent spreading styles.

Distr. Malesia: N. Sumatra (Mts Goh Lembuh and Pinto) and northern Borneo (Sabah: Mt Kinabalu; Brunei: Pagon Ridge; Sarawak: Mt Murut and Kalabit Highlands).

Ecol. Local in montane, mossy forest, and alpine thickets, 1700–3100 m.

Vern. Borneo: *merit*, Kalabit Highlands.

Notes. Flower greenish or cream, fruit black.

This species exhibits considerable variation in size and shape of leaf, inflorescence and fruit, and

also in venation pattern, but these variations are not correlated with geographical distribution. Specimens from the two Sumatran localities have small fruits and leaves, but similar specimens occur

in Borneo. The presence of pellucid glands between the reticulations of the veins of the lamina distinguishes this species from the other two species in the area.

16. ACANTHOPANAX

(DECNE & PLANCH.) H. WITTE, Ann. Hort. Bot. 4 (1861) 89; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 10; BTH. in B. & H. Gen. Pl. 1 (1865) 938; SEEM. J. Bot. 5 (1867) 238; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 49; MERR. Philip. J. Sc. 1 (1906) Suppl. 217; HUTCH. Gen. Fl. Pl. 2 (1967) 69. — *Panax* subg. *Acanthopanax* DECNE & PLANCH. Rev. Hort. IV, 3 (1854) 105. — Fig. 39.

Small trees or scandent shrubs, prickly or unarmed. *Leaves* digitately compound, stipules absent, glabrous or with bristles. *Inflorescence* terminal, with umbels either solitary or more usually umbellately or racemosely arranged; pedicels not articulated below the flower. *Flowers* hermaphrodite or sexually dimorphic. *Calyx* margin minutely dentate. Petals 4 or 5, valvate. *Stamens* as many as the petals, anthers dorsifixed, introrse. Ovary 2–4(–5)-celled; disk fleshy; styles 2, connate to about the middle. *Fruit* a subglobose drupe, crowned by the persistent bifid style, 2–4(–5)-seeded; exocarp fleshy, endocarp chartaceous or cartilaginous. Endosperm smooth or undulate.

Distr. About 30 *spp.* in eastern Asia and the Himalayan region, south to *Malesia* (2 *spp.*): Malay Peninsula, N. Sumatra (Gajo Lands), Philippines (N. Luzon).

Ecol. Usually in montane forest or in secondary growth.

Note. A sterile specimen from Gunong Iran, Cameron Highlands (SYMINGTON CF 36300) in the Kepong Herbarium, probably represents an undescribed species.

KEY TO THE SPECIES

1. Twigs with prickles. Leaf margins without bristles 1. *A. trifoliatum*
 1. Twigs without prickles. Leaf margins with bristles 2. *A. malayanum*

1. *Acanthopanax trifoliatum* (L.) MERR. Philip. J. Sc. 1 (1906) Suppl. 217. — *Zanthoxylum trifoliatum* LINNÉ, Sp. Pl. (1753) 270. — *Panax aculeatum* AIT. Hort. Kew. ed. 1, 3 (1789) 448. — *A. aculeatum* H. WITTE, Ann. Hort. Bot. 4 (1861) 89, *nom. illeg.*; SEEM. J. Bot. 5 (1867) 238; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 50.

Scandent shrub, *c.* 2–8 m, with broadly based recurved prickles sparsely disposed on the branches, usually below the nodes; buds with small brown cataphylls. *Leaves* disposed along the branchlets; petiole up to *c.* 5 cm, flattened above, with a slightly dilated base, glabrous, usually with a few prickles; leaflets (1–)3(–5); petiolules up to 8 mm, articulated with the petiole, channelled above; blade up to 3½ by 2¼ cm, broadly ovate to subrotund, apex acute, base cuneate, margins serrate, chartaceous, glabrous, lateral veins conspicuous on both surfaces, pinnate, reticulation inconspicuous. *Inflorescence* terminating the main or lateral branches, a sessile compound umbel; primary

rays *c.* 4–5, or rarely solitary, slender or the central ray stronger (the laterals sometimes apparently male), with minute furfuraceous bracts at their bases, occasionally with a few prickles, glabrous, *c.* 3–6 cm long; secondary rays (pedicels) numerous, slender, *c.* 1–1¾ cm. *Calyx* a rim with 5 minute teeth. Petals 5, ligulate, *c.* 2 mm long. Stamens 5, filaments *c.* 2 mm. Ovary turbinate, *c.* 1½ mm high, 2-celled; styles 2, connate to about the middle. *Fruit* a spheroidal drupe, *c.* 5 mm \varnothing when dry, crowned by the persistent bifid style; endocarp chartaceous. Endosperm surface slightly undulate.

Distr. From the Himalayas through S. China to Japan and Formosa; in *Malesia*: Philippines (N. Luzon: Benguet; Bontoc).

Ecol. In montane forest and thickets, 1100–1400 m.

2. *Acanthopanax malayanum* M. R. HENDERSON, Gard. Bull. S. S. 7 (1933) 105, pl. 22. — Fig. 39.

Unarmed tree to 17 m, trunk to 1 m \varnothing ; branch-

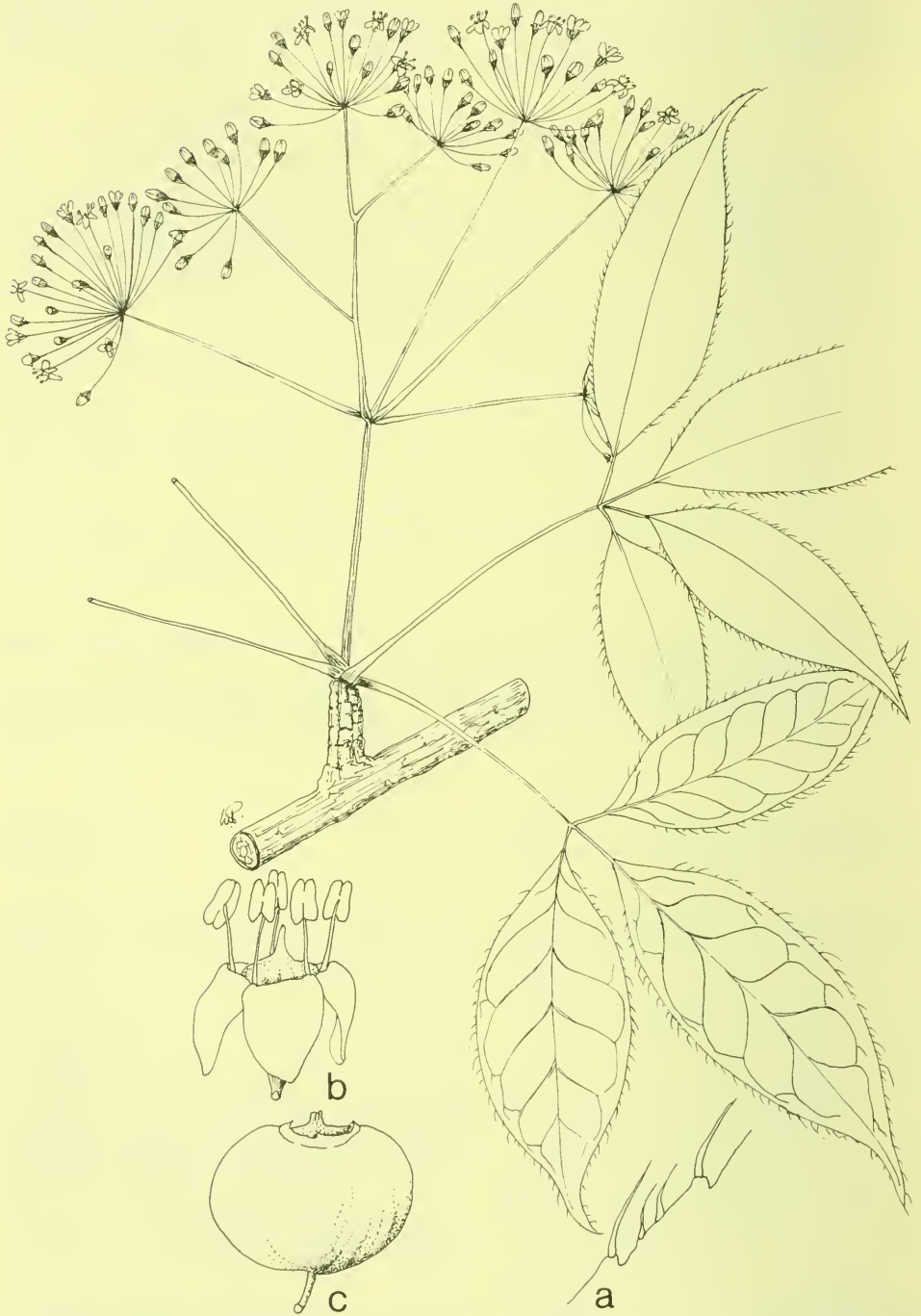


Fig. 39. *Acanthopanax malayanus* HENDERSON. a. Habit, $\times \frac{1}{2}$, b. flower, $\times 7$, c. fruit, $\times 4$ (a, b DE WILDE c.s. 16725, c DE WILDE c.s. 15925). Drawn by W. R. PHILIPSON.

lets rather stout (c. 5 mm \varnothing); bark greyish brown, glabrous, smooth; buds with small brown cataphylls. *Leaves* crowded at the ends of the branchlets; petiole terete, striate, glabrous, with a slightly dilated base, up to 12½ cm; leaflets 3–5; petiolules up to 7 mm, articulated with the petiole, channelled above; blade up to 17 by 5½ cm, ovate-lanceolate to narrowly elliptic, apex acute, base cuncate or one side truncate, chartaceous, the principal veins pinnately arranged and conspicuous, the minor veins forming a dense reticulation, margin with numerous spinulose teeth. *Inflorescence* a terminal, sessile, compound umbel, often on short lateral shoots, apparently dioecious; primary rays c. 3–7, slender, terete, glabrous, striate, c. 4–8 cm; secondary rays (pedicels) of male flowers numerous, slender, 1½–2 cm, of female flowers stouter. *Calyx* a rim with 4–5 minute teeth. *Petals* 4–5, ligulate, c. 2½ by 1½ mm long. *Stamens* 4–5, filaments c. 2¾ mm long. *Ovary* turbinate, 3–4-celled; styles 2, at first connate, but becoming free to about the middle. *Fruit* an oblate spheroidal

drupe, c. 10 by 8 mm when dry, with a small stylopodium bearing a persistent bifid style; endocarp cartilaginous. Endosperm surface strongly undulate.

Distr. Malesia: Malay Peninsula (Pahang; Cameron Highlands), N. Sumatra (Gajo Lands).

Ecol. Montane rain-forest and mossy forest, 1400–2600 m.

Vern. Berlaki, Sakai lang.

Notes. The interpretation of this species as having sexually dimorphic inflorescences cannot be proved with the available material. This appears to consist of twigs bearing either inflorescences of male flowers, or infructescences. Appearances suggest that the putative male flowers have rudimentary ovaries. There is no evidence whether the fruiting flowers had produced pollen.

The tree is said to be conspicuous when flowering by reason of its delicate feathery foliage, which is pale green with a reddish tinge, the petioles and inflorescence also being reddish.

Excluded

Meryta colorata F. M. BAILEY, Queensl. Agric. J. 3 (1898) 283; HARMS, Bot. Jahrb. 56 (1920) 384.

The type specimen of this species cannot be located, but the original description does not seem to relate to a member of the *Araliaceae*, and certainly not to a *Meryta*.

Panax ? anisum DC. Prod. 4 (1830) 254. — *Anisum moluccanum* RUMPH. Herb. Amb. 2: 131, t. 42. — *Nothopanax ? anisum* MIQ. Fl. Ind. Bat. 1, 1 (1856) 766; SEEM. Fl. Vit. (1866) 114. — *Polyscias anisum* HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45.

According to MERRILL (Int. Rumph. 1917, 289) these names are all based on the Rumphian description and plate and must refer to some species of *Fagara*, possibly *F. avicennae* LAMK = *Zanthoxylum avicennae* (LAMK) DC. (*Rutaceae*).

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. Linnæa 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, gynæcandrous 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 *sq.* evaluation of a number of names in *sect. Vigneastra*, which also prohibited the finishing of the practical key to the species. Dr. H. P. NOOTEBOOM 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. NOOTEBOOM. (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 Malasia

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. Vigneastrae*
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. Oclusae*
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. hypolytrides**
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. gracilisipica**
13. Leaves 1–3 mm wide. Beak of utricles $\frac{3}{4}$ –1 mm long. Stems central **30. C. rhynchaenium**
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. oedorrhampa*
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 cespitose.
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, $\frac{4}{2}$ –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 \pm 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 mucous 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. filicina**
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 σ 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) σ 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 σ 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 σ 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 σ 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 mucous 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 spathaceous, 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 utricle, 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. Crucitatae* (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, $1\frac{1}{4}$ – $2\frac{1}{2}$ 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, sessile, 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 antrorsely 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 truncate 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, subpersistent 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.

E. V. J. S. M. A. '78

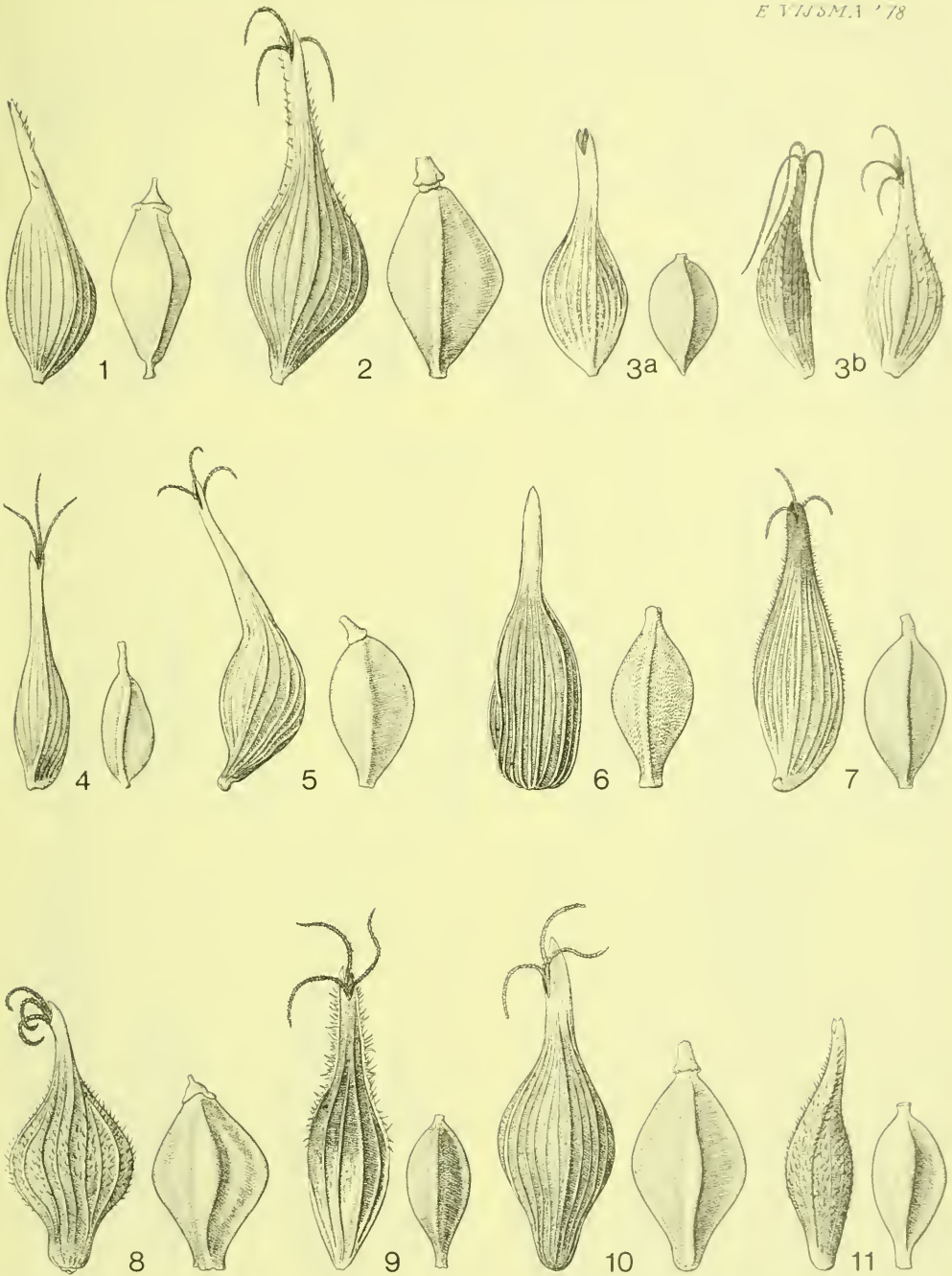


Fig. 118. Utricles and nuts of *Carex*. Species numbered as in the text (1 CUMING 1764, 2 JACOBS 8046, 3a CHEW, CORNER & STAINTON 1706, 3b (left) VERHEIJEN 2585, 3b (right) VAN OOSTSTROOM 13154, 4 HARTLEY 11122, 5 NGF 21261, 6 RIDLEY 15721, 7 BRASS 24684, 8 B. F. HERNAY 652, 9 PULLEN 6106, 10 BAKHUIZEN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

E. V. J. S. M. A. '75

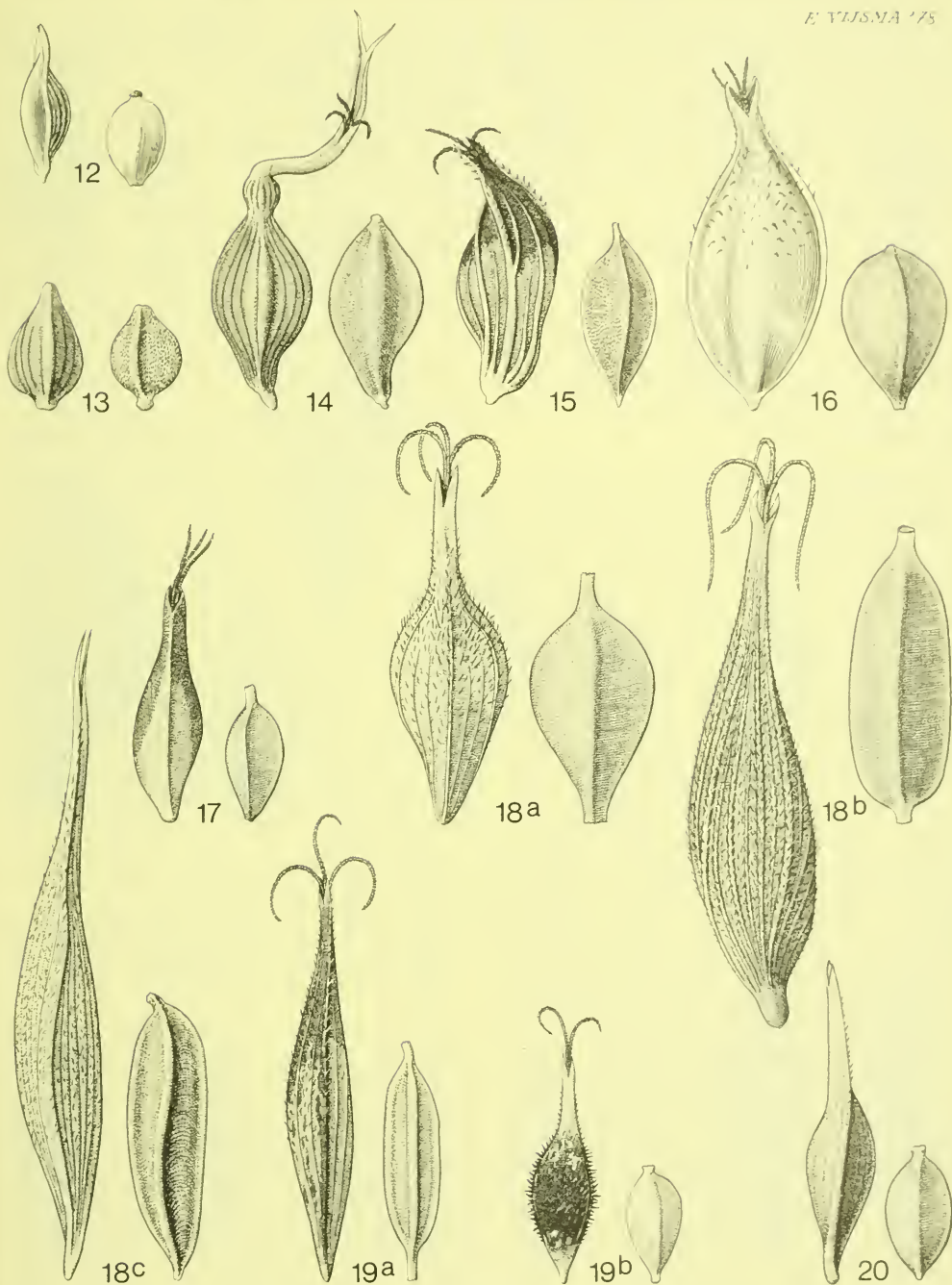


Fig. 119. Utricles and nuts of *Carex*. Species numbered as in the text (12 SANTOS 5776, 13 BÜNNEMEIJER 9820, 14 BACKER 22996, 15 ELBERT 62, 16 VAN OOSTSTROOM 13293, 17 NGF 39555, 18a VAN STEENIS 8277, 18b BROOKE 8561, 18c VAN STEENIS 8461, 19a ANU 15532, 19b SANTOS 5785, 20 MEIJER 6127). All $\times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

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 ⅓-1 mm. *Style-base* slightly thickened.

Distr. 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 ⅓-1 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*, *tanalang*, 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. scleroides* 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, decompound, 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, ferrugineous, 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, *fide* 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, decompound, 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,

E. V. J. S. M. A. '78

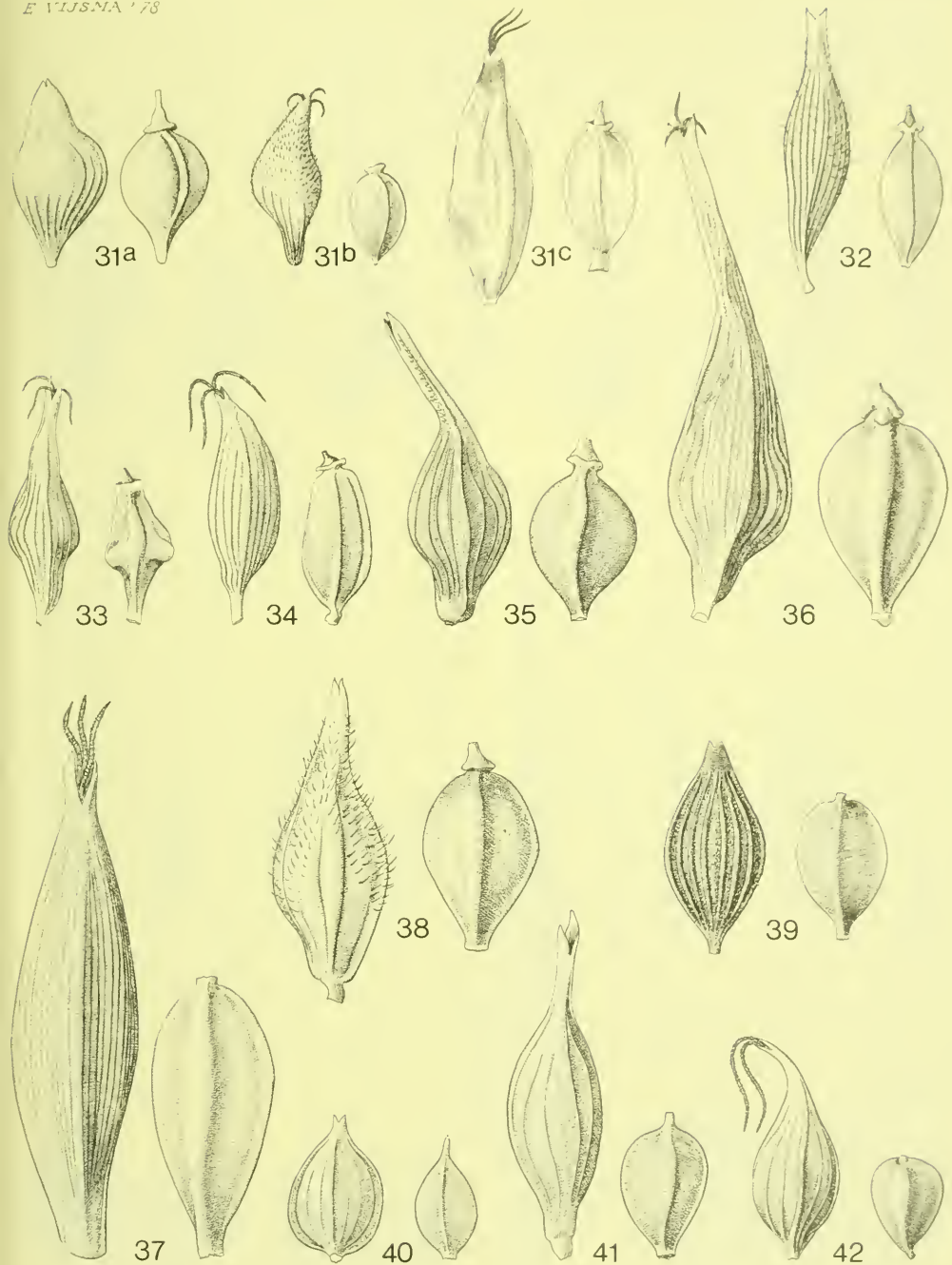


Fig. 121. Utricles and nuts of *Carex*. Species numbered as in the text (31a BRASS 4697, 31b EYMA 864, 31c BRASS 9032, 32 SANTOS 5394, 33 EDAÑO 17857, 34 ROBBINS *s.n.*, 35 ROBINSON 6186, 36 RAMOS 20990, 37 LÖRZING 16274, 38 BACKER 20462, 39 DE WILDE *c.s.* 13325, 40 KALKMAN 5213, 41 BRASS 10255, 42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

2-2¹/₄ by 1-1¹/₃ 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.

KÜKENTHAL 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 decomposed, 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, 2-3¹/₂ mm long, the midnerve excurrent into an antrosely scabrid, recurved, up to 3¹/₂ 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, 3¹/₂-5 by 1²/₃-2¹/₃ mm; beak straight or slightly bent, 1¹/₂-2 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 1¹/₂-2 mm. *Style-base* pyramidally thickened, subsistent 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)

E. VIJLSMA '78

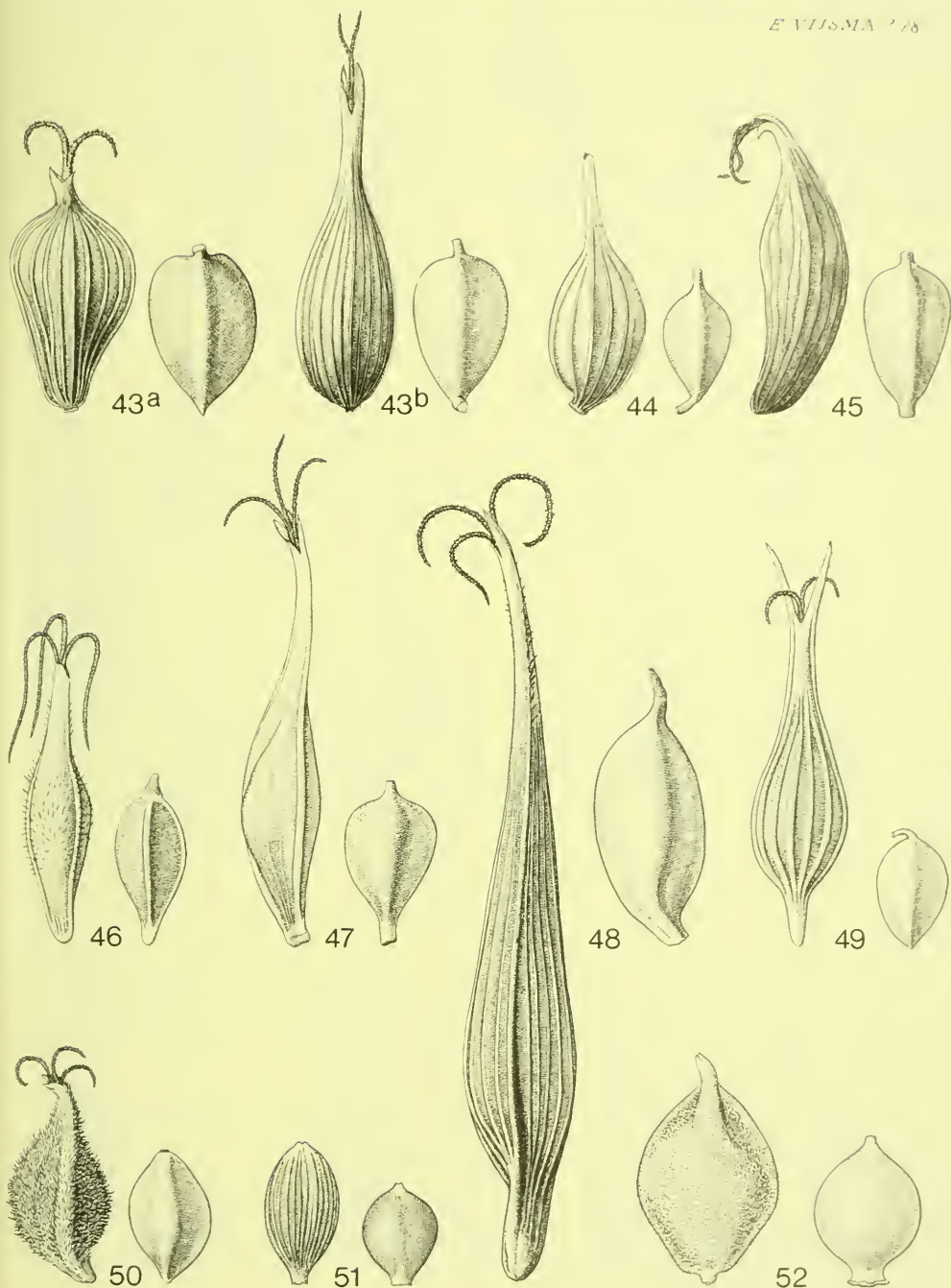


Fig. 122. Utricles and nuts of *Carex*. Species numbered as in the text (43a WOMERSLEY 5122, 43b ANU 614, 44 BRASS 4867, 45 MEIJER 6656, 46 BRASS 9803, 47 LAE 61655, 48 SCHODDE 1992, 49 EYMA 4709, 50 KOSTERMANS 14005, 51 SINCLAIR 9797, 52 JERMY 4634). All $\times 10$.

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, decomposed 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 glumi-form, 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, ($\frac{3}{4}$ –)1–1 $\frac{2}{3}$ 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 $\frac{1}{2}$ –)3–4 mm by 1–1 $\frac{1}{4}$ 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 $\frac{1}{2}$ mm long; mouth bidentate, not or scarcely oblique. *Nut* ellipsoid or slightly obovoid, triquetrous with shallowly concave sides, brown, 1 $\frac{1}{2}$ –2 by $\frac{9}{10}$ –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 $\frac{1}{4}$ –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, $\frac{1}{2}$ 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 $\frac{1}{2}$ –4 $\frac{1}{2}$ by 1 $\frac{1}{2}$ –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 $\frac{1}{4}$ –2 $\frac{1}{2}$ by 1 $\frac{1}{2}$ –1 $\frac{3}{4}$ 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-*

E. VIJSSMA '78

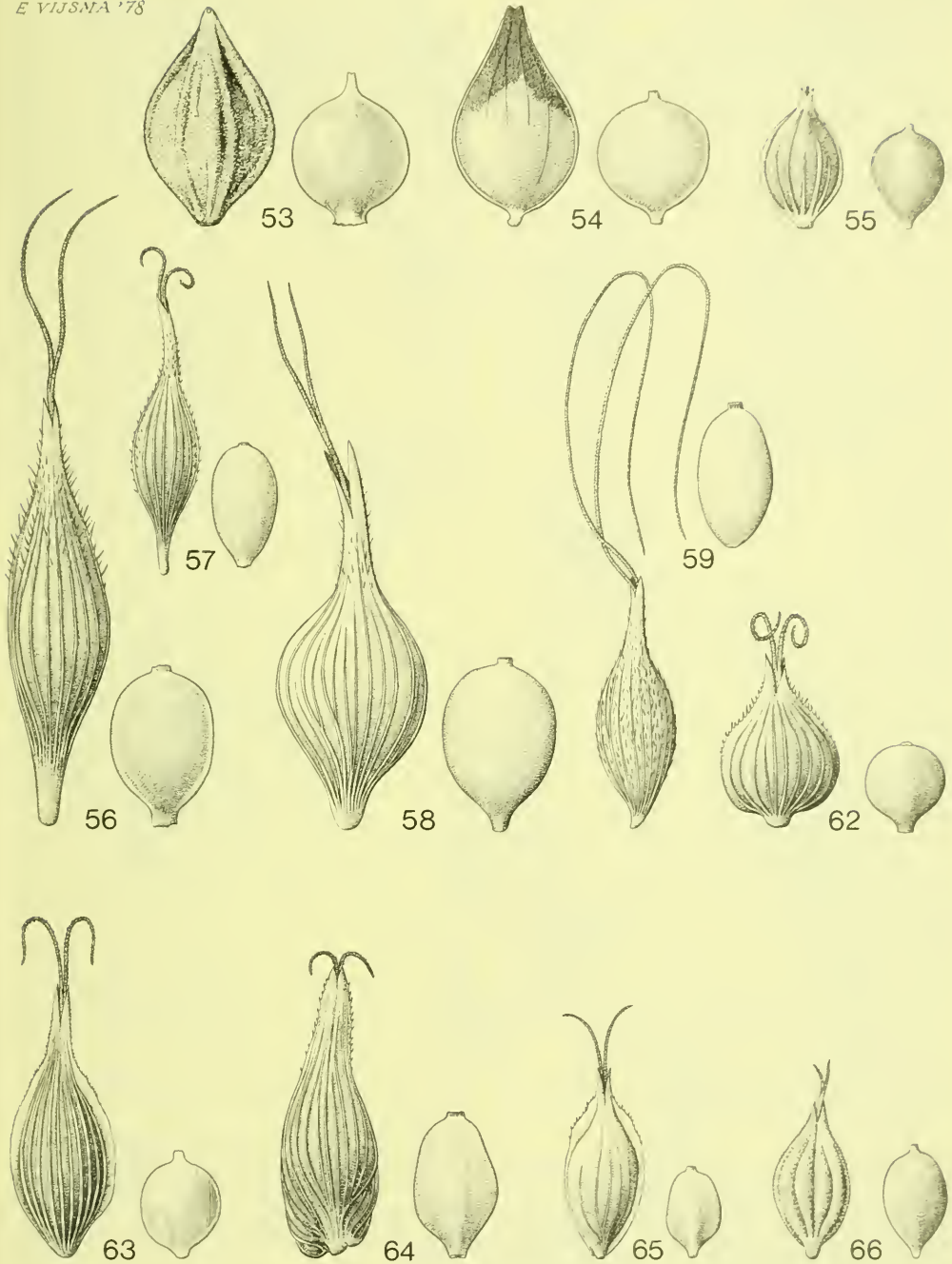


Fig. 123. Utricles and nuts of *Carex*. Species numbered as in the text (53 VAN STEENIS 4624, 54 DE WILDE c.s. 13329, 55 BRASS 9284, 56 BRASS 9515, 57 EYMA 3862, 58 herb. VAN SOEST 88, 59 VAN STEENIS 9804, 62 HOOGLAND & SCHODDE 7470, 63 JESWIET 39, 64 DE WILDE c.s. 13323, 65a KOORDERS 43403, 66 BRASS 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 decompound, 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, mucous 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, $2\frac{3}{4}$ –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 Naho).

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 $\frac{3}{4}$ 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. — 6. *C. indica* L., j-k. — 13. *C. hypolytroides* RIDL. l. — 10. *C. stramentitia* BOOTT, m-n. — 11. *C. vesiculosa* BOOTT, o-p. (a-b CHEW, CORNER & STANTON 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, 2¹/₂–4¹/₂ mm long, the midnerve in the upper glumes excurrent in a hispid, up to 1³/₄ 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 ³/₄, scarcely stipitate, rather abruptly beaked, reddish with castaneous flecks, 3–5 by 1–1³/₄ mm; beak slender, scabrid on the margins, mouth not oblique, 1¹/₄–2 mm long. *Nut* triquetrous, ellipsoid or slightly obovoid, with concave faces, shortly stipitate, abruptly beaked, 1¹/₂–2¹/₂ by 1–1¹/₂ 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 1–1¹/₂ 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 ♀ 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 cladoprophyll 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. hypolytropis* GROSS in Fedde, Rep. 50 (1941) 213. — Fig. 119, 1241, 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 exerted, 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. Cladoprophylls 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. moupiniensis* 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, dupunculate below (narrowed into a pseudo-petiole), otherwise flat, long-acuminate, minutely scabrid on the margins in the upper part, with the midnerve and 2 mid-lateral nerves prominent, $1\frac{1}{2}$ – $3\frac{1}{2}$ cm wide; ligule elongate-triangular, brown-bordered, $1\frac{1}{2}$ –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 – $3\frac{1}{2}$ by 1 – $2\frac{1}{2}$ cm, on exserted, smooth or finely scabrid peduncles. Bracts sheath-like, ampliate, 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 $1\frac{1}{2}$ – $1\frac{4}{5}$ 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 $1\frac{1}{2}$ – $1\frac{3}{4}$ mm from the apex), 3– $3\frac{1}{2}$ 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, $2\frac{1}{2}$ – $2\frac{3}{4}$ by $1\frac{1}{2}$ – $1\frac{3}{4}$ 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. Acrarrheneae* 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, Linnæa 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, mucous 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 Malesia; in *Malesia*: 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: *djigudjigufa, Dunantina, djugudjuguha, Asoro: Kefamo, pul, Chimbub: 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. Phil. 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 ('*longebracteata*'), 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 decomposed, 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 exserted, 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 *Malesia*: 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 BOECKLER 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 subdpaniculata, spiculae numerosae" in *C. myosurus*, versus "inflorescentia paniculata rarius spicata, spiculae haud numerosae" in *C. longibracteata*).

No how 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. $1\frac{1}{2}$ 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, $1\frac{1}{2}$ –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, $\frac{1}{2}$ –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, $2\frac{1}{3}$ – $3\frac{1}{2}$ by $\frac{9}{10}$ –1 mm, subabruptly narrowed into a smooth or sparsely hispidulous-margined $\frac{3}{4}$ –1 mm long beak; mouth subentire or bidenticulate. Nut ellipsoid or ovoid, triquetrous with flat faces, densely punctulate, dilate-annulate at the apex, $1\frac{1}{3}$ – $1\frac{1}{2}$ by $\frac{4}{5}$ –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 *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 – $2\frac{2}{3}$ 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 STAPF 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 NERMES placed it in subg. *Carex*, but *C. perakensis*, *C. tonkinensis* and *C. leucostachys* in subg. *Indocarex*. The two subgenera he distinguished by their cladophylls (utriculiform in subg. *Indocarex*, ocreiform in subg. *Carex*). He described the cladophylls 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 compound. Utricles 5–9½ 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, 3½–5½ 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, 5–9½ mm. Glumes light brown or reddish brown, the margin often whitish hyaline, 2½–7 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 2½–4 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 1½ mm long. Beak of the 1½–2⅓ mm wide utricles 1½–2(–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. Btzg III, 16 (1940) 320, *incl. var. clemensii* (KÜK.) KÜK. f. *angustifrons* KÜK.; NERMES, Reinwardtia 1 (1951) 351. — *C. fusiformis* (non NEES) STAFF, Trans. Linn. Soc. II, 4 (1894) 246. — *C. fusiformis* NEES var. *borneensis* (CLARKE) KÜK. Pfl. R. Heft. 38 (1909) 598. — *C. kinabaluensis* STAFF, J. Linn. Soc. Bot. 42 (1914) 183; NERMES, Kew Bull. (1950) 200; Reinwardtia 1 (1951) 349; *ibid.* 2 (1954) 377; RAYM. Mém. Jard. Bot. Montréal n. 53 (1959) 82. — *C. rivulorum* RIDL. J. Fed. Mal. St. Mus. 6 (1915) 195, *non* DUNN, 1908. — *C. breviglumis* RIDL. Fl. Mal. Pen. 5 (1925) 183; NERMES, Reinwardtia 1 (1951) 348. — *C. clemensii* KÜK. in Fedde, Rep. 29 (1931) 202. — *C. pseudorivulorum* KÜK. Bull. Jard. Bot. Btzg III, 16 (1940) 319, *quoad basionym.* — *C. eymae* NERMES, 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 margined, 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 margined, 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: *tangtañgo*, 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, 3–3¾ 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 Teub; 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 Back. & 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.*; BACK. 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. Btzg 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. Btzg 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 Reehinger, 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, $2\text{--}2\frac{1}{4}$ by $1\text{--}1\frac{1}{4}$ mm. Style-base not thickened. Stigmas 3.

Distr. Assam, Upper Burma, S. China, Tonkin, through Malesia to the Solomon Is.; in Malesia: 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* NELMES. a. Habit, $\times \frac{2}{3}$, b. glume, c. fruit in utricle, d. fruit, all $\times 6$ (RAHMAT SI BOEEA 10601).

Rhizome short, not creeping. *Stems* central, erect, triquetrous, smooth, 30–70 cm by 1½–2 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 ♂, cylindrical, 2½–5 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, 3–4½ 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 2–2¼ mm, rather abruptly narrowed into a 2½–4 mm long, conical, bidentate beak; teeth 1–1½ 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, 4–5½ mm long; beak cylindrical, ½–1¼ 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; Tobo), W. Java (Priangan: Tjadas Malang S. of Tjiandjur; Mt Bèsèr near Tjidadap).

Ecol. 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. ½ mm long), and the beak of the nut slenderer, c. 1½ 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 cylindrical (or clavate), 1–3 cm by 2–4 mm, lateral ones ♀ (rarely androgynous), oblong-cylindric, subax-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, 3–5½ mm long. *Utricles* fusiform-ellipsoid, trigonous, subcoriaceous, densely and strongly many-nerved, glabrous, straight, suberect, shortly stipitate, olivaceous, 5½–7½ by 1½–2 mm, gradually narrowed into the conical, straight, bidentate beak; teeth ¼–¾ 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, 2¼–3 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.

Ecol. 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; MIQ. Fl. Ind. Bat. 3 (1856) 353; BOECK. Linnæa 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. Btzig 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 $\frac{1}{4}$ -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, peduncle on shortly exerted or wholly included peduncles, sometimes one 1-3 cm lower down; terminal spikelet ♂, cylindrical, 5-10 by $\frac{1}{2}$ -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 $\frac{1}{3}$, 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 KÜENTHAL. 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. grandimascula* 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 $\frac{1}{4}$ 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 $1\frac{1}{4}$ -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 KÜENTHAL 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) NERMES, *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; NERMES, *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, 2¹/₄-2³/₄ 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, 3¹/₂-5¹/₂ by 1¹/₂-2 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) NERMES, *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; NERMES, *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, caespitose. *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 BOOTH) RIDL. Fl. Mal. Pen. 5 (1925) 181. — ? *C. tristachya* THUNB. var. *pseudopocilliformis* GROSS, Notizbl. Berl.-Dahl. 14 (1938) 191. — *C. malayana* NELMES, Kew Bull. (1950) 209; Reinwardtia 1 (1951) 366.

Rhizome short, caespitose. 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 $\frac{4}{5}$ 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; NELMES, 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.* $\frac{2}{2}$ 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 rhynchachaenium* 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. hatsimana* 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, caespitose. *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, (obtuse) 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 overtopping 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. tunens* 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. Ryukyuu 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, caespitose, 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 δ , linear, ($1\frac{1}{2}$ -)3-6 cm by $1\frac{1}{2}$ -2 mm, lateral σ or with a few δ flowers at the top, lax-flowered, ($1\frac{1}{2}$ -)3-5 cm by $2\frac{1}{2}$ - $3\frac{1}{2}$ 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, $2\frac{1}{2}$ -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. Herb. 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, caespitose. *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 δ , 1-2 cm long, 2-3 mm thick, lateral ones single at the nodes, usually gynaeandrous, with very few σ 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 $1\frac{1}{2}$ 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. *Egededán*, 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. I (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 $1/2$ –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, $1/2$ –3 cm by $1/2$ –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, muticous, those of the ♀ spikelets ovate or oblong-ovate, rounded at the ciliolate apex, glabrous, muticous 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 $3/4$ –1 mm; beak subconical, glabrous or hispidulous-margined, bidenticulate, $1/2$ 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; ROEGER, 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

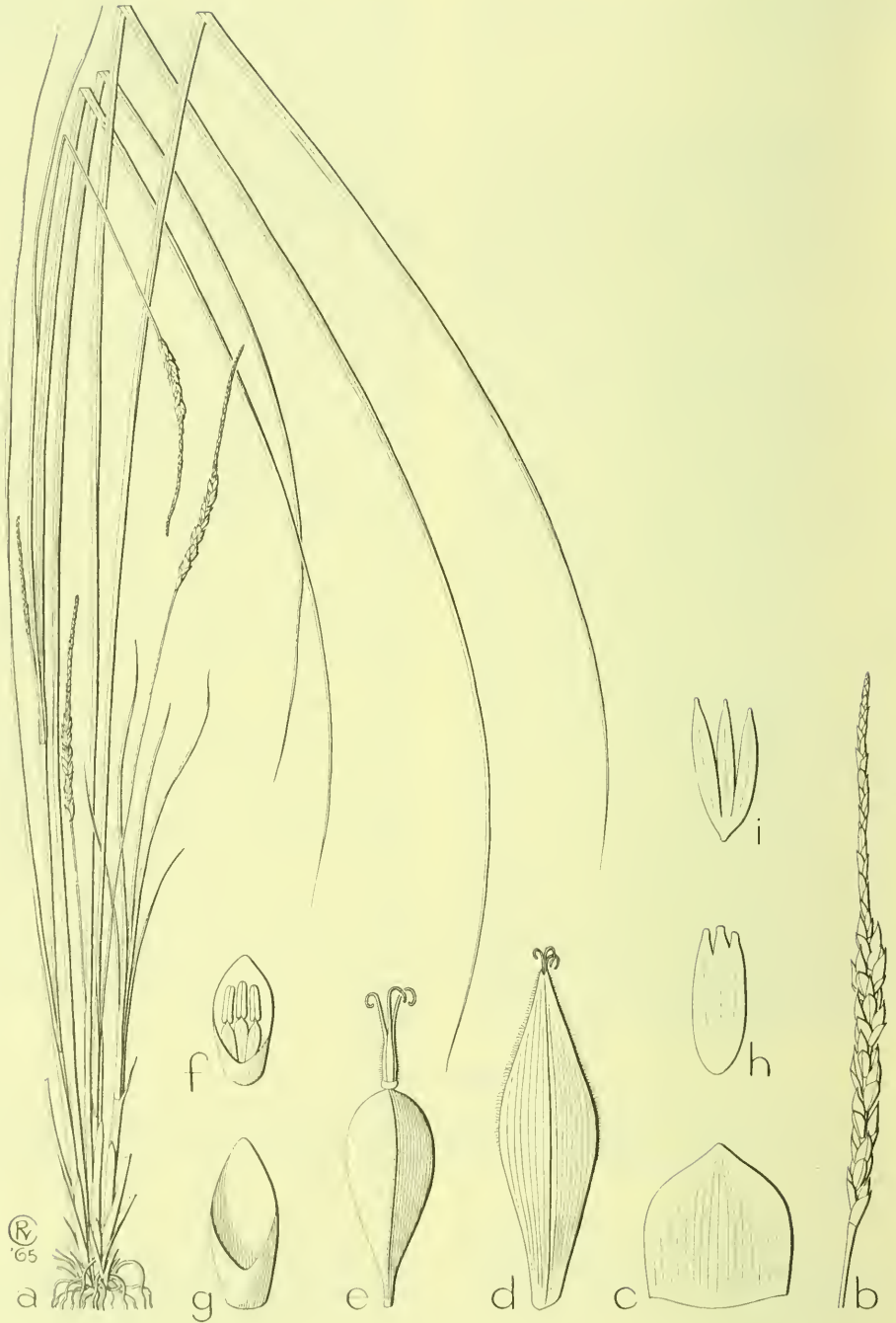


Fig. 129. *Carex speciosa* KUNTH. a. Habit, $\times \frac{1}{2}$, b. spikelet, lower part ♀, upper part ♂, $\times 1\frac{1}{2}$, c. glume, d. fruit in utricle, e. fruit, f. young stamens in glume, g. glume, h. seemingly connate filaments, i. filaments, all $\times 13$ (WAITZ s.n.).

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, $4\frac{3}{4}$ by $1\frac{4}{5}$ – $2\frac{1}{4}$ 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, $2\frac{1}{4}$ 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 NERMES 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; NERMES, 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, $3\frac{3}{4}$ mm long, the midnerve excurrent in a minutely scabrid, $1\frac{3}{4}$ 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 $2\frac{2}{3}$ 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; NERMES, 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* NERMES, 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 overlapping 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, mucicous, minutely ciliolate 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, ciliolate, persistent. Stigma 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, Chiengmai, Doi Chiengdao, at 1200 m (SLEUMER & SMITINAND 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 with ciliolate 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 $1\frac{1}{2}$ – $2\frac{1}{3}$ 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. Btzg 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. Btzg 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 subobtusate, thin, translucent, often minutely ciliolate, 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– $\frac{3}{4}$ 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 Papandajan; 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 $1/2-3/4$ 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, $1/2-2$ mm wide; sheaths pale, membranous in front. *Spikelet* solitary, terminal, androgynous, ovoid or shortly cylindric, 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, $1 1/2-3$ 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, ($1 1/2-2 1/2-3 1/2(-4)$) by c. 1 mm, rather gradually tapering to a very short, subtentire or slightly emarginate beak. *Nut* ellipsoid or oblong-ellipsoid, triquetrous, shortly stipitate, abruptly short-beaked, stramineous to brownish, $1 1/2-2 1/2$ 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, puncticulate utricles, and the caducous glumes. Except for the much longer, linear spikelets (♂ part much longer than the ♀ 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 Rhizopodae

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. Rhizopodae* (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 ♂ part shorter than the ♀ 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 1⅓ 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. mesogyna* 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 gynaeceandrous), 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–)1–1¾ 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 1–1¾ 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 KÜENTHAL, 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. KÜENTHAL 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, ½–2½(–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. turrata* CLARKE var. *turrata*, 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').

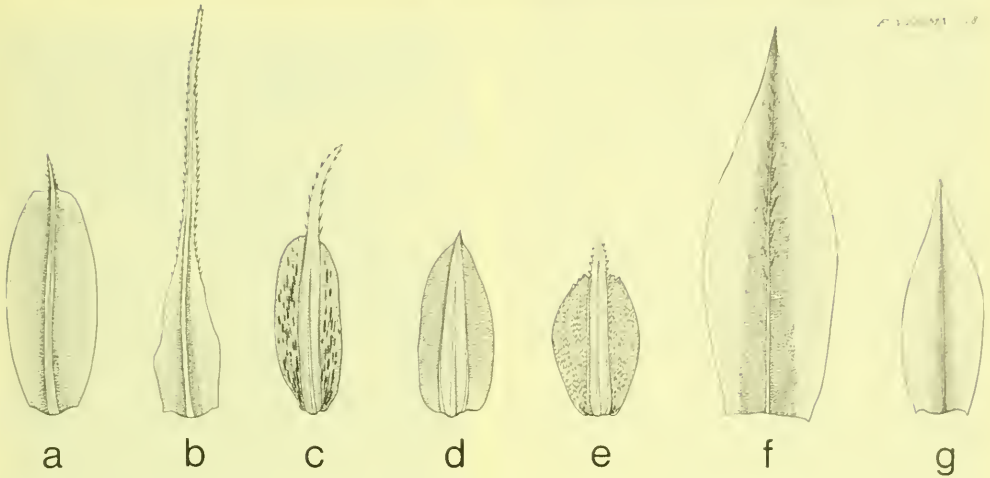


Fig. 132. Glumes, $\times 10$. — 46. *Carex brachyathera* OHWI, a. — 49. *C. pseudocyperus* L. var. *fascicularis* (SOLAND. ex BOOTT) BOOTT, b. — 52. *C. phacota* SPRENG., c. — 53. *C. pruinosa* BOOTT, d. — 54. *C. teres* BOOTT, e. — 56. *C. bilateralis* HAYATA, f. — 57. *C. brunnea* THUNB., g (a BRASS 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 oedorrhapha* 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. oedorrhapha* var. *arfakiana* OHWI, Bot. Mag. Tokyo 56 (1942) 214. — *C. oedorrhapha* 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 1½ cm long. Spikelets 4–6, erect or subcernuous, upper approximate and fastigate, lower distant; terminal spikelet ♂, long-linear, sessile, not or slightly exceeding the uppermost lateral spikelet, pale, 2–6 cm long, 1–2 mm thick, lateral spikelets ♀, narrowly cylindrical, densely flowered, 2½–12 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, $3\text{--}3\frac{3}{4}$ 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 cylindric, 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; III. 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, fastigiate, 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. oedorrhampa* 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. *perciolata* (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 – $1\frac{1}{2}$ 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 – $3\frac{1}{2}$ mm wide. *Spikelets* 3–5, single at the nodes, erect to cernuous, often subfastigate, rather densely flowered above, lax-flowered below, $1\frac{1}{2}$ –6 cm long, terminal one ♂, subclavate, 1–2 mm thick, long-peduncled, lateral ones ♀, linear-cylindric, $2\frac{1}{2}$ – $3\frac{1}{2}$ mm thick, on exserted, slender, smooth or antorsely 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 – $4\frac{1}{2}$ mm long, with strong midrib excurrent in a hispidulous, up to 1 mm long awn. *Utricles* ellipsoid or ellipsoid-fusiform, obtusely compressed-trigonous, angled ventrally, membranous, nerveless except for 2 submarginal nerves, sparsely to rather densely subappressed-hispid, suberect, stipitate, 3 – $4\frac{1}{2}$ by c. 1 mm, rather gradually narrowed into a stout, straight or slightly bent, bidentate, 1 – $1\frac{1}{2}$ 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 ('*atjehiensis*'). — 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 gynaeceandrous, 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, scarious 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 KREZC. 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 exserted, 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, 1/3–1/2 as long as the utricule. *Utricules* 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, 2/3 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 Pseudocyperae

[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. Pseudocyperae* (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. Agr. 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 long, 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 ⅔–1 mm, in some Australian specimens up to 1½ mm), greenish to stramineous, 4–5(–7) by 1–1½ mm long, 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 Malesia: 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 KÜKENTHAL (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. Scleriiculmes* NERMES, 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, III. 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; NERMES, 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, fastigiate, 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. exploratorium* NELMES, Kew Bull. (1938) 108; Reinwardtia 1 (1951) 418. — *C. pandanus* OHWI, Bot. Mag. Tokyo 56 (1942) 214. — *C. euphlebica* 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 overtopping 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 punctulate, 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 $\frac{4}{5}$ – $1\frac{1}{4}$ 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. *lataum*, S; Philippines: *alagas*, 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. exploratorium* (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. euphlebica* 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 exploratorium* 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. Btzg III*, 16 (1940) 317; OHWI, *Bot. Mag. Tokyo* 56 (1942) 214; S. T. BLAKE, *J. Arn. Arb.* 28 (1947) 107; BACK. *Bekn. f. 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 ferrugineous 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, $1\frac{1}{2}$ – $4\frac{1}{2}$ 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 overlapping the inflorescence, upper ones much smaller, none sheathing, but dark brown auricled at the base. *Glumes* oblong, obtuse, truncate, or bilobed-emarginate, thinly membranous, ferrugineous to castaneous, or pale with reddish flecks, $1\frac{1}{4}$ –3 mm long, with 3-nerved central stripe excurrent in a wide, scaberulous-margined awn $\frac{1}{2}$ –2 mm long. *Utricles* elliptic, obovate, or suborbicular, compressed-biconvex, membranous, nerveless, narrowly marginate, glabrous, densely beset with ferrugineous or reddish, raised glandular papillae, obliquely erect, shortly stipitate, $2\frac{1}{4}$ –3(– $3\frac{1}{2}$) by $1\frac{1}{2}$ – $2\frac{1}{4}$ mm; beak extremely short,

entire. *Nut* pyriform to suborbicular, compressed-biconvex, broadly stipitate and beaked, $1\frac{3}{4}$ –2 by $1\frac{1}{4}$ – $1\frac{3}{4}$ 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 Pongonan 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. tristigmata* 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), muticous 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, fastigate, and suberect to subcernuous, $\frac{3}{4}$ – $5\frac{1}{2}$ 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. 1, 1 (1950) 554. KÜKENTHAL'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. petecticalis* 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 1/3 of the stem, flattish with revolute margins, stiff, 4–7(–11) mm wide. *Spikelets* 4–8, cernuous, upper subapproximate, fastigiate, 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, subobtuse to very obtuse, truncate or bilobed, 2 1/2–3 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 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-puncticulate, scarcely stipitate, gradually beaked, 3–4(–4 1/2) by 1 1/2–2 mm; beak short, 1/2–3/4 mm long, entire or slightly emarginate. *Nut* broadly elliptic or suborbicular, compressed-biconvex, 1 1/2–2 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. kerrii* 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. petecticalis* from *C. spathulata* by its longer inflorescence (11–13 versus 7–10 cm), longer spikelets (3–6 versus 2–4 1/2 cm), and shorter utricles (2 3/4–3 1/2 versus 3 1/2–4 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.

KÜKENTHAL thought the Sumatran and Javan plants to be varietyally 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*

Sec. Vulgares (ASCHERS.) NELMES, Reinwardtia 1 (1951) 429.

Type species: *Carex acuta* (L.) 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, III. 4 (1867) 169, t. 567; BENTH. Fl. Austr. 7 (1878) 442. — *C. vulgaris* (non FR.) F.V.M. Fragm. 8 (1874) 257. — *C. lacerans* 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: DURIETZ, Act. Phytogeogr. Suec. 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. Arn. 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 ¼–1½ 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 to 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. *Malesia*: 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; SCHKUHR, 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. Pf. 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. spadiceo-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 to 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 fastigiate, 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 *Malesia*: 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. teinogyna* 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. *subteinogyna* KÜK. (non *C. subteinogyna* 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. Linnaea 40 (1876) 376; CLARKE, Fl. Br. Ind. 6 (1894) 704; J. Linn. Soc. Bot. 34 (1898) 108; *ibid.* 36 (1903) 295; KÜK. Pfl. 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 cernuous, 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, antrorsely scabrid, up to 5 mm long awn often overtopping the utricle. *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 utricle in axil of bract, c. fruit in utricle, d-e. fruits, all $\times 7$ (VAN STEENIS 6788).

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

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 teiogyna* 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 (*teiogyna*), incl. var. *scabriculmis* KÜK.; Bull. Jard. Bot. Btzg III, 16 (1940) 320, excl. pl. jav.; NERMES, *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. scabriculmis* 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.) NERMES, 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 σ 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, mucicous or with an awn up to 2 mm long, $3\frac{1}{2}$ –5 mm long. *Utricles* 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 divisa* 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 (♂ part about as long as the ♀), sessile, approximate, elliptic-lanceolate (very young), subdense-flowered, 5–7 mm long, forming a more or less oblong head 1–1½ 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, 3½–4 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 utricles.

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 spadiceous, dark-nerved, bladeless sheaths and their fibrous remains. *Leaves* in the lower ¼–1/3 of the stem, shorter to longer 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 (♂ and ♀ 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, 2½–3½ by 1¼–2 mm; beak ½–1 mm long, bidentate, grooved on the back, with slightly oblique mouth. *Nut* ovate to obovate, compressed-biconvex, broadly stipitate, beakless or shortly beaked, 1¼–1¾ 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 $\frac{1}{2}$ –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* GOODEN.

64. *Carex echinata* MURR. Prod. Stirp. Gotting. (1770) 76; BOECK. *Linnaea* 39 (1875) 124; BENTH. Fl. Austr. 7 (1878) 439. — *C. stellulata* GOODEN. Trans. Linn. Soc. 2 (1794) 144; KÜK. Pfl. R. Heft 38 (1909) 228. — *C. nubigena* (non DON) KÜK. Bull. Jard. Bot. Btzg 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 bidentate 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., *armemsena*, *kul*, Manikiong 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. omiana* 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. *spp. 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 1/3 of the stem, shorter to longer than the stems, flat, scabrid on the margins especially towards the long-attenuated

apex, $1\frac{1}{2}$ –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, gynaeceandrous 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 $\frac{1}{2}$ 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 $\frac{1}{2}$ – $\frac{3}{4}$, yellowish green to brownish, scarcely stipitate, subabruptly beaked, $2\frac{3}{4}$ –3 by 1 – $1\frac{1}{4}$ mm; wings varying in width, denticulate-ciliate; beak c. $\frac{1}{2}$ mm long, bidentate with slender, straight teeth. *Nut* ellipsoid or ovoid, biconvex, shortly stipitate and beaked, $1\frac{1}{3}$ – $1\frac{2}{3}$ by $\frac{2}{3}$ – $\frac{5}{6}$ mm. *Style* slightly thickened at the base. *Stigmas* 2.

Distr. Insufficiently known; according to literature from India (Himalaya) to Central China; *C. craspedotricha* 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* $\frac{3}{4}$ –4 mm long. *Utricles* lanceolate, ventrally nerveless or nearly so, narrowly winged, 4–4 $\frac{1}{2}$ 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 KÜKENTHAL), 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; SCHKUHR, 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. Linnaea 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 1–1 $\frac{1}{2}$ 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, 2–3 $\frac{1}{2}$ (–6) cm long. *Spikelets* 4–8, gynaeceandrous (σ 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, 2–2 $\frac{1}{2}$ 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 bidenticulate. *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 Woitape 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 subflicina 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. flicina* 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. (Arnett)”. 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. musci berol. sine indicatione loci.” Wrongly localized; see *Fl. Males.* 1, 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 Malesia.

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, exerted 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.

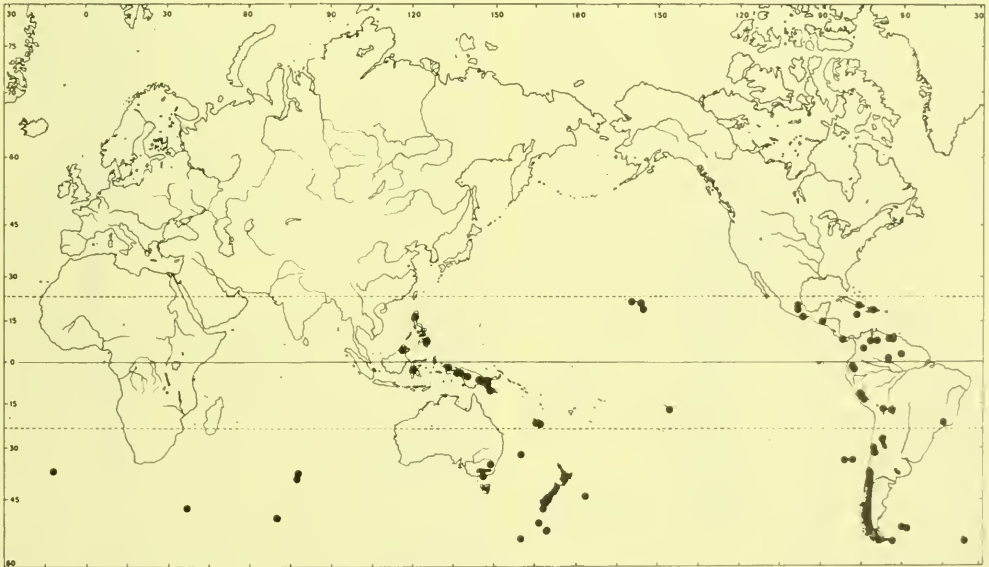


Fig. 136. Range of the genus *Uncinia* PERS. (from VAN BALGOOY, Pac. Pl. Areas 3, 1975, 320, map 209)

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. Platyantra* 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(–24) mm wide; basal sheaths bladeless or short-bladed, fuscous. *Spikelet* narrowly linear, often very loosely flowered, ebracteate or with a filiform bract usually not overlapping 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, mucicous, rigid, stramineous with broad 3-nerved green centre and sometimes brown margins, (4–)5–6(–7 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–

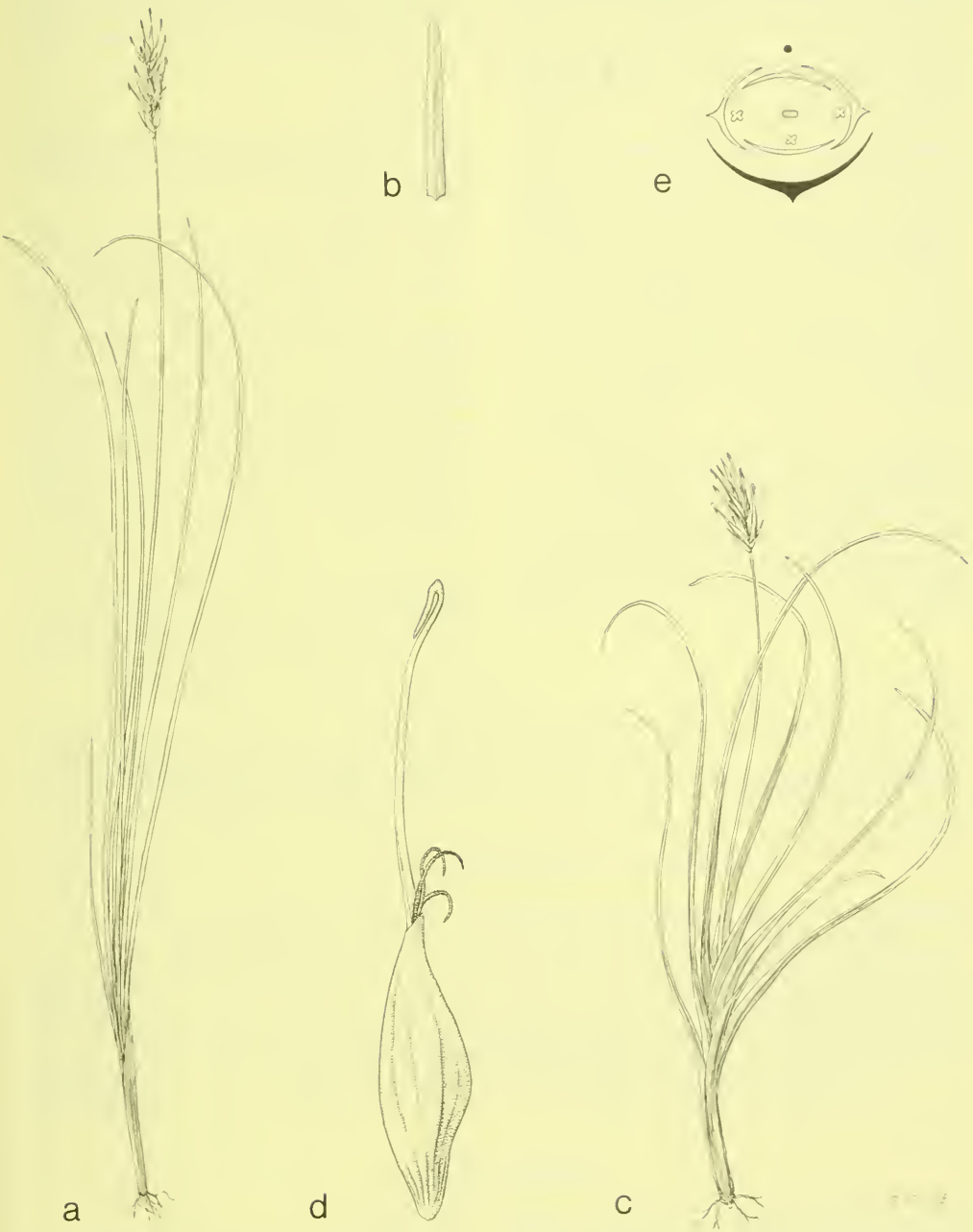


Fig. 137. *Uncinia compacta* R. BR. var. *nervosa* CLARKE. a. Habit, nat. size, b. leaf tip, $\times 7$. — *U. compacta* R. BR. var. *alpina* NOOT. c. Habit, nat. size, d. utricle, $\times 10$. — *Exocarya scleroides* (F.v.M.) BENTH. e. Flower diagram (a-b ANU 7161, c-d ANU 7289).

20 mm, the ♂ part $1/2$ – $1\frac{1}{2}$ 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 ls.) 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 circinnate towards the apex. Usually small plants
c. var. alpina
1. Spikelets $1\frac{1}{2}$ – $5\frac{1}{2}$ cm. Leaves not or less circinnate. 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* BOOTH 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 Hypolytreae* 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.).

Ec. 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 *Hypolytraeae* 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; Mtq. 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.

LILIACEAE—I (J. P. Jessop, Adelaide)¹

Herbs, usually glabrous, with perennial underground stems (corms, bulbs, tubers, or rhizomes) in all *Mal. spp.* Aerial stems usually herbaceous and annual, erect or climbing. *Leaves* simple, caespitose and basal, sometimes distichous, if cauline usually alternate, generally linear to lanceolate or oblanceolate especially when basal, but sometimes shorter and broader (to ovate) when cauline, usually sessile (in *Asparagus* and *Petrosavia* reduced to non-photosynthetic scales), usually with parallel venation. Stipules 0. *Inflorescence* terminal or axillary, usually racemose (less often at least partly umbellate) or flowers solitary, usually bracteate. *Flowers* bisexual (except, in *Mal.*, *Asparagus cochinchinensis* and *Astelia alpina*), usually actinomorphic. *Perianth segments* almost invariably 6 in two more or less similar or less often distinctly dissimilar whorls of 3, petaloid, connate or free, the outer whorl sometimes saccate at the base. *Stamens* 6, inserted on receptacle or perianth; filaments connate or free, rarely forming a corona-like ring attached to the perianth; anthers basifixed or dorsifixed, rarely sessile, usually 2-celled, extrorse to introrse or rarely dehiscent by an apical pore. *Ovary* usually superior, of 3 (usually fused) carpels; styles 1 or 3, simple or 3-branched; locules usually 3 (1 in *Tricalistra*); ovules 1 to numerous, placentation axile, rarely basal or parietal, usually in 2 rows. *Fruit* usually a loculicidal or septicidal capsule or berry, rarely the ovary wall ruptured by the developing seed which develops unprotected by a fruit, perianth caducous or persistent. *Seeds* with copious fleshy or cartilaginous endosperm.

Distribution. About 180 genera with approximately 3500 *spp.*, distributed all over the world, especially in the temperate regions of Asia, Australasia and Africa, but relatively poorly represented in South America (13 genera).

In *Malesia* 22 genera, with a total of 31 *spp.*, no genus being represented by more than two species. The only genus endemic to the region is the Malayan genus *Tricalistra* whose separation from *Tupistra* is, however, somewhat uncertain. Most other genera are represented in *Malesia* by a minority of their species, exceptions being *Gloriosa* and *Peliosanthes*, which are probably both monotypic, and *Petrosavia*, which consists probably of two species.

The genera can roughly be arranged into three geographical groups.

Old World genera are *Asparagus*, *Chlorophytum*, *Dianella*, *Gloriosa* and *Iphigenia*, among which *Chlorophytum* is mainly Africa-centred, and *Dianella* mostly Australasian.

Northern hemisphere genera, especially from the Far East, Sino-Himalayan, are the following: *Aletris*, *Disporopsis**, *Disporum*, *Lilium**, *Liriope**, *Ophiopogon*, *Peliosanthes*, *Petrosavia*, *Tricyrtis**, and *Tupistra*. Of these four, provided with an asterisk, are found only in *Malesia* in the Philippines, and *Tupistra* only in Malaya and Sumatra. All of them are absent from East *Malesia*. Most of their species occur in the montane zone, testimony of their subtemperate ecology.

Australasia-derived genera are *Arthropodium*, *Astelia*, *Caesia*, *Schelhammera*, *Thysanotus*, and *Tricoryne*. Their occurrence in *Malesia* is confined to New Guinea, except for *Thysanotus chinensis* BTH, which is found through *Malesia* as far as Thailand and S. China. Their ranges are sometimes wider in Austral regions, as *Arthropodium* and *Caesia* occur also in the Malagasy area, and *Caesia* also in South Africa, while *Astelia* ranges widely from Mauritius to the southern Pacific islands and the Falkland Islands. Except for *Astelia*, which occurs in *Malesia* only in the

(1) Gratefully acknowledging a stipend from C.S.I.R., Pretoria, for work on this revision during the period July 1973 to June 1974, at the Rijksherbarium, Leyden, when on long-leave from Rhodes University, Grahamstown, South Africa.

With bibliographic co-operation of the General Editor.

alpine zone of New Guinea, all the species of the genera of this southern group are bound to lowland drought habitats.

Ecology. Of the 22 genera 13 are integrated in lowland to montane everwet-forest conditions. *Astelia alpina* is a high-altitude cushion plant which sometimes plays a significant role in the alpine bogs of New Guinea. The eight other genera, *Arthropodium*, *Asparagus*, *Caesia*, *Gloriosa*, *Iphigenia*, *Schelhammera*, *Thysanotus*, and *Tricoryne*, are constituents of areas subject to a seasonal climate. Consequently, the ranges of *Asparagus racemosus*, *Gloriosa superba*, *Iphigenia indica* and *Thysanotus chinensis* show in Malesia the usual disjunctions of drought-preferring plant species. They are predominantly grassland or open savannah plants at low altitudes. Most of them are Australasia-centred.

Except for *Astelia papuana*, species of these *Liliaceae sensu stricto* do not form major constituents or natural communities.

Dispersal. The great majority of *Liliaceae* spread and reproduce vegetatively by the branching of their subterranean axes. In most species this appears to be a slow process, with the branches often not extending more than a few centimetres in a year. It may, however, result in fairly dense monospecific stands, for example, in *Astelia* and *Liriope*.

Fruits are generally capsules or berries. In the former, dispersal mechanisms do not usually result in the removal of seeds to any great distance, although wind and water can contribute significantly.

Birds are probably the most efficient vectors over longer distances. Several genera have fleshy fruits and two (*Ophiopogon* and *Peliosanthes*) have a fleshy coating to the seeds, which are exposed through rupture of the ovary wall. Mammals may also disperse the seeds by eating the fruits. *Liliaceae* seeds in other areas are known to be carried by ants if there is a substance attractive to ants (often oil bodies) in the testa or fruit. Specific data on the Malesian species have not, however, been found.

For a study of the structure and relationships of the seeds, see HUBER, Die Samenmerkmale und Verwandtschaftsverhältnisse der Liliifloren, Mitt. Bot. Staatssamml. Münch. 8 (1969) 219–538.

Cytology. *Liliaceae*, because of the usually large size of their chromosomes, because of the ease with which material can often be obtained at the stages of division required for study, and because many species are in cultivation, have been fairly well studied cytologically. Chromosome numbers, and even basic chromosome numbers vary widely sometimes within, as well as between, genera. At least six different somatic numbers have, for example, been reported for *Disporum*, based on $x = 6, 7, 8, 9$ and 11 . Other genera, for example, *Asparagus* ($x = 10$) and *Dianella* ($x = 8$), have relatively stable basic numbers, although polyploidy may be common.

Taxonomy. The family *Liliaceae*, in the sense of BENTHAM & HOOKER and of KRAUSE in E. & P. Nat. Pfl. Fam. is a very large and rather heterogeneous one including possibly as many as 3500 species. Many more recent authors have attempted to distribute these species over a larger number of families. In this treatment the family delimitation of HUTCHINSON (Families of flowering plants, ed. 3, 1973) has been adopted, with two modifications: the inclusion of *Petrosavia* which HUTCHINSON placed in its own family, and of the naturalised *Nothoscordum* which HUTCHINSON placed in the *Amaryllidaceae*. It is very doubtful if the family is more naturally defined by excluding a number of genera represented in Malesia, as HUTCHINSON has done, but this has been followed here as much for the convenience of dealing with smaller families as for any conviction that these families have any botanical significance. Table 1 indicates the genera retained in the *Liliaceae* and the families to which other genera, sometimes included in the *Liliaceae*, were ascribed by HUTCHINSON. These families have also been included in the key to the genera of Malesian *Liliaceae*.

Much work remains to be done on the relationships of Liliaceous genera and HUTCHINSON's work, although the most recent, is probably no better than KRAUSE's. HUTCHINSON's placing of *Ophiopogon* and *Peliosanthes* in separate tribes is, for example, almost certainly unjustified.

Uses. Several species of *Liliaceae* native to Malesia have been taken into cultivation as garden ornamentals, for example of the genera *Dianella*, *Gloriosa*, *Lilium*, *Liriope*, and *Ophiopogon*. Other uses are, however, rather few. Several genera, for example, *Asparagus*, *Gloriosa*, *Ophiopogon*, have been used in traditional medicines but they have not contributed to modern

Table 1. Malesian Liliaceous genera in the classification by KRAUSE (1930), first column, and by HUTCHINSON (1973), third column.

Subfamily I.	<i>Melanthioideae</i>		
I.	2. <i>Petrosavieae</i>	— <i>Petrosavia</i>	(<i>Petrosaviaceae</i>)
I.	6. <i>Uvularieae</i>	— <i>Schelhammera</i> — <i>Gloriosa</i>	} <i>Uvularieae</i>
I.	7. <i>Tricyrteae</i>	— <i>Tricyrtis</i>	<i>Tricyrtideae</i>
I.	8. <i>Anguillarieae</i>	— <i>Iphigenia</i>	<i>Iphigenieae</i>
Subfamily III.	<i>Asphodeloideae</i>		
III.	11. <i>Asphodeleae</i>	— <i>Chlorophytum</i> — <i>Thysanotus</i>	} <i>Asphodeleae</i>
III.	11a. <i>Asphodelinae</i>	— <i>Arthropodium</i> — <i>Tricoryne</i> — <i>Caesia</i>	} <i>Asphodeleae</i> <i>Johnsonieae</i> <i>Asphodeleae</i>
III.	11g. <i>Dianellinae</i>	— <i>Stypandra</i> — <i>Dianella</i>	} <i>Dianelleae</i>
III.	17. <i>Lomandreae</i>	— <i>Lomandra</i> — <i>Rommalda</i>	} (<i>Xanthorrhoeaceae</i>)
Subfamily IV.	<i>Allioideae</i>	— <i>Nothoscordum</i> (introduced)	(<i>Amaryllidaceae</i>)
Subfamily V.	<i>Lilioideae</i>	— <i>Lilium</i>	<i>Tulipeae</i>
Subfamily VII.	<i>Dracaenoideae</i>		
VII.	27. <i>Dracaeneae</i>	— <i>Cordyline</i> — <i>Dracaena</i> — <i>Astelia</i>	} (<i>Agavaceae</i>) <i>Milliganieae</i>
Subfamily VIII.	<i>Asparagoideae</i>		
VIII.	28. <i>Asparageae</i>	— <i>Asparagus</i>	<i>Asparageae</i>
VIII.	29. <i>Polygonatae</i>	— <i>Disporum</i> — <i>Disporopsis</i>	} <i>Polygonatae</i>
VIII.	30. <i>Convallarieae</i>	— <i>Tupistra</i> — <i>Tricalistra</i>	} <i>Aspidistreae</i>
Subfamily IX.	<i>Mondoideae</i>	— <i>Liriope</i> — <i>Ophiopogon</i> — <i>Peliosanthes</i>	} <i>Ophiopogoneae</i> <i>Peliosantheae</i>
Subfamily X.	<i>Aletroideae</i>	— <i>Alettris</i>	<i>Narthecieae</i>
Subfamily XI.	<i>Luzuriagoideae</i>	— <i>Luzuriaga</i> — <i>Geitonoplesium</i> — <i>Eustrephus</i>	} (<i>Philesiaceae</i>)
Subfamily XII.	<i>Smilacoideae</i>	— <i>Rhipogonum</i> — <i>Smilax</i> — <i>Heterosmilax</i>	} (<i>Smilacaceae</i>)

medicine. Others have edible underground parts (e.g. *Arthropodium*) or fruits (e.g. *Astelia*), but none is probably of great significance.

Notes. A very large number of exotic *Liliaceae* are recorded to be or have been cultivated in gardens in Malasia. They have been treated elaborately, with keys for their identification by C. A. BACKER in his 'Handboek voor de Flora van Java', part 3 (1924), in Dutch, and by C. A. BACKER & R. C. BAKHUIZEN VAN DEN BRINK Jr in their 'Flora of Java', volume 3 (1968), in English.

Only one exotic, *Nothoscordum inodorum*, has been introduced and has run wild in West Java; this has been incorporated in the treatment.

Almost all drawings were made by Mr. L. DUTKIEWICZ, Adelaide.

KEY TO THE GENERA

including the families sometimes segregated from Liliaceae sensu lato

1. Leaves reduced to small, non-photosynthetic scales.
 2. Stem branched, bearing green cladodes 13. *Asparagus*
 2. Stem simple. Small echlorophyllous saprophyte 4. *Petrosavia*
1. Leaves usually well-developed, always green (sometimes absent when the plant is in flower).
 3. Anthers 1-celled. Plants usually woody and often prickly climbers (*Heterosmilax*, *Rhipogonum*, *Smilax*) **Smilacaceae**
 3. Anthers 2-celled. Plants erect or herbaceous, not prickly, rarely woody climbers.
 4. Plants dioecious.
 5. Panicle glabrous or scaberulous. Flowers clustered at all or most nodes (*Lomandra*) **Xanthorrhoeaceae**
 5. Panicle silvery-scaly. Flowers solitary at each node 22. *Astelia*
 4. Flowers bisexual.
 6. Foliage leaves caespitose, usually basal or radical.
 7. Inner perianth segments fringed 10. *Thysanotus*
 7. Perianth segments not fringed.
 8. Inflorescence a simple umbel. Bulbous 23. *Nothoscordum*
 8. Inflorescence a raceme, spike or panicle. Plant rhizomatous.
 9. Flowers sessile. Anthers sessile or subsessile on the perianth.
 10. Fruit a capsule 21. *Aletris*
 10. Fruit fleshy.
 11. Style distinct. Stigma simple or indistinctly lobed 17. *Tupistra*
 11. Style absent. Stigmas distinctly 3 16. *Tricalistra*
15. Anthers dorsifixed.
 16. Ovary half-inferior 21. *Aletris*
 16. Ovary fully superior.
 17. Fruit a capsule. Stems to 5 cm long and 2–3 mm diameter (*Romnaldia*) **Xanthorrhoeaceae**
 17. Fruit a berry. Stems woody and usually long (*Dracaena*, incl. *Pleomele*) **Agavaceae**
15. Anthers basifixed.
 18. Fruit a berry 9. *Dianella*
 18. Fruit a capsule.
 19. Base of anthers with a papillose appendage. Pedicels 12–20 mm. Outer perianth segments distinctly broader than inner ones 6. *Arthropodium*
 19. Base of anthers without appendages. Pedicels 3–12 mm. Perianth segments equal.
 20. Perianth spirally twisting after anthesis, blue 7. *Caesia*
 20. Perianth segments persistent, but not twisted after flowering, white to green 8. *Chlorophytum*
6. Foliage leaves distributed at intervals along the stem.
 21. Plant with scaly bulb. Flowers 10–25 cm long 12. *Lilium*

21. Plant with a rhizome, corm or tuber. Flowers up to at most 9 cm.
 22. Stem(s) woody. Venation reticulate (*Eustrephus*, *Geitonoplesium*) Philesiaceae
 22. Stem(s) herbaceous. Venation parallel.
 23. Style simple, or if 3 lobed the filaments forming a corona.
 24. Fruit a berry. Inflorescence a panicle 9. *Dianella*
 24. Fruit consisting of 1-3 nutlets. Inflorescence consisting of umbels each on a winged peduncle 11. *Tricoryne*
 23. Style branched, sometimes to the base.
 25. Flowers large, 5-9 cm. At least some leaves ending in a coiled tendril 1. *Gloriosa*
 25. Flowers smaller, up to 3 cm. Leaves never ending in a tendril.
 26. Filaments expanded to form a corona. Fruit a berry 15. *Disporopsis*
 26. Filaments free, sometimes connivent.
 27. Fruit a berry 14. *Disporum*
 27. Fruit a capsule.
 28. Pedicels not articulated. Anthers dorsifixed.
 29. Rootstock a rhizome. Style branches bifid 2. *Tricyrtis*
 29. Rootstock a corm. Style branches simple 3. *Iphigenia*
 28. Pedicels articulated. Anthers basifixed 5. *Schelhammera*

1. GLORIOSA

LINNÉ, Sp. Pl. (1753) 305; Gen. Pl. ed. 5 (1754) 144; BAKER, J. Linn. Soc. Bot. 17 (1879) 457; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 266; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 606; FIELD, Kew Bull. 25 (1971) 243; Lilies and other *Liliaceae* 1973 (1972) 93. — *Methonica* Tourn. ex CRANTZ, Inst. rei herb. 1 (1766) 474. — Fig. 1, 2.

Climbing, or less often erect, glabrous herbs. *Rhizome* perennial, tuberous, horizontal; roots fibrous. Aerial stem annual, moderately branched; the branches spreading or erect-spreading at the base. *Leaves* cauline, alternate, opposite or in whorls of 3 (4), flat, with many veins and a strong midrib, sessile, entire, lanceolate to ovate, slightly amplexicaul, obtuse at the base, narrowing gradually to an apical, coiled tendril (sometimes lacking tendrils in erect forms); basal leaves lacking a lamina or tendril, ensheathing the stem. *Pedicels* solitary, axillary in the axils of vegetative leaves, not articulated, cernuous. *Perianth* segments connate at the base, many-veined, subequal, reflexed or rarely spreading with a longitudinal papillose furrow in the basal \pm third of the adaxial surface. *Filaments* filiform, attached to the receptacle; anthers dorsifixed, linear-oblong, extrorse. *Ovary* superior, sessile, oblong-ovoid to oblong-obovoid, 3-celled, 1 cell slightly shorter than the other 2; ovules axile, numerous; style filiform with 3 stigmatic branches, reflexed or spreading from the attachment to the ovary. *Capsule* coriaceous, septicidal; seeds globose; perianth persistent but withering as the capsule enlarges.

Distr. Widespread in tropical and southern Africa, Madagascar, India, Burma and SE. Asia, as far as West Malesia.

Ecol. Usually climbing in bushes, in habitats ranging from savanna to forest.

Note. Stated by FIELD (1971, 1972) to be monotypic. In Malesia only a single indigenous species has ever been recognized, although other species have been described elsewhere.

1. *Gloriosa superba* LINNÉ, Sp. Pl. (1753) 305; BAKER, Fl. Cap. 6 (1897) 525; BACK, Trop. Natuur 3 (1914) 117, tab. col.; RIDL, Fl. Mal. Pen. 4 (1924) 338; BACK, Handb. Fl. Java 3 (1924) 50; PETCH, Ann. R. Bot. Gard. Perad. 9 (1925) 243; HEYNE,

Nutt. Pl. (1927) 436; BACK, Onkr. Suiker. (1928) 189, Atlas (1933) t. 201; GAGNEP, Fl. Gén. I.-C. 6 (1934) 807; H. PERRIER, Fl. Madag. fam. 40 (1938) 135; SILVA, Ceyl. J. Sc. sect. A, 12 (1945) 155; SANTAPAU, J. Bomb. Nat. Hist. Soc. 46 (1946) 202;



Fig. 1. *Gloriosa superba* L. Botanic Garden Singapore, Febr. 1952 (Photogr. M. R. HENDERSON).

HEND. Mal. Gard. Pl. 4 (1951) 10; Mal. Wild Flow. Monoc. (1954) 178, f. 104; HOLTZ. MAHA Mag. 15 (1958) 75 (hybrids); BACK. & BAKH. f. Fl. Java 3 (1968) 85; HUTCH. & DALZ. Fl. W. Trop. Afr. ed. 2, 3 (1968) 106; FIELD, Kew Bull. 25 (1971) 243. — *Methonica superba* (L.) CRANTZ, Inst. rei herb. 1 (1766) 474; ZOLL. Syst. Verz. 1 (1854) 66; Nat. Tijds. N. I. 14 (1857) 149; MIQ. Fl. Ind. Bat. 3 (1859) 550. — *G. virescens* LINDL. Bot. Mag. (1825) t. 2539. — Fig. 1, 2.

Stems usually climbing to c. 2 m (rarely to 6 m), less often erect; green. *Leaves* (including the tendril) 8–17½(–25) by (1¼–)1½–4(–4½) cm; tendril usually less than 1 cm long. *Pedicels* 4½–19 cm. *Perianth* segments narrowly elliptic, with undulate or crisped margins, 5–7(–9) by ¾–1½(–3) cm broad, yellow or red, often (perhaps always in Asia) yellow or green towards the base at first but becoming red throughout later. *Filaments* spreading, 2½–5 cm long; anthers 7–10 mm long. *Ovary* 8–15 mm long; style including the filiform, 3–7(–12) mm long style branches 3½–5½ cm long. *Capsule* 4–10 by c. 1½–2 cm. *Seeds* vivid-red or orange-red, with a fleshy testa, c. 5 mm Ø, tardily falling.

Distr. Tropical and southern Africa, Madagascar, India to Indo-China; in *Malesia*: Java (also Madura and Kangean Is.), S. Celebes, and all Lesser Sunda Is.

Ecol. Brushwood, hedges, teak-forest, only in regions subject to a strong dry season, from near the beach and dunes up to c. 300 m altitude (very rarely 600 m), locally common. It is not native in Sumatra and Borneo, and probably not in continental Malaya. This disjunction in its range between continental SE. Asia and Central South Malesia is clearly caused by its drought preferring ecology. *Fl. fr.* Jan.–Dec.

Uses. Commonly grown as a garden ornamental. The tuber is said to be poisonous (through colchicin), but only slightly so as was tested by BOORSMA (BACKER, 1914; HEYNE, 1927). Fig. 2.

Vern. *Klimlelie*, D, *flame lily*, *superb lily*, E; Java: *kembang djonggrang*, *k. kuku matjan*, *k. sung-*

sang, M, *dongkèl sungsang*, *mandalika*, *pa(n)tjing towo*, J, *katongkat*, S, *mand(h)alika*, Md, Balin.; Lesser Sunda Is.: *enatba*, *sikal*, Dawan lang., Timor.

Note. In sterile state easily distinguished from another climbing monocot with coiled apical leaf-tendrils, *Flagellaria indica* L., by absence of a leaf-sheath.



Fig. 2. *Gloriosa superba* L. Old rhizome with scar, the apex with a new tuber emitting roots and a vertical shoot. The two triangular elongations of the new tuber will grow later into new rhizomes; $\times \frac{1}{2}$. Botanic Garden, Bandung, 1952. Dug up by L. VAN DER PIJL.

2. TRICYRTIS

WALL. Tent. Fl. Nap. (1826) 61, t. 46; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 269; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 608, *nom. gen. cons.* — *Compsoa* D. DON, Prod. Fl. Nep. (1825) 50. — Fig. 3.

Erect puberulous or glabrescent herbs. *Rhizome* short, creeping. Aerial stem annual, simple or branched. *Leaves* cauline, alternate, flat, with several veins and a strong midrib, sessile, entire, lanceolate to ovate, with a sheathing base. *Inflorescence* terminal, racemose, simple or branched, or flowers in the axil of vegetative leaves. *Pedicels* solitary, not articulated. *Perianth* segments free or very shortly united, equal or subequal but the outer three saccate at the base, erect to spreading.

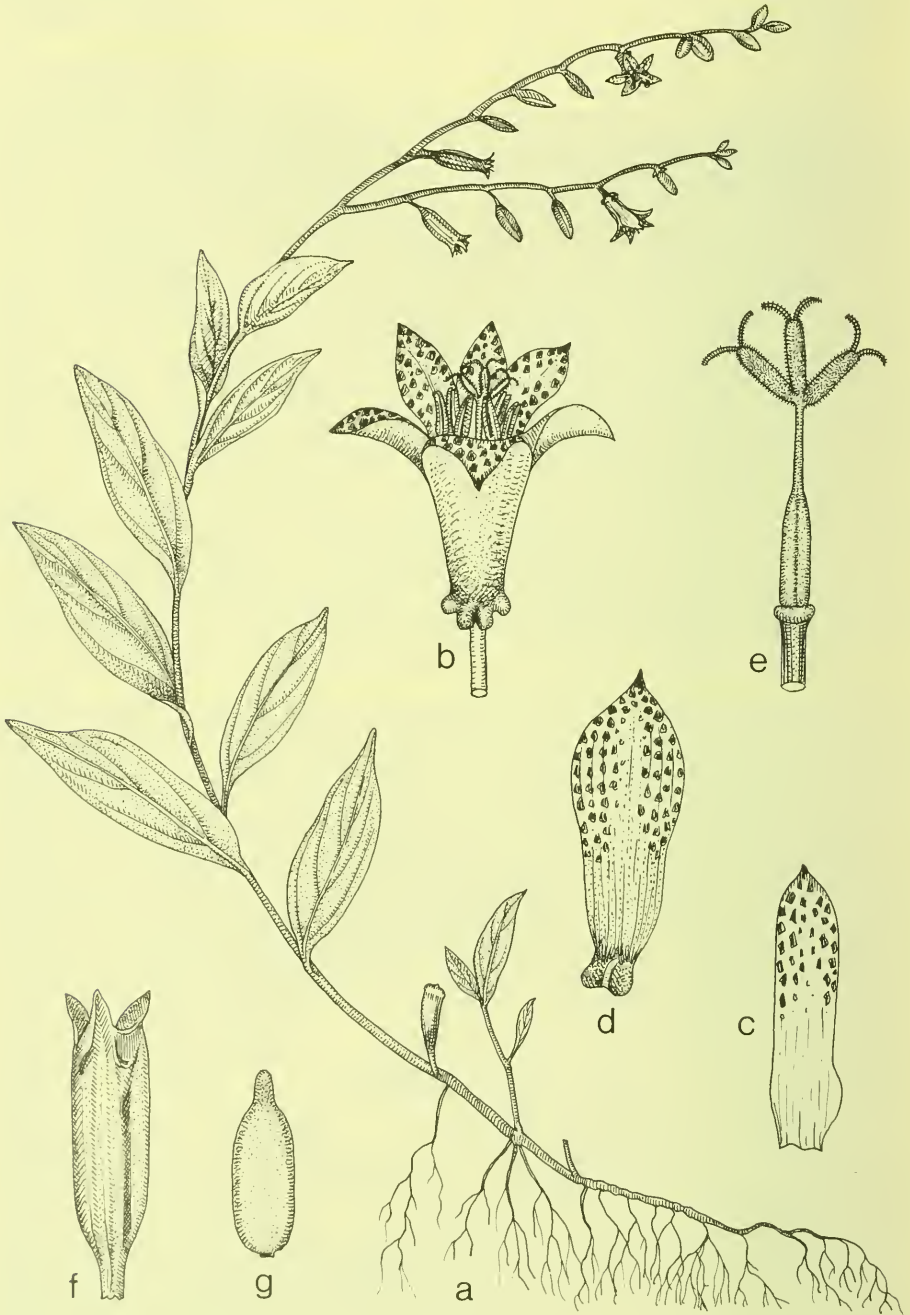


Fig. 3. *Tricyrtis imeldae* GUTIERREZ. *a*. Habit, $\times \frac{1}{4}$, *b*. flower, nat. size, *c*. outer perianth segment, *d*. inner perianth segment, *e*. gynoecium, all $\times 1\frac{1}{2}$, *f*. fruit, nat. size, *g*. seed, $\times 12$ (Redrawn from GUTIERREZ, Philip. J. Sc. 103, 1974, 3, fig. 1).

Filaments flattened, more or less connivent, free of the perianth; anthers dorsifixed, versatile, oblong, extrorse. *Ovary* superior, sessile, oblong, 3-celled, 3-angled; ovules axile, numerous; style columnar; with 3 spreading or recurved bifid branches. *Capsule* septical. Seeds oblong or ovoid.

Distr. Possibly *c. 20 spp.*, largely in Japan, also in Manchuria, Korea, throughout China to the Himalayas, Taiwan, and *North Malesia*: Philippines.

Notes. HUTCHINSON placed this genus in the tribe *Tricyrtideae* possibly with a South African genus *Sandersonia* as the only other member. KRAUSE placed it in the *Tricyrteae* with the closely related, possibly congeneric, *Brachycyrtis*. The genus appears to be taxonomically rather isolated, but probably closest to *Gloriosa* of the Malesian genera.

A thorough revision of the species is badly needed.

1. *Tricyrtis imeldae* GUTIERREZ, Philip. J. Sc. 103 (1974) 171, f. 1. — Fig. 3.

Stems erect to 70 cm high, unbranched, puberulous at first. *Leaves* thick and fleshy when fresh but becoming membranous when dried, acute, the lower narrowly elliptic-lanceolate, with cuneate base, the upper broadly lanceolate to elliptic, with cordate base, (6–)12–16 by (3–)4–5 cm, glabrous except for the main veins beneath. *Inflorescence* a terminal bifurcate raceme *c. 18–20* cm, puberulous; pedicels 3–5 mm, puberulous. *Flowers* greenish-white with purple spots inside, to over 3 cm long, infundibuliform, glabrous, segments linear-oblong to oblong spatulate. *Filaments* 16–18 mm long; anthers 3 mm long, yellowish-brown. *Ovary* 10 mm long; style 8 mm, its branches 8 mm long, purple,

spreading, tuberculate on the inner surface. *Fruit* *c. 25–30* by 4–6 mm. *Seeds* flat, oblong, *c. 2* mm long.

Distr. *Malesia*: S. Philippines (Mindanao: Tasaday, Cotabato), reported to be rather rare; only known from the type.

Ecol. Primary forest, along stream at *c. 1300* m. Fl. Aug.

Vern. Philippines: *amutmagiso*, Tasaday.

Notes. I have only seen the type and have not been able to add to the description by GUTIERREZ.

He compared the species with the Formosan *T. stolonifera*, from which it chiefly differs in the shape and colouring of the perianth segments. Close study of more material and variability is needed to check the specific difference.

3. IPHIGENIA

KUNTH, En. Pl. 4 (1843) 213; BAKER, J. Linn. Soc. Bot. 17 (1880) 450; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 272; H. PERRIER, Fl. Madag. fam. 40 (1938) 136; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 612; OBERMEYER, *Kirkia* 1 (1961) 84, *nom. gen. cons.* — *Aphoma* RAF. Fl. Tellur. 2 (1836) 31, *nom. rejic.* — **Fig. 4.**

Erect, glabrous herbs. Corm enclosed in dry leaf bases; roots fibrous. Aerial stem annual, unbranched. *Leaves* cauline, with tubular, ensheathing bases; the lowest 1 or 2 often with a poorly developed lamina; the others decreasing in size from the lowest towards the uppermost, the uppermost often approaching the lowest bracts in size, *c. 4–7*; lamina flat, glabrous, sessile, entire, linear to lanceolate, acute. *Flowers* solitary, in a few-flowered cluster or in a raceme terminating the stem. *Pedicels* solitary, erect-spreading, not articulated. *Perianth* segments free, \pm equal, spreading or reflexed, few-veined. *Filaments* flattened, attached to the receptacle; anthers dorsifixed or basifixed, extrorse. *Ovary* superior, sessile, ovoid, oblong or obovoid, 3-celled; ovules ∞ , axile; styles 3, (free or) fused at the base only. *Capsule* globose, cylindrical or ellipsoid, loculicidal. Seeds globose or angular; perianth deciduous.

Distr. Southern and tropical Africa (*5 spp.*), Madagascar (*2 spp.*), SE. Asia (*4 spp.*), of which one species extends through *Malesia* to Australia, and New Zealand.

Ecol. Usually in open grassland, sometimes in damp areas.

1. *Iphigenia indica* (L.) A. GRAY ex KUNTH, En. Pl. 4 (1843) 213; MIQ. Fl. Ind. Bat. 3 (1859) 552; BTH. Fl. Austr. 7 (1878) 31; BAKER, J. Linn. Soc. Bot. 17 (1880) 450; F.v.M. Descr. Not. 6 (1885) 18; HOOK. f. Fl. Br. Ind. 6 (1892) 357; BAILEY, Queensl. Fl. 5 (1902) 1641; LAUT. Bot. Jahrb. 50 (1913) 292; MERR. En. Philip. 1 (1922) 202; BACK. Handb. Fl. Java 3 (1924) 51; KRAUSE, Bot. Jahrb. 59 (1925) 548; BACK. & BAKH. f. Fl. Java 3 (1968) 85. — *Melanthium indicum* LINNÉ, Mant. 2 (1771) 226. — *Anguillaria indica* (L.) R. BR. Prod. (1810) 273; WALL. Pl. As. Rar. 3 (1832) 37, t. 259. — Fig. 4.

Corm usually \pm globose, 5–10 mm \varnothing . *Leaves* linear-lanceolate, often with a single conspicuous vein and 2–8 rather inconspicuous ones, the longest c. 10–40 cm long, up to 6 mm wide, the shortest often less than a quarter of the length of the longest; lower leaf bases sometimes pubescent, glandular pubescent or scabrid, especially on the veins. Flowers 1–3. *Pedicels* erect or erect-spreading 5–40 mm. *Perianth* segments \pm spreading, narrowly oblanceolate (inner whorl sometimes narrower than the outer), 5–9 by up to 2 mm, dark-brown or red-brown, reddish, purplish or white, described by BACKER (1924) as having a green keel and apex. *Filaments* linear, up to half as long as the perianth, green basally, brown distally; anthers dorsifixed, c. $\frac{1}{2}$ –1 mm long. *Ovary* obovoid to ovoid, c. $1\frac{1}{2}$ – $2\frac{1}{2}$ mm long; styles recurved, c. 1 mm. *Capsule* c. 10–20 mm long; seeds c. $1\frac{1}{2}$ mm \varnothing .

Distr. Ceylon, India to Thailand, S. China, in *Malesia* rare: N. Sumatra (Lake Toba), Java (Indramayu in W, Surabaya and Madura I. in E), the Lesser Sunda Is. (Timor and Wetar), Philippines (Luzon, Mindanao), New Guinea, and Australia (W. Australia, Northern Territory and Queensland).

Ecol. A rather uncommon species of open, often poor grassland, always under seasonal climatic conditions. In Java only in the lowland but elsewhere also in the hills, in N. Sumatra at c. 1000 m. Flowers are reported by BACKER (1924) to occur for a short period during the rainy period (Dec.–Jan.) in Java, with fruit ripening in March, after which the aerial parts soon wither and disappear. Elsewhere other flowering dates have been noted from July to August, N of the equator, where seasons are reversed.

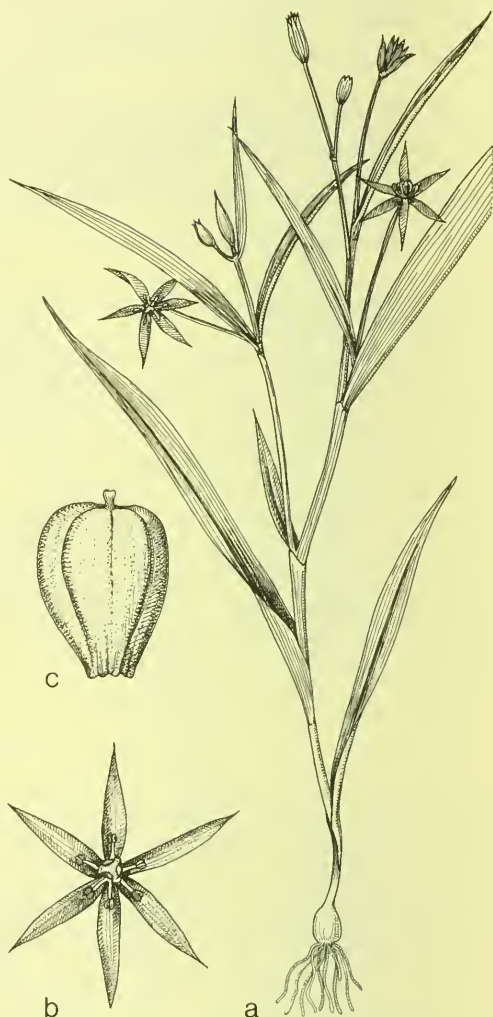


Fig. 4. *Iphigenia indica* (L.) A. GRAY ex KUNTH. a. Habit, nat. size, b. flower, c. fruit, both $\times 2$ (Partly after WALLICH, Pl. As. Rar. 3, 1832, t. 259).

4. PETROSAVIA

BECC. Nuov. Giorn. Bot. Ital. 3 (1871) 7, t. 1; RIDL. J. Str. Br. R. As. Soc. n. 24 (1891) 170; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 256; HUTCH. Kew Bull. (1933) 156; STEEN. Trop. Natuur 23 (1934) 52; NAKAI, J. Jap. Bot. 17 (1941) 191; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 546. — *Protolirion* RIDL. Ann. Bot. 9 (1895) 45; GROOM, l.c.; RIDL. Fl. Mal. Pen. 4 (1924) 322; KRAUSE in E. & P. Nat.

Pfl. Fam. ed. 2, 15a (1930) 257, f. 87; NAKAI, J. Jap. Bot. 17 (1941) 191. — *Miyoshia* MAKINO, Bot. Mag. Tokyo 17 (1903) 144; NAKAI, J. Jap. Bot. 17 (1941) 191. — **Fig. 5.**

Erect, glabrous, saprophytic, pale yellow or cream coloured, herbs lacking chlorophyll. *Rhizome* slender, simply or sparsely branched, bearing alternate, often imbricate scale-leaves. Aerial stems 1 or less often up to 3 or more, unbranched. *Leaves* scale-like, spiral, sessile, entire; the base usually partly embracing the stem, rather well-spaced. *Raceme* terminal, usually simple, sometimes corymbose. *Pedicels* solitary, with 0–2 alternate bracteoles near the centre or in the lower half (often concealed by the subtending bract), not articulated, in the axils of bracts resembling the scale-leaves. *Perianth* segments erect-spreading, with a single vein, cream-coloured to yellow; the outer 3 distinctly inserted outside the inner 3, even in the open flower, and narrower and shorter. *Filaments* sublinear attached to the receptacle or to the base of the perianth segments; anthers basifixed, introrse or dehiscing laterally. *Ovary* superior or semi-inferior; the 3 carpels free above the receptacle; styles 1 on each carpel, capitate or subcapitate; ovules attached to ventral surface, numerous, in 3–c. 6 rows. *Fruit* dry, dehiscing along the ventral suture; the 3 segments spreading. *Seeds* numerous, ovoid, with longitudinal ridges; perianth persistent.

Distr. Japan (Prov. Mino), China (Kwangsi and Taiwan), Indo-China (Tonkin), in *Malesia*: Malaya, N. half of Sumatra, Borneo (Sabah, Sarawak), and Central Celebes.

In addition to the two species from Malesia and Japan, a third has been described from Tonkin and S. China (Kwangsi): *Petrosavia sinii* (KRAUSE) KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 257; GAGNEP. Fl. Gén. I.-C. 6 (1934) 802, f. 78 (10–13); (Anonymous) Icon. Corm. Sin. 5 (1976) 424, f. 7677. — *Protolirion sinii* KRAUSE, Notizbl. Berl.-Dahl. 10 (1929) 806.

It is highly probable that this is a synonym of *P. sakuraii* and would thus neatly fill a gap in the range of that species.

Ecol. Saprophytes on the forest flora, in Malesia in the hills at 1000–2000 m.

Notes. This genus has been placed in the *Liliaceae* (*Liliales*) by KRAUSE (1930), the *Petrosaviaceae* (*Alismatales*) by HUTCHINSON (1959) and the *Miyoshiaceae* (*Miyoshiales*) by NAKAI (1941). Both in being saprophytic and in having 2- or multi-seriate ovules it is anomalous in either the *Liliales* (*sensu* HUTCHINSON) or the *Alismatales*. ERDTMAN (Pollen Morph. & Pl. Taxon., Angiosp., 1952, 235) described the pollen as 1-sulcoidate which is unknown in the *Scheuchzeriaceae* or *Alismataceae* (*Alismatales*) but present, although uncommon, in the *Liliaceae*. M. Y. STANT (Bot. J. Linn. Soc. 63, 1970, Suppl. 1, 147) investigated the anatomy of *P. stellaris* and found it to be indistinguishable from that in the (saprophytic) *Triuridaceae* (*Triuridales*). Although here retained in the *Liliaceae* it is admitted that further investigation may show it to be better placed elsewhere.

The roots lack root-hairs but contain an endotrophic mycorrhiza (GROOM, 1895).

KEY TO THE SPECIES

1. Inflorescence corymbose; pedicels all arising close to the peduncle apex, usually 10 mm or more long **1. *P. stellaris***
1. Inflorescence racemose; pedicels spaced along the peduncle, usually 8 mm or less long **2. *P. sakuraii***

1. *Petrosavia stellaris* BECC. Nuov. Giorn. Bot. Ital. 3 (1871) 8, t. 1; RIDL. J. Str. Br. R. As. Soc. n. 24 (1891) 171; GROOM, Ann. Bot. 6 (1892) 380; HUTCH. Kew Bull. (1933) 156; STEEN. Trop. Natuur 23 (1934) 52, f. 12 right; NAKAI, J. Jap. Bot. 17 (1941) 191; HEND. Mal. Wild Flow. Monoc. (1954) 178, f. 103; STANT, Bot. J. Linn. Soc. 63 (1970) Suppl. 1, 147, anat. — *Protolirion paradoxum* RIDL. Ann. Bot. 9 (1895) 56; GROOM,

l.c. 45, pl. 3; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 87; Fl. Mal. Pen. 4 (1924) 322, f. 195; NAKAI, J. Jap. Bot. 17 (1941) 191. — **Fig. 5a.**

Aerial stems (4–)6–11 cm high. *Scale-leaves* of rhizome ovate, c. 2–5 mm long, their base amplexicaul, often forming a closed sheath. *Scale-leaves* of aerial stem narrowing gradually to the acute apex, 3–6 mm long, their base partly embracing the stem. *Raceme* simple, corymbose, with 1–12 flowers.

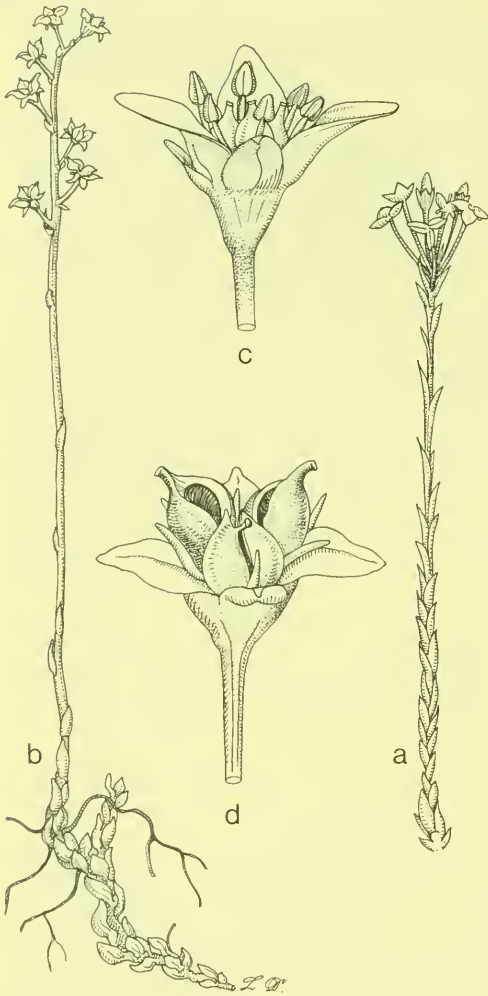


Fig. 5. *Petrosavia stellaris* BECC. a. Habit, nat. size (Redrawn from HUTCHINSON, Fam. Fl. Pl. 2, 1959, fig. 347). — *P. sakuraii* (MAKINO) J. J. SMITH ex STEEN. b. Habit, nat. size, c. flower, d. flower in fruit, both $\times 10$ (Redrawn from MAKINO, Bot. Mag. Tokyo 17, 1903, pl. 5).

Pedicels all arising close to the apex of the stem, usually less than 1 mm apart, (5-)10-16(-20) mm. *Outer perianth* segments ovate to lanceolate, acute, 1-2 by c. $\frac{1}{2}$ mm. *Inner perianth* segments ovate, \pm acute, $2\frac{1}{4}$ - $3\frac{1}{2}$ by $1\frac{1}{2}$ -2 mm. *Filaments* c. 2 mm; *anthers* less than $\frac{1}{2}$ mm long. *Ovary* \pm superior; *styles* up to 1 mm long. *Capsule* segments 3-4 mm long. *Seeds* c. $\frac{3}{4}$ mm long.

Distr. Malesia: Sumatra (West Coast Res.), Malay Peninsula, Borneo (Sarawak, Sabah), and Central Celebes (Masamba: Mt Kambuno).

Ecol. Recorded by RIDLEY (1924) "in dry woods at the foot of *Dacrydiums*" and by EYMA (EYMA 1305, L) from "forest, rather dark, without undergrowth". Other records refer to sandy forest, mossy forest and among bamboos. Recorded between 100 and 1000 m. *Fl.* usually Febr.-Sept.

2. *Petrosavia sakuraii* (MAKINO) J. J. SMITH ex STEEN. Trop. Natuur 23 (1934) 52. — *Miyoshia sakuraii* MAKINO, Bot. Mag. Tokyo 17 (1903) 144, pl. 5; l.c. 208. — *Protolirion miyoshia-sakuraii* MAKINO, Bot. Mag. Tokyo 17 (1903) 208, *nomen err. et provis., illeg.*; PILG. in E. & P. Nat. Pfl. Fam. Nachtr. 3 (1908) 44, f. 8, *ditto*. — *Protolirion sakuraii* (MAKINO) DANDY, J. Bot. 69 (1931) 53. — Fig. 5b-d.

Aerial stems (5-)10-21(-27) cm high. *Scale-leaves* of rhizome ovate, c. 2-5 mm long, their base amplexicaul, often forming a closed sheath. *Scale-leaves* of aerial stem narrowing gradually to the acute apex, 4-6 mm long, their base partly embracing the stem or rarely completely amplexicaul. *Raceme* simple or with few-flowered branches towards the base, elongate, with (3-)6-25(-30) flowers. *Pedicels* of mature flowers usually at least 2 mm apart, 3-8 mm. *Outer perianth* segments ovate to lanceolate, acute, $1\frac{1}{2}$ -2 by $\frac{1}{2}$ -1 mm. *Inner perianth* segments ovate, \pm acute, 2-3 by $1\frac{1}{4}$ - $1\frac{3}{4}$ mm. *Filaments* c. 2 mm; *anthers* less than $\frac{1}{2}$ mm long. *Ovary* superior to semi-inferior; *styles* up to 1 mm. *Capsule* segments 2-3 mm long. *Seeds* c. $\frac{3}{4}$ mm long.

Distr. Japan (Prov. Mino), Formosa, Burma and *Malesia:* northern half of Sumatra (Gajolands; Westcoast Res.).

Ecol. Along forest paths and on flat forest ridges, 1000-2000 m. *Fl.* March-July, Nov.

5. SCHELHAMMERA

R. BR. Prod. (1810) 273; BTH. Fl. Austr. 7 (1878) 31; BAKER, J. Linn. Soc. Bot. 17 (1879) 466; BAILEY, Queensl. Fl. 5 (1902) 1642; MAIDEN & BETCHE, Cens. N.S.W. Pl. (1916) 40, as *Schellhammera*; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 266; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 606, as *Schelhammeria*; *nom. gen. cons.* — Fig. 6.

Erect, mainly glabrous herbs. *Rhizome* rather thick; roots fibrous. Aerial stems annual, simple or with 1–3 branches, often slightly swollen at the nodes; branches erect. *Leaves* cauline, alternate, flat, with many veins and usually a strong midrib, sessile or shortly petioled, lanceolate to ovate, often at least partly amplexicaul, obtuse or cuneate at the base, acute at apex. Leaves on rhizome and lower parts of aerial stems and branches scale-like. *Inflorescence* terminal, consisting of a sessile or peduncled umbel or of a single flower. *Pedicels* straight, articulated or not. *Perianth* segments free, equal, spreading to shallowly campanulate, with several usually inconspicuous veins. *Filaments* flattened, tapering from the base, attached to the base of the perianth segments; anthers basifixed, linear-oblong, extrorse. *Ovary* superior, sessile, obovoid, globose or oblong, often fairly deeply 3-lobed, 3-celled; ovules axile, few (*c.* 4–12) per locule; style filiform, with 3 deeply divided branches. *Capsule* somewhat fleshy.

Distr. Three *ssp.* in eastern Australia, one of which also in *East Malesia*: New Guinea.

Ecol. Most records suggest a preference for rain-forest, but also recorded in scrub and on open slopes in the lowland and hills.

1. *Schelhammera multiflora* R. BR. Prod. (1810) 274; F.v.M. Descr. Not. 4 (1876) 73; BTH. Fl. Austr. 7 (1878) 32; LAUT. Bot. Jahrb. 50 (1913) 292; HALL. f. Nova Guinea 8 (1914) 989; KRAUSE, Bot. Jahrb. 59 (1925) 548. — Fig. 6.

Stems 10–40 cm, rarely minutely and sparsely pubescent. *Leaves* 4–8 by 1–3 cm, usually minutely ciliate on the margin and veins towards the base; petiole usually absent, rarely up to 5 mm. Scale-leaves ovate to lanceolate, dry, sessile, amplexicaul, usually 5–10 mm long. *Pedicels* usually 5–30, articulated at base of flower, 1–3 cm. *Perianth* segments obovate, acute, with the sides turned up to form a gutter-shaped structure in which the anthers are partly enclosed, swollen on the abaxial surface at the base, $4\frac{1}{2}$ –8 by *c.* 2 mm, white. *Filaments* *c.* 3 mm; anthers *c.* 2 mm long, brown or black. *Ovary* obovoid, 6-lobed, *c.* $1\frac{1}{2}$ mm long; style 3–4 mm, divided for at least half its length; branches adhering to one another rather firmly at first, later recurving; ovules few (*c.* 2–4) per locule. Fruit and seeds not seen.

Distr. Australia (Queensland) and *E. Malesia*: S. New Guinea (Merauke area: Okaba; Fly R. area).

Ecol. In lowland grassland on open slopes, subject to a strong or distinct dry season, in Queensland also in open forest, obviously a rare species, below 400 m. *Fl.* March–Sept.

Note. The two further Australian species are *S. undulata*, which has larger solitary flowers, and *S. pedunculata*, which has peduncled umbels.

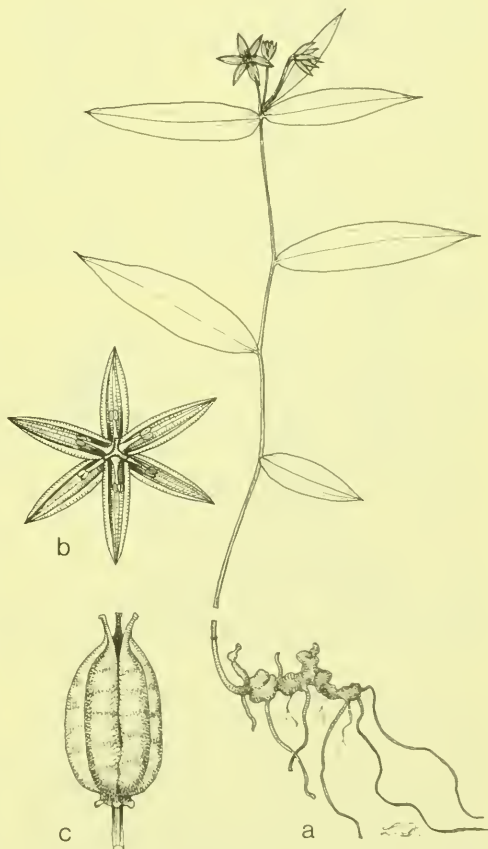


Fig. 6. *Schelhammera multiflora* R. BR. a. Habit, $\times \frac{1}{2}$, b. flower, c. capsule, both $\times 2$.

6. ARTHROPODIUM

R. BR. Prod. (1810) 276; BAKER, J. Linn. Soc. Bot. 15 (1876) 351; BTH. Fl. Austr. 7 (1878) 55; BAILEY, Queensl. Fl. 5 (1902) 1629; EWART, Fl. Vict. (1930) 292; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 286; BLACK, Fl. S. Austr. 1 (1943) 193; PAYENS, Nova Guinea n.s. 8 (1957) 388; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, map; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598. — *Dichopogon* KUNTH, En. Pl. 4 (1843) 622; BAKER, J. Linn. Soc. Bot. 15 (1876) 318; BTH. Fl. Austr. 7 (1878) 58; BAILEY, Queensl. Fl. 5 (1902) 1631; EWART, Fl. Vict. (1930) 291; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 285; BLACK, Fl. S. Austr. 1 (1943) 193; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598. — Fig. 7.

Stemless herbs. *Rhizome* very short. Roots fibrous or somewhat fleshy, often producing well-defined, distant tubers. *Leaves* basal, linear to lanceolate, gradually expanding towards the base to form (apparently dry and membranous) open sheaths, sometimes ciliate or with bristles along the margins; veins of the sheaths sometimes persisting on an outer zone of fibres. *Inflorescence* a raceme or panicle. *Pedicels* 1–3(–5)-nate, in the axils of bracts and usually associated with a few smaller bracts also apparently in the axil of the principal bract, articulated usually in the distal half, rather long and filiform. *Perianth* segments usually free, the inner whorl broader, with 3 or less often 5 veins, spreading. *Filaments* linear-filiform, usually attached to the base of the perianth segments; anthers basifixed, oblong to linear, often strongly arcuate, dehiscent laterally or introrsely; papillose or pubescent appendages always present, usually adnate to the filaments and often also to the anthers. *Ovary* superior, sessile, subglobose to ellipsoid, 3-celled; ovules axile, 2–10 in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscent loculicidally; perianth segments adhering, marcescent, not twisting after flowering. Seeds angular.

Distr. Madagascar (1 *sp.*), New Zealand (2 *spp.*), New Caledonia (1 *sp.*), and c. 9 *spp.* in Australia, of which one extends into *Malesia*: New Guinea (South Papua).

Ecol. Usually in open grassland or open woodland, often at rather low altitudes (below 250 m).

Species have been described as having chocolate or vanilla scents.

Notes. PAYENS (1957) made a strong case for combining *Dichopogon* with *Arthropodium*. Nevertheless, authors (e.g. BURBIDGE and GRAY, Fl. A.C.T., 1970) have continued to separate these genera principally on whether the papillose or pubescent staminal appendages are adnate to the filaments (in *Arthropodium*) or to the anthers (in *Dichopogon*). An examination of species represented at Leyden and Adelaide has convinced me that these two genera cannot be separated. A particularly significant form is *A. neocaledonicum* in which the appendages are attached to both filaments and anthers such that it would be difficult to assign this species to a genus. In most of the material of *Dichopogon* the appendages are also distinctly adnate to the filaments as well as to the anthers. *Dichopogon strictus* and *Arthropodium capillipes*, although placed in separate genera, have almost indistinguishable stamens.

1. *Arthropodium strictum* R. BR. Prod. (1810) 276; F.v.M. Descr. Not. 6 (1885) 17; LAUT. Bot. Jahrb. 50 (1913) 292; KRAUSE, *ibid.* 59 (1925) 548; PAYENS, Nova Guinea n.s. 8 (1957) 390; EICHLER, Suppl. Fl. S. Austr. (1965) 83. — *Dichopogon strictus* (R. BR.) BAKER, J. Linn. Soc. Bot. 15 (1876) 319; BTH. Fl. Austr. 7 (1878) 58; BAILEY, Queensl. Fl. 5 (1902) 1631; EWART, Fl. Vict. (1930) 291; GARDNER, En. Pl. Austr. Occ. (1931) 18; BLACK, Fl. S. Austr. 1 (1943) 194. — Fig. 7.

Roots bearing distant tubers c. 1–1½ cm long. *Leaves* 3–12, suberect, sublinear but narrowing gradually towards the apex and sometimes also towards the basal sheath where they again become broader, glabrous or minutely ciliate on the margins, 20–45 cm by 3–7 mm; veins of leaves not forming fibrous sheaths at base of plant. Peduncle simple or more often with 1–4 ascending branches, (20–)30–60(–110) cm high. Bracts rarely up to 6 cm long at the base of the lowest branch, but usually

5–15 mm long, ovate to lanceolate, narrowing gradually to the apex, partly scarious. *Pedicels* solitary or less often 2- or 3-nate, erect-spreading, 12–20 mm. *Perianth* segments purple, 9–14 by c. 3–3½ mm. *Filaments* c. 1½–2 mm; anthers 3–5 mm long; appendages less than 1 mm long, free of or only shortly adnate to filaments. *Ovary* globose-ellipsoid, 1½–4 mm long; ovules 8–10 in each locule; style 6–7 mm. *Capsule* subglobose, c. 5 mm \varnothing , with several seeds; perianth marcescent or rarely persistent.

Distr. Australia (all states but not yet from the Northern Territory) and *Malesia*: SE. New Guinea (Port Moresby area).

Ecol. Open grassland and open woodland at low altitude, subject to a long dry season.

Vern. *Chocolate lily*, E (Australia).

Note. PAYENS (1957) stated that the perianth segments are connate for 1 mm. This was not confirmed by me for material he had examined.

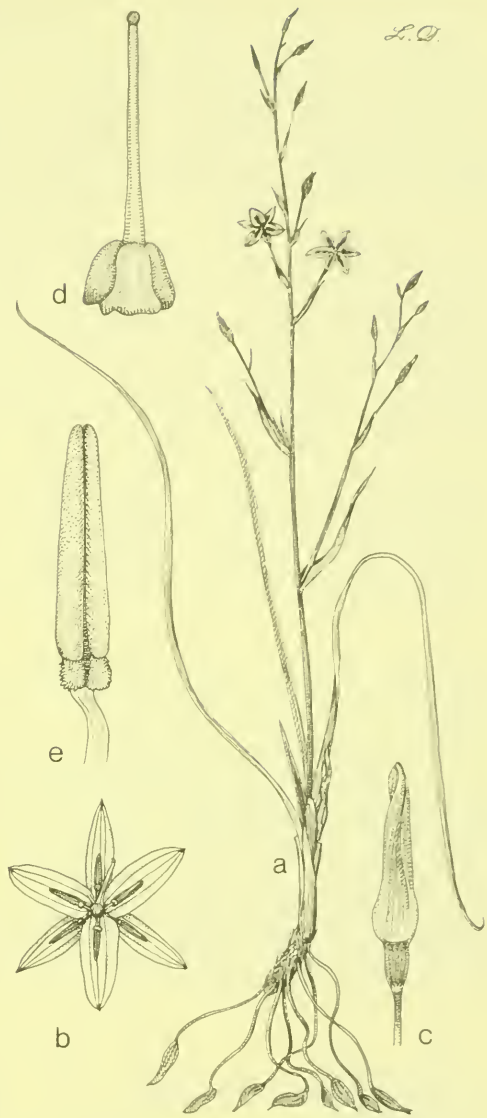


Fig. 7. *Arthropodium strictum* R. BR. a. Habit, $\times \frac{1}{2}$, b. flower, $\times 2$, c. withered flower, $\times 3$, d. gynoecium, $\times 7$, e. anther, $\times 10$ (C. R. ALCOCK 2875, S. Australia).

7. CAESIA

R. BR. Prod. (1810) 277; BAKER, J. Linn. Soc. Bot. 15 (1876) 357; BTH. Fl. Austr. 7 (1878) 46; BAKER, Fl. Cap. 6 (1897) 400; BAILEY, Queensl. Fl. 5 (1902) 1632; EWART, Fl. Vict. (1930) 289; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 288; BLACK, Fl. S. Austr. 1 (1943) 192; PHILLIPS, Gen. S. Afr. Fl. Pl. ed. 2 (1951)

1002; PAYENS, Nova Guinea n.s. 8 (1957) 383; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, map; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 596; OBERMEYER, Bothalia 11 (1973) 122. — **Fig. 8.**

Stemless herbs. *Rhizome* very short. Roots fibrous, fleshy or tuberous. *Leaves* basal, subulate to linear, expanded at the base to form a sheath. *Inflorescence* a raceme or more often a panicle. *Pedicels* 1–3-nate, in the axils of bracts and usually associated with a few smaller bracts also apparently in the axil of the principal bract, articulated usually in the distal half. *Perianth* segments free or shortly connate, subequal, 3-veined, spreading. *Filaments* filiform or linear, glabrous, attached to the receptacle or to the base of the perianth segments; anthers basifixed, oblong, dehiscent introrsely. *Ovary* superior, sessile, globose or subglobose, 3-celled; ovules axile, 2 in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscent loculicidally; perianth segments adhering, marcescent, twisting spirally after flowering. Seeds angular or globose, usually solitary in each locule.

Distr. Madagascar (1 *sp.*), South Africa (2 *sp.*; Cape Province) and Australia (7–9 *sp.*), of which one species also occurs in *Malesia*: S. Papua New Guinea (W. Distr.: Wassi Kussa area).

Ecol. Usually in the open, but also in savanna.

Note. Generically this group is regarded as well-defined by the spirally-twisting perianth and 2-ovuled locules. The South African monotypic genus *Nanolirion* BTH. (1883) was formerly distinguished by having a 1–3-flowered inflorescence (PHILLIPS, 1951), but OBERMEYER (1973) placed it under *Caesia*.

1. *Caesia setifera* BAKER, J. Linn. Soc. Bot. 15 (1876) 359; BTH. Fl. Austr. 7 (1878) 47; EWART & DAVIES, Fl. North. Terr. (1917) 71; PAYENS, Nova Guinea n.s. 8 (1957) 384, f. 1. — **Fig. 8.**

Roots bearing distant spindle-shaped tubers *c.* 1–1½ cm long. *Leaves* 2–4, suberect, filiform, glabrous, *c.* 10–25 cm long, *c.* 1 mm broad; veins of leaves forming fibrous sheaths at base of plant. Peduncle thin and wiry, usually with 1 or 2 ascending branches, (17–)25–45 cm high. Bracts bearing branches or pedicels in their axils, rarely up to 5 mm long, ovate to lanceolate, partly scarious. *Pedicels* 1–6-nate, usually erect-spreading, (3–)5–10 mm. *Perianth* segments blue, linear-oblong, 6–8 by 1–1½ mm. *Filaments* 3–4 mm (the outer up to 1 mm

longer than the inner); anthers yellow, *c.* ½–¾ mm long. *Ovary* *c.* ¾–1 mm long; style 4–5 mm. *Capsule* subglobose, deeply 3-lobed, *c.* 3 mm Ø.

Distr. Australia (Queensland and Northern Territory); in *Malesia*: S. Papua New Guinea: Western District, Wassi Kussa area: Morehead, Weam, Arufi, Tarara.

Ecol. In the Wassi Kussa area scattered on open, grass-sedge plains on thin sand over clay, in maintained savanna grassland, in savanna with *Melaleuca* and *Acacia*, on wet flats in savanna forest, on sour grey soils, at very low altitudes subject to a long dry season. *Fl.* July–Aug., Dec.–Jan.

A field note recorded that usually one flower is opening in sequence.

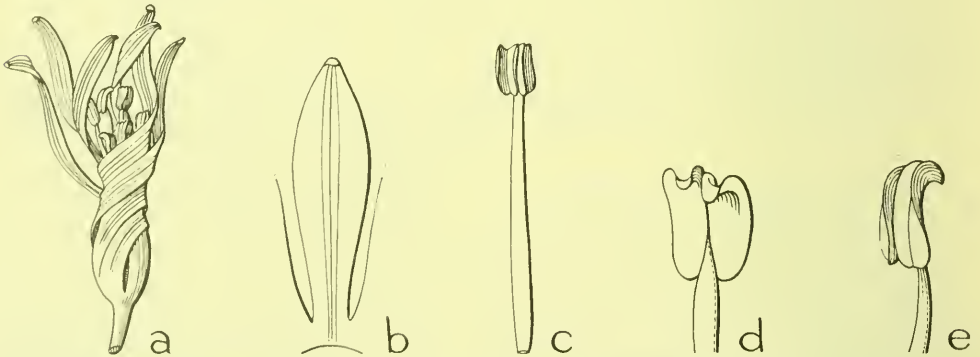


Fig. 8. *Caesia setifera* BAKER. a. Flower after anthesis, with persistent twisted perianth, b. sepal inside, c. stamen, all $\times 6$, d–e. anther, dorsal and lateral, $\times 15$ (a BRASS 8599, b–e BRASS 8560).

8. CHLOROPHYTUM

KER-GAWL. Bot. Mag. 27 (1808) t. 1071; BAKER, J. Linn. Soc. Bot. 15 (1876) 321; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 284; POELLN. Ber. Deut. Bot. Ges. 61 (1943) 126; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598; DRESS, *Baileya* 9 (1961) 29; OBERMEYER, *Bothalia* 7 (1962) 690; BACK. & BAKH. *f. Fl. Java* 3 (1968) 86; CHAROENPHOL, *Thai For. Bull.* 7 (1973) 67; PANIGRAHI, *Kew Bull.* 30 (1975) 563; MARAIS & REILLY, *Kew Bull.* 32 (1978) 653.

Perennial stemless herbs. *Rhizome* horizontal, often very short. Roots fibrous, or fleshy or tuberous. *Leaves* basal, usually rosulate, linear to lanceolate, often with a fimbriate margin, expanding towards the base to form a sheath. *Inflorescence* a raceme or a panicle. *Pedicels* 1–6-nate, in the axils of bracts and associated with a few small bracts also apparently in the axil of the principal bract, articulated usually near or below the middle. *Perianth* segments free, subequal, with 3 or 5 veins, most frequently spreading or reflexed. *Filaments* filiform, glabrous or papillate, attached to the receptacle; anthers basifixed, linear-oblong, introrse. *Ovary* superior, sessile or shortly stipitate, globose or obovoid, 3-lobed, 3-celled; ovules axile, 2 or more in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscent loculicidally; perianth segments adhering, marcescent, not twisting after flowering. Seeds flat, suborbicular.

Distr. Especially in Africa (mainly southern and tropical), Madagascar and Asia (especially India) to Australia (2 *spp.*); in *West Malesia* two non-endemic species.

The total number of species is estimated by KRAUSE (1930) at c. 100 and by OBERMEYER (1962) at nearly 300.

Ecol. Species of *Chlorophytum* occur in a wide range of habitats from coastal to montane regions. They grow in many soil types and in rock crevices, and in open grassland and dense forest.

Notes. OBERMEYER (1962) recorded that in species with fascicled flowers plants do occasionally occur in which the flowers are borne spirally on a distinct but very short lateral branch of the inflorescence. This supports the theory that fascicled flowers and their associated bracts represent an abbreviated lateral shoot.

She also discussed the difficulty encountered in separating *Chlorophytum* from *Anthericum* L. (1753). She was only able to find a single character on which these genera could always be separated: the seeds of *Chlorophytum* are flat, but of *Anthericum* angular and smaller. Several other characters were found to be generally, but not universally, of value in separating them.

KEY TO THE SPECIES

1. Perianth segments 3–5 mm long. Anthers less than 1 mm long. Leaves usually 4–8 mm broad
 1. *C. laxum*
1. Perianth segments 7–12 mm long. Anthers 4–5 mm long. Leaves usually 10–50 mm broad
 2. *C. malayense*

1. *Chlorophytum laxum* R. Br. Prod. (1810) 277; HOOK. *f. Fl. Br. Ind.* 6 (1892) 336; BACK. *Handb. Fl. Java* 3 (1924) 52, *incl. f. javanicum* (HASSK.) BACK.; GAGNEP. *Fl. Gén. I.-C.* 6 (1934) 804; BACK. & BAKH. *f. Fl. Java* 3 (1968) 86; HUTCH. & DALZ. *Fl. W. Trop. Afr.* ed. 2, 3 (1968) 100. — *C. laxiflorum* BAKER, J. Linn. Soc. Bot. 15 (1876) 328, *nom. illeg.* — *Nolina javanica* HASSK. *Tijd. Nat. Gesch. Phys.* 10 (1843) 120; MIQ. *Fl. Ind. Bat.* 3 (1859) 554.

Roots often bearing tubers c. 1–5 cm long (absent in material I have seen from Malesia and stated by BACKER & BAKHUIZEN VAN DEN BRINK *f.* to be absent in Javanese plants). *Leaves* 4–12 or rarely more, linear to lanceolate, usually channelled especially towards the base, with a rather prominent midrib; suberect, glabrous, 10–30(–50) cm by 4–8(–12) mm, rarely forming fibrous sheaths round the base of the plants; the outer arcuate and recurved; the inner often straight. Peduncle straight

or flexuous, unbranched or rarely with a single branch, (5-)15-35(-60) cm. Lower bracts 3-12 mm long, usually lanceolate-acuminate, partly scarious. *Pedicels* solitary or, less often, 2-nate, often erect-spreading but recurving in fruit, 3-12 mm. *Perianth* segments white or 'greenish white', linear-oblong, 3-5 by c. 1 mm. *Filaments* (1 $\frac{1}{2}$ -)2-3 (-4) mm long (the outer often longer than the inner); anthers up to $\frac{1}{2}$ mm long. *Ovary* c. 1 mm long, obovoid or globose; style less than 2 mm; ovules 2 per locule. *Capsule* usually obovoid, less often globose or depressed-globose, 3-lobed, 5-10 mm long.

Distr. Tropical Africa (e.g. Senegal, Liberia, Ghana, Nigeria, Zambia, Ethiopia), S. Asia (e.g. India, Indo-China, Thailand), China (incl. Hainan); in *Malesia*: N. Sumatra (Eastcoast Res.), Malay Peninsula, W. and Central Java, and SE. Borneo (Bandjermasin), extending to N. Australia (Queensland and Northern Territory).

Ecol. Recorded from a variety of localities including rock crevices and in sandy soils, but usually a species of shady places (including bamboo forest, deciduous forest and a coconut grove), usually below 1000 m. *Fl.* Jan.-Dec.

Notes. BACKER (1924) and BACKER & BAKHUIZEN VAN DEN BRINK f. (1968) treat the Javanese plants as belonging to *forma javanicum* (HASSK.) BACK. They give no reason for this decision and in the absence of a monograph of this species I would prefer not to uphold this form.

Extra-Malesian synonyms are omitted from the references.

2. *Chlorophytum malayense* RIDL. *Fl. Mal. Pen.* 5 (1925) 341; PANIGRAHI, *Kew Bull.* 30 (1975) 565. — *C. orchidastrum* (non LINDL. *Bot. Reg.* 10 (1824) t. 813) RIDL. *Mat. Fl. Mal. Pen. Monoc.* 2 (1907) 92; *Fl. Mal. Pen.* 4 (1924) 327; GAGNEP. *Fl. Gén.* I.-C. 6 (1934) 806; CHAROENPHOL, *Thai For. Bull.* 7 (1973) 67.

Roots sometimes bearing tubers 3-4 mm or more long. *Leaves* 3-10, sublinear or indistinctly petioled and with a lanceolate lamina, channelled towards the base, with a rather prominent midrib, suberect, glabrous, (10-)25-60 by (1 $\frac{1}{2}$ -)1-5(-10) cm, never forming fibrous sheaths round the base of the plant. Peduncle glabrous or less often glandular pubescent, with 0-~ branches (30-)40-50(?-90) cm high. Lower bracts up to 9 cm long, usually narrowly lanceolate-acuminate, usually partly scarious; the lowest usually sterile. *Pedicels* usually 2-3-nate,

less often solitary, erect-spreading, not recurving in fruit, 3-10 mm. *Perianth* segments white, elliptic to linear-oblong, 7-12 by 2-3 mm. *Filaments* occasionally minutely pubescent, 4-5 mm (not always similar in length but neither whorl regularly longer than the other); anthers 4-5 mm long. *Ovary* c. 1 $\frac{1}{2}$ -2 mm long, obovoid or globose; style 3-4(-8, GAGNEPAIN, 1934) mm; ovules 4-6 per locule. *Capsule* globose, strongly emarginate and very deeply 3-lobed, c. 5-8 mm \varnothing .

Distr. Indo-China, Thailand and *Malesia*: Malay Peninsula (Perak and Perlis).

Ecol. This is usually a forest (including bamboo, oak, pine) species, often associated with limestone, 50-1500 m. *Fl.* Jan.-Dec.

Notes. GARRETT (*in sched.*) recorded that the plant is night-flowering in Thailand.

RIDLEY (1925) gave the new name *C. malayense* to what he had previously identified as *C. orchidastrum* LINDL. However, he gave no characters by which these species could be separated.

In the neighbouring territories of Thailand and Indo-China CHAROENPHOL (1973) and GAGNEPAIN (1934) have continued to recognize *C. orchidastrum*, but I am following PANIGRAHI (1975) who considers that *C. orchidastrum sensu stricto* is confined to Africa, that the Indian material should be referred to *C. nimmonii* and *C. glaucum*, and that the SE. Asian material is *C. malayense*. Our species can, according to PANIGRAHI, be recognized *inter alia* by drying greenish brown or glaucous, in the leaves not being distinctly petioled and 3-5 cm broad, in the scape being up to 50 cm long and shorter than the leaves and in the bracts being up to 9 cm long. Few collections have been made of *C. malayense* and further field work is needed to confirm its status.

C. longissimum RIDL. (*J. Str. Br. R. As. Soc.* n. 49, 1907, 209) was described from Trang, Peninsular Thailand, close to the Malesian border. It closely resembles *C. malayense*. CHAROENPHOL distinguished these species on whether the inflorescence is erect and sometimes branched (*C. malayense*) or trailing on the ground and never branched (*C. longissimum*). The type of *C. longissimum* has not been seen, but specimens at Kew identified as such, and agreeing with the type description, are possibly sufficiently characterized by these inflorescence characters to retain it as a distinct taxon. Whether the differences are sufficient for specific rank must be left to future examination; it is provisionally kept distinct. It was not discussed by PANIGRAHI.

9. DIANELLA

LAMK [*Encycl.* 2 (1786) 276, *nom. inval.*] *ex* JUSS. *Gen. Pl.* (1789) 47; BAKER, *J. Linn. Soc. Bot.* 14 (1875) 574; BTH. *Fl. Austr.* 7 (1878) 13; BACK. *Handb. Fl. Java* 3 (1924) 53; KRAUSE in E. & P. *Nat. Pfl. Fam.* ed. 2, 15a (1930)

295; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 256; Blumea 6 (1948) 200; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 606. — *Rhuacophila* BL. En. Pl. Jav. (1827) 13. — Fig. 9.

Erect or climbing glabrous herbs. *Rhizome* short to stoloniferous. Roots fibrous. *Leaves* usually cauline and distichous or basally rosulate, linear, distally dorsiventral, in the lower parts sometimes laterally compressed and keeled and often forming a closed sheath at the base. *Inflorescence* a panicle. *Pedicels* solitary or few, usually in the axils of bracts, articulated immediately below the flower. *Perianth* segments free, 3–7-nerved, spreading or recurved, equal or subequal. *Filaments* filiform or linear, often swollen in the distal half, glabrous, attached to the receptacle or the inner whorl attached to the perianth segments; anthers basifixed, linear to oblong, dehiscent by an apical pore or by a slit which is initiated in an apical pore. *Ovary* superior, more or less sessile, globose, 3-celled; ovules axile, 4–8 in each locule; style filiform, simple, minutely capitate. *Fruit* a berry, usually shiny blue; perianth segments adhering, marcescent, not twisting after flowering; base of style persistent. Seeds globose or angled.

Distr. Continental Africa (one record), Madagascar, through India into China, throughout Malasia and Australia to New Zealand and the Pacific Islands (New Caledonia, Sandwich Is., Norfolk and Fiji). Estimates of the number of species vary widely; there are possibly 20–30 spp. in all. Ecol. Both in forest and in more open localities.

KEY TO THE SPECIES

1. Leaf bases strongly compressed and keeled. Leaves usually with minute teeth or prickles along the margin and abaxial surface of the midrib. Fertile bracts differing considerably in size from even the smaller leaves. Filaments strongly thickened at the apex under the anther 1. *D. ensifolia*
1. Leaf bases obtuse in section, not keeled. Leaves always smooth. Fertile bracts grading into the leaves. Filaments widened about the middle 2. *D. javanica*

1. *Dianella ensifolia* (L.) DC. in Redouté, Liliac. 1 (1802) t. 1, cf. COODE in Bosser c.s. Fl. Masc. L. (1978) 32; MIQ. Fl. Ind. Bat. 3 (1859) 560; HEMSL. Rep. Chall. Bot. 1, 3 (1884) 201; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 92; LAUT. Bot. Jahrb. 50 (1913) 293; HALL. f. Nova Guinea 8 (1914) 995; MERR. En. Born. (1921) 114; En. Philip. 1 (1922) 203; RIDL. Fl. Mal. Pen. 4 (1924) 329; KRAUSE, Bot. Jahrb. 59 (1925) 551; MERR. Contr. Arn. Arb. 8 (1934) 18; WILD, Kew Bull. 8 (1953) 251; M. R. HENDERSON, Mal. Wild Flow. Monoc. (1954) 186, f. 110; BACK. & BAKH. f. Fl. Java 3 (1968) 87; STEEN. Mt. Fl. Java (1972) t. 28–1. — *Gladiolus odoratus indicus* RUMPH. Herb. Amb. 5 (1747) 185, t. 73. — *Dracaena ensifolia* LINNÉ, Mant. (1767) 63. — *Dianella nemorosa* LAMK, Encycl. 2 (1786) 276, *nom. inval.*; Tabl. Enc. 2 (1792) 388, t. 250, *nom. illeg.*; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 256; Blumea 6 (1948) 209, incl. many forms, *l.c.* 216–223. — *Dracaena ensata* THUNB. Diss. Bot. Drac. (1808) 4. — *Dianella montana* BL. En. Pl. Jav. 1 (1827) 12; HASSK. Tijds. Nat. Gesch. Phys. 11 (1844) 180; Pl. Jav. Rar. (1848) 114; MIQ. Fl. Ind. Bat. 3 (1859) 560; BACK. Handb. Fl. Java 3 (1924) 54. —

D. odorata [RUMPH.] BL. En. Pl. Jav. 1 (1827) 13; HALL. f. Nova Guinea 8 (1914) 996; MERR. Int. Rumph. (1917) 136; KRAUSE, Bot. Jahrb. 59 (1925) 550; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 258. — *D. revoluta* (non R. BR.) SCHAUER, Nov. Act. Ac. Nat. Cur. 19 (1843) Suppl. 1: 445; LAUT. Bot. Jahrb. 50 (1913) 293; MERR. En. Philip. 1 (1922) 203. — *D. bancana* MIQ. Fl. Ind. Bat. Suppl. (1861) 610; BACK. Handb. Fl. Java 3 (1924) 54. — *D. caerulea* (non SIMS, Bot. Mag. 15, 1801, t. 505) MERR. Philip. J. Sc. 2 (1907) Bot. 266; *ibid.* 5 (1910) Bot. 337; HALL. f. Nova Guinea 8 (1914) 993; GIBBS, Arfak (1917) 100; MERR. En. Philip. 1 (1922) 202; KRAUSE, Bot. Jahrb. 59 (1925) 552; HOLTHUIS, Blumea 5 (1942) 167. — *D. robusta* ELMER, Leaf. Philip. Bot. 5 (1913) 806. — *D. bambusifolia* HALL. f. Nova Guinea 8 (1914) 995, t. 182; KRAUSE, Bot. Jahrb. 59 (1925) 550. — *D. flabellata* HALL. f. *l.c.* 997, t. 183; KRAUSE, *l.c.* 549. — *D. carinata* HALL. f. *l.c.* 999, t. 186; KRAUSE, *l.c.* 550. — *D. parviflora* ZIPP. ex HALL. f. *l.c.* 998, t. 184; KRAUSE, *l.c.* 551. — *C. albiflora* HALL. f. *l.c.* 998, t. 185; KRAUSE, *l.c.* 551. — *D. monophylla* HALL. f. *l.c.* 1000, t. 188; KRAUSE, *l.c.* 551. — *D. serrulata* HALL. f. *l.c.* 1000, t. 187; KRAUSE,



Fig. 9. *Dianella javanica* (BL.) KUNTH, on Mt Kaba, S. Sumatra (Photogr. DE VOOGD).

l.c. 549. — *D. parviflora* RIDL. J. Fed. Mal. St. Mus. 6 (1915) 186. — *D. pullei* KRAUSE, Nova Guinea 14 (1924) 175; Bot. Jahrb. 59 (1925) 553. — *D. ledermannii* KRAUSE, Bot. Jahrb. 59 (1925) 549. — *D. monticola* KRAUSE, *l.c.* 553. — ? *D. levis* (non R. BR.) C. T. WHITE, Proc. Linn. Soc. N.S.W. 51 (1926) 298. — *D. sparsiflora* SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 163 (1940) 262. — *D. ensata* (THUNB.) R. J. HENDERSON, Taxon 26 (1977) 136.

Stem 0–1 m high, unbranched, rarely with a few branches. *Rhizome* horizontal, moderately branched. *Leaves* basal, scattered along the stem or in a terminal rosette, distichous, with a sheathing lower part, (25–)30–60(–100) cm by (4–)8–30 mm; above the base keeled and with the sides of the lamina becoming firmly appressed to one another and fused to form an isobilateral portion; distally with a dorsiventral linear or linear-lanceolate

lamina which is sometimes absent from the lower leaves, almost always with minute serrations or prickles along the midrib on the lower surface, with a conspicuous midrib and numerous smaller veins. *Inflorescence* exceeding the leaves, lax or with short terminal branches often c. 1–2 cm long, bearing up to 20 pedicels. Lower bracts usually narrowly linear-lanceolate and bilaterally compressed above the basal sheath like the leaves; bracts subtending pedicels 1–4(–7) mm long or rarely absent. *Pedicels* 4–15(–22) mm. *Perianth* segments blue, white, lilac or yellow, spreading, (4)5–8(–9) mm long. *Filaments* often more than half as long as the perianth segments, filiform or narrowly linear, white or yellow with a yellow or orange, glabrous swelling below the anther. *Ovary* green, 1½–2 mm long; ovules 4 in each locule; style green, white or blue, 4–6 mm long. *Fruit* shiny blue, 6–8(–11) mm \varnothing . Seeds several, 3–4 mm long.

Distr. Continental Africa (WILD, 1953), Madagascar, continental Asia (Himalayas, Burma, Thailand, Indo-China) to southern China (Yunnan, Hainan), Japan and Formosa, throughout *Malesia* to Australia (Northern Territory, Queensland, New South Wales), Tasmania, New Zealand and many Pacific islands.

Ecol. A highly adaptable species, occurring in habitats ranging from open grassland to primary forest, from sea-level to over 3000 m. *Fl.* Jan.–Dec.

Vern. Malaya: *benjuang, satagit, senjuang, siak-siak jantan*; Sumatra: (*akar*) *tu(n)daun, mentuntit, tengari, ukop*, Banka, *siak-siak*, Riouw, *sieuh, Djambi, sitanggit*, Batak, *tesiah*, Pasemah, *sitangie*, Indragiri; Java: *djamaka, d. putih, suliga, S, tegari, J*; Borneo: *labeh-labeh*, Dusun Penampang dial., *angkup-angkup*, Bokan dial., *tembalong tipoh*, Dusun dial.; Philippines: *abláas*, Bag., *bariu-báriu, oyon-oyon*, P.Bis., *duñgau*, Ig., *hogangan*, If.; Moluccas: *mariuí*, Talaud; New Guinea: *suruma; bururl, tirambaramp*, Mendi, *buru-buru*, Biak dial., *moalengen*, Aiome, *tanglenu*, Wigote, Wapi lang., *sinda*, Mumuni, Orokaiva lang., *tsiri kande kande*, Hagen Subdistr., *bonkaige*, Sinasina lang., Nimai dial., *pfifiriki*, Kutubu lang., *kili-kili*, Bembi, *kikipatia*, Koroba Subdistr., *sabetari*, Rawa, *kilina*, Kaigorin, *sarpeim*, Miwaute, Wapi lang., *pengeh-pengeh*, Maipa, Mekeo lang., *baibigehgi*, Utukap, Miniafi lang.

Notes. BACKER (1924, 1968) recognized two species, *D. montana* and *D. bancana*, to include the material from Java, which he distinguished mainly on flower colour, venation of petals, and inflorescence form. However, the large number of intermediates makes this separation impracticable.

SCHLITTLER (1940) recognized 3 spp. in *Malesia* (*D. odorata*, *D. nemorosa* and *D. sparsiflora*), but in 1948 he reduced these to a single one under the name *D. nemorosa*, with 24 forms in *Malesia*.

Being a common species over a large area,

D. ensifolia is exceptionally well represented in herbaria and, despite its variability, I doubt that even with intensive field work distinct subspecific taxa can be defined.

2. *Dianella javanica* (BL.) KUNTH, En. Pl. 5 (1850) 52; MIQ. Fl. Ind. Bat. 3 (1859) 561; HALL. f. Nova Guinea 8 (1914) 995; MERR. En. Born. (1921) 114; En. Philip. 1 (1922) 203; RIDL. Fl. Mal. Pen. 4 (1924) 328; BACK. Handb. Fl. Java 3 (1924) 53; KRAUSE, Bot. Jahrb. 59 (1925) 549; MERR. Contr. Arn. Arb. 8 (1934) 19; SCHLITTLER, Blumea 6 (1948) 206, incl. f. *stenophylla, alba et rubra* SCHLITTLER, l.c. 208; Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, 11, map, 25; BACK. & BAKH. f. Fl. Java 3 (1968) 87; STEEN. Mt. Fl. Java (1972) t. 28–2. — *Rhuacophila javanica* BL. En. Pl. Jav. (1827) 14; RIDL. J. Linn. Soc. Bot. 42 (1914) 166; J. Fed. Mal. St. Mus. 6 (1915) 186. — *Rhuacophila celebica* BL. En. Pl. Jav. (1827) 14. — *Eustrephus javanicus* (BL.) D. DIETR. Syn. Pl. 2 (1840) 1117. — *Eustrephus celebicus* (BL.) D. DIETR. l.c. — *D. celebica* (BL.) KUNTH, En. Pl. 5 (1850) 45; MIQ. Fl. Ind. Bat. 3 (1859) 561. — *D. austro-caledonica* SEEM. Fl. Vit. (1868) 312; LAUT. Bot. Jahrb. 50 (1913) 294. — Fig. 9.

Stem always present, up to 2 m high, unbranched or branched. *Rhizome* horizontal, moderately branched. *Leaves* concentrated towards the ends of the branches, distichous, 12–35(–40) by ¾–2½ cm, with a sheathing but not closed base which is continuous with the lamina, lacking a compressed and fused intermediate portion, lacking serrations or prickles; midrib usually more conspicuous than the many other veins. *Inflorescence* lax, exceeding the leaves. Bracts subtending branches of the inflorescences grading gradually in size into the foliage leaves, up to 25 by 3 cm, ovate to lanceolate not bilaterally compressed; bracts subtending the pedicels ½–3(–5) mm long or absent. *Pedicels* 6–20 mm. *Perianth* segments blue (usually pale), white to yellow or lilac, spreading, (6)–8–12 mm long; outer whorl strongly cucullate at the apex. *Filaments* usually less than half as long as the perianth segments, white or yellow, filiform, usually with a distinct papillose fusiform swelling about the middle. *Ovary* green, c. 2 mm long; ovules c. 8–10 in each locule; style white or green 2–5 mm. *Fruit* green or yellow at first, sometimes (at least) becoming black, ellipsoid, 8–15 mm long, with up to 10 seeds. Seeds c. 1½ mm \varnothing .

Distr. Throughout *Malesia*, also in New Caledonia and Ile des Pins, and Fiji Is. (Viti Levu).

Ecol. Grows in a wide variety of habitats, including mossy forests, thickets, forest borders, on narrow open ridge-crests, in debris of craters, among rocks, on stream banks and in exposed places, locally common, (1000–)1500–3000 m. *Fl.* Jan.–Dec.

Vern. Java: *hadjèra*, S; Philippines: *kallawad*, If., *apilug, sapiláu, uráya*, Ig., *talobatub*, Bon.



Fig. 10. *Thysanotus tuberosus* R. BR. a. Habit, $\times \frac{1}{4}$, b. flower, $\times 5$, c. sexual organs, $\times 10$, d. fruit in persistent perianth, $\times 5$. — *T. chinensis* BTH. e. Habit, $\times \frac{1}{2}$ (a-d BRASS 6517, e VAN ROYEN & SLEUMER 5632).

L. D.

10. THYSANOTUS

R. BR. Prod. (1810) 282; BAKER, J. Linn. Soc. Bot. 15 (1876) 334; BTH. Fl. Austr. 7 (1878) 36; RIDL. Fl. Mal. Pen. 4 (1924) 328; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 285; EWART, Fl. Vict. (1930) 288; BLACK, Fl. S. Austr. 1 (1943) 190; PAYENS, Nova Guinea n.s. 8 (1957) 386; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 598, *nom. gen. cons.* — *Chlamysporum* SALISB. Parad. Lond. (1808) t. 103. — *Halongia* JEANPLONG, Act. Bot. Ac. Sc. Hung. 16 (1970) 293, f. 1–6. — **Fig. 10.**

Stemless herbs. *Rhizome* horizontal, very short. Roots fibrous or tuberous. *Leaves* basal, rosulate, filiform or linear, glabrous, expanding towards the base to form a sheath. *Inflorescence* a raceme, panicle or umbellate, erect or twining. *Pedicels* 1–7-nate, in the axils of bracts and associated with a few small bracts also apparently in the axil of the principal bract, or umbellate, articulated often in the median third. *Perianth* segments free, 3–5-nerved, spreading; outer whorl green; inner whorl usually blue to purple or violet, fringed. *Stamens* usually 6, rarely 3. *Filaments* linear, glabrous, attached to the perianth segments, bent over to one side of the ovary (BLACK, 1943); 3 often shorter; anthers basifixed, linear, curved dehiscent introrsely. *Ovary* superior, sessile, oblong to globose, 3-celled; ovules axile, 2 in each locule; style filiform, simple, minutely capitate. *Capsule* dehiscent loculicidally; perianth segments adhering, marcescent, twisting after flowering; style persistent. Seeds angled, with a fleshy white or orange strophiole.

Distr. Up to 30 *spp.*, all in Australia (all states, but especially Western Australia); in *Malesia*: 2 of these *spp.*, one in New Guinea and another throughout Malesia as far as Thailand, Indo-China and southern China.

Ecol. A wide range of mostly open habitats from grasslands and sandy heaths to open forests, including both *Eucalyptus* savanna and pine forest.

Notes. The fleshy appendage of the seed has been referred to as a caruncle (*e.g.* BLACK, 1943), but it appears to be derived from the funicle rather than from the testa and I am, therefore, using the term strophiole as done by PAYENS (1957).

The term 'cluster' is sometimes used in preference to umbel as in some material the inflorescence appears umbellate but in other material the pedicels arise from a short but distinct axis.

KEY TO THE SPECIES

1. Roots lacking tubers. Inflorescence a simple umbel 1. *T. chinensis*
 1. Roots with tubers. Inflorescence a panicle, the branches terminated by umbels 2. *T. tuberosus*

1. *Thysanotus chinensis* BTH. Fl. Hongk. (1861) 372; BAKER, J. Linn. Soc. Bot. 15 (1876) 337; HALL. *f.* Nova Guinea 8 (1914) 994; MERR. En. Philip. 1 (1922) 202; KRAUSE, Bot. Jahrb. 59 (1925) 548; GARDN. En. Pl. Austr. Occid. (1931) 18; SCHLITTLER, Mitt. Bot. Mus. Un. Zürich 207 (1957) 6, map; PAYENS, Nova Guinea n.s. 8 (1957) 386; STEEN. Blumea 20 (1972) 433. — *T. chrysantherus* F.v.M. [in BTH. Fl. Hongk. (1861) 372, *nomen*] Fragm. 5 (1866) 202; BTH. Fl. Austr. 7 (1878) 40; NAVES, Nov. App. (1880) 266; VIDAL, Phan. Cuming. (1885) 153; BAILEY, Queensl. Fl. 5 (1902) 1629. — *Chlamysporum chrysantherum* (F.v.M.) O. K. Rev. Gen. Pl. 2 (1891) 708. — *T. siamensis* RIDL. J. Str. Br. R. As. Soc. n. 59 (1911) 209; Fl.

Mal. Pen. 4 (1924) 328. — *Halongia purpurea* JEANPLONG, Act. Bot. Ac. Sc. Hung. 16 (1970) 296, f. 1–6. — **Fig. 10e.**

Roots fibrous. *Leaves* c. 5 to numerous, erect, often shallowly channelled, usually 15–40 cm, up to c. 1 mm wide. Peduncle about as long as the leaves, straight, unbranched, terminating in a 2–6(–12)-flowered cluster. Bracts with scarious margins, 2–4 mm long. *Pedicels* 1–2 cm, articulated in the basal third, erect in bud, usually spreading or recurving in fruit. Outer *perianth* segments (? always) green, with a scarious, white margin, 6–9 by 2–3 mm; inner segments pale blue to purple or light violet, with inturned usually fringed margins, 6–9 by 3–5 mm. *Filaments* 1½–2 mm,

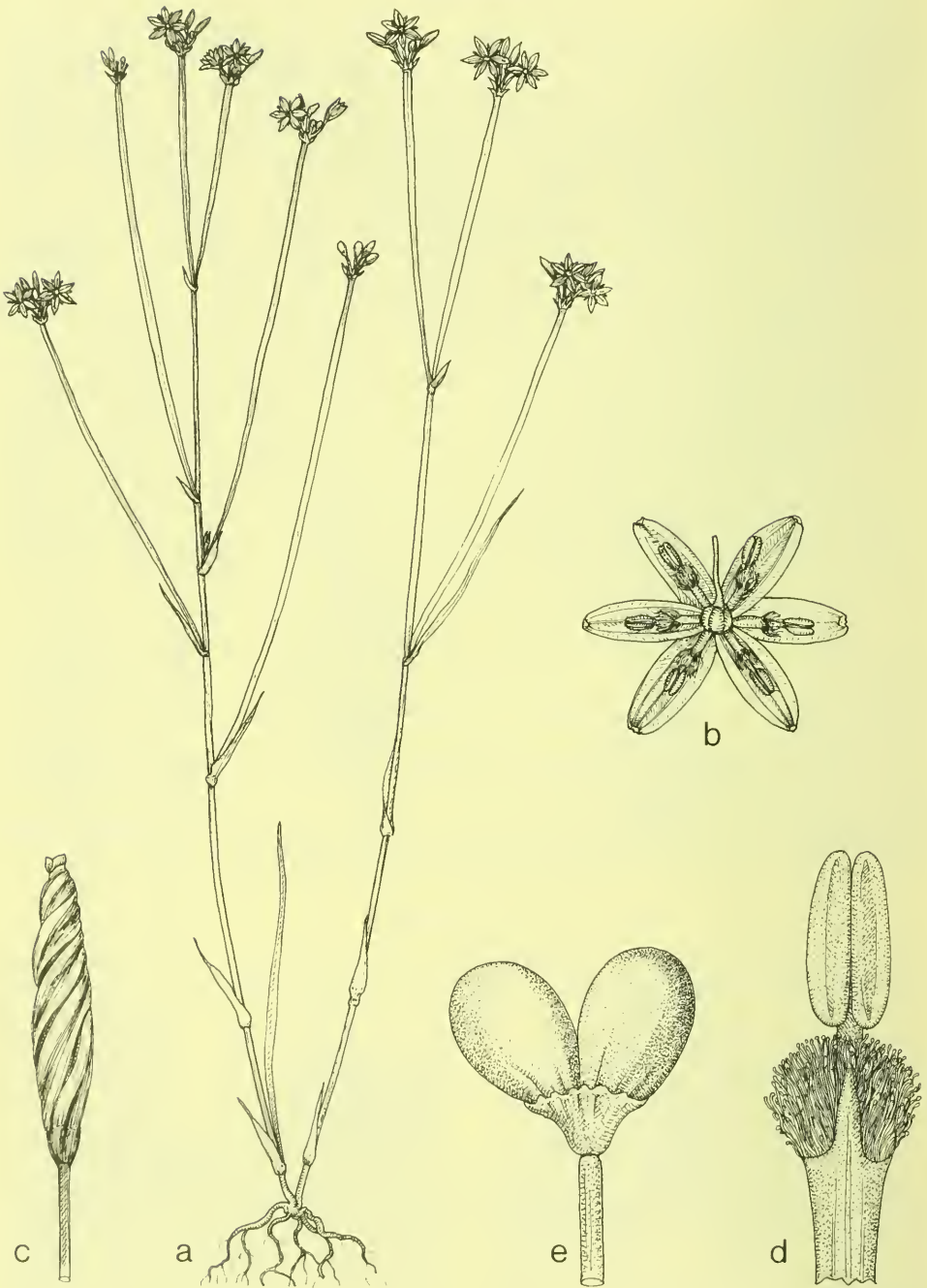


Fig. 11. *Tricoryne platyptera* RCHB. a. Habit, $\times \frac{1}{4}$, b. flower, $\times 2$, c. withered flower, $\times 4$, d. stamen, $\times 20$, e. fruit, $\times 5$ (NGF 38690, PULLEN 7090).

the outer whorl shorter than the inner; anthers $1\frac{1}{2}$ –3 mm long, the outer shorter than the inner. *Ovary* c. 1 mm long; style c. 3–4 mm. *Capsule* oblong, 4–5 mm long. Seeds c. $1\frac{1}{2}$ mm long.

Distr. Australia (Western Australia and Northern Territory); in *Malesia*: New Guinea (West New Guinea and Papua), SE. Moluccas (Aru Is.: Tranggan), Celebes (Masamba), Philippines (Luzon, Mindanao), Lesser Sunda Is. (Flores), onto continental SE. Asia: S. Peninsular Thailand (Setul), Indo-China (Tonkin), S. China (incl. Hong Kong).

Ecol. Open grassland, in grassy pine forest, most frequently in open savanna, in New Guinea of *Melaleuca*, etc., in places subject to a moderate to strong dry season, from close to sea-level up to 1600 m. *Fl.* Dec.–Aug.

2. *Thysanotus tuberosus* R. BR. Prod. (1810) 282; BAKER, J. Linn. Soc. Bot. 15 (1876) 335; BTH. Fl. Austr. 7 (1878) 41; EWART, Fl. Vict. (1930) 289; GARDN. En. Pl. Austr. Occid. (1931) 18; BRASS, J. Arn. Arb. 19 (1938) 190; BLACK, Fl. S. Austr. 1 (1943) 191; PAYENS, Nova Guinea n.s. 8 (1957) 387; BURB. & GRAY, Fl. A.C.T. (1970) 102. — *Chlamyosporum tuberosum* (R. BR.) O. K. Rev. Gen. Pl. (1891) 708. — Fig. 10a–d.

Roots partly fibrous, bearing spindle-shaped distant tubers 10–25 mm long. *Leaves* 2–6, erect, linear to terete, 20–50 cm by up to c. 1 mm broad. Peduncle about as long as the leaves or up to 50% longer, usually with 1–6 branches; main axis

and branches each terminating in a 2–6(–20)-flowered cluster; 1–3(–8) flowered fascicles of flowers usually also present in the axils of bracts along the main axis and branches. Bracts usually with scarious margins, the lowest 3–60(–80) mm long; the upper shorter. *Pedicels* 7–17 mm, articulation usually below the centre, erect to spreading. Outer *perianth* segments purple with a scarious pale margin, 7–14 by 2–3 mm; inner segments purple with inturning fringed margin, 7–15 by $2\frac{1}{2}$ –5 mm. *Filaments* 1–2 mm, those of the outer whorl often shorter than the inner; anthers 2–4 mm long; outer often shorter than the inner. *Ovary* 1– $1\frac{1}{2}$ mm long; style (2–)3–5 mm. *Capsule* oblong, c. 5–6 mm long. Seeds up to 2 mm long.

Distr. Australia (all states except Tasmania) and S. Papua New Guinea (Western District: Wassi Kussa; Mabaduan).

Ecol. Common grass associate in lowland savanna forest on poorly drained flats, subject to a distinct dry season. *Fl.* Dec.–April. In Australia found in exposed localities up to 500 m.

Notes. VAN ROYEN recorded in Queensland that the outside of the flowers was white with a green midrib and the anthers dark purplish green.

PAYENS (1957) recognized two varieties separable on flower size. Both occur in Australia but only *var. parviflora* BTH. in Papua. The material available is insufficient to justify recognition of these varieties.

Six other synonyms based on *extra-Malesian* material are omitted from the synonymy.

11. TRICORYNE

R. BR. Prod. (1810) 278; BAKER, J. Linn. Soc. Bot. 15 (1876) 361; BTH. Fl. Austr. 7 (1878) 50; BAILEY, Queensl. Fl. 5 (1902) 1636; EWART, Fl. Vict. (1930) 287; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 287; BLACK, Fl. S. Austr. 1 (1943) 192; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 602. — Fig. 11.

Erect, glabrous or variously hairy herbs; stems green, terete, angled or flattened and leaf-like. *Rhizome* horizontal or erect, often very short; roots thick or fibrous. *Leaves* basal and/or cauline, more or less linear or reduced to scales, alternate, often amplexicaul at the base. *Inflorescence* of terminal umbels surrounded by small scarious bracts and outer larger, sometimes leaf-like bracts. *Pedicels* articulated just below the flower. *Perianth* segments free or shortly connate, equal or subequal, with 3 or 5 (less often 7) prominent veins, spreading. *Filaments* filiform, with a dense tuft of hairs in the distal part, attached to the receptacle; anthers basifixed, linear to oblong; introrse. *Ovary* superior, sessile, deeply 3-lobed, 3-celled; ovules basal, 2 in each locule; style filiform, simple, minutely capitate. *Fruit* consisting of (1–)3 indehiscent nutlets; perianth segments adhering, marcescent, twisting spirally after flowering. Seeds subglobose.

Distr. In Australia (all states) 6 *spp.*, of which one in *Malesia*: S. Papua New Guinea.

Ecol. Low altitude plant. BAILEY recorded most of the Queensland species from 'sandy shores' and specimen annotations suggest a preference for sandy soils in grassland or savanna.

Note. The terms 'stem' and 'leaves' give some difficulty as the aerial shoot might be better regarded as an inflorescence often bearing leaf-like bracts rather than as a vegetative shoot with leaves.

1. *Tricoryne platyptera* RCHB. Syst. Pflanzen. (1871) 72; BTH. Fl. Austr. 7 (1878) 51; BAILEY, Queensl. Fl. 5 (1902) 1636; Compr. Cat. Queensl. Pl. (1913) 559, f. 539; BRASS, J. Arn. Arb. 19 (1938) 190; PAYENS, Nova Guinea n.s. 8 (1957) 385. — *T. pterocaulon* BAKER, J. Linn. Soc. Bot. 15 (1876) 363. — Fig. 11.

Virgate, erect or subsucculent herb. Stems and branches strongly flattened (winged), terete towards the base of the plant, glabrous, 25–80 cm high; flattened portions with a prominent midrib, c. 2–8 mm broad. *Rhizome* short; roots rather thick. *Leaves* cauline, narrowly triangular, scale-like, up to 12(–25) mm long. Bracts 1–4 mm long. *Pedicels* usually 5–12(–15) in number, (2)–4–12 mm.

Perianth segments yellow, oblong or elliptic-oblong, with a scarios margin, 6–8(–10) by up to c. 3 mm; those of the outer whorl usually with (3)–5(–7) veins; those of the inner whorl slightly narrower, with 3 veins. *Filaments* 2½–3 mm, yellow; anthers c. 1–1¼ mm long. *Ovary* c. ½ mm long; style 3½–4 mm. Nutlets green.

Distr. Australia (tropical Queensland) and *Malesia*: S. Papua New Guinea (Western District: Wassi Kussa area), Thursday I.

Ecol. In New Guinea in savanna with *Melaleuca* and *Acacia*, in lowland savanna-woodland on sour grey soil and in grass of creek flats, subject to a strong dry season. *Fl.* Dec.–Jan., July–Aug.

In N. Queensland found up to 950 m.

12. LILIUM

LINNÉ, Sp. Pl. (1753) 302; Gen. Pl. ed. 5 (1754) 143; BAKER, J. Linn. Soc. Bot. 14 (1875) 225; ELWES, Monogr. genus *Lilium* (1880); WILSON, Lilies of E. Asia (1925); KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 329; DRYSDALE WOODCOCK & STEARN, Lilies of the World (1950); SEALY, Kew Bull. 5 (1950) 273; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 609.

Erect, usually glabrous herbs. Bulb scaly; roots thick, produced from below the bulb and in some species from the base of the aerial stem. Aerial stem annual, erect, usually unbranched. *Leaves* cauline, alternate or verticillate, linear or broadly flattened, usually sessile, sometimes with bulbils in their axils. *Flowers* solitary and terminal, or in a racemose inflorescence of solitary flowers in the axils of the often leaf-like bracts. *Pedicels* erect to cernuous, not articulated. *Perianth* segments free, ± equal, infundibuliform or campanulate, sometimes clawed, sometimes adhering and forming a tube, spreading or recurving distally, with a nectariferous longitudinal furrow towards the base. *Filaments* filiform or subulate, attached to the receptacle or to the base of the segments; anthers dorsifixed, linear, introrse, versatile. *Ovary* superior, sessile, oblong to obovoid, 3-celled; ovules axile, ∞; style terete sometimes clavate, 3-lobed. *Capsule* coriaceous, loculicidal, perianth deciduous. Seeds flat.

Distr. Widespread with possibly 80 *spp.* in the temperate regions of North America, Europe and Asia (also Taiwan); in *Malesia*: Philippines.

Ecol. The species occupy a wide range of habitats, including open areas and woods.

Note. Many species are of horticultural importance.

KEY TO THE SPECIES

1. Leaves 6–15 mm broad. Nectariferous furrow on perianth segments glabrous . . . **1. *L. longiflorum***
 1. Leaves 2–4 mm broad. Nectariferous furrow on perianth segments papillose . . . **2. *L. philippinense***

1. *Lilium longiflorum* THUNB. Trans. Linn. Soc. 2 (1794) 333; ELWES, Monogr. genus *Lilium* (1880) t. 7; MERR. En. Philip. 1 (1922) 204; BACK. Handb. Fl. Java 3 (1924) 62; WILSON, Lilies of E. Asia

(1925) 23; DRYSDALE WOODCOCK & STEARN, Lilies of the World (1950) 253; HATUS. Mem. Fac. Agric. Kagoshima Un. 5 (1966) 62, *err. longifolium*; BACK. & BAKH. f. Fl. Java 3 (1968) 90.

Bulb usually subglobose, often yellowish, up to 6½ cm \varnothing ; scales closely imbricate. Stem 30–90 (–100) cm high, smooth, green, producing roots above the bulb. *Leaves* alternate, 20–40(–60), sessile, lanceolate or oblong-lanceolate, attenuate, with up to 20 or more veins of which up to 7 are usually more conspicuous, the largest on each plant up to 15 by 1½ cm, usually much smaller distally. *Flowers* often solitary, but up to at least 7, white, horizontal, (12–)15–20 cm long, infundibuliform, the tube (in dried material) 9–12 mm \varnothing . *Perianth* segments not clawed, reflexed distally; nectariferous furrow glabrous. *Filaments* filiform above, linear below, in dried material 9–14 cm; anthers 7–12 mm long; pollen yellow. *Style* 8–12 cm; stigma deeply 3-lobed. *Capsule* c. 4–6 cm long.

Distr. China, Japan and Taiwan; in *Malesia*: Philippines: Batan Is. and Y'ami (N of Luzon), cf. MERRILL and HATUSIMA.

Native country not exactly known, possibly naturalized over part of its range.

Ecol. Open grassy slopes at low altitude.

Vern. *Easter lily*, E; *teppo-yuri*, Japan; Philippines: *vonitan*, Iv.

Note. Stated by DRYSDALE WOODCOCK & STEARN to be commercially the most important species of *Lilium*, with numerous cultivated forms.

2. *Lilium philippinense* BAKER, Gard. Chron. (1873) 1141, f. 243; J. Linn. Soc. Bot. 14 (1875) 228

(*'philippense'*); CURTIS, Bot. Mag. III, 32 (1876) t. 6250; ELWES, Monogr. genus *Lilium* (1880) t. 3; MERR. Philip. J. Sc. 5 (1910) Bot. 337; En. Philip. I (1922) 204; WILSON, Lilies of E. Asia (1925) 20; DRYSDALE WOODCOCK & STEARN, Lilies of the World (1950) 311.

Bulb subglobose, whitish, c. 3½–4 cm \varnothing ; scales unknown. Stem 30–90 cm high, smooth, green or mottled with purple, producing roots above the bulb. *Leaves* alternate, 30–40, linear, attenuate, with up to 7 veins of which 1 or 3 are more conspicuous, 8–17 cm by 2–4 mm. *Flowers* 1 or 2, white, with green and reddish outside towards the base, horizontal, (10–)14–25 cm long, infundibuliform, the tube (in dried material) 8–12 mm \varnothing . *Perianth* segments not clawed, spreading distally; nectariferous furrow papillose. *Filaments* linear in dried material, 13–17 cm; anthers 5–15 mm long; pollen yellow. *Style* 10½–16 cm; stigma deeply 3-lobed. *Capsule* c. 5 cm long.

Distr. Taiwan and *Malesia*: Philippines: North Luzon (Bontoc, Benguet and Pangasinan Prov.).

Ecol. Open grassy slopes in the pine region, 1100–2300 m. *Fl.* May, *fr.* Oct.

Vern. Philippines: *kanyon*, Ilk., *luplupak*, *soyasoi*, *tubtubkau*, Ig., *tuktukpau*, Bon.

Note. Except for the presence of papillae on the nectariferous furrow hard to distinguish in flower from *L. longiflorum*.

13. ASPARAGUS

LINNÉ, Sp. Pl. (1753) 313; Gen. Pl. ed. 5 (1754) 147; BAKER, J. Linn. Soc. Bot. 14 (1875) 594; BTH. Fl. Austr. 7 (1878) 17; BAKER, Fl. Trop. Afr. 7 (1898) 425; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 362; HUTCH. Fam. Fl. Pl. ed. 2, 2 (1959) 608; JESSOP, Bothalia 9 (1966) 31; BACK. & BAKH. f. Fl. Java 3 (1968) 92. — *Asparagopsis* KUNTH, Abh. K. Ak. Wiss. Berlin (1842) 35.

Climbing or erect, glabrous or pubescent, softly woody plants usually with bisexual flowers, rarely dioecious. *Rhizome* perennial; roots mostly thick and often tuberous. Aerial stems annual or perennial, usually much-branched; branches sometimes similar to the main stems and sometimes morphologically distinct. *Leaves* cauline, alternate, scale-like, usually brown and at least partially scarious, often with a spine from the abaxial surface; leaves of the rhizome scale-like, lacking a spine. Leaf-like structures (*cladodes*) solitary or fascicled, flat, angled or terete, arising in the axils of cauline leaves but sometimes absent from flower-bearing branchlets. *Pedicels* solitary or fascicled in the axils of the cauline leaves, articulated. *Perianth* segments free or minutely connate, equal or subequal, 1-veined, white or nearly so, often with a green longitudinal band on the abaxial surface, spreading or less often reflexed. *Filaments* flattened, attached to the perianth segments; anthers dorsifixed, oblong, introrse. *Ovary* superior, \pm sessile, 3-celled; ovules axile, 2 to few; style usually filiform with 3 short branches, less often divided

nearly to the base. *Fruit* usually a red 1- to few-seeded berry; perianth not usually persistent. Seeds globose or partly angled.

Distr. Widespread in Europe, Africa, Madagascar, and Asia; in Malasia 2 *spp.*, one of which is widespread in the Old World and the single one known from Australia.

There are probably fewer than 100 *spp.*, but the taxonomy of the genus is poorly understood.

Ecol. Species have a preference for arid areas in the open and for savanna, but some occur in damp forests.

Notes. The morphology of the spines has been discussed by CUSSET & TRAN (Bull. Soc. Bot. Fr. 113, 1966, 151). The nature of the leaf-like organs (cladodes) is controversial. They are most frequently treated as axillary structures, *i.e.* modified branches (*e.g.* KAUSMANN, Bot. Stud. 3, 1955), and my own work confirms this. However, ARBER (Monocotyledons: a morphological study, 1925) believed that in a few species they were in fact leaves, while SCHLITTLER (Bot. Jahrb. 79, 1959, 428) concluded that they are leaves in all species.

KEY TO THE SPECIES

1. Flowers unisexual, borne at normal vegetative nodes. Cladodes usually flat, less often triquetrous . . . 1. *A. cochinchinensis*
 1. Flowers bisexual, usually on branches lacking cladodes. Cladodes triquetrous . . . 2. *A. racemosus*

1. *Asparagus cochinchinensis* (LOUR.) MERR. Philip. J. Sc. 15 (1919) Bot. 230; En. Philip. 1 (1922) 206; GAGNEP. Fl. Gén. I.-C. 6 (1934) 780; MERR. Comm. Lour. (1935) 108; MAKINO, Ill. Fl. Japan (1954) 735. — *Melanthium cochinchinense* LOUR. Fl. Coch. (1790) 216. — *A. lucidus* LINDL. Bot. Reg. 30 (1844) Misc. 29; BAKER, J. Linn. Soc. Bot. 14 (1875) 605; MERR. & ROLFE, Philip. J. Sc. 3 (1908) Bot. 96, *incl. var. dolichocladus* MERR. & ROLFE.

Plant dioecious. Stems glabrous, erect, procumbent or climbing, shallowly ridged; branches numerous, usually simple, arising singly, less than 10(–30) cm long, spreading or erect-spreading, often straight. Roots with distant, elongate tubers. Scale-leaves with scariosus portion less than 5(–8) mm long; spines absent on branches, poorly developed or up to 5 mm long on main axes. *Cladodes* present on branches and towards the ends of stems, flat, or 3-angled, 1–3-nate, linear-arcuate, 5–15(–40) by $\frac{1}{2}$ – $1\frac{1}{2}$ mm. *Pedicels* 1- or 2(–3)-nate, arising from the axils of scale-leaves subtending cladodes, articulated near or above the middle, 2–3(–6) mm long. *Perianth* segments yellow-green, pale green or white, spreading similar, oblong-elliptic, *c.* 2– $3\frac{1}{2}$ mm long. — ♂ *Flowers*: filaments shorter than the perianth segments, cuneate from a broad base; anthers nearly 1 mm long (one specimen); ovary rudimentary. — ♀ *Flowers*: filaments *c.* half the length of the perianth segments; anthers rudimentary; ovary obovoid, $1\frac{1}{2}$ –2 mm long; style *c.* $\frac{1}{2}$ mm, with 3 stigmatic ridges; ovules 2 per locule. *Berry* green when ripe, *c.* 4–7 mm \varnothing . Seeds 1–4, globose or angled, *c.* 2–3 mm \varnothing .

Distr. Korea, Japan, Ryu Kyu Is., S. China, Indo-China, Taiwan; in *Malasia*: Philippines (N. Luzon: Benguet Prov.), one record (LOHER 1928), probably from above 1200 m.

Ecol. There are several records from within the spray zone on coral or limestone substrates; also in

bush up to at least 200 m, but no ecological details known from the Philippines.

Notes. The recorded flower colours may be misleading. It is possible that the segments are white with a green or yellow-green band.

GAGNEPAIN recorded that the flowers were unisexual. I have seen insufficient material to determine whether the plants are always dioecious or to confirm that the flowers are always functionally unisexual, but in all flowers I examined one sex appeared to be rudimentary.

2. *Asparagus racemosus* WILLD. Sp. Pl. 2 (1799) 152; BAKER, J. Linn. Soc. Bot. 14 (1875) 623; BTH. Fl. Austr. 7 (1878) 17; ENGL. Bot. Jahrb. 7 (1886) 448; RIDL. Fl. Mal. Pen. 4 (1924) 331; BACK. Handb. Fl. Java 3 (1924) 72; HEYNE, Nutt. Pl. (1927) 444; H. PERRIER, Fl. Madag. fam. 40 (1938) 21; STEEN. Atlas Trop. Nederl. (1938) map 72; JESSOP, Bothalia 9 (1966) 72; HUTCH. & DALZ. Fl. W. Trop. Afr. ed. 2, 3 (1968) 93; BACK. & BAKH. f. Fl. Java 3 (1968) 93. — *A. dubius* DECNE, Nouv. Ann. Mus. Paris 3 (1834) 363; Herb. Timor. Descr. (1835) 35; SPAN. Linnæa 15 (1941) 476, added *A. penduliflorus* ZIPP., *nomen, in syn.* — *Asparagopsis decaisnei* KUNTH, En. Pl. 5 (1850) 103, *nom. illeg.*; ZOLL. Syst. Verz. 1 (1854) 67; MIQ. Fl. Ind. Bat. 3 (1859) 562; RIDL. in Forbes, Wand. (1885) 520. — *Asparagopsis schoberioides* KUNTH, En. Pl. 5 (1850) 70; IL'IN, Fl. U.S.S.R. 4 (1968) 328. — *Asparagopsis javanica* KUNTH, En. Pl. 5 (1850) 100; ZOLL. Syst. Verz. 1 (1854) 67; MIQ. Fl. Ind. Bat. 3 (1859) 562.

Plant with bisexual flowers. Stems glabrous, usually climbing, up to 2–3 m high or more, smooth or grooved, in their lower part unbranched; branches numerous and branched; solitary; final branches usually 1–4-nate, up to 5(–10) cm long, spreading or ascending, straight. Roots with distant, elongate tubers. Scale-leaves

with scarious portion up to 5(–10) mm long and spine usually absent on final branches, up to 5(–10) mm long. *Cladodes* present mainly on branches and towards the ends of stems, triquetrous, linear-crenate, 1–3(–4)-nate, (7–)10–25 (–40) mm long, rarely over 1 mm broad. *Pedicels* 1- or 2-nate, usually on branches 2–6 mm long lacking cladodes, less often on normal branches, articulated usually near the middle, 3–5 mm long. *Flowers* bisexual, scented. *Perianth* segments white with a green band, spreading similar oblong to obovate-oblong, 2–3(–4) mm long. *Filaments* shorter than or about the same length as the perianth segments; anthers *c.* 0.2–0.3 mm long. *Ovary* obovoid, *c.* 1½ mm long; style *c.* ½ mm, with 3 stigmatic ridges or 3 short branches; ovules 2 per locule. *Berry* red when ripe, *c.* 4–6 mm Ø. Seeds 1–3, globose or angled, *c.* 2–3 mm Ø.

Distr. Widespread in Africa including the southern Cape, Guinea and Madagascar, through southern Asia into China, in South Malesia and the northern states of Australia; in *Malesia*: Malay Peninsula (Langkawi, on limestone rocks), Java (in the western half only on the Northcoast, in E on both sides; also Madura and Kangean Is.), Lesser Sunda Is. (Lombok, Sumba, Sumbawa, Flores, Timor), and SE. Moluccas (Tenimber Is.).

The range in Malesia is distinctly disjunct on both ends which is due to its drought preference;

it is absent from the Sundaland rain-forest core.

Ecol. In Malesia a distinct drought-loving plant and bound to the seasonal areas, in Java to the zone with at most 20 rainy days in the 4 driest consecutive months of the year, mostly in coastal areas, in sunny thickets and on dunes, in monsoon forest with *Bambusa spinosa*, *Acacia leucophloea*, etc., predominantly in the lowland, but ascending to *c.* 1150 m (BACKER). *Fl.* mostly Aug.–Jan.

Vern. *Christusdoorn*, D; *bek bun*, Chinese; Java: *sangga langit*, J; Timor: *niesie saub*, *nônôsan*; Tenimber Is.: *skikirie*, Saumlak.

Notes. There are many synonyms from Africa, Asia and Australia, but none are known to have been used for the Malesian area.

A. racemosus is closely allied to *A. cochinchinensis* and can only be distinguished by a combination of characters. In Malesia they are geographically separated but until a revision of the genus, at least in Asia, is undertaken the taxonomy of this group must remain uncertain.

Excluded

According to MERRILL (En. Philip. 1, 1922, 206) NAVES (Nov. App. 1880, 264) has credited *A. declinatus* L. and *A. racemosus* WILLD. to the Philippine flora, but both were apparently admitted on erroneous identifications.

14. DISPORUM

SALISB. Trans. Hort. Soc. 1 (1812) 331; D. DON, Trans. Linn. Soc. Lond. 18 (1841) 513; BAKER, J. Linn. Soc. Bot. 14 (1875) 588; HOOK. *f.* Fl. Br. Ind. 6 (1894) 359; BACK. Handb. Fl. Java 3 (1924) 73; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 368. — *Lethea* NORONA, Verh. Bat. Gen. ed. 1, 5 (1790) Art. 4, 2, *nomen.* — *Drapiezia* BL. En. Pl. Jav. (1827) 8. — **Fig. 12.**

Glabrous rhizomatous herbs. Aerial stems annual, erect, branched. *Leaves* cauline; the lower brown and scale-like with a sheathing base; the others alternate becoming opposite distally, flat, with many veins, petioled, usually ovate, obtuse at base. *Peduncles* terminating vegetative branches, not articulated, bearing 1–6 nutant flowers in an umbel. *Perianth* segments free, equal or subequal, erect or distally recurved, several-veined, usually saccate or spurred at the base. *Filaments* linear to lanceolate, attached to the receptacle or the base of the perianth; anthers dorsifixed, linear-oblong, extrorse. *Ovary* superior, sessile, ovoid to obovoid, 3-celled; ovules axile, 2 per cell; style filiform, with 3 recurved stigmatic branches. *Fruit* a 1–3-seeded berry.

Distr. Approximately 30 *spp.* currently recognized in the western U.S.A. and Canada, Japan, China, northern Deccan Peninsula, through Thailand to *West Malesia*: Malay Peninsula, Sumatra, Java, and Bali.

In my opinion it is highly unlikely that more than half of these will be recognized after critical revision. *Ecol.* Typical forest plants.

Note. BACKER *l.c.* pointed to the peculiar sympodial structure of the stem.

1. *Disporum cantoniense* (LOUR.) MERR. Philip. J. Sc. 15 (1919) 229; MERR. Comm. Lour. (1935) 109. — *Fritillaria cantoniensis* LOUR. Fl. Coch. (1790) 206. — *Uvularia chinensis* KER-GAWL. Bot. Mag. (1806) t. 916. — *D. pulum* SALISB. Trans. Hort. Soc. 1 (1812) 331; HASSK. Pl. Jav. Rar. (1848) 105; MIQ. Fl. Ind. Bat. 3 (1859) 552; BAKER, J. Linn. Soc. Bot. 14 (1875) 589; HOOK. f. Fl. Br. Ind. 6 (1892) 360; RIDL. J. Fed. Mal. St. Mus. 4 (1909) 82, incl. var. *multiflorum* RIDL.; KOORD. Fl. Tjib. 1 (1922) 47; RIDL. Fl. Mal. Pen. 4 (1924) 338; HEND.

Mal. Wild Flow. Monoc. (1954) 185, f. 109; CHAROENPHOL, Thai For. Bull. 8 (1974) 89. — *Drapiezia multiflora* BL. En. Pl. Jav. (1827) 8; (1974) 89. — *Drapiezia multiflora* BL. En. Pl. Jav. (1827) 8; JUNGH. Java ed. 2 (neerl.) 1 (1853) 522; ZOLL. Syst. Verz. 1 (1854) 66, incl. var. *albiflora* ZOLL. — *D. leschenaultianum* D. DON, Proc. Linn. Soc. 1 (1839) 45; Trans. Linn. Soc. 18 (1841) 518; MERR. Contr. Arn. Arb. 8 (1934) 19. — *D. horsfieldii* D. DON, Proc. Linn. Soc. 1 (1839) 45 (WALLICH 5088D). — *Streptopus multiflorus* (BL.)



Fig. 12. *Disporum cantoniense* (LOUR.) MERR. a. Habit, $\times \frac{3}{4}$, b. flower of the spurred form, c. ditto of the non-spurred form, both $\times \frac{2}{2}$, d. gynoecium, e. stamen, both $\times 5$, f. fruit, $\times 1\frac{1}{2}$ (drawn from various collections).

D. DIETR. Syn. Pl. 2 (1840) 1121. — *D. multiflorum* (BL.) D. DON, Trans. Linn. Soc. 18 (1841) 518; MIQ. Fl. Ind. Bat. 3 (1859) 552. — *D. calcaratum* D. DON, Trans. Linn. Soc. 18 (1841) 516; BAKER, J. Linn. Soc. Bot. 14 (1875) 588; HOOK. f. Fl. Br. Ind. 6 (1892) 359; CHAROENPHOL, Thai For. Bull. 8 (1974) 89. — *Uvularia multiflora* (BL.) KUNTH, En. Pl. 4 (1843) 207. — *D. chinense* (KER-GAWL.) O. K. Rev. Gen. Pl. 2 (1891) 708; BACK. Handb. Fl. Java 3 (1924) 73; DOCT. v. LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. 11, 31 (1933) 147; BACK. & BAKH. f. Fl. Java 3 (1968) 94. — Fig. 12.

Stems erect, often 45–80 cm high, up to 2½ m, branched only in the upper half; branches erect-spreading, becoming flexuose distally. Roots fibrous or slightly thickened but not tuberous. Leaves usually ovate, less often oblong or lanceolate, rarely suborbicular, acuminate, 6½–17 by 2½–9 cm, with 5–9 veins prominent on the lower surface and numerous finer veins; petiole to 8 mm. Inflorescence an umbel of 2–7 flowers terminating a short branch which arises opposite a leaf and bears a single sometimes somewhat reduced leaf; peduncle 0–3½ cm; pedicels 1–4 cm. Perianth segments lanceolate to oblanceolate, acute, keeled below and usually saccate or less often with a spur to 5 mm long at the base, white, greenish to purple, 1–2(–2½) cm long. Filaments linear to lanceolate, often less than half as long as the

perianth; anthers bright yellow, 2½–4 mm long. Berry bluish black, 7–10 mm Ø. Seeds c. 3 mm Ø.

Distr. SE. Asia from the northern Deccan Peninsula to southern China and Japan; in Malesia: Malay Peninsula (Perak, Pahang) and throughout Sumatra, Java, and Bali.

Ecol. In both primary and secondary forest, rarely in the open, (700–)1000–2550 m; especially common in W. Java. Fl. Jan.–Dec. DOCTERS VAN LEEUWEN *l.c.* observed the flowers to be protogynous; self-pollination is possible but bumblebees also regularly visit the flowers.

Vern. Java: *baradja lintang*, *kamalakian*, *kibeunteur areuj*, (*ki*)*tamiang*, *lili leuweung*, *radja lintang*, *tangkal milon*, S, *ègèr ègèr*, *glinggangan*, *lenguk*, *srintil*, *tombagan*, J; N. Sumatra: *sidemsapo*, *sumbul sumbul*, Karo-Batak, *kayu (si-mar)soma-soma*, S.

Notes. Variation in the length of the spur has been used in segregating species, but BACKER recognized the continuity of this gradation in Javanese material. Some Javanese plants have spurs as long as those in typical '*D. calcaratum*'.

Branching is partly sympodial. Short terminal axes bear the umbel. Continuation of growth of the aerial shoot is by a branch arising in the axil of the second leaf below the umbel. The node separating two leaves associated with the inflorescence is sometimes so short that the leaves appear opposite.

15. DISPOROPSIS

HANCE, J. Bot. 21 (1883) 278; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 370; NAKAI, J. Jap. Bot. 12 (1936) 147; CHANG & HSU, Taiwania 19 (1974) 64. — Fig. 13.

Glabrous rhizomatous herbs. Aerial stems annual, erect, unbranched. Leaves cauline, alternate, flat, with many veins, petioled, entire, ovate to oblong, obtuse or subcuneate at the base; brown scale-like leaves on the rhizome, less often also at the base of the aerial stems. Flowers solitary in the axils of the leaves, nutant. Pedicels articulated. Perianth campanulate; segments 3–5, fused, equal, viscid, saccate at the base. Filaments expanded to form a corona attached to the perianth; anthers dorsifixed, sagittate, introrse. Ovary superior, sessile, ovoid, 3-celled; ovules axile, 4–6 per cell; style short and thick, with simple or 3-lobed stigma. Fruit a 1–5-seeded berry.

Distr. Probably 4 or 5 spp. from Thailand, Indo-China, southern China, Taiwan; in Malesia: Philippines.

Ecol. Forests, usually in the mountains.

1. *Disporopsis fusco-picta* HANCE, J. Bot. 21 (1883) 278. — *Disporum pullum* (non SALISB.) MERR. Philip. J. Sc. 1 (1906) Suppl. 182. — *Disporum luzoniense* MERR. Philip. J. Sc. 5 (1910) Bot. 338; En. Philip. 1 (1922) 206. — Fig. 13.

Stems erect, 25–45 cm. Roots fibrous or slightly

thickened but not tuberous. Leaves 6–9, ovate to oblong, obtuse or subcuneate at the base, acuminate, 6–12½ by 2½–5 cm, with usually 7 veins prominent on the lower surface and numerous finer veins; petiole (3–)5–12 mm. Flowers in the axils of the lower leaves. Pedicels 1–2½ cm. Perianth seg-

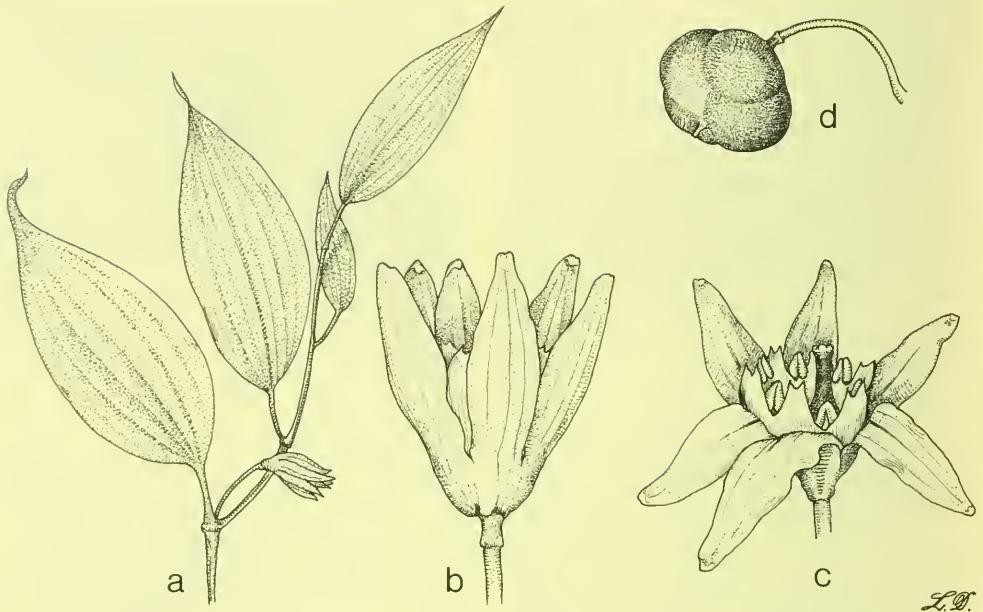


Fig. 13. *Disporopsis fusco-picta* HANCE. *a.* Habit, $\times \frac{1}{2}$, *b.* flower, *c.* ditto, laid open showing corona and stamens, both $\times 2\frac{1}{2}$, *d.* fruit, $\times 2$ (*a-c* STEINER 2147, *d* PNH 7471).

ments fused below middle, 13–15 by 2–3 mm, lanceolate, obtuse, shallowly saccate at the base, white with (always?) dull purple inside. *Corona* attached close to perianth sinus, *c.* 4 mm long, its lobes emarginate. *Anthers* sessile on the corona, *c.* 1 mm long, very shallowly sagittate. *Berry* becoming purple, blue or black, *c.* 1 cm \varnothing . Seeds *c.* 4 mm \varnothing .

Distr. Southern China, Taiwan, in *Malesia*: Philippines (N. Luzon: Lepanto, Bontoc and Benguet Prov.).

Ecol. Mossy forest, 1700–2500 m, with one record of association with (the secondary pyrogenous savanna of) *Pinus insularis*. *Fl.* rarely recorded; May–June, or later.

16. TRICALISTRA

RIDL. J. Fed. Mal. St. Mus. 4 (1909) 83; Fl. Mal. Pen. 4 (1924) 330. — *Tupistra sensu* HUTCH. Fam. Fl. Pl. ed. 3 (1973) 749, in part. — Fig. 14d.

Stemless herbs. *Rhizome* horizontal, woody; roots thick and fleshy. *Leaves* large, basal, caespitose, petioled, expanding towards the base to form a sheath, with a strong main vein and numerous finer veins. *Inflorescence* a spike. Flowers numerous, each in the axil of a bract. *Perianth* segments 6, fleshy, fused for about half their length, campanulate, equal. *Stamens* 6, attached to the perianth; anthers subsessile, dorsifixed, oblong, dehiscent introrse-laterally. *Ovary* superior, sessile, subcylindrical, 3-lobed, 1-celled, containing (2 or) 4 discord ovules but with traces of two further carpels; stigmas 3, hippocrepiform, sessile. *Fruit* a drupe, green when unripe, globose, 1-seeded.

Distr. Monotypic. *Malesia*: Malay Peninsula.

Note. Regarded as a synonym of *Tupistra* by HUTCHINSON and recognized, but with some doubt, by AIRY SHAW (Willis Dict. ed. 8, 1973). The only consistent difference is that *Tricalistra* has no style, consistently 6 stamens, and a 3-lobed stigma, a set of characters of equal standing as those separating other genera in the *Aspidistreae*.

1. *Tricalistra ochracea* RIDL. J. Fed. Mal. St. Mus. 4 (1909) 83; Fl. Mal. Pen. 4 (1924) 331. — Fig. 14d.

Scale-like leaves several, sessile, lanceolate to 5 cm long. Foliage leaves few, broadly lanceolate to oblanceolate, acuminate, cuneate at the base; dark green, chartaceous, 30–40 cm long when in flower, lengthening in fruit, 8–11 cm broad; petiole poorly differentiated, sometimes winged, 12–20 cm. Inflorescence 12–15 cm long when in flower, lengthening in fruit, with 25–35 flowers. Bracts ovate, obtuse, caducous, to 3 mm long. Perianth fleshy, c. 5 mm long, lobes as long as the tube, recurved, ovate, acute, dull ochreous yellow.

Anthers united below the mouth of the perianth tube, thecae divaricate at base, less than 1 mm long. Ovary c. 3 mm long. Fruit to c. 2 cm long.

Distr. *Malesia*: Malay Peninsula (Pahang; Cameron Highlands).

Ecol. One collection annotated 'on rocks in open places', 1000 m. Fl. Nov. (one record), fr. April.

Note. Syntypes collected by RIDLEY (13692) are in SING and K. RIDLEY referred to the leaf having 6 veins. However, leaves on both type specimens have at least 100 of which about 13 are more conspicuous than the others. The only other collection (NUR SF 32725) agrees with the type.

17. TUPISTRA

KER-GAWL. Bot. Mag. 39 (1814) t. 1655; BL. Tijd. Nat. Gesch. Phys. 1 (1834) 67; BAKER, J. Linn. Soc. Bot. 14 (1875) 580; HOOK. f. Fl. Br. Ind. 6 (1892) 324; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 372. — Fig. 14a–c.

Stemless herbs. Rhizome tuberous or horizontal, thick and woody; roots thick and fleshy. Leaves large, basal, scattered or distichous, usually distinctly petioled, expanding towards the base to form a sheath, with a strong main vein and numerous finer veins. Inflorescence a spike. Flowers numerous, each in the axil of a bract. Perianth segments 6 or 8, fleshy, fused, campanulate, equal. Anthers sessile or subsessile, inserted in tube, dorsifixed, oblong or ovoid, introrse. Ovary superior, sessile, subglobose or not externally differentiated from style, 3(–4)-celled; ovules 2 in each locule; style cylindrical; stigma large, peltate or capitate, entire or variously lobed. Fruit a globose berry, usually 1-seeded; seeds turgid; perianth persisting below the fruit.

Distr. Eastern Himalayas to southern China; in *Malesia*: Malay Peninsula and Sumatra.

The type of *T. squalida* (the type species) was described, undoubtedly in error, from Amboina.

About 25 spp. have been described, but many of these should probably be reduced to synonymy.

Ecol. Most frequently recorded from dry evergreen forest, often in deep shade and often from near streams.

Syst. It appears to me that in the *Aspidistreae* too many small genera are distinguished on insignificant characters.

Note. The Malesian species have been insufficiently collected for convincing taxonomic judgements to be made.

KEY TO THE SPECIES

1. Spike to 17 cm long; style and ovary up to 7 mm long; stigma usually $1\frac{1}{2}$ –3 mm \varnothing . 1. *T. violacea*
1. Spike at least 20 cm long; style and ovary at least $7\frac{1}{2}$ mm long; stigma at least $4\frac{1}{2}$ mm \varnothing . 2. *T. grandis*

1. *Tupistra violacea* RIDL. J. Str. Br. R. As. Soc. n. 41 (1904) 35; Mat. Fl. Mal. Pen. Monoc. 2 (1907) 93; Fl. Mal. Pen. 4 (1924) 330.

Leaves few, elliptic to oblanceolate, acute or acuminate, cuneate at the base; lamina 50–70 by $7\frac{1}{2}$ –13 cm; petiole well-defined, to 40 cm. Inflorescence ascending to 17 cm long when in flower, somewhat amplexicaul ovate, c. 5 by 3–8 mm.

Perianth segments violet; the tube 5–6 mm long, $4\frac{1}{2}$ –6 mm wide; lobes darker than tube, oblong to ovate, 4–5 $\frac{1}{2}$ by 3–4 mm. Anthers sessile, attached in tube or throat, c. 1–1 $\frac{1}{4}$ mm long. Style and ovary white, spotted violet, 3 $\frac{1}{2}$ –7 mm long; stigma $1\frac{1}{2}$ –4 mm \varnothing , obscurely lobed.

Distr. *Malesia*: Malay Peninsula (Perak; Bujong Malacca; Penang Highlands); probably also in Thailand.

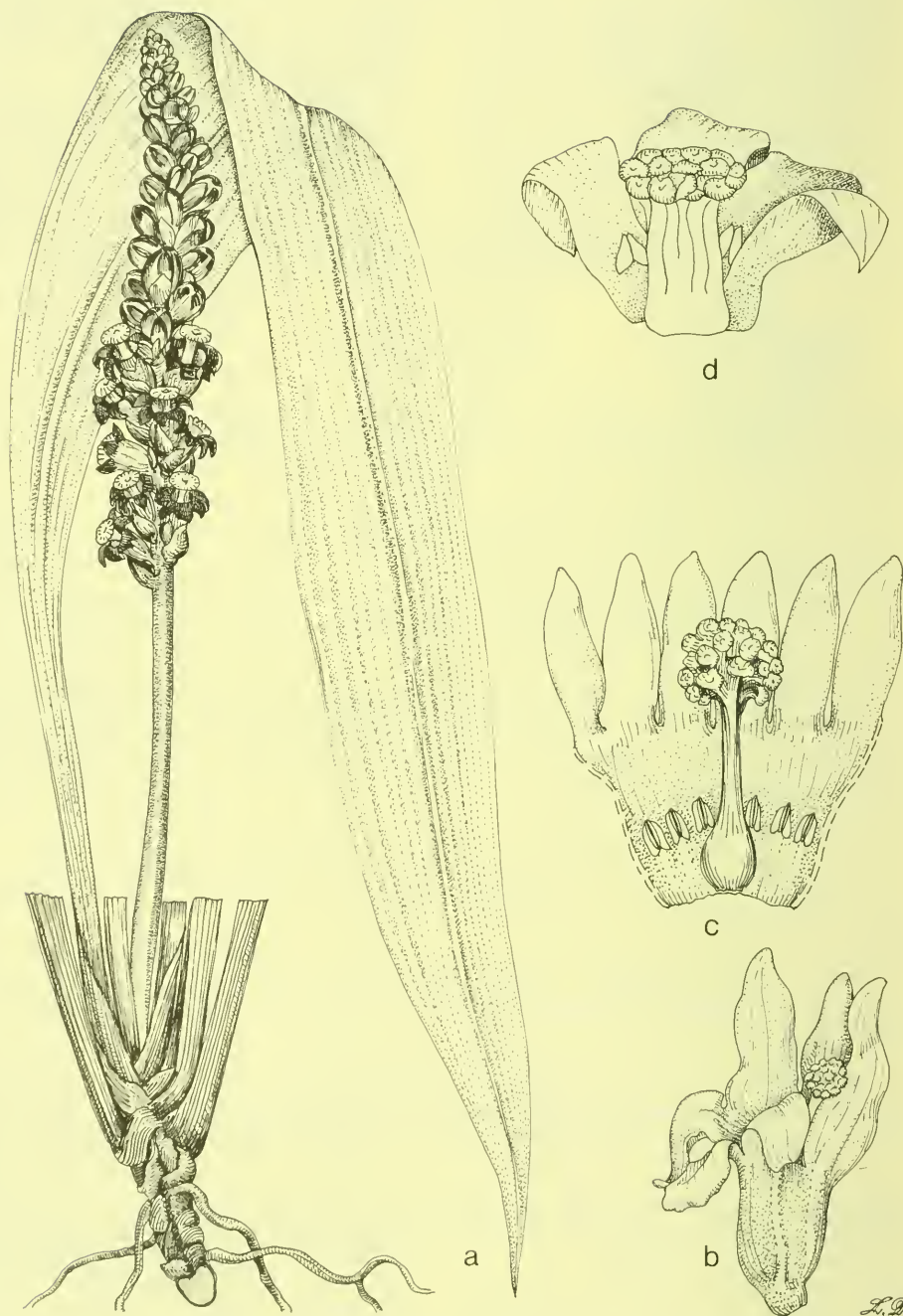


Fig. 14. *Tupistra grandis* RIDL. a. Habit, $\times \frac{1}{2}$, b. flower from outside, c. flower laid open, both $\times 2$. — *Tricalistra ochracea* RIDL. d. Flower, halved, showing gynoecium, 3 tepals, to which stamens are attached, $\times 10$ (a-c LÖRZING 8753, d RIDLEY 13692).

Ecol. Mountain forest, apparently rare and no collections made since 1901 have been seen. *Fl.* March, Dec.

Note. This species closely resembles *T. squalida*, the type species of the genus, from the Himalayas. Further study is needed to confirm that they should be kept separate. In the absence of recent collections much of the information here is taken from RIDLEY (1924). The scale-like leaves recorded for *T. gracilis* are likely to occur in *T. violacea*, but the basal part of the plant has not been preserved.

2. *Tupistra grandis* RIDL. *J. Bot.* (1900) 73; *Mat. Fl. Mal. Pen. Monoc.* 2 (1907) 93; *Fl. Mal. Pen.* 4 (1924) 330; B. M. ALLEN, *Mal. Nat. J.* 19 (1966) 303. — *T. perakensis* NICHOLS. *Ill. Dict. Gard., Cent. Suppl.* (1901) 722. — **Fig. 14a-c.**

Leaves few, surrounded by several sessile lanceolate scale-like leaves to 25(–40) cm long, elliptic or sublinear to oblanceolate, acute or acuminate, cuneate at the base; lamina (50)–70–150 by 6–14 cm; petiole often winged and poorly defined, to 40 cm. *Inflorescence* erect, 20–50 cm long when in flower, lengthening slightly in fruit, with up to 100 or more flowers, with a strong smell. Bracts somewhat amplexicaul, ovate, 5–10 by 2–6 mm. *Perianth* segments violet to dark purple; tube 5–11 mm long, 5–10 mm wide; lobes darker than tube, oblong to ovate, 4–14 by 3–5 mm. *Anthers* sessile, attached near top of tube, 1¼–2 mm long. *Style* and *ovary* white, 7½–16 mm long; stigma 4½–12½ mm \varnothing , peltate, flat to biconvex, sometimes rugulose or irregularly lobed.

Distr. *Malesia*: Malay Peninsula (Perak, Kelantan, Pahang, Selangor, Langkawi) and N. Sumatra (Tapanuli Res.: Karo Highlands); probably also in Thailand.

Ecol. In Malaya records suggest that it usually occurs in wet rocky places on limestone. In Sumatra it grows in forest at 600–1225 m, but in

Malaya there is a record of 150 m in Perak. *Fl.* Jan.–Dec.

Vern. N. Sumatra: *singkut antu*, Karo-Batak.

Note. The Sumatran specimens tend to have longer spikes and larger flowers than the Malayan material. No characters have, however, been found on which to base taxonomic separation.

Excluded

Tupistra singaporeana [WALL. *Cat. n.* 5195]; BAKER, *J. Linn. Soc. Bot.* 14 (1875) 581; HOOK. *f. Fl. Br. Ind.* 6 (1892) 325, was omitted from the genus by S. KURZ (*J. As. Soc. Beng.* 44, ii, 1875, 199) and has indeed appeared not to belong to *Liliaceae*. It was referred by RIDLEY (*Mat. Fl. Mal. Pen. Monoc.* 1, 1907, 232) to *Neuwiedia curtisii* ROLFE and by ROLFE (*Kew Bull.* 1907, 412) to *Neuwiedia singaporeana* (BAKER) ROLFE.

According to DE VOGEL (*Blumea* 17, 1969, 331) = *Neuwiedia zollingeri* RCHB. *var. singaporeana* (BAKER) DE VOGEL (*Orchidaceae*).

Tupistra squalida KER-GAWL. *Bot. Mag.* 39 (1814) t. 1655; EDWARDS, *Bot. Reg.* (1823) t. 704; LODDIGES, *Bot. Cab.* 6 (1821) t. 515; BL. *Tijd. Nat. Gesch. Phys.* 1 (1834) 67, t. IIIC; MIQ. *Fl. Ind. Bat.* 3 (1859) 569; BAKER, *J. Linn. Soc. Bot.* 14 (1875) 580; *cf.* HOOK. *f. Fl. Br. Ind.* 6 (1892) 324, *in nota sub T. nutans*. — *Rhodea tupistra* SCHULT. *Syst.* 7, 2 (1829) 173, *nom. illeg.*

The provenance of this species, the type of the genus, was given as 'Amboyna'. This is certainly erroneous. It was described from a cultivated plant in the nurseries of LODDIGES, and was obviously in the former century cultivated in several botanic gardens. The more curious it is that its proper identity and native country remains more or less uncertain.

BAKER *l.c.* reduced *T. nutans* WALL. (*Bot. Reg.* t. 1333) from India to this species, but HOOKER *f.* kept these two entities apart.

18. LIRIOPE

LOUR. *Fl. Coch.* (1790) 200; L. H. BAILEY, *Gent. Herb.* 2 (1929) 3; KRAUSE in E. & P. *Nat. Pfl. Fam.* ed. 2, 15a (1930) 376; WANG & TANG, *Act. Phytotax.* 1 (1951) 331; HUME, *Baileya* 9 (1961) 135. — *Ophiopogon* (*non* KER-GAWL.) KUNTH, *En. Pl.* 5 (1850) 297, in part. — **Fig. 16d.**

Stemless or shortly caulescent, rhizomatous herbs. Roots thick, sometimes with tuberous swellings. *Leaves* usually basal, petioled or subpetioled linear to oblanceolate or lanceolate, many-nerved. *Inflorescence* a spike or raceme. Flowers solitary or fascicled in the axil of each bract. *Perianth* segments fleshy, campanulate, free or with a broad tube and short lobes, equal, with 1 vein, violet or white. *Anthers* 6–8, subsessile or pedicels short, attached near base of perianth, dorsifixed, introrse. *Ovary* superior, sessile, ovoid to subglobose, 3–4-celled; ovules axile, 2 in



Fig. 15. *Ophiopogon caulescens* (BL.) BACK. Habit, with seed, $\times \frac{1}{4}$. In forest above mountain garden Tjibodas, Febr. 1936.

each locule; style short and thick; stigma capitate or peltate. Ovary wall rupturing early in the growth of the seeds which are therefore exposed during most of their development. *Seeds* black, globose or slightly elongate, with fleshy testa; perianth persistent.

Distr. About 5 *spp.*, in Japan, China, Indo-China and *North Malesia*: N. Philippines.

Note. Some species are widely grown as ornamentals.

1. *Liriope graminifolia* (L.) BAKER, J. Linn. Soc. Bot. 17 (1879) 499; MERR. En. Philip. 1 (1922) 207; HUME, Baileya 9 (1961) 150. — *Asparagus graminifolius* LINNÉ, Sp. Pl. ed. 2 (1762) 450. — *Dracaena graminifolia* (L.) LINNÉ, Syst. Nat. ed. 12 (1767) 275. — ? *L. spicata* LOUR. Fl. Coch. (1790) 201; L. H. BAILEY, Gent. Herb. 2 (1929) 33; MERR. Comm. Lour. (1935) 109; HUME, Baileya 9 (1961) 150, 152, 158. — ? *Ophiopogon spicatus* (LOUR.) KER-GAWL. Bot. Reg. 7 (1821) t. 593; NAVES, Nov. App. (1880) 264. — *Mondo graminifolia* (L.) KOIDZ. Tokyo Bot. Mag. 40 (1926) 333. — *L. muscari* [non (DECNE) L. H. BAILEY] HATUS. Mem. Fac. Sc. Kagoshima Un. 5, 3 (1966) 62. — Fig. 16d.

Rhizome horizontal, slender, moderately woody. Roots bearing distant tubers. *Leaves* basal, caespitose, linear to narrowly linear-oblancoolate, minutely denticulate on the margins, the central vein sometimes conspicuously larger than the others, expanded to form membranous wings towards the base, 25–90 cm long, 2–9 mm broad. Peduncle erect, (12–)30–50 cm long, shorter than leaves. Bracts deltoid, to 4 mm long. *Pedicels*

2–5-nate, 2–12 mm long, articulated at the base of the flower. Leafy shoots occasionally produced from axil of bracts on inflorescence. *Perianth* segments free, 3½–4 mm long, violet. *Filaments* to 2 mm long; anthers c. 1 mm long. *Seeds* oblong (perhaps only when young) or globose, c. 5 mm long.

Distr. Japan, China and *North Malesia*: Philippines (Batan Is.; Mindoro and Luzon).

The paucity of collections suggests that this species is rare in the Philippines.

Ecol. Open slopes at c. 1400 m (MERRILL, *l.c.*), but obviously in the Batan Is. at low altitude.

Notes. The differences between *L. graminifolia* and *L. spicata* are not clear. HUME depended for their separation largely on the conspicuous membranous basal wings to the leaves of the former, associated with quantitative characters of the leaves and inflorescence. *L. graminifolia* is likely to remain the correct name for the Philippine species whether *L. spicata* is treated as a synonym or not.

L. muscari (DECNE) L. H. BAILEY (Gent. Herb. 2, 1929, 35) differs according to HUME by caespitose habit and stiffer and wider leaves (8–26 mm).

19. OPHIOPOGON

KER-GAWL. Bot. Mag. 27 (1807) t. 1063; HOOK. *f.* Fl. Br. Ind. 6 (1892) 267; RIDL. Fl. Mal. Pen. 4 (1924) 326; RODRIGUEZ, Bull. Soc. Bot. Fr. 75 (1928) 997; Fl. Gén. I.-C. 6 (1934) 655; BACK. & BAKH. *f.* Fl. Java 3 (1968) 95, *nom. gen. cons.* — *Mondo* ADANS. Fam. 2 (1763) 496; FARWELL, Amer. Midland Nat. 7 (1921) 41; L. H. BAILEY, Gentes Herb. 2 (1929) 17; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 377; OHWI in Fedde, Rep. 36 (1934) 45. — *Flueggea* RICH. Neues J. Bot. 2 (1807) 8 (*'Fluggea'*); BAKER, J. Linn. Soc. Bot. 17 (1879) 500. — *Chloopsis* BL. En. Pl. Jav. (1827) 14; HASSK. Flora 34 (1851) 481. — Fig. 15, 16a–c.

Stemless herbs. *Rhizome* sometimes very short; roots fibrous or fleshy, sometimes tuberous. *Leaves* basal, linear or petioled with a broad lamina, expanded at the base to form a conspicuous scarious sheath. *Inflorescence* a raceme. *Pedicels* 1–several-nate, in the axils of bracts and usually associated with a few smaller bracts also apparently in the axil of the principal bract, articulated usually in the distal half. *Perianth* segments free, equal, with 1 vein, spreading or campanulate, white or violet. *Filaments* often connate, short, thick, glabrous, attached to the base of the perianth segments or to the receptacle; anthers basifixed, linear-oblong, dehiscing introrsely. *Ovary* superior to inferior, 3-celled; ovules basal, 2(–6) in each locule;

style columnar, minutely 3-lobed. Ovary wall rupturing early in the growth of the seeds which are therefore exposed during most of their development. *Seeds* blue, often globose, with fleshy testa; perianth often wholly or partly persistent.

Distr. India through to southern China to Thailand, Indo-China, Japan and Taiwan; in *Malesia*: Malay Peninsula, Sumatra, Java, Borneo, and Philippines.

About 70 *sp.* of *Ophiopogon* have been described, but I doubt whether more than a third of these should be recognized.

Ecol. In forest.

Notes. RIDLEY recognized *O. malayanus*, *O. intermedius* and *O. prolifera* from the Malay Peninsula. No fertile material has been seen from this area and the only specimens seen (CORNER SF 37872, K & L, and SOEPADMO & MAHOMUD 1214, K) do not differ significantly from *O. caulescens*.

No Malayan material identified as *O. intermedius* or *O. prolifera* has been seen.

RIDLEY characterized *O. prolifera* by having the filaments connate, and distinguished *O. intermedius* from *O. malayanus* on its larger flowers (12 mm wide). He did not give a comparable figure for *O. malayanus* but recorded that the segments were 3 mm long.

The descriptions could all be of varieties of *O. caulescens*, falling within the morphological range known for that species from Java, except that the shortest perianth recorded for Java material is 4 mm long (almost 50% greater than the length recorded for *O. malayanus*).

O. malayanus has also been recorded from the Philippines and Borneo (MERRILL, 1922).

Material from continental Asia of *O. intermedius* resembles *O. japonicus*, but no material has been seen from the Malay Peninsula.

KEY TO THE SPECIES

1. The broadest leaves on each plant more than 4 mm broad. Rhizome well-developed. Lowest bracts 12–25 mm long 1. *O. caulescens*
1. The broadest leaves on each plant less than 3 mm broad. Rhizome poorly developed. Lowest bracts 5–10 mm long 2. *O. japonicus*

1. *Ophiopogon caulescens* (BL.) BACK. Handb. Fl. Java 3 (1924) 74; VAN HELTEN, Med. Alg. Proefstation Landb. n. 16 (1924) 49 ('*gauliscens*'); RIDL. J. Bot. 43 (1925) Suppl. 122; DOCT. v. LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. II, 31 (1933) 252; BACK. & BAKH. f. Fl. Java 3 (1968) 95. — ? *O. intermedius* D. DON, Prod. Fl. Nep. (1825) 48; RIDL. J. Fed. Mal. St. Mus. 4 (1909) 81, incl. var. *macranthum* RIDL.; Fl. Mal. Pen. 4 (1924) 327. — *Chloopsis caulescens* BL. En. Pl. Jav. (1827) 14; ZOLL. Syst. Verz. 1 (1854) 67; MIQ. Fl. Ind. Bat. 3 (1859) 553. — *Chloopsis acaulis* BL. En. Pl. Jav. (1827) 14; MIQ. Fl. Ind. Bat. 3 (1859) 553. — ? *O. prolifera* LINDL. J. Hort. Soc. 1 (1846) 76; MIQ. Fl. Ind. Bat. 3 (1859) 568; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 91. — *Fluggea wallichiana* KUNTH, En. Pl. 5 (1850) 303. — *O. wallichianus* (KUNTH) HOOK. f. Fl. Br. Ind. 6 (1892) 268; RIDL. J. Fed. Mal. St. Mus. 8 (1917) 118. — *O. malayanus* RIDL. J. Str. Br. R. As. Soc. n. 41 (1904) 34; Mat. Fl. Mal. Pen. Monoc. 2 (1907) 91; MERR. En. Born. (1921) 115; En. Philip. 1 (1922) 207; Contr. Arn. Arb. 8 (1934) 19. — *Mondo malayanum* (RIDL.) FARWELL, Amer. Midland Nat. 7 (1921) 42. — *O. japonicus* (non (L. f.) KER-GAWL.) KOORD. Fl. Tjib. 1 (1922) 47. — *O. acaulis* (BL.) RIDL. J. Bot. 63 (1925) Suppl. 122. — Fig. 15, 16b.

Rhizome rather woody and well-developed, sometimes supported by several thick prop-roots; roots thick but not bearing tubers. *Leaves* numer-

ous, linear to linear-oblongate, often slightly arcuate, subacute or narrowly obtuse, often with a prominent midrib, glaucous (waxy), or with glaucous stripes, on the lower surface, (15–)25–55(–65) cm by 3–10(–22) mm. Peduncle flattened, 10–35(–46) cm long. *Flowers* 3–12, ± secund. Lower bracts 12–25 mm long. *Pedicels* solitary or, less often, 2-nate, spreading or erect-spreading, articulated often near the centre, 3–8 mm. *Perianth* segments white or violet, oblong or ovate- or elliptic-oblong, usually obtuse, the inner often slightly smaller than the outer, free segments (5–)7–7½ by 2–3 mm. *Anthers* (2–)4–5½ mm long; filaments connate at the base, c. ½–2 mm, up to 1 mm broad at the base. *Ovary* inferior or semi-inferior; style terete, linear-obconic, (4½–)5–7(–9) mm, simple or minutely trifid; ovules 2 per locule. *Seeds* up to 6, glossy blue, globose or slightly ovoid or ellipsoid, 4–8 mm long.

Distr. Continental SE. Asia and *West Malesia*: Malay Peninsula (also Langkawi), Sumatra, all over Java, Sabah (Kinabalu area), S. Philippines (Sulu Is.: Jolo).

Ecol. Generally a forest species reported from 'rain forest' and 'primary forest'. Also recorded from screes, (650–)1000–2000 m. *Fl.* Jan.–Dec. DOCTERS VAN LEEUWEN *l.c.* stated that self-pollination is the rule.

Vern. Java: *suket alank*, J; Sabah: *ryran*, Murut dial.

Note. If it is shown that *O. intermedius* is synonymous with *O. caulescens*, it will become the correct name.

2. *Ophiopogon japonicus* (L. f.) KER-GAWL. Bot. Mag. 27 (1807) t. 1063; MERR. Philip. J. Sc. 1 (1906) Suppl. 35; *ibid.* 5 (1910) Bot. 338; En. Philip. 1 (1923) 207; HUME, Baileya 9 (1961) 142. — *Convallaria japonica* LINNÉ f. Suppl. (1781) 204. — *Mondo japonicum* (L. f.) FARWELL, Amer. Midland Nat. 7 (1921) 42. — *O. merrillii* MASAM. Bull. Soc. Bot. Fr. 84 (1937) 90. — Fig. 16a.

Rhizome poorly developed; roots fibrous with distinct tubers usually less than 1½ cm long and 4 mm broad (not present in all herbarium material even where roots are well represented). Leaves numerous, linear, usually more or less straight, acute or subacute, usually minutely denticulate on vein and margin, usually with a distinct midrib, glaucous (waxy) on the lower surface, 18–60 cm by 1½–3(–3½) mm. Peduncle (10–)12–35 cm. Lower

bracts 5–10 mm long. Pedicels solitary, spreading or erect-spreading, articulated near or below the middle, 2½–3 mm. Perianth segments white or violet, oblong-elliptic or ovate, obtuse, the inner slightly smaller than the outer, free segments, 3½–4 by 2–3 mm. Anthers 2–2½ mm long; filaments connate at the base, c. ¼ mm long and up to ¼ mm broad at the base. Ovary inferior or semi-inferior; style terete, sublinear, c. 3 mm, simple; ovules 2 per locule. Seeds up to 6, glossy blue, globose or slightly ellipsoid, c. 4 mm long.

Distr. Japan and North Malesia: Philippines (Luzon: Benguet Prov.; Mindanao: Mt Apo).

Ecol. Chiefly in mossy forest, rather common in the Mountain Province, 850–2400(–2900) m. Fl. May–July, fr. Dec.–Jan.

Vern. Philippines: *langigit*, Ig., *takaáu*, Bon., *uli-uli*, Bag.

Note. A commonly cultivated garden plant in Java and other places in Malesia, especially for lining borders, but never flowering in the lowland.

20. PELIOSANTHES

ANDR. Bot. Repos. 10 (1810) t. 605; HASSK. Tijd. Nat. Gesch. Phys. 10 (1843) 121 ('*Pilosanthes*'); BAKER, J. Linn. Soc. Bot. 17 (1879) 503; HOOK. f. Fl. Br. India 6 (1892) 265; RIDL. Fl. Mal. Pen. 4 (1924) 323; RODRIGUEZ, Fl. Gén. I.-C. 6 (1934) 668; JESSOP, Blumea 24 (1976) 141. — *Teta* ROXB. [Hort. Beng. 1814, 24, *nomen*] Fl. Ind. ed. Carey 2 (1832) 165. — *Bulbisperma* REINW. ex BL. Cat. (1823) 59, *nomen*. — *Bulbospermum* BL. En. Pl. Jav. (1827) 15. — *Lourya* BAILL. Bull. Soc. Linn. Paris 1 (1888) 743. — *Neolourya* RODRIGUEZ, Bull. Mus. Hist. Nat. Paris II, 6 (1934) 96. — Fig. 16e–g.

Erect, stemless, perennial herbs. Rhizome usually very short and horizontal; roots thick. Leaves basal, usually distinctly petioled, the blade sublinear to ovate or obovate, many-nerved. Peduncles flattened, at least at the base, erect, usually solitary. Pedicels and inflorescence surrounded at the base by scarious scale-like leaves. Inflorescence a simple raceme. Pedicels articulated. Flowers 1–6-nate in the axils of each bract. Perianth segments fleshy, campanulate or subglobose, fused below, equal, 1-veined, white, green, blue, violet or purple. Anthers sessile, attached to a short annular tube (corona) arising from the perianth, introrse. Ovary superior to inferior, 3-celled; ovules basal, 2–5 in each locule; style simple, conical to cylindrical; stigma capitate or undifferentiated. Ovary wall rupturing early in the growth of the seeds which are therefore exposed during most of their development. Seeds blue, ellipsoid to pyriform, with fleshy testa; perianth often persistent.

Distr. Monotypic, widespread in continental SE. Asia, from the southern Deccan to NE. India and southern China, in West Malesia: Malay Peninsula, Sumatra, Java, Lesser Sunda Is. (Sumbawa) and Borneo.

Ecol. Usually in forest, from the lowland to the mountains.

Note. In the past far too many species were described. For an account of the taxonomic problems on specific delimitation, see JESSOP (1976).

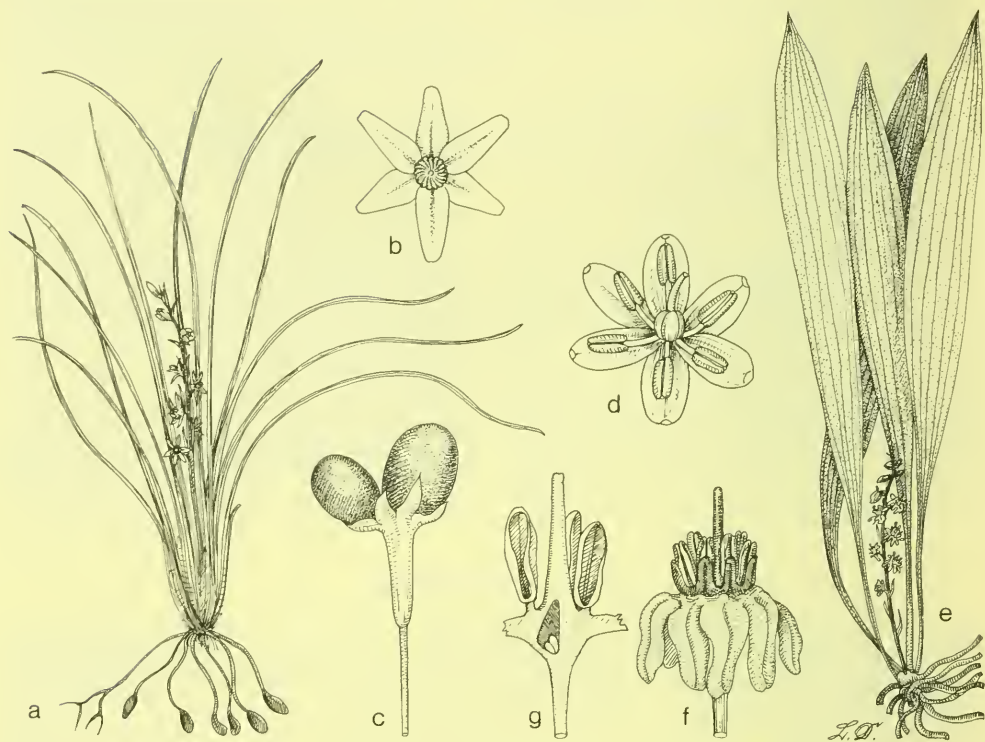


Fig. 16. *Ophiopogon japonicus* (L. f.) KER-GAWL. a. Habit, $\times \frac{1}{4}$. — *O. caulescens* (BL.) BACK. b. Flower, $\times 2$. — *Ophiopogon* sp. c. Mature seeds, $\times 2$. — *Liriope graminifolia* (L.) BAKER. d. Flower, $\times 4$. — *Peliosanthes tetra* ANDR. ssp. *humilis* (ANDR.) JESSOP. e. Habit, $\times \frac{1}{2}$, f. flower, perianth shown reflexed to reveal corona, $\times 3$, g. LS of flower to show attachment of corona and position of ovary, $\times 7$ (a, c SWINBURNE s.n. ex Hort. Adelaide, b after STEEN. Mt. Fl. Java pl. 28: 3b, d largely after E. & P. Nat. Pfl. Fam. ed. 2, 15a, fig. 153 '*O. spicata*', e-g SØRENSEN c.s. 2960).

1. *Peliosanthes tetra* ANDR. Bot. Repos. 10 (1810) t. 605; BAKER, J. LINN. Soc. Bot. 17 (1879) 505; HOOK. f. Fl. Br. Ind. 6 (1892) 265; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 88; Fl. Mal. Pen. 4 (1924) 323; RODRIGUEZ, Fl. Gén. I.-C. 6 (1934) 669; JESSOP, Blumea 24 (1976) 154.

For synonyms see under the subspecies.

Leaves (2)–4–8(–12); leaf-blades $(7\frac{1}{2})$ – $12\frac{1}{2}$ – $47\frac{1}{2}$ by $1\frac{1}{2}$ – $8\frac{1}{2}$ (– $11\frac{1}{2}$) cm; petioles (4)– $7\frac{1}{2}$ –50 cm long, slightly compressed. Peduncles to 35(–75) cm high; lower sterile bracts 0–4(–15), to 15(–40) mm long; fertile bracts to 15(–30) mm long, smaller towards the apex of the raceme. Flowers 1–6-nate. Pedicels 1–6(–10) mm long, enlarging after flowering; articulation usually close to flower. Perianth segments suborbicular to linear, $1\frac{1}{2}$ –6(–8) mm long. Corona forming a disk c. 3–4 mm \varnothing , entire or 6-toothed. Anthers usually rather closely adpressed to the style, c. $\frac{1}{2}$ –2 mm long. Ovary most frequently semi-inferior; style often 3- or

6-ridged or fluted, $\frac{3}{4}$ –1(–2) mm long. Seeds up to 10–12 mm long.

Distr. Tropical SE. Asia; in *Malesia*: Malay Peninsula, Sumatra, Java, Lesser Sunda Is. (Sumbawa), Borneo.

Ecol. Primarily in wet evergreen forest, from 0–3000 m above sea-level. A few records indicate that dry areas are also occasionally occupied, possibly in wet enclaves. The subspecies appear to grow in similar habitats.

Note. Grown as a garden ornamental or pot plant.

a. ssp. *teta*. — Cf. JESSOP, Blumea 24 (1976) 155. — *Teta viridiflora* ROXB. Fl. Ind. ed. Carey 2 (1832) 165. — *P. tetra* var. *mantegazziana* PAMP. Nuovo Giorn. Bot. Ital. n.s. 11 (1904) 151; Bull. R. Soc. Toscanaortic. III, 10 (1905) 50, f. 11. — *P. mantegazziana* (PAMP.) PAMP. Nuovo Giorn. Bot. Ital. n.s. 13 (1906) 138; MERR. & QUIS. Philip. J. Sc. 82

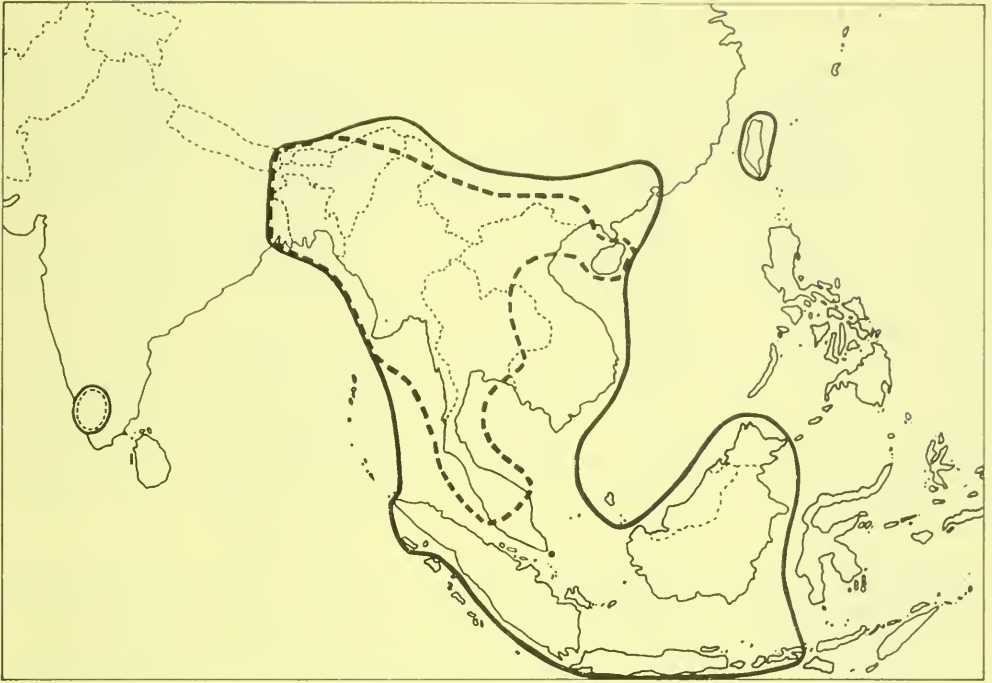


Fig. 17. Range of *Peliosanthes teta* ANDR. *ssp. teta* (broken line), and *ssp. humilis* (ANDR.) JESSOP (even line).

(1953) 323. — *P. graminea* RIDL. J. Str. Br. R. As. Soc. n. 59 (1911) 207. — *P. teta* var. *angustifolia* RIDL. *l.c.* — *P. tonkinensis* WANG & TANG, Bull. Fan Mem. Inst. Biol. Peiping, Bot. 7 (1936) 83.

Pedicels 2–6-nate. Leaf index 2–24(–34). Flowers usually green, rarely blue. Anthers *c.* 0.5–0.6 mm long.

Distr. India to southern China; in *Malesia*: Malay Peninsula (Pahang, Selangor, Penang and Langkawi Is.). Fig. 17.

b. *ssp. humilis* (ANDR.) JESSOP, *Blumea* 24 (1976) 155. — *P. humilis* ANDR. Bot. Repos. 10 (1811) t. 634; MIQ. Fl. Ind. Bat. 3 (1859) 568. — *Bulbosperma ovigera* REINW. ex BL. Cat. (1823) 59, *nomen*. — *Bulbospermum javanicum* BL. En. Pl. Jav. (1827) 15; ZOLL. Syst. Verz. 1 (1854) 68. — *P. javanica* (BL.) DIETR. Syn. Pl. 2 (1840) 1123; HASSK. Tijds. Nat. Gesch. Phys. 10 (1843) 121; Pl. Jav. Rar. (1848) 116; MIQ. Fl. Ind. Bat. 3 (1859) 568; BACK. Handb. Fl. Java 3 (1924) 75; BACK. & BAKH. f. Fl. Java 3 (1968) 95; STEEN. Mt. Fl. Java (1972) t. 28–4. — *P. violacea* WALL. ex BAKER, J. Linn. Soc. Bot. 17 (1879) 504; HEND. Mal. Wild Flow. Monoc. (1954) 184, f. 108. —

Lourya campanulata BAILL. Bull. Soc. Linn. Paris 1 (1888) 743. — *P. albida* BAKER, Bot. Mag. 116 (1890) t. 7110; HOOK. f. Fl. Br. Ind. 6 (1892) 267; RIDL. Mat. Fl. Mal. Pen. Monoc. 2 (1907) 90; MERR. En. Born. (1921) 115; FISCHER, Kew Bull. (1932) 183. — *P. viridis* RIDL. J. Str. Br. R. As. Soc. n. 31 (1898) 95. — *P. lurida* RIDL. *l.c.* 95. — *P. grandifolia* RIDL. *l.c.* 97. — *P. stellaris* RIDL. *l.c.* 97. — *P. parviflora* RIDL. *ibid.* n. 61 (1912) 61. — *P. sumatrensis* RIDL. J. Fed. Mal. St. Mus. 8 (1917) 118. — *P. sessiliflora* RIDL. *l.c.* 118. — *P. hypogyna* RIDL. *ibid.* 10 (1920) 121. — *P. monticola* RIDL. *l.c.* 155. — *P. campanulata* (BAILL.) RODRIGUEZ, Bull. Mus. Hist. Paris II, 6 (1934) 96. — Fig. 16e–g.

Pedicels solitary in the axil of each bract. Leaf index 2–10. Flowers sometimes green, but often white, blue, violet or purple. Anthers *c.* $\frac{1}{2}$ –2 mm long.

Distr. India to southern China; in *Malesia*: Malay Peninsula (throughout, incl. the Langkawi, Penang, Singapore and Tioman Is.), Sumatra (throughout, incl. Simalur and Billiton Is.), Java (throughout), Lesser Sunda Is. (Sumbawa) and Borneo (Sarawak, Southeast, Sabah, incl. the Anambas and Karimata Is.). Fig. 17.

21. ALETRIS

LINNÉ, Sp. Pl. (1753) 319; Gen. Pl. ed. 5 (1754) 149; Amoen. Acad. 3 (1756) 11 ('*Alethris*'); HOOK. f. Fl. Br. Ind. 6 (1892) 264; FRANCHET in Morot, J. de Bot. 10 (1896) 178, 195; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 378; HARA, J. Jap. Bot. 42 (1967) 312. — *Metanartheceum* MAXIM. Bull. Ac. St. Pétersb. 11 (1867) 438; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 260. — *Meta-aletris* MASAM. Trans. Nat. Hist. Soc. Formosa 28 (1938) 46. — **Fig. 18, 19.**

Erect, stemless, rhizomatous herbs. Roots fibrous. *Leaves* basal, linear or lanceolate, sessile, the veins of the decayed bases persisting as fibres at the base of the plant. *Inflorescence* a raceme or spike. Flowers solitary in the axils of the bracts, with a single bracteole. *Pedicels* not articulated. *Perianth* segments connate at the base, equal, with three (often indistinct) veins, ascending or reflexing, glabrous or pubescent, white or pink. *Filaments* subulate, shorter than and attached to perianth; anthers dorsifixed, oblong to ovoid, dehiscing introrsely. *Ovary* half-inferior, 3-celled; ovules axile, numerous; style simple or minutely 3-lobed. *Fruit* a capsule; perianth persistent. Seeds oblong.

Distr. North America (few *spp.*) and eastern Asia, from Japan to southern China (also Taiwan) and the Himalayas, in *Malesia*: only on the high mountains of the Philippines (N. Luzon), Sabah (Mt Kinabalu) and N. Sumatra (Gajolands and Westcoast Res.).

There are possibly fewer than 15 *spp.*, mostly in Asia, but HARA *l.c.* estimates the number at *c.* 30.

Ecol. Elfin forest and mossy mountain forest, but mostly in open, sometimes damp situations in sedge- or grasslands, crevices of rocks, and mountain heaths, locally often common, between (1000–)1600 and 3250 m.

KEY TO THE SPECIES

1. Perianth glabrous. Leaves mostly spreading, usually at least 4 mm broad 1. *A. foliolosa*
 1. Perianth glandular-pubescent. Leaves usually erect, less than 4 mm broad 2. *A. spicata*

1. *Aletris foliolosa* STAFF, Trans. Linn. Soc. II, 4 (1894) 240; DOCT. v. LEEUWEN, Trop. Natuur 9 (1920) 98, fig.; MERR. En. Born. (1921) 115; DOCT. v. LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. II, 31 (1933) 251, f. 66 ('*foliosa*'). — *A. rigida* STAFF, Trans. Linn. Soc. II, 4 (1894) 241; GIBBS, J. Linn. Soc. Bot. 42 (1914) 164; MERR. En. Born. (1921) 115. — ? *Liriope brachyphylla* MERR. Philip. J. Sc. 2 (1907) Bot. 266; En. Philip. 1 (1922) 206. — ? *Metanartheceum brachyphyllum* (MERR.) MASAM. Bull. Soc. Bot. Fr. 84 (1937) 18. — *A. sumatrana* MASAM. *l.c.* 18. — *Meta-aletris sumatrana* (MASAM.) MASAM. Trans. Nat. Hist. Soc. Formosa 28 (1938) 46. — *Meta-aletris rigida* (STAFF) MASAM. *l.c.* 46. — **Fig. 18a–d, 19.**

Leaves glabrous, ascending at first but usually spreading when mature and finally recurved, to 6(–10) cm by 4–7(–10) mm; veins several, close to one another. Peduncles 1 or more, 6–65 cm high, glabrous, rigid, with 1–6 narrow-lanceolate, sterile bracts to 2 cm long; fertile bracts 4–20, lanceolate, 5–10 mm long; bracteoles similar to bracts but shorter. *Pedicels* 0–5 mm long in flower, sometimes over 1 cm in fruit, usually expanding gradually to

the ovary. *Perianth* segments white, pink, yellow or brownish, glabrous, shortly connate, arising near the middle of the ovary, oblong, obtuse, 2½–3½ by *c.* ½–¾ mm. *Anthers* yellow to red, ½–1 mm long; filaments arising *c.* ½ mm from base of perianth, the base conspicuously decurrent, 1½–2 mm long. *Ovary* 3-lobed, 2–2½ mm long, ellipsoid or obovoid; style 1–1½ mm, simple or minutely 3-lobed, caducous. *Capsule* ellipsoid or ovoid, to 7 mm long.

Distr. *Malesia*: Sabah (Mt Kinabalu) and North Sumatra (Gajolands and some volcanoes of the Westcoast Res., especially Mt Singalang), possibly also in the Philippines (Mindoro: Mt Halcon).

STAFF's (1894) record from Malaya seems to be erroneous.

Ecol. Elfin and mossy forest, but mostly in the open mountain heath, both on stony ground and in boggy places, between moss-cushions, 2000–3450 m. *Fl.* (Jan.–)March–Sept.(–Dec.).

In West Sumatra DOCTERS VAN LEEUWEN *l.c.* observed that the flowers are protogynous and self-pollination is the rule, all flowers setting fruit.

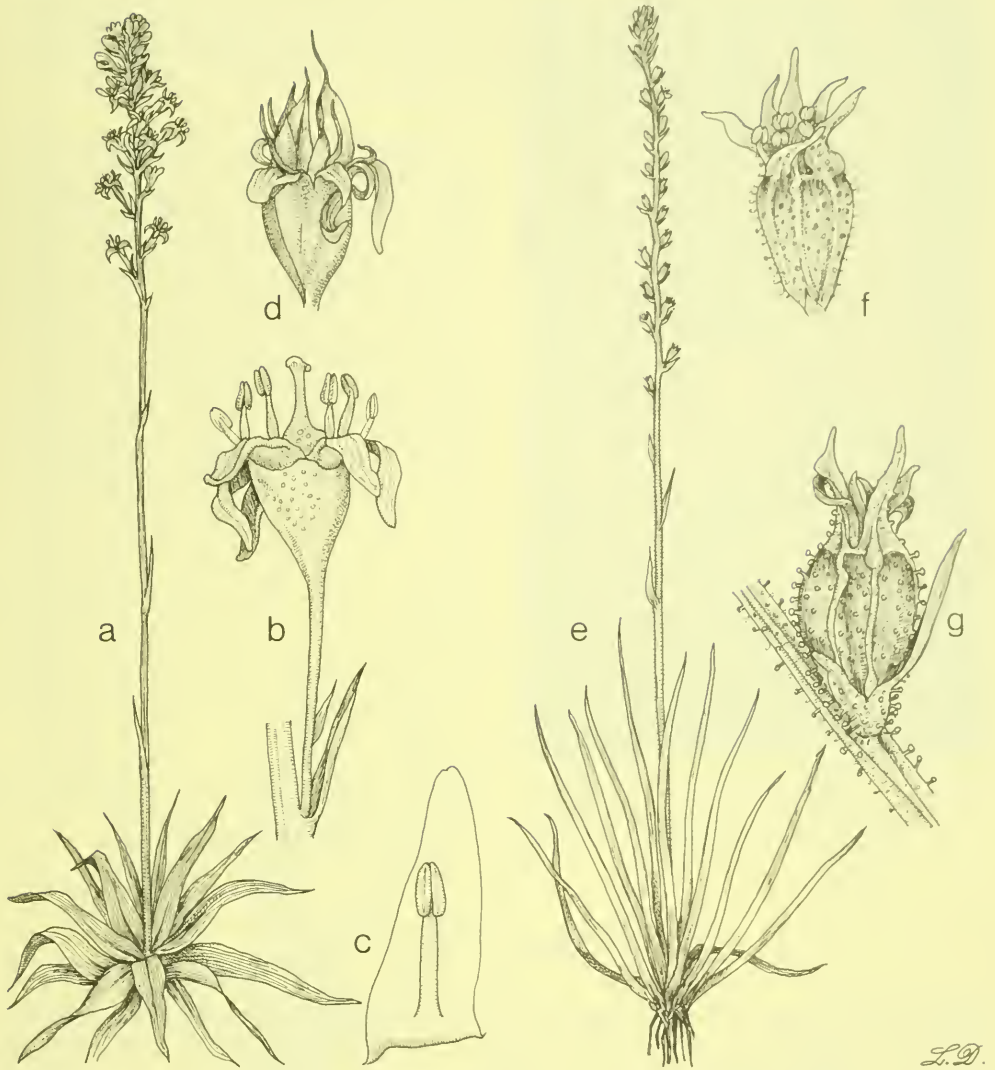


Fig. 18. *Aletris foliolosa* STAFF. a. Habit, $\times \frac{1}{2}$, b. flower, $\times 5$, c. tepal with stamen, $\times 10$, d. dehiscent fruit, $\times 4$. — *A. spicata* (THUNB.) FRANCH. e. Habit, $\times \frac{1}{4}$, f. flower, $\times 7\frac{1}{2}$, g. fruit, $\times 7\frac{1}{2}$ (a-d SCHIFFNER 1700, e CLEMENS 9178, f-g JACOBS 7426).

Notes. *A. foliolosa* and *A. rigida* were both originally described from Borneo, differing principally in size, but, as pointed out by several collectors in field notes (e.g. SINCLAIR and SLEUMER), the range of intermediates is such that the characters STAFF used to separate them break down. The smaller form tends to occur at higher altitudes (above 2700 m) and does not occur in Sumatra.

Plants from Sumatra often differ from those from Borneo in having longer pedicels, but this character is too variable to be of taxonomic significance.

Liriope brachyphylla MERR. is known only from the type collection from Mt Halcon in Mindoro (Philippines: MERRILL 5710). This collection falls within the above description of *A. foliolosa*, being



Fig. 19. *Aletris foliolosa* STAPF. In low vegetation on old lavas; Sumatra Westcoast Res., Mt Singalang, c. 2800 m altitude (W. MEIJER, 1956).

somewhat atypical in that the leaves appear softer and the flowers fewer (up to 7 per inflorescence) than usual. Further material is needed to decide on the identity of the Philippine material with certainty.

2. *Aletris spicata* (THUNB.) FRANCH. in Morot, J. de Bot. 10 (1896) 199; MERR. Philip. J. Sc. 1 (1906) Suppl. 182; *ibid.* 5 (1910) Bot. 338; En. Philip. 1 (1922) 207. — *Hypoxis spicata* THUNB. Fl. Jap. (1784) 136. — *A. japonica* LAMBERT, Trans. Linn. Soc. 10 (1811) 407, non THUNB. — Fig. 18e-g.

Leaves glabrous, usually erect, thinner than in *A. foliolosa*, usually 7–20 cm by 1–3 mm; veins 3, well-spaced. Peduncles 25–60 cm, glandular pubescent at least in the upper part, rigid, with 6–15 narrow-lanceolate sterile bracts to 5 cm long; fertile bracts 30–70, lanceolate, 3–8 mm long; bracteoles similar to the bracts but shorter; pedicels 0–1 mm, not greatly elongating in fruit, rather abruptly expanding to the base of the ovary. *Perianth* segments white, sometimes pink towards the tip, glandular pubescent, connate to one-third of their length, arising near the apex of the ovary, oblong, subacute, 2½–3 by c. 1 mm. *Anthers* orange, to c. ½ mm long, subsessile, attached near middle of perianth. *Ovary* c. 2 mm long, oblong to obovoid; style c. 1 mm, minutely 3-lobed. *Capsule* obovoid, 5 mm long.

Distr. Japan, southern China, Taiwan and N. Malesia: Philippines (N. Luzon: Abra, Benguet and Bontoc Prov.).

Ecol. Among grasses above (1000–)1600–2300 m, usually in pine forest, but often in open places. Fl. Jan.–Dec.

Vern. Philippines: *salenganga*, Ig.

22. ASTELIA

BANKS & SOLAND. *ex* R. BR. Prod. (1810) 291, *nom. gen. cons.*; BTH. Fl. Austr. 7 (1878) 11; KRAUSE in E. & P. Nat. Pfl. Fam. ed. 2, 15a (1930) 360; SKOTTSB. Kongl. Svenska Vet. Ak. Handl. III, 14, 2 (1934) 1–106; VAN BALGOOY, Pac. Pl. Areas 2 (1966) 86, map 47; MOORE & EDGAR, Fl. New Zeal. 2 (1970) 27–38. — *Funckia* WILLD. Mag. Ges. Naturf. Fr. Berlin 2 (1808) 19, *nom. rejic.* — Fig. 20.

Stemless or short-stemmed, dioecious herbs. *Rhizome* usually well-developed; roots fibrous. *Leaves* rosulate, 3-ranked, linear to lanceolate, forming a closed sheath at the base. *Inflorescence* a panicle; peduncles 3-angled. *Pedicels* solitary in the axils of bracts, not articulated. *Perianth* segments connate, 1- or 3-nerved, erect, spreading or reflexed, the outer often larger than the inner. *Filaments* filiform or somewhat flattened, attached to the perianth segments; anthers dorsifixed, ovoid, introrse. *Ovary* superior, sessile, depressed-globose to ellipsoid, 1- or 3-celled; ovules few to numerous, axile or parietal; style thick or absent. *Fruit* a berry; perianth persistent. Seeds ovoid or angled, glossy.

Distr. About 20–30 *spp.* in the Pacific (13 in New Zealand) including Australia (Victoria, New South Wales and Tasmania), Mauritius and the Falkland Is.; in *E. Malesia*: New Guinea.

Ecol. Some species are epiphytic in forests; others grow on the ground or on rocks, usually in wet areas. Several occur in bogs and may contribute to peat formation. They are to be found from sea-level in the south but only at alpine altitudes near the equator.

1. *Astelia alpina* R. BR. Prod. (1810) 291; BTH. Fl. Austr. 7 (1878) 11; F.v.M. Trans. R. Soc. Vict. 1, 2 (1889) 35; BURKILL, Kew Bull. (1899) 113; RODWAY, Tasm. Fl. (1903) 212; LAUT. Bot. Jahrb. 50 (1913) 298; KRAUSE, Bot. Jahrb. 59 (1925) 559; SKOTTSB. Kongl. Svenska Vet. Ak. Handl. III, 14, 2 (1934) 26. — *A. papuana* SKOTTSB. l.c. 29, incl. *f. minor* SKOTTSB. l.c. 30; HOOGL. Blumea Suppl. 4 (1958) 235. — Fig. 20.

Erect herb, forming dense cushions. *Leaves* linear to narrowly lanceolate, often with a silvery film on the upper surface and densely covered by silvery scales on the lower surface or glabrescent, often with red margins, 3–13(–40) cm by 3–7 (–25) mm, with 1–3 major veins and several minor;

leaf bases persistent and forming a silvery sheath round the rhizome. — ♂ *Panicle* densely covered by silvery scales, 2–8 cm long, with up to 3 simple branches subtended by bracts to 4(–12) cm long. Pedicels 3–6(–15) mm. Perianth segments green, pale yellow or brown, spreading or reflexed, 2½–4 mm long, scaly on the outer surface. Filaments ¾–1½ mm; anthers c. ½ mm long. Gynoecium sterile, green, 1½–2½ mm long. — ♀ *Panicle* similar to the male but shorter, 1–5 cm long, bracts to 3(–7) cm long. Pedicels 2–4(–10) mm. Perianth segments green, pale yellow or brown, erect, 6–7½(–9) mm long, glabrescent on the outer surface. Staminodes ¾–1¼ mm long. Gynoecium c. 6 mm long, ovoid; style not differentiated from



Fig. 20. *Astelia alpina* R. BR. a. Habit, ♂ plant, $\times \frac{1}{2}$, b. ♂ flower, $\times 5$, c. ♀ flower, $\times 2\frac{1}{2}$, d. fruit, $\times 2$ (a–b BRASS 10332, c HOOGLAND & PULLEN 5782, d BRASS 10217).

ovary. Berry green, becoming bright red when ripe, ovoid or ellipsoid, c. 8–13 mm long. Seeds numerous, c. 2 mm \varnothing .

Distr. Australia (Tasmania, Victoria, southern New South Wales) and *E. Malesia*: New Guinea (from Mt Wilhelmina in W through the highlands of Papua New Guinea to Mt Albert Edward in E).

Ecol. Alpine and subalpine grasslands forming tussocks to large solid cushions in bogs, sometimes forming almost pure communities in very wet areas (e.g. in Pindaunde Valley), 3225–4500 m. Fig. 21.

Vern. Papua New Guinea: *maunz*, Habiⁿz dial., *pangjubank*, Enga lang., *pogwe*, *tudik*, Mendi lang., *waiamaia*, Chimbu, *whyameya*, Kundiawa Subdistr.

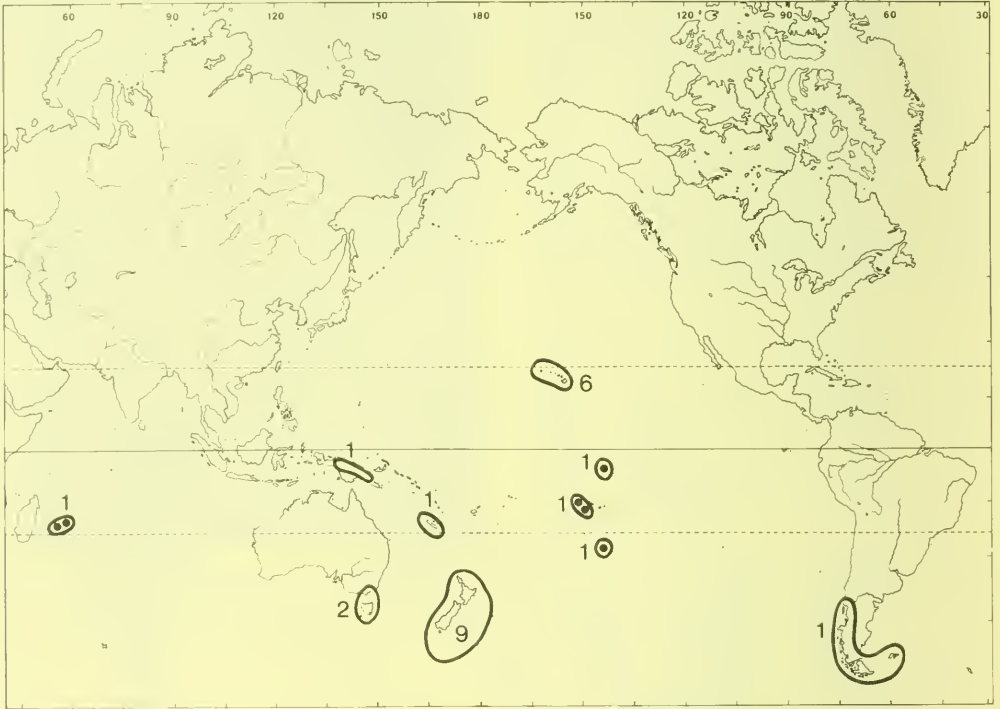


Fig. 21. Range of the genus *Astelia* (after VAN BALGOOY, in *Pac. Pl. Areas* 2, 1966, 87).

23. NOTHOSCORDUM

KUNTH, *En. Pl.* 4 (1843) 457, *nom. gen. cons.*; KRAUSE in *E. & P. Nat. Pfl. Fam.* ed. 2, 15a (1930) 322; BACK. *Handb. Fl. Java* 3 (1924) 61; TRAUB, *Plant Life* 10 (1954) 123; BACK. & BAKH. *f. Fl. Java* 3 (1968) 132.

1. *Nothoscordum inodorum* (W. AIT.) G. NICHOLS. *Ill. Dict. Gard.* 2 (1885–89) 457; A. & G. *Syn. Mitt. Eur. Fl.* 3 (1905) 167; BACK. *Handb. Fl. Java* 3 (1924) 62; BACK. & SLOOT. *Handb. Theekonkr.* (1924) 89, fig.; TRAUB, *Plant Life* 10 (1954) 127; BACK. & BAKH. *f. Fl. Java* 3 (1968) 132. — *Allium inodorum* W. AIT. *Hort. Kew.* 1 (1789) 427. — *Allium fragrans* VENT. *Jard. Cels.* (1800) t. 26. — *N. fragrans* KUNTH, *En. Pl.* 4 (1843) 461.

Erect, inodorous, glabrous herb with a subterranean coated bulb. *Leaves* radical, linear, flat, somewhat glaucous, shorter than the peduncle, 15–45 by $1\frac{1}{2}$ – $1\frac{1}{4}$ cm. *Umbels* borne on an erect, 20–70 cm long peduncle, 6–17-flowered. Flowers fragrant. *Pedicels* $1\frac{1}{2}$ –5 cm. *Tepals* basally shortly connate and green, 1– $1\frac{1}{4}$ cm, persistent, the segments oblong, 1-nerved, white, whether or not with a purple median streak. *Stamens* 6, inserted

on the base of the perianth; filaments ligulate with a subulate top; anthers medifixed. *Ovary* oblong-obovoid, sessile, 3-celled, each cell with ~ ovules; style filiform; stigma small. *Capsule* obovoid, membranous, loculicidally 3-valved, 8-9 mm long. Seeds several, black, often containing more than 1 embryo.

Distr. Native of subtropical North America, often cultivated and naturalized (e.g. in the

Mediterranean), in Java sometimes cultivated as an ornamental, escaped from the Tjibodas Botanic Garden in West Java on Mt Gedch.

Ecol. Locally naturalized, in W. Java (Priangan) sometimes occurring in great numbers in fields, tea-estates, and along roadsides; 1000-1500 m. *Fl.* Jan.-Dec. Easily propagating by bulbils and seed, difficult to eradicate.

Vern. Java: *babawangan*, S.

Excluded

Astelia novoguineensis KRAUSE, Bot. Jahrb. 59 (1925) 559 is according to SKOTTSBERG (Bot. Jahrb. 65, 1932, 260) = *Helmholtzia novoguineensis* (KRAUSE) SKOTTSB. (*Philydraceae*).

Laxmannia sessiliflora DECNE, Herb. Timor. Descr. (1835) 35, t. 16; SPAN. Linnæa 15 (1841) 477; MIQ. Fl. Ind. Bat. 3 (1859) 66; BTH. Fl. Austr. 7 (1878) 66. This was said by MIQUEL to occur both in West Australia and Timor, but the latter addition is a slip of the pen. Cf. STEEN. Bull. Jard. Bot. Btzg III, 17 (1948) 463.

Veratrum malayanum JACK, Mal. Misc. 1 (1820) 25; in Hook. Bot. Misc. 2 (1831) 74. — *Veratronia malayana* (JACK) MIQ. Fl. Ind. Bat. 3 (1859) 553 is, according to KURZ (Flora 56, 1873, 224) and MERRILL (cf. Fl. Males. I, 4, 1951, 249) = *Hanguana malayana* (JACK) MERR. (*Flagellariaceae*).

Xerotes arenaria R. BR. and *X. longifolia* R. BR. were cited by MIQUEL (Fl. Ind. Bat. 3, 1859, 248) to occur in Java, obviously both based on specimens collected by ZOLLINGER on Mt Salak, in West Java. Cf. ZOLLINGER, Syst. Verz. 1 (1854) 66. According to KURZ (Flora 56, 1873, 224) these are misidentifications for *Hypolytrum*, assumedly *H. nemorum* (VAHL) SPRENG. (*Cyperaceae*).



3 5185 00202 7009



FLORA MALESIANA

under the Auspices of
Lembaga Biologi Nasional (Botanic Gardens of
Indonesia), Bogor, Indonesia,
and the Rijksherbarium, Leyden, Holland,
executed by Foundation Flora Malesiana

Scientific Communications
concerning the Flora Malesiana should be addressed to
the General Editor, Dr. C. G. G. J. VAN STEENIS

SUBSCRIPTION REQUESTS AND RELATED CORRESPONDENCE
SHOULD BE DIRECTED EXCLUSIVELY TO
SIJTHOFF & NOORDHOFF INTERNATIONAL PUBLISHERS
P.O. Box 4, Alphen aan den Rijn, The Netherlands

For sale only - Not for exchange

Series I - Spermatophyta (Flowering Plants)

- Volume 1. Cyclopaedia of collectors & collections. 1950. pp. clii + 639. Out of print. Available in microfiche.
- Volume 2. Malesian vegetation (In preparation)
- Volume 3. Malesian plant geography (In preparation)
- Volume 4. General chapters and revisions. 1948-1954. pp. ccix + 631
- Volume 5. Bibliography, specific delimitation & revisions. 1955-1958. pp. ccxlii + 596
- Volume 6. Systematic revisions, Parts 1-6. 1960-1972. pp. 20 + 1023. Out of print. Available in microfiche.
- Volume 7. Systematic revisions. Parts 1-4. 1971-1976. pp. 18 + 876
- Volume 8. Cyclopaedia of Collectors, Suppl. 2. Systematic revisions. Parts 1-3. 1974-1978. pp. 19 + cxv + 577
- Volume 9. Systematic revisions. Part 1. 1979.

SIJTHOFF & NOORDHOFF INTERNATIONAL PUBLISHERS,
ALPHEN AAN DEN RIJN, THE NETHERLANDS

PRINTED IN THE NETHERLANDS

ISBN 90 286 0629 7