

ICACINACEAE (H. Sleumer, Leyden)

Trees, or whether or not climbing shrubs, or lianas. *Leaves* spirally arranged, rarely opposite, simple, entire or lobed (in Mal. never crenate or serrate), penni- or palmatinerved, exstipulate. *Inflorescences* mostly axillary, sometimes terminal, rarely extra-axillary, or from old wood, in spikes or spike-like racemes, or often in cymes, both spikes and cymes not rarely collected to panicles or heads, very rarely reduced to few-flowered fascicles or to a solitary flower. *Flowers* bi- or unisexual, in the latter case at least functionally so, *i.e.* the plants dioecious, actinomorphic, (4-)5(-6)-, by reduction rarely in part 3-merous, cyclic (with sepals or calyx lobes and petals) or rarely spiral (with petals only in *Pyrenacantha*, or without petals in the ♀ flowers of *Platea* and some *spp.* of *Iodes* and *Gomphandra*). Pedicels, if any, articulated with the calyx. *Sepals* 4-6, free or mostly connate below to various degree to a 4-6-lobed calyx, the lobes imbricate or valvate, generally persistent. *Petals* 4-6, free or connate below to various degree, sometimes to a tube, the lobes valvate, very rarely subimbricate, tip inflexed, mostly caducous, sometimes persistent. *Stamens* as many as sepals or petals, episepalous, inserted basally or sometimes in the upper part of the tube; filaments subulate, fleshy, often flattened, or filiform, not rarely with clavate subglandular elongate hairs distally; anthers 2-celled, cells often diverging below, basifixed, latrorse or introrse, in *Polyporandra* dismissing the pollen from numerous operculate pores. *Disk* whether or not present, either annular or cup-like, free or adnate to the ovary, or a unilateral fleshy scale. *Ovary* free, 1-celled (in *Pseudobotrys*, *Gonocaryum* and *Citronella* 2-celled with an empty tube-like unilateral cell) (in Mal.); ovules 2 (rarely 1 abortive), apical, pendent, anatropous, apotropous, unitegmic, style 1 or none; stigma punctiform, subcapitate or peltate, entire or slightly 2-5-lobed or -crenate, often depressed to one side. *Drupe* ellipsoid to globose, often laterally compressed and almond-like; exocarp generally thin-fleshy; endocarp thin-crustaceous to thick-woody, sometimes spongy or fibrous, often veined or ribbed lengthwise or reticulate-lacunose outside, smooth or with tubercles or blunt aculei inside, the seed pitted then. *Seed* 1, exarillate, generally with abundant endosperm, which rarely is ruminant; embryo straight; cotyledons whether or not foliaceous.

Distribution. About 56 genera with *c.* 300 *spp.*, all woody, predominantly in the tropics, rapidly decreasing in number towards the subtropics; 5 genera with part of their species in the temperate zones of Africa, Asia, Australia and S. America.

In Malesia a total of *c.* 100 *spp.* in 21 genera, of which 3 are strictly endemic, *viz* *Cantleya* (W. Malesia), *Hartleya* and *Pseudobotrys* (both in New Guinea); 8 other genera find their main area of distribution and generally their greatest number of species in Malesia, but occur also in parts of S. and SE. Asia, *viz* *Gonocaryum*, *Platea* (both also in New Britain), *Codiocarpus*, *Stemonurus* (also in the Solomon Is.), *Miquelia*, *Nothapodytes*, *Phytocrone*, and *Sarcostigma*; 3 genera, *viz* *Apodytes*, *Iodes* and *Pyrenacantha*, are found in Africa (also Madagascar), SE. Asia and Malesia. The genus *Citronella* is amphipacific (Malesia, E. Australia, Melanesia, New Caledonia, New Hebrides, Fiji, Samoa, Tonga, Costa Rica, Venezuela, Brazil, Paraguay, N. Argentina, Bolivia, and Central Chile); 6 genera, *viz* *Gomphandra*, *Medusanthera*, *Merrilliodendron*, *Polyporandra*, *Rhyticaryum*, and *Stemonurus*, extend from Malesia into Micronesia and Melanesia or even W. Polynesia; of these only *Gomphandra* and *Rhyticaryum* are also found in NE. Australia. *Whitmorea*, so far known, is limited to the Solomon Is., but might occur also in SE. New Guinea.

Icacinaceae of Malesia show a strong affinity with those of tropical South Asia (SW. India, Ceylon) and Southeast Asia (Sikkim to Assam, Bengal, Burma, Thailand, Indo-China, W., Central and S. China incl. Hainan and Formosa, S. Japan). Most of the members of the family in Australia point to an Asiatic-Malesian origin; *Irvingbaileya*, limited to Queensland, is taxonomically very close to *Codio-*

carpus and *Medusanthera*. *Pennantia* in New Zealand and on Norfolk I. is more distinct from the Asiatic-Malesian bloc of genera. New Caledonia has, besides *Citronella*, 2 endemic genera, viz *Anisomallon* (allied to *Apodytes*) and *Gastrolepia* (related to the group of genera around *Medusanthera*).

Ecology. Most Malesian *spp.* occur in the substage of the primary or secondary rain-forest, a few are canopy trees (*Stemonurus*, *Platea*, *Cantleya*, *Citronella p.p.*). They are mainly found in the lowlands, but may ascend to the montane and even the mossy forest (*Platea p.p.*, *Rhyticaryum p.p.*, *Gomphandra p.p.*) up to 2400 m (higher altitudes mentioned on collector's labels being rather doubtful); several genera reach their highest altitude on Mt Kinabalu or in New Guinea. The distribution is scattered in general for the tree species, even more so for the climbers, and can cover enormous areas as for instance *Platea latifolia*, a species ranging from Sikkim, Himalaya, to New Guinea. Several species (*Stemonurus*, *Gomphandra*; *Platea* even with stilt roots) are clearly limited to peat swamp forest. Some *Icacinaeae* are found also in coastal forest, and such species may possibly derive their wide range of distribution from the floating capacity of the fruit.

Large dimensions are reached only by a few species of *Platea*, *Cantleya*, *Stemonurus*, *Citronella*, *Gomphandra*, *Apodytes*, or rarely by such of *Nothapodytes* and *Medusanthera*.

Among the rain-forest species none is reported to be dominant in any vegetation type, though occasionally single species may be locally frequent.

Few species occur in the drier, mainly seasonally dry parts of Malesia, all of them being shrubs or climbers.

Dispersal. Little is known of the dispersal of fruits, part of which are eaten by wild animals (e.g. of *Gonocaryum*, *Cantleya*, *Gomphandra*, *Medusanthera*). Buoyancy of fruits is certain for *Merrilliodendron*, less so for *Gonocaryum* and *Stemonurus*, and may have contributed to their dispersal.

Galls. No galls specific for a distinct genus or species are hitherto known from Malesian *Icacinaeae* (cf. DOCTERS VAN LEEUWEN, Zoococcidia, 1926, 332, f. 597-599: *Gomphandra*, *Phytocrene*, *Platea*; Ned. Kruidk. Arch. 51, 1941, 175, f. 48: *Stemonurus*).

Anatomy. Wood. Structure, properties and identification: DEN BERGER, Determinatietabel Malesië, Veenman, Wageningen (1949) (hand lens), BALAN MENON, Res. Pamphl. For. Dept Malaya 18 (1955) 1-16 (*Cantleya*), CHATTAWAY, Trop. Woods 102 (1955) 55-74, *ibid.* 104 (1956) 100-124 (crystals), DESCH, Mal. For. Rec. 15 (1941) 233 (*Cantleya*, *Stemonurus*), FEI-TAN & CHU, Malayan Forester 32 (1969) 287-293 (fibres, *Stemonurus*), GOSH, RAO *c.s.* Indian Woods 2 (1963) New Delhi (*Apodytes*, *Gomphandra*, *Nothapodytes* as 'Mappia'), JANSSONIUS, Key to Javanese woods, Leyden (1952), and MOLL & JANSSONIUS, Mikr. 2 (1911) 234-254 (*Apodytes*, *Gomphandra*, *Platea*, *Stemonurus*), VAN DER WALT *c.s.* T. Nat. Wetensk. Suid-Afr. (1970) 173-199 (*Pyrenacantha*, anomalous growth). For general surveys also comprehensively covering the older literature see SOLEREDER, Syst. Anat. Dicot. Stuttgart (1899) 227-237 and *ibid.* (1908) 81-83, and METCALFE & CHALK, Anat. Dicot. Oxford (1950) 367-377.

The vegetative anatomy of the *Icacinaeae* is extremely diverse and no character from leaf, twig or wood anatomy is consistent or even typical for the family. Because of the enormous range in structure, anatomical characters have been extensively used in discussing the relationships and subdivisions within the family. ENGLER's wood-anatomical characterizations of the tribes *Icacineae*, *Iodeae*, *Sarcostigmataeae* and *Phytocreneae* (Sitz. Ber. Preuss. Akad. Wiss. Berlin 18, 1893, 1-23) were not based on enough material and therefore inaccurate. BAILEY & HOWARD (J. Arn. Arb. 22, 1941, 125-132, 171-187, 432-442, 556-568) distinguished three groups based on a combination of the nodal anatomy and the type of vessel perforation. Group I with trilacunar nodes and exclusively scalariform vessel perforation includes *Apodytes*, *Citronella*, *Pittosporopsis* and *Platea* (all *Icacineae*), Group II with trilacunar nodes and a mixture of simple and scalariform vessel perforations includes *Cantleya*, *Gonocaryum*, *Medusanthera*, *Gomphandra* (as '*Stemonurus*') and *Stemonurus* (as '*Urandra*') (all *Icacineae*). Group III with unilacunar nodes and simple vessel perforations includes *Iodes*, *Mappianthus*, *Merrilliodendron*, *Miquelia*, *Natsiatum*, *Nothapodytes*, *Phytocrene*, *Polyporandra*, *Pyrenacantha*, *Rhyticaryum*, and *Sarcostigma* (from all four tribes *sensu* ENGLER). Other xylem characters such as vessel distribution, vessel member length, type of fibres, parenchyma arrangement and ray structure are more or less related to these groups of increasing xylem specialization. *Codiocarpus*, *Hartleya*, *Pseudobotrys* and *Whitmorea* were not included in the studies of BAILEY & HOWARD. *Whitmorea* has a trilacunar node and mixed vessel perforations and therefore belongs to group II. This observation supports SLEUMER's view that *Whitmorea* is related to *Stemonurus* (Blumea 17, 1969, 264). All data on wood anatomy provided by BAILEY & HOWARD suggest a more or less continuous range of xylem characters within *Icacinaeae* rather than the presence of distinct boundaries.

Hairs. HEINTZELMANN & HOWARD (Amer. J. Bot. 35, 1948, 42-52) distinguish ten hair types that occur in floral parts or on leaves and young twigs of *Icacinaeae*. Noteworthy are the two-armed or Malpighiaceae hairs in *Nothapodytes* and some genera from outside Malesia. This hair type intergrades with the so-called *Icacinaeae* hair with one much reduced and one well developed arm occurring in a majority of the genera. *Rhyticaryum* has clustered hairs; *Platea* stellate-peltate hairs (called 'scales' in the taxonomic part) (see also UPHOF, HUMMEL & STAESCHE, Handb. Pflanzenanat. IV, 5, 1962).

Stomata are very imperfectly known in *Icacinaeae*. Both anomocytic and paracytic stomata have been recorded in literature, but actinocytic (*Merrilliodendron*) and anisocytic (*Medusanthera* and *Stemonurus*) types also occur.

The vascularization of the petiole and midrib would also merit further investigation. Species of *Apodytes*, *Citronella*, *Medusanthera*, *Phytocrene*, and *Stemonurus* have central strands with or without latero-dorsal bundles, but the range in the whole family must be much greater since *Pennantia* shows a very complex pattern (cf. Blumea 18, 1970, 217).

Crystals occur as druses, solitary rhomboids and crystal sand in various combinations (cf. HEINTZELMANN & HOWARD, l.c.).

The fine translucent dots of the leaves of *Merrilliodendron* are caused by large intercellular spaces in the spongy tissue of the mesophyll.

Domatia have been recorded for several Icacinaceous genera but are absent from all Malesian species. — P. BAAS.

Phytochemistry. The few chemical data available about the chemistry of this family were summarized in my 'Chemotaxonomie der Pflanzen' 4 (1966) 275-277, 494. In the meantime, oleanolic acid was isolated from the bark of *Apodytes dimidiata* E. MEYER (= *A. beddomei* MAST.). The scanty chemical information available about *Icacinaceae* at this time, prevents a chemotaxonomic discussion. — R. HEGNAUER.

Uses. In Malesia but a few tree species grow to big dimension with a clear bole (*Cantleya*, *Stemonurus*, *Platea*). Of these only *Cantleya corniculata* (BECC.) HOWARD has a marketing value and is exported from Sarawak and Brunei. *Icacinaceae* have a hard or mostly rather soft, often whitish or cream, sometimes aromatic wood, and are apparently only locally used by the natives, as can be deduced from the many vernacular names known.

The leaves of *Rhyticaryum* species are eaten as a vegetable. Medicinal use is recorded for several species but needs confirmation. The seeds of *Cantleya*, *Phytocrene*, *Stemonurus* and *Sarcostigma* are edible, but of a poor quality. The stems of lianas (*Miquella*, *Phytocrene*) hold fresh edible water.

Taxonomy. Four of the genera found in Asia and Malesia were revised by R. A. HOWARD (*Cantleya*: J. Arn. Arb. 21, 1940, 479; *Codiocarpus*: Brittonia 5, 1943, 60; *Medusanthera*: Lloydia 6, 1943, 133; *Nothapodytes*: J. Arn. Arb. 23, 1942, 66); these revisions were based on rather scarce materials as far as Malesia is concerned. A precursory paper with revisions of most of the genera concerned and based on practically all Asiatic and Malesian specimens available today was published by myself in Blumea 17 (1969) 181-264, supplementing my previous studies on the family (Notizbl. Berl.-Dahl. 15, 1940, 228-257; *ibid.*, 1942, 359-365; in E. & P. Natl. Pfl. Fam. ed. 2, 20 b, 1942, 322-396).

KEY TO THE GENERA

1. Trees or (not climbing) shrubs.
2. Sepals essentially free at least in their upper $\frac{3}{4}$ and imbricate.
3. Flowers bisexual.
 4. Petals free, valvate, or subimbricate in their upper part. 1. *Citronella*
 4. Petals connate below into a tube, their upper part free and valvate in bud. 2. *Pseudobotrys*
 3. Flowers unisexual. (Petals connate below.)
 5. Filaments free, fixed to the very base of the petals. Leaves with a layer of rounded to star-shaped appressed scales underneath at least in the young state. 3. *Platea*
 5. Filaments adnate for almost their entire length to the lower tubular part of the petals. Scales absent. 4. *Gonocaryum*
2. Sepals connate into a cup-like calyx, its upper free part (or lobes), if any, short and not imbricate.
6. Flowers unisexual (or functionally so).
 7. Drupe ovoid-ellipsoid or oblongoid, without a fleshy lateral appendage. Flowers in rather short cymes. 5. *Gomphandra*
 7. Drupe laterally compressed (almond-like).
 8. Drupe without a fleshy lateral appendage. Flowers in spikes (very rarely in panicles composed of spikes, or almost fascicled) 6. *Rhyticaryum*
 8. Drupe with a thick fleshy, laterally borne, practically entirely adnate appendage. Flowers in cymes.
 9. Disk unilateral, thick-squamular 7. *Hartleya*
 9. Disk absent.
 10. Filaments glabrous. Fleshy appendage of drupe covering two pronounced ribs of the endocarp. 8. *Codiocarpus*
 10. Filaments with apical, longish, club-shaped hairs at least in the fertile stamens. Prominent ribs under the appendage of the drupe less pronounced or absent. 9. *Medusanthera*
6. Flowers bisexual.
 11. Ovary with a lateral swelling which in the fruit develops into a thick succulent appendage. Disk absent. 10. *Apodytes*
 11. Ovary and fruit without such an adnate appendage. Disk whether or not present.
 12. Connective surpassing the anther cells as a marked glabrous apiculus. Outer part of the endocarp finally spongy-corky and deeply irregularly lacunose. Disk absent. 11. *Merrilliodendron*

12. Connective, if any, hardly or not surpassing the anther cells. Outer part of the endocarp fibrous, slightly ribbed or grooved lengthwise, or smooth outside.
13. Peduncle of inflorescence with numerous small knob-like bracts which form alveoles. Stigma peltate. Disk absent. 12. *Cantleya*
13. Peduncle quite smooth. Stigma small, subcapitate or point-like. Disk \pm cup-shaped.
14. Inflorescence usually terminal. Anthers glabrous. 13. *Nothapodytes*
14. Inflorescence axillary. Anthers with an apical tuft of penicillate hairs.
15. Flowers sessile. Petals up to 6 mm, free to almost the base. Stigma point-like at the top of the \pm attenuate (sometimes shortly style-like) part of the ovary. 14. *Stemonurus*
15. Flowers 1–2 mm pedicelled. Petals (12–)13–15 mm, free in the distal part only. Stigma small on one side of the inverted, i.e. cup-like distal part of the ovary. 15. *Whitmorea*
1. Climbing shrubs, or lianas, sometimes with tendrils. Flowers unisexual or functionally so.
16. Leaves opposite.
17. Anthers broadly club-shaped to subglobular, many-celled, with numerous pollen-bearing alveoles. 16. *Polyporandra*
17. Anthers, as usual, with 2 cells. 17. *Iodes*
16. Leaves spirally arranged.
18. Flowers in elongate spikes or spike-like racemes, these solitary or sometimes composed to panicles.
19. Leaves markedly prominently tessellate on both faces. Sepals persistent. Albumen absent; cotyledons thick-fleshy. 18. *Sarcostigma*
19. Leaves with rather lax and but slightly raised reticulation. Sepals absent. Albumen thick, ruminate; cotyledons foliaceous. 19. *Pyrenacantha*
18. Flowers in peduncled heads or umbels, these solitary or composed to racemes or panicles.
20. Style absent, i.e. stigma sessile, thick-peltate. 20. *Miquella*
20. Style (very) shortly thick-columnar, with 2–4 stigmatic lobes. 21. *Phytocrene*

1. CITRONELLA

D. DON, Edinb. New Phil. J. 13 (1832) 243; SLEUM. Blumea 17 (1969) 186. — *Villaresia* R. & P. Fl. Per. Chil. 3 (1803) 9, t. 231, non R. & P. 1793. — *Pleuropetalon* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 248, non HOOK. f. 1845. — *Chariessa* MIQ. Fl. Ind. Bat. 1 (1856) 794. — Fig. 1.

Trees or shrubs, bisexual (Mal.). *Leaves* spiral, entire and slightly revolute at the edge (Mal.), petiolate. *Inflorescences* terminal and/or (supra-)axillary, paniculate or thyrsoid, cymes of secondary branches scorpioid, whether or not forked, in Mal. greyish to rusty hirsute. *Flowers* 5-merous, sessile, subtended by a minute bract. *Calyx* imbricately lobed $\frac{1}{3}$ to $\frac{1}{2}$, persistent. *Petals* free, valvate, or subimbricate in the upper part, apex inflexed, midrib inside much prominent, sometimes wing-like. *Stamens* 5, free; filaments fleshy, subulate; anthers elliptic, or ovate, or subcordate, introrse, basifixed. *Disk* 0. *Ovary* subgibbous, 1-celled, rarely 2-celled by the presence of a pseudoloculus. *Style* 1 (rarely 2), slender, stigma small, capitate, subbilobed. *Drupe* moderately fleshy; endocarp woody, rather thin. *Seed* 1, longitudinally plicate around the vertical pseudoloculus, hipocrepiform; embryo in the copious endosperm small.

Distr. About 21 *spp.* of which c. 12 occur in tropical Central and South America, and 6 *spp.* in Australia (New South Wales, Queensland), Solomon Is., New Caledonia, Loyalty Is., New Hebrides, Fiji, Samoa and Tonga Is.; in *Malesia* 3 *spp.* Fig. 2.

Ecol. Understorey of lowland and lower montane rain-forest.

Taxon. The genus was revised by R. A. HOWARD (Contr. Gray Herb. 142, 1942, 60–89, t. 4–6). The inflorescence and floral characters used there to separate the Malesian *spp.* have been found of little value after a reinvestigation on the base of much more material than seen by HOWARD. This is the reason why in the key fruit characters have been preferred for the discrimination of species. HOWARD keeps the New World *spp.* apart from the Old World ones on the sectional level; the characters given for the discrimination of these sections are rather vague or do not hold.

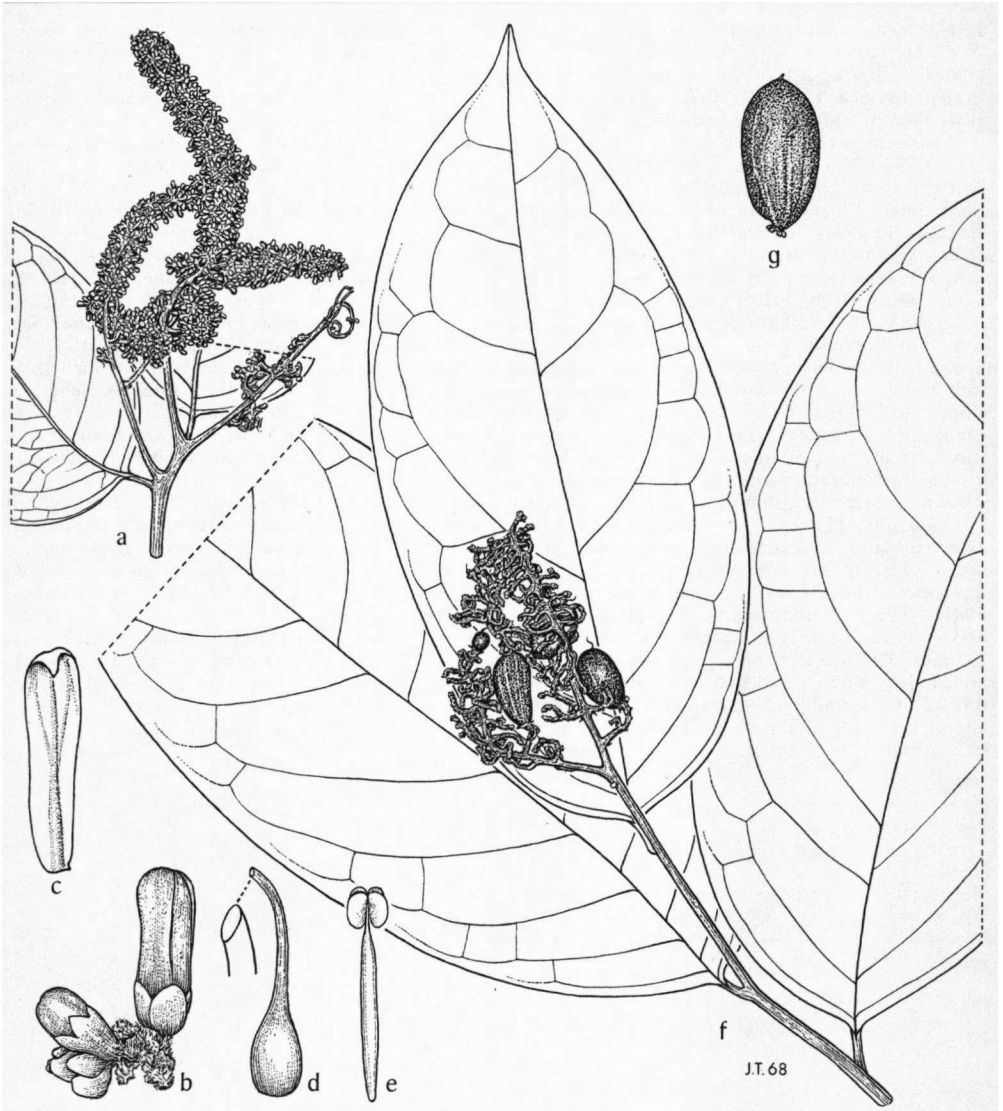


Fig. 1. *Citronella suaveolens* (BL.) HOWARD. a. Inflorescence, $\times \frac{1}{2}$, b. flower bud, $\times 5$, c. petal from the inside, $\times 7\frac{1}{2}$, d. ovary, $\times 7\frac{1}{2}$, e. stamen, $\times 7\frac{1}{2}$, f. habit and infructescence, $\times \frac{1}{2}$, g. drupe, $\times 1$ (a-e ACHMAD 1181, f-g ACHMAD 220).

KEY TO THE SPECIES

1. Drupe essentially ellipsoid-oblongoid, (1.6-)1.8-2.2(-2.4) by 0.9-1.2(-1.3) cm. 1. *C. suaveolens*
1. Drupe ovoid, or ellipsoid-ovoid, or broadly ellipsoid, 2-3 by 1.8-2 cm.
2. Leaves broadly ovate, base \pm obtuse to rounded. Solomon Is., Samoa, Tonga, New Hebrides.
C. samoensis (A. GRAY) HOWARD
2. Leaves oblong- to obovate-elliptic, base \pm cuneate.
3. Leaves \pm obtuse or shortly and rather abruptly acuminate, tip bluntish. 2. *C. latifolia*
3. Leaves rather gradually and \pm acutely acuminate at apex. 3. *C. philippinensis*

1. *Citronella suaveolens* (BL.) HOWARD, J. Arn. Arb. 21 (1940) 475; Contr. Gray Herb. 142 (1942) 82; BACK. & BAKH. f. Fl. Java 2 (1965) 59; SLEUM. Blumea 17 (1969) 187. — *Pleuropetalon suaveolens* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 248. — *Chariessa suaveolens* (BL.) MIQ. Fl. Ind. Bat. 1 (1856) 794; BECC. Malesia 1 (1877) 118; SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 229; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 2. — *Villaresia suaveolens* (BL.) VALET. Crit. Overz. Olacin. (1886) 199, t. 5, f. 32 a-g; BACK. Schoolf. Java (1911) 228. — *C. brassii* HOWARD, Contr. Gray Herb. 142 (1942) 81. — Fig. 1.

Tree, (8-)15-36 m, trunk up to $\frac{1}{2}$ m \varnothing , rarely with thin buttresses; bark grey-brown, irregularly fissured. Branchlets smooth or striate, older parts lengthwise set with elongate lenticels. *Leaves* elliptic to oblong- or ovate-elliptic, variable in shape and size, apex generally short-acuminate (tip subacute and often plicate then), or obtuse-rounded, base broadly attenuate to rounded, often subequal, coriaceous, shining above, (6-)10-24(30) by (3-)5-13(-17) cm, nerves (4-)5-6 curved-ascending and anastomosing pairs, lower 1(-2) rather close to the base of the lamina, slightly impressed above, much raised beneath, reticulation fine to rather coarse, a little prominent above, more distinctly so beneath; petiole 6-15 by 2-3 mm. *Panicles* terminal, greyish-rusty hirsutulous, mostly solitary and spike-like initially, sometimes 2 or 3 forming a \pm pyramidal inflorescence, lateral branches of the single panicles of \pm the same length (0.5-2 cm), mostly 2-(rarely more-)

forked, each branch recurved and bearing several flowers arranged in a cyme. *Flowers* bisexual, fragrant. *Calyx* c. 1.8 mm, lobes ciliate. *Petals* elliptic-oblong, white to cream, or sometimes suffused with red, (4-)5(-6) mm at full anthesis, midrib inside raised considerably, sometimes almost wing-like in the lower $\frac{1}{2}$ - $\frac{3}{4}$ part. *Filaments* thick-subulate, c. 3 mm; anthers ovate-elliptic or subcordate, 1 mm. *Ovary* ovoid, glabrous, style 1-2 mm, stigma small, a little oblique. *Drupe* ellipsoid to oblongoid (subcylindrical), sometimes a little oblique, (1.6-)1.8-2.2 (-2.4) by 0.9-1.2(-1.3) cm, smooth or irregularly lengthwise, very slightly many-ribbed in the lower part, purple when ripe, blackish when dry.

Distr. *Malesia*: NW. Sumatra (Simalur I.), W. & Central Java, N. & E. Borneo, Celebes, S. Moluccas (Kai Is.), New Guinea.

Ecol. Primary rain-forest on well drained soil, from the lowland up to 1600 m, apparently scattered.

Uses. Wood light brown, hard and heavy, not used. Known by numerous vernacular names.

Vern. Simalur: *awa iseum-iseum*, *iseum batu*, *iseum fatuh*, *i. pajo*, *i. sito bulung*, *sitenheur dëlok*, *tutun surimanu*, M; Java: *jëruk*, S; Celebes: *kekèr*, Menado (Tt), *balula lembo*, Tobela, *lenguru tanru*, *pano*, Bugin., *sokko*, Makassar; New Guinea: *garus*, Dumpu, *mara*, Fata, *pomak*, Armat, *sakohukwa*, Manikiong, *sibeer*, Hattam, *soromma rinde*, Depapre, *tambeu*, Iko (Hollandia), *ulumon*, Amele, *yewel*, Bilia.

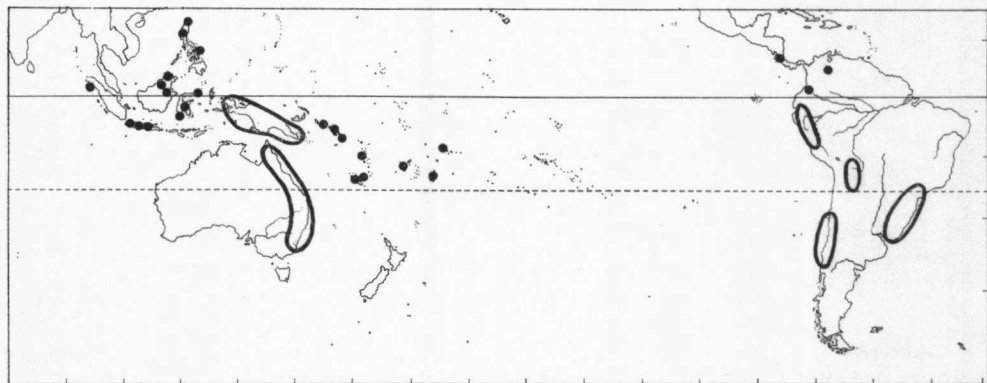


Fig. 2. Distribution of *Citronella*.

2. *Citronella latifolia* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 472; Contr. Gray Herb. 142 (1942) 80, t. 6, f. 9-12; SLEUM. Blumea 17 (1969) 188. — *Villaresia latifolia* MERR. Philip. J. Sc. 14 (1919) 415; En. Philip. 2 (1923) 488. — *Chariessa latifolia* (MERR.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 229.

Large tree. Branchlets dark brown, with sparse lenticels. *Leaves* obovate or oblong-elliptic, apex

obtuse or rounded, the bluntish tip sometimes abruptly short-acuminate and folded, base cuneate, a little decurrent, coriaceous, shining above, (12-)14-18 by (6-)8-11 cm, nerves 5-6 anastomosing pairs, reticulation rather dense, minutely raised on both faces; petiole 1-1.5(-2.5) cm by 2(-3) mm. *Infructescence* terminal, consisting of 1 or 2, sometimes 3 almost pyramidal panicles, up to 15 cm, rusty hirsute; each panicle with

numerous racemously arranged branches which generally are 2(-3)-forked and bear several flowers crowded at the curved end of the branches, the latter up to 5 cm in the lowest, and c. 1 cm (and usually not forked) in the uppermost part of the panicle. *Drupe* ovoid to broadly ellipsoid-ovoid, c. 2 by 1.8 cm in submature state, brown when dry, very slightly and irregularly many-ribbed lengthwise in the lower $\frac{2}{3}$; endocarp hard, c. 1 mm.

Distr. *Malesia*: Philippines (Samar, in the Catubig R. area), one collection in fruit.

Ecol. Damp forest near river at low altitude. Vern. *Malaampipi*, S. L. Bis.

3. *Citronella philippinensis* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 474; Contr. Gray Herb. 142 (1942) 85, t. 6, f. 1-8; DAHL, J. Arn. Arb. 33 (1952) 260, f. 20 & 20 A (pollen); SLEUM. Blumea 17 (1969) 188. — *Villaresia philippinensis* MERR. Philip. J. Sc. 14 (1919) 414; En. Philip. 2 (1923) 488. — *Chariessa philippinensis* (MERR.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 229; HATUS. Mem. Fac. Agr. Kagosh. Un. 5, 3 (1966) 38.

Tree, 4-5 m. Branchlets smooth. *Leaves* elliptic to elliptic-oblong, apex rather gradually acuminate for 1-1.5 cm and subacute, base cuneate

and a little decurrent on the petiole, \pm inequal, coriaceous, shining on both faces, 6-12 by (2-)4-6.5 cm, nerves 4-5 rather steeply curved-ascending pairs, reticulation dense, distinctly raised mainly on the undersurface; petiole 2(-3) cm by 2 mm. *Panicles* terminal, solitary or in twos, 5-8(-10) cm, lateral branches numerous and of equal length (c. 1 cm), rather crowded, each bearing at apex 5-8 crowded cymosely arranged flowers. *Calyx* 1.5 mm, lobes ciliate. *Petals* oblong, white, glabrous, 5(-6) mm, the midrib extending as a keel in the lower half of the petal. *Filaments* c. 5 mm; anthers broadly ovate-cordate, 1 mm. *Ovary* ovoid, glabrous, 5 mm, style slender, 3-4 mm, stigma capitate, minute. *Drupe* ovoid, rather oblique, blackish, 2.5-3 by 2 cm; endocarp shallowly and irregularly many-ribbed lengthwise, 1-1.5 mm \varnothing .

Distr. *Malesia*: Philippines (N. Luzon).

Ecol. On forested slopes, c. 1000 m, apparently rare.

Excluded

Villaresia scandens HASSK. Nat. Tijds. N. I. 10 (1856) 152 = *Dichapetalum timoriense* (DC.) BOERL. (*Dichapetalaceae*).

2. PSEUDOBOTRYS

MOESER in Fedde, Rep. 10 (1912) 310; SLEUM. in E. & P. Nat. Pfl. Fam. ed. 2, 20 b (1942) 360, f. 101, A & B; Blumea 17 (1969) 248. — Fig. 4.

Trees. *Leaves* spirally arranged, coriaceous, entire, penninerved. *Flowers* bisexual, born in short fascicles or panicles on the trunk. Pedicel articulated with the calyx, subtended by 2 small bracteoles. *Sepals* 5, connate at base, imbricate. *Petals* 5, linear, valvate, tips a little inflexed inside, connate into a tube in the lower $\frac{1}{3}$ - $\frac{1}{4}$, caducous. *Stamens* 5, almost equalling the petals in length; filaments filiform, dilated towards the base and fixed there to the petals; anthers linear, subsagittate, introrse, almost basifixed. *Ovary* ovoid-subglobose; style filiform; stigma small, depressed-subcapitate. *Drupe*: exocarp thin, fleshy, early dissolved; endocarp woody, verrucose outside, forming a pseudoseptum along the funiculus inside. *Seed* 1; embryo small.

Distr. *Malesia* (New Guinea), 2 spp. Fig. 3.

KEY TO THE SPECIES

1. Ovary densely brownish-pubescent. Petals 2.8-3.2 cm. Anthers 5-6 mm. 1. *P. dora*
1. Ovary glabrous. Petals c. 2.2 cm. Anthers 3-4 mm. 2. *P. cauliflora*

1. *Pseudobotrys dora* MOESER in Fedde, Rep. 10 (1912) 310; SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 235; in E. & P. Nat. Pfl. Fam. ed. 2, 20 b (1942) 360, f. 101, A & B; Blumea 17 (1969) 249.

Treelet or shrub, 1.5-6 m, glabrous; bark grey, squamular. Branchlets terete, striate, slender. *Leaves* lanceolate to oblong or elliptic-oblong, apex gradually more shortly or long acuminate, tip blunt, base broadly cuneate to rounded,

coriaceous, of a dull olivaceous-green colour and a minutely tubercled undersurface when dry, greenish yellowish in fresh specimens, entire, 16-32(-44) by 5-14(-18) cm, midrib slightly raised above, strongly so beneath, nerves (6-)8-10(-12) pairs, lower ones curved, upper ones generally more straight, faintly inarching before the edge, hardly raised or obscure above, slightly prominent beneath, veins lax, generally rather inconspicuous; petiole

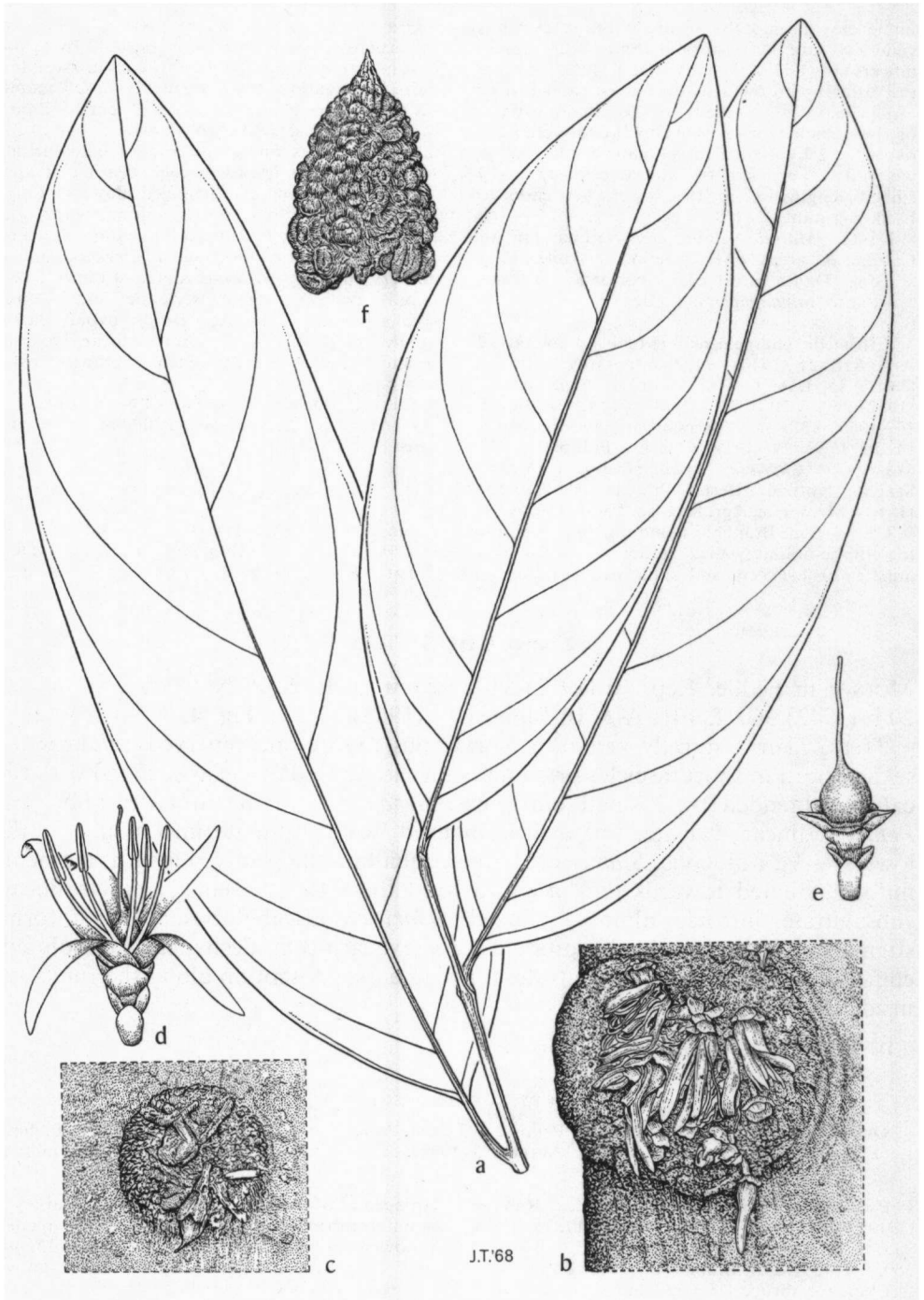


Fig. 4. *Pseudobotrys cauliflora* (PULLE) SLEUM. a. Habit, $\times \frac{1}{2}$, b. inflorescence, $\times 1$, c. young infructescence, $\times 1$, d. flower, $\times 1\frac{1}{2}$, e. ovary, $\times 1\frac{1}{2}$, f. endocarp of mature drupe, $\times 1$ (a & c DOCTERS VAN LEEUWEN 9127, b, d & e ditto 9307, f ditto 11243).

rugose, 1-1.5(-2) cm by 2-3 mm. *Flowers* in short fascicles or corymbs from swollen parts of the trunk (occasionally also from the axils of leaves?). Pedicels thickish, short. *Sepals* subovate, blunt, dull purple, *c.* 3 mm. *Petals* linear, blunt, thin, connate irregularly in the lower part, *i.e.* early splitting from top after the bud stage, spreading or recurved at full anthesis, white all over, or purplish at tube, 2.8-3.2 cm by 2-2.5 mm. *Filaments* 2-2.4 cm; anthers 5-6 mm. *Ovary* 3-4 mm, densely brownish-pubescent; style 2.5-2.7 cm. *Drupe* only known in submature state, obliquely obovoid, apiculate, laterally a little compressed, *c.* 2 by 1.7 by 1.3 cm, subtended by the reflexed sepals, brownish-hairy, finely verrucose outside; endocarp hard; pseudoseptum protruding for *c.* 1 mm. *Seed* 1.

Distr. Malasia: New Guinea (Morobe, Central and Northern Distr.). Fig. 3.

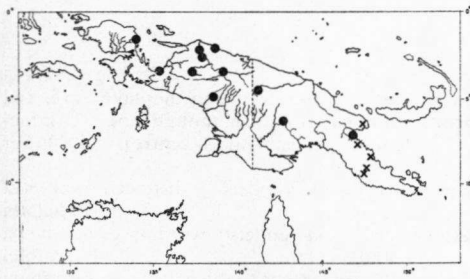


Fig. 3. Distribution of *Pseudobotrys*. *P. dorae* MOESER (crosses), *P. cauliflora* (PULLE) SLEUM. (dots).

Ecol. Primary (also swampy) forest, 30-1525 m, apparently very local. *Fl.* May-Sept., *fr.* Nov.

2. *Pseudobotrys cauliflora* (PULLE) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 235; DAHL, J. Arn. Arb. 36 (1955) 160, f. 1 & 1 A (pollen); SLEUM. Blumea 17 (1969) 249. — *Chariessa cauliflora* PULLE, Nova Guinea 8 (1912) 657; SCHELLENB. Bot. Jahrb. 58 (1923) 159; BIRNIE, Nova Guinea 14 (1926) 275. — Fig. 4.

Tree, (4-)6-18 m; bark dark grey-green; wood white, with prominent rays. *Leaves* very similar to those of *P. dorae*, though sometimes more ovate, up to 36 by 19 cm. *Flowers* massed on dome-like swellings of 1-3(-10) cm ϕ on lower trunk, numerous, set in small fascicles. Pedicels 1-3 mm, minutely bracteolate at base. *Sepals* ovate, ciliate, purple, 2(-3) mm. *Petals* linear, apex acute, in bud stage coherent in a tube which splits downwards at full anthesis to the lower third or less, white, or white inside and purplish outside, with 3 longitudinal darker lines, *c.* 2.2 cm by 2 mm. *Filaments* *c.* 1.6 cm; anthers 3-4 mm. *Ovary* glabrous, *c.* 3 mm; style slender, 16-18 mm. *Drupe* ovoid, attenuate-apiculate, 2.5-3 by 2 cm, on thickish pedicel 8-12 mm; exocarp fleshy, dark blue at full maturity, wrinkled in dry fruit; endocarp woody (2 mm), outside with knob-like emergences in numerous longitudinal rows, knobs smaller towards apex of the fruit; inside with a large woody pseudoseptum around which the seed is formed.

Distr. Malasia: New Guinea. Fig. 3.

Ecol. Rain-forest substage, river flood-plains, or hillsides, 3-175 m (once said to be collected at 1645 m), scattered in general, though sometimes locally common. *Fl. fr.* Jan.-Dec.

3. PLATEA

BL. Bijdr. (1826) 646; SLEUM. Blumea 17 (1969) 242. — *Platystigma* R. BR. in Wall. Cat. (1832) n. 7523, *nom. nud.*; ex BENTH. in Benth. & Hook. f. Gen. Pl. 3 (1880) 283, *nota*; HOOK. f. Ic. Pl. 18 (1887) t. 1707. — Fig. 6.

Trees, generally tall and with straight, angular or \pm deeply grooved bole, rarely treelets or shrubs, dioecious. *Leaves* spiral, almost distichous, entire, penninerved, at least initially covered with fascicled or star-shaped, early going hairs, and/or subpersistent star-shaped, flat, finally silvery scales with a distinct darker centre, as are branchlets and inflorescences; petioles not rarely transversely wrinkled as in *Gonocaryum*. *Flowers* axillary, the δ ones in interrupted, glomerulose, mostly to panicles arranged spikes, sessile, subglobular in bud, each subtended by a small persistent bract, the ϕ ones in few-flowered short cymes, each on a distinct pedicel and subtended by a subpersistent bract immediately below the calyx lobes. *Calyx* lobes (4-)5, slightly imbricate, small, persistent. *Petals* (4-)5, small, valvate, glabrous, inflexed at apex, shortly connate at base, absent in the ϕ flowers. — δ Flowers: *Stamens* (4-)5, inserted with short filaments at the tube of the petals; anther cells ovoid-2-celled, basifixed, laterally (almost extrorsely) dehiscent. Rudiment of an *ovary* generally absent. — ϕ Flowers: *Ovary* thick-cylindric to ob-

conical, blunt, crowned by a large sessile discoid stigma. *Drupe* elongate-ovoid, crowned by the large stigma, on short pedicel; exocarp thin-fleshy, red-orange to finally purplish blackish; endocarp woody, thin, with 1 or 2 slight longitudinal grooves, reticulately wrinkled; embryo small, in the apex of the albumen.

Distr. About 5 *spp.*, one endemic in Hainan, another extending from Sikkim into SE. Asia and Malesia; in *Malesia* 4 *spp.*, of which 2 endemic in Borneo and the other 2 from the Malay Peninsula and Sumatra to New Guinea and New Britain (not known yet from the Solomon Is.). Fig. 5.

Ecol. Mainly rain-forest, from the lowland up to c. 2200 m (on Mt Kinabalu up to 2895 m?), often on wet soil, scattered. *Fl. fr.* Jan.–Dec.

Uses. The wood is whitish cream, available in big dimensions due to the large size of the trees, but soft and suitable only for inside house constructions.

Note. The distinction of species in this genus is mainly based on the type of indument, clearly recognizable only with a lens. This can only well be examined on young leaves, where the full set of indument characters is still present, as hairs and/or scales go rather early, and old leaves may become practically glabrous. The scales give the undersurface of the leaves a metallic silvery lustre similar to that found in leaves of certain *Myristicaceae*, *Euphorbiaceae*, *Sapotaceae*, and even *Lauraceae*, with which they are sometimes confused in sterile sheets. Young leaves may show fine, round, translucent dots against strong light (ENDERT, *Med. Proefst. Boschw. Ned. Ind.* 20, 1928, 193).

KEY TO THE SPECIES

1. Indumentum on the undersurface of *young* leaves giving a woolly appearance to the naked eye, and under a lens representing two distinct strata, *i.e.* an upper layer of partly flattish, though mostly obliquely erect star-shaped or fascicled *hairs* (with a very small or generally invisible dark centre), and a lower layer of *scales*.
2. Leaves shortly cordate at base, almost peltate, lateral nerves, veins and veinlets \pm distinctly impressed above, the lamina \pm bullate, hairs persistent. 1. *P. bullata*
2. Leaves never properly cordate at base, nerves sometimes, veins and veinlets never impressed above, hairs generally early disappearing except along midrib and nerves. 2. *P. latifolia*
1. Indumentum on the undersurface of *young* leaves giving a scaly appearance to the naked eye, seemingly representing a single layer of scales, but under the lens appearing to consist of two layers of flat star-shaped scales, *i.e.* a lower layer of \pm persistent, small and densely arranged scales, and an upper layer of similar, though larger and more scattered, rather early caducous ones.
3. Leaves (elliptic or ovate-elliptic, rarely ovate) coriaceous, rigid 3. *P. sclerophylla*
3. Leaves (of various shape) coriaceous to subcoriaceous, \pm flexible. 4. *P. excelsa*

1. *Platea bullata* SLEUM. Blumea 17 (1969) 243.

Tree 13–14 m, c. 15 cm \varnothing ; bark smooth, grey-brown. Branchlets rufous-brownish tomentose and slightly many-grooved lengthwise as are petioles and rachises in dry specimens. *Leaves* lax, sub-ovate-elliptic or -oblong, apex subacutely acuminate for c. 1.5 cm, base rounded in general, the very base short-cordate and the lamina almost peltate, firmly chartaceous, olivaceous-brownish

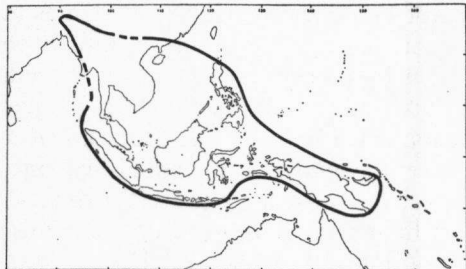


Fig. 5. Distribution of *Platea*.

and dull above, more rufescent beneath in dry specimens, \pm deeply bullate by nerves, veins and partly also veinlets above, these well prominent beneath, glabrous above except the short-tomentose midrib and maybe nerves, brownish-rufous-tomentose and soft to the touch by obliquely erect stellate or fascicled longish hairs all over the undersurface especially on midrib, nerves and veins, moreover covered all over beneath with a coherent greyish silvery layer of small star-shaped, flat, appressed scales each with a minute dark centre (similar to stellate flattish hairs), 14–32 by (6–)7–13 cm, nerves 7–10(–12) pairs moderately curved-ascending and looping, reticulation fine and dense, minutely raised above, rather obscure beneath; petiole 2–2.5 cm by 2–3 mm. σ *Inflorescences* (only known in juvenile state) axillary, paniculate, with few dense-flowered, much spaced, subspicate racemes or short-branched panicles, 1.5–3 cm; rachis 6–12 cm by 2–3 mm.

Distr. Malesia: Borneo (Sarawak), once found.

Ecol. In mixed Dipterocarp forest of steep-sided valley on basalt beside waterfall, c. 900 m.

2. *Platea latifolia* BL. Bijdr. (1826) 647; WALP. Rep. 1 (1842) 378; HASSK. Cat. Hort. Bog. (1844) 214; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 110, repr. Contr. Bot. 1 (1852) 97; MIQ. Fl. Ind. Bat. 1 (1856) 793, incl. var. *sumatrana* (BL.) MIQ.; BECC. Malesia 1 (1877) 116; VALET. Crit. Overz. Olacin. (1886) 251, 253, t. 6, f. 40 & 41; K. & V. Bijdr. 5 (1900) 156; HOCHR. Pl. Bog. Exs. (1904) 45; Bull. Inst. Bot. Btzg. 22 (1905) 50; BACK. Schooffl. Java (1911) 227; KOORD. Exk. Fl. Java 2 (1912) 531; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 1, p.p.; KOORD. Atlas 1 (1913) t. 119; RIDL. Fl. Mal. Pen. 1 (1922) 426; BURK. Dict. (1935) 1768; MERR. J. Arn. Arb. 19 (1938) 44; CHUN, Sunyatsenia 4 (1940) 229; GAGNEP. Fl. Gén. I.-C. Suppl. (1948) 754; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 4; HEYNE, Nutt. Pl. 1 (1950) 986; BACK. & BAKH. f. Fl. Java 2 (1965) 60; SLEUM. Blumea 17 (1969) 243; Fl. Thail. 2 (1970) 76. — *P. sumatrana* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 249; WALP. Ann. 2 (1851) 182; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 110, repr. Contr. Bot. 1 (1852) 97. — *Sideroxylon gamblei* C. B. CLARKE in Hook. f. Fl. Br. Ind. 3 (1882) 538. — *Platystigma myristicium* R. Br. in Wall. Cat. (1832) n. 7523, nom. nud.; ex HOOK. f. Ic. Pl. 18 (1887) t. 1707; Fl. Br. Ind. 5 (1887) 381. — *P. excelsa* (non BL.) KING, J. As. Soc. Beng. 64, ii (1895) 111. — *P. fuliginea* ELM. Leaf. Philip. Bot. 8 (1915) 2790; MERR. En. Philip. 2 (1923) 489. — *P. myristicea* (R. Br. ex HOOK. f.) HALL. f. Med. Rijksherb. 36 (1918) 5; SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 360. — *Planchonella gamblei* (CLARKE) H. J. LAM, Bull. Jard. Bot. Btzg III, 7 (1925) 199. — *P. ledermannii* SLEUM. Notizbl. Berl.-Dahl. 15 (1941) 360. — *P. hainanensis* HOWARD, Lloydia 6 (1943) 149, t. 2; DAHL, J. Agr. Arb. 33 (1952) 261; CHUN & CHANG, Fl. Hainan. 2 (1965) 449, f. 512. — *P. parviflora* (non K. & V.) DAHL, J. Arn. Arb. 33 (1952) 261 (pollen). — '*Gomphocarpus*' *gamblei* (CLARKE) VAN ROYEN, Blumea 8 (1957) 425. — *Gomphandra gamblei* (CLARKE) VAN ROYEN ex Ind. Kew. Suppl. 13 (1966) 61.

Large tree, (10-)20-45 m, bole columnar, angular and with shallow to rather deep grooves, up to 60 cm ø, buttresses, if any, short, rarely up to 1.5 m; crown high inserted, irregular. Bark grey to brown, rather smooth, with irregular shallow fissures and numerous lenticels, 12-16 cm thick, outer part in cross-section red, inner one yellowish white, with a peculiar aromatic agreeable smell (of cumarine?) and very bitter taste as they are also found in the leaves. Tip of branchlets, inflorescences, petioles and young blades covered with a rather coarse woolly rusty and detersile tomentum of flattish to obliquely erect star-shaped or fascicled hairs, and with minor scales, which go early. Leaves elliptic, or ovate-, rarely oblong-elliptic, apex generally shortly subacutely acuminate, base broadly attenuate to rounded, thin-coriaceous, at maturity glabrous and shining above, and dull yellowish-greenish-greyish to almost bluish (as in *Lauraceae* and *Myristicaceae*) beneath, still covered there with sparse flattish to

obliquely erect star-shaped or fascicled hairs especially along midrib and nerves, and besides over the whole undersurface with a skin-like layer of small, thin, ± confluent, finally greyish-silvery scales (these with a minute or scarcely recognizable darker centre), which lasts for a while, finally almost glabrous even under a lens, (7-)10-20(-25) by (3-)5-11 cm, midrib and 6-10(-12) pairs of rather straight robust nerves ± sunken above, distinctly raised beneath, reticulation of veinlets dense, fine and generally more visibly raised on both faces of fully mature leaves; petiole (1.2-) 2-4 cm. — ♂ *Inflorescences* ± pyramidal in circumference, (2-)4-6 cm, consisting of spikes with spaced glomeruli or short panicles. *Petals* light green, at least finally glabrous, c. 1.5 mm. — ♀ *Inflorescences* in 2-5(-8)-flowered cymes. Pedicel stout, 2-5 mm, slightly elongated in fruit. *Ovary* obconical, whether or not covered initially with fine stellate appressed hairs, base included by the dorsally pubescent sepals (c. 2 mm). *Drupe* narrowly ovoid-ellipsoid, glabrous, variable in size, 2.5-4.5 by 2-2.5 cm; fleshy exocarpe first lemon yellow to reddish orange, finally purplish-blackish especially when dry, of a bitter taste; stony endocarpe acuminate, with 2-3 longitudinal grooves and oblongish to subquadrangular markings between; albumen white, slimy, becoming bluish when cut.

Distr. Sikkim, East Bengal (Syhlet), Indo-China (Tonkin, Annam), China (Kwangsi, Hainan), and Thailand; in *Malesia*: Sumatra, Malay Peninsula, Banka, Java, Borneo, Philippines (Biliran, Mindanao), Celebes, and New Guinea; also in Melanesia (New Britain).

Ecol. Primary lowland and montane rain-forest, also oak forest, scattered, not rare in Java, mainly on constantly wet, even swampy places, found in Borneo in heath forest up to 560 m, in Java also on volcanic sand or loam, up to 1750 m.

Uses. Timber of large size, whitish, a little lustrous, with a smell of cumarine, soft, not durable, locally used for house building in positions under the roof. For descriptions of the wood of *P. latifolia* cf. MOLL & JANSSONIUS, Mikr. 2 (1908) 248, f. 108; the description of the wood of *P. excelsa* (l.c. 253) also refers here, as the cited KOORDERS coll. no. actually belongs to *P. latifolia*.

Galls. DOCTERS VAN LEEUWEN (Zooecidia, 1926, 332, f. 599) mentions a gall on the stem and the leaves caused by a gall-midge.

Vern. Sumatra: *katji pako*, Batak, *pandan*, M. (Indragiri); Banka: *kédang tjabè*, *medang tjabè*, *ménjiur*, *pajit*, M.; Malay Peninsula: *kadondong*, *k. hërong* (Pahang); Java: *huru*, *h. kapas*, *ki kadantja*, *mandalaksa*, S, *wuru*, J; Madura: *buru*; Borneo: *kaju bulu*, M, *pangak*, Kayan; Celebes: *mawi*, Ramp., *songku*, Tado, *talang laki*, Bugin.; Philippines: *caliso*, Bag.; New Guinea: *bengok*, Hattam, *kabugó*, *kaburó*, Kapauku, *siera*, Manikiong.

3. *Platea sclerophylla* SLEUM. Blumea 17 (1969) 245.

Tree, 9-18 m, with spreading branches. Branchlets rather slender, tips lepidote. Leaves elliptic

or ovate-elliptic, rarely ovate, apex shortly attenuate or obtuse, sometimes emarginate, base broadly cuneate to rounded, coriaceous, rigid, brown in dry specimens, glossy above sometimes, dull beneath, early glabrous above, subdensely set with a lower layer of small substellate, almost contiguous scales, and a so to say upper layer of scattered, major stellate scales, these early disappearing, whilst the smaller scales go tardily, the undersurface too finally practically glabrous, 5-9 by (2.5-)-3-6 cm, midrib and nerves slightly to more deeply impressed above, prominent beneath, nerves 6-8(-9) pairs, rather straight or more curved from the midrib, not properly looping, reticulation of veins and veinlets dense, slightly or hardly impressed above, well visibly raised beneath; petiole \pm distinctly transversely rugulose, deeply grooved above, 5-10 by 2(-3) mm. — σ *Inflorescences* from the upper axils, paniculate, with spike-like lax-flowered 1-3 cm long branches, densely scaly on axes, more laxly so on bracts and calyx lobes; rachis angular, c. 1 mm ϕ . Pedicels almost none. *Calyx* lobes ovate-acuminate, coriaceous, ciliate, 1.5 mm. *Petals* deep red, glabrous, 2.5 mm. *Anther* cells elliptic, 1.5 mm. — ρ *Inflorescences* raceme-like, few-flowered, (1-)-2-3.5 cm. Pedicels thick, 2-5 mm. *Ovary* thick-cylindric, densely minutely stellate-lepidote.

Distr. *Malesia*: Borneo (Mt Kinabalu, twice found on the eastern shoulder).

Ecol. Forest, 2440-2895 m.

4. *Platea excelsa* BL. Bijdr. (1826) 697; WALP. Rep. 1 (1842) 378; HASSK. Cat. Hort. Bog. (1844) 214; MERRS, Ann. Mag. Nat. Hist. II, 10 (1852) 110, repr. Contr. Bot. 1 (1852) 97; MIQ. Fl. Ind. Bat. 1 (1856) 793; BECC. Malesia 1 (1877) 116; VALET. Crit. Overz. Oclac. (1886) 250, 253, t. 6, f. 39; K. & V. Bijdr. 5 (1900) 153; HOCHR. Pl. Bog. Exs. (1904) 45; Bull. Inst. Bot. Btzig 22 (1905) 50; BACK. Schoolfl. Java (1911) 227; KOORD. Exk. Fl. Java 2 (1912) 530; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 1; KOORD. Atlas 1 (1913) t. 118; BAKER f. J. Bot. 62 (1924) Suppl. 21; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 3; BACK. & BAKH. f. Fl. Java 2 (1965) 60; SLEUM. Blumea 17 (1969) 245. — Fig. 6.

See for synonyms under the varieties.

KEY TO THE VARIETIES

1. Leaves oblong to elliptic-lanceolate, rarely subovate-elliptic or -oblong, generally widest in the middle, and up to 4.5 (rarely -6) cm wide.
2. Leaves \pm acutely acuminate at apex, nerves 10-14 pairs, rather straight from the midrib. Drupes 3.5-4.5 by 1-2 cm. 1. *var. excelsa*
2. Leaves obtusely acuminate or rounded at apex, nerves 6-8(-10) pairs \pm curved-ascending from the midrib. Drupes 2.5-3 by 1-1.3 cm.
3. Leaves markedly finely reticulate on both faces, generally up to 6 cm wide.

2. *var. riedeliana*

3. Leaves more faintly or hardly reticulate, 2-3.5(-4.5) cm wide. 3. *var. microphylla*
1. Leaves ovate or ovate-elliptic, or, if elliptic or oblong-elliptic, generally wider than 6 cm.
4. Leaves shortly subacutely or obtusely acuminate at apex, faintly reticulate in general, nerves 10-12(-14) pairs, these usually rather straight and/or rather closely subparallel to each other, (9-)-12-17(-26) by (4.5-)-6-9(-12) cm 4. *var. borneensis*
4. Leaves subcaudate-acuminate and subacute at apex, \pm distinctly reticulate on both faces, nerves 6-8 pairs, these curved-ascending and rather distant from each other, 8-12 by 3.5-5.5 cm 5. *var. kinabaluensis*

1. *var. excelsa*.

Tall tree, (12-)-25-37 m, trunk \pm angular, deeply channelled or fissured, 30-60 (rarely -100) cm ϕ , with buttresses up to 1.5 m. Bark dark grey to brown, smooth, with fine longitudinal fissures and small lenticles, thin, with a certain aromatic smell and bitter taste. Tips of branchlets, young leaves and inflorescences densely covered with appressed star-shaped major and minor scales (each with a \pm distinct dark, almost sooty centre), which disappear late. *Leaves* oblong- or elliptic-lanceolate, apex subacutely acuminate, base \pm broadly cuneate, subcoriaceous or thin-coriaceous, at maturity glabrous and shining above, still rather densely scaly beneath especially on nerves and petiole, and of a dull pale yellowish-green colour in fresh state, flush deep pink, 10-17 by 3.5-4.5(-5.5) cm, midrib impressed above, bold beneath, nerves 10-14 pairs, rather straight from the midrib, \pm flat above, not much raised beneath, reticulation fine, but slightly raised on both faces or beneath only; petiole 1.5-2 cm by c. 2 mm. — σ *Inflorescences* in simple spikes or by them composed (then almost pyramidal), covered with a rusty short tomentum of stellate hairs and scales, flowers glomerulose, 3-5 cm. *Petals* pale greenish yellowish or pale pink, glabrous, c. 2 mm. *Anther* cells elliptic, 1.5 mm. — ρ *Inflorescences* in 2-6-flowered cymes (these sometimes reduced to a single flower). Pedicels stoutish, 5-8 mm, elongate in fruit. *Ovary* glabrous, base included by the calyx lobes (c. 1.5 mm). *Drupe* very similar to that of *P. latifolia*, (sub)ovoid-oblongoid, manifestly narrowed upwards, 3.5-4.5 by 1-2 cm; fleshy exocarp shiny, dark red when ripe, finally blackish, taste aromatic-bitter; endocarp hard, with the same markings found in *P. latifolia*.

Distr. *Malesia*: Sumatra (Tapanuli: Nias I., Westcoast, Bencoolen), Java (Bantam to Banjumas).

Ecol. Primary forest, often on fertile volcanic soil, scattered, 240-1800(-2200, only c. 6 m tall there) m.

Uses. Timber whitish, with an aromatic smell, apparently not in use.

Vern. *Béntenu*, *talas èndriung*, Lampong, *rasak bareh*, Minangkabau, *tjutjuho*, Nias, M; *gèmpél*, *mèrji*, J, *durènan*, *dudurènan*, *mandalaksa*, S.

2. *var. riedeliana* (BECC.) SLEUM. *Blumea* 17 (1969) 245. — *P. riedeliana* BECC. *Malesia* 1 (1877) 116; VALET. *Crit. Overz. Olacin.* (1886) 253. — *P. excelsa* (non BL. s. str.) ANDERSON, *Gard. Bull. Sing.* 20 (1963) 166.

Tree, up to 24 m, up to 45 cm ϕ . *Leaves* elliptic to subovate-elliptic, apex obtuse or rounded, rarely subemarginate, 7–15(–21) by 4.5–6 (in sterile specimens or suckers rarely up to 8.5) cm, nerves 6–8(–10) pairs, curved-ascending and rather spaced from each other, reticulation fine and dense, generally markedly raised on both faces. *Drupe* c. 3 by 1.3 cm. *Flowers* as in *var. excelsa*.

Distr. Malesia: Sumatra (Eastcoast), Malay Peninsula (Johore), Banka, Billiton, Borneo (Sarawak, Brunei, W. part of North Borneo).

Ecol. Generally in lowland, often (in Borneo always) in peat swamp forest (then usually with irregular spreading stilt-roots), once found on Mt Kinabalu at 1525 m.

Vern. *Médang tjabek*, Banka, *měnpisang*, P. Ke-bal, *randjan antu*, Bengkalis, *sérangop*, P. Mendol, M.

3. *var. microphylla* (SLEUM.) SLEUM. *Blumea* 17 (1969) 246. — *P. microphylla* SLEUM. *Notizbl. Berl.-Dahl.* 15 (1941) 360. — *P. montana* HOWARD, *Lloydia* 6 (1943) 150, t. 3.

Tree up to 30 m, up to 50 cm ϕ . *Leaves* oblong to elliptic-oblong, apex obtusely short-acuminate or obtuse, base \pm broadly attenuate, thin-coriaceous, (5–)6–10 by 2–3.5(–4.5) cm, nerves 6–8 pairs, rather straight to moderately curved-ascending, subparallel to and rather distant to each other, often a little depressed above, reticulation fine, rather faintly raised, sometimes obscure even beneath. *Drupe* 2.5 by 1–1.3 cm. *Inflorescences* as in *var. excelsa*.

Distr. Malesia: New Guinea.

Ecol. Subcanopy tree in primary montane rain-forest (Conifer-*Nothofagus*-mossy oak forest), on slopes, 700–2200 m, scattered or sometimes rather frequent locally.

Vern. *Kaderei*, *sawera*, *terori*, *Ambai*, *uwar*, *Kebar*.

4. *var. borneensis* (HEINE) SLEUM. *Blumea* 17 (1969) 246. — *P. latifolia* BL. *var. borneensis* HEINE in Fedde, *Rep.* 54 (1951) 238; Pfl. d. Samml. Clemens Kinabalu (1953) 58. — *P. parviflora* K. & V. *Bull. Inst. Bot. Btzg* 2 (1899) 3; *Bijdr.* 5 (1900) 155; *Nat. Tijd. N. I.* 60 (1901) 383; *BACK. Schoolfl. Java* (1911) 228; *KOORD. Exk. Fl. Java* 2 (1912) 530; *KOORD.-SCHUM. Syst. Verz.* 1, *Fam.* 162 (1912) 3; *KOORD. Atlas* 1 (1913) t. 120. — *P. latifolia* (non BL. s. str.) MERR. *Philip. J. Sc.* 1

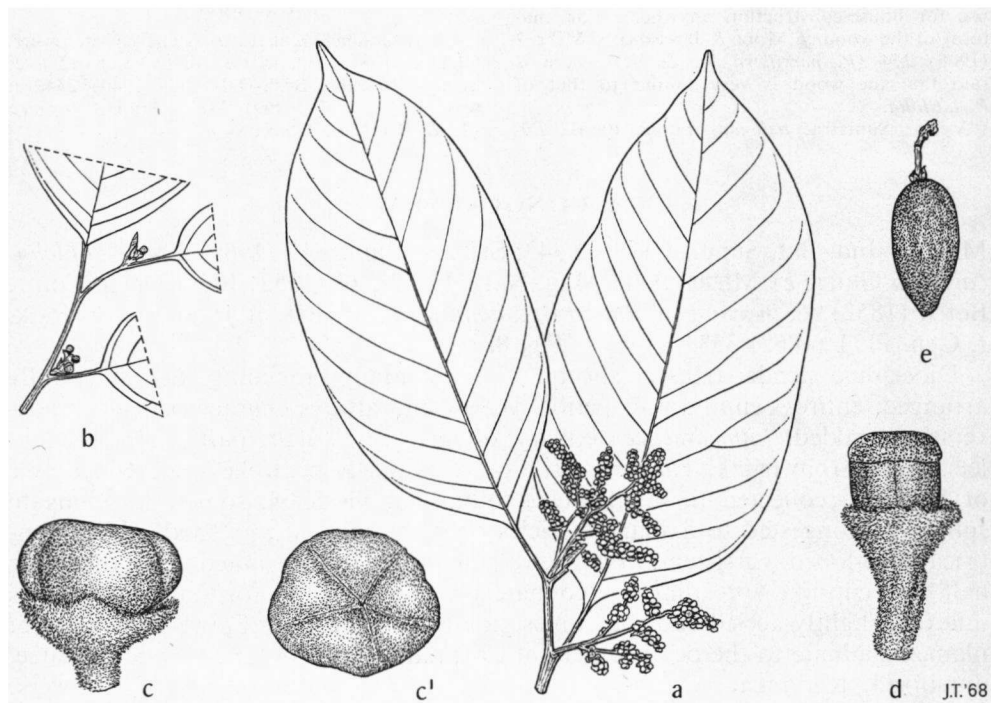


Fig. 6. *Platea excelsa* BL. *var. borneensis* (HEINE) SLEUM. a. Habit with δ inflorescences, $\times \frac{1}{2}$, b. ♀ inflorescences, $\times \frac{1}{2}$, c. & c'. δ flower buds, $\times 10$, d. ♀ flower, $\times 5$, e. drupe, $\times \frac{1}{2}$ (a, c & c' BRASS 11564, b & d BW 6477, e KOSTERMANS 18753).

(1906) Suppl. 58; HALL. *f. Med. Rijksherb.* 1 (1910) 13; SCHELLENB. *Bot. Jahrb.* 58 (1923) 159. — *P. excelsa* (non BL. s. str.) KOORD. *Junghuhn Gedenk.* (1910) 175. — *P. philippinensis* MERR. *Philip. J. Sc.* 9 (1914) Bot. 313; *En. Philip.* 2 (1923) 489; HOWARD, *J. Arn. Arb.* 21 (1940) 488, t. 2, f. 26; DAHL, *ibid.* 33 (1952) 260, f. 23 & 23 A (pollen). — *P. apoensis* ELM. *Leaf. Philip. Bot.* 8 (1915) 2789; MERR. *En. Philip.* 2 (1923) 489. — Fig. 6.

Leaves similar in shape and size to those of *P. latifolia*, elliptic or ovate-elliptic, rarely ovate, apex shortly subacutely or obtusely acuminate, thin-coriaceous, (9-)12-17(-26) by (4.5-)6-9(-12) cm, nerves 10-12(-14) pairs, generally rather straight or only slightly curved-ascending. *Flowers* as in *var. excelsa*. *Drupe* ovoid-oblongoid, much attenuate towards the apex, (2.5-)3-3.5(-4) by 1.5(-2) cm.

Distr. Malesia: Sumatra, Java, Lesser Sunda Is. (Bali, Lombok, Sumbawa, Flores), Borneo, Philippines, Celebes, Moluccas (Ambon, Batjan, Buru), New Guinea, and New Britain.

Ecol. Primary (or rarely secondary, also montane *Quercus* and mossy *Nothofagus*) forest or lowland (Dipterocarp) forest, from sea-level up to 2000(-2400?) m, scattered, often in water containing soil along rivers or on temporarily inundated flats.

Uses. Wood whitish or yellowish; hardly in use for house-construction anywhere. For anatomy of the wood cf. MOLL & JANSSONIUS, *Mikr.* 2 (1908) 254 (*P. parviflora* K. & V.) where is said that the wood is very similar to that of *P. latifolia*.

Vern. Sumatra: *balunan, hoting*, Batak, *ku-*

rungan tendi, sibaubakan, Karo-Batak, *malenbu*, Nias, *médang sékarut*, Kubu, *sitépu*, Toba, *tjémpoka gading utan*, M; Java: *ki kadantja, ki tjémpaka*, S, *njampoh budéng, rékisi*, J; *madas, udu*, Bali, *tarokeli*, Endeh; Borneo: *balubug*, Labuk, *lalak*, Sampit, *maparé*, Balikpapan, *njawan*, Bulungan; Celebes: *makalohi*, Toradja, *kapaloré*, Tado, *lari-lari*, Bela, *marasulo*, Torongkong, *talang birang*, Bugin., *wuamendu maeto*, Tobela; Philippines: *kalisán, kaliso*, Bag., *pagpágo*, Bon.; Moluccas: *boba*, Ambon, *mahu*, Buru; New Guinea: *bilou*, Mooi, *emmok*, *tegému*, Muju, *kidap*, Mendi, *maar, nokimbuwo*, Amberbaken, *mesimeski*, Arfak, *niebatek*, Kebar, *sira*, Manikiong, *subar*, Wandammen, *tindokopa*, Enga.

5. var. kinabaluensis (SLEUM.) SLEUM. *Blumea* 17 (1969) 247. — *P. kinabaluensis* SLEUM. *Notizbl. Berl.-Dahl.* 15 (1940) 234. — *P. latifolia* (non BL.) DAHL, *J. Arn. Arb.* 33 (1952) 260 (pollen).

Leaves similar in texture and nervation, especially reticulation to those of *var. riedeliana*, ovate-oblong or -elliptic, apex subcaudate-acuminate and subacute, 8-12 by 3.5-5.5 cm, nerves 6-8 pairs curved-ascending and rather distant from each other. ♂ *Flowers* only known, as in *var. excelsa*.

Distr. Malesia: Borneo (Mt Kinabalu), in montane forest at 1430-1525 m, twice found.

Excluded

Platea oblonga KORTH. *ex VALET. Crit. Overz. Olacin.* (1886) 252, in text & t. VI, f. 42 a-d; SLEUM. *Notizbl. Berl.-Dahl.* 15 (1940) 234, in text; *Blumea* 17 (1969) 248 = *Prunus javanica* (T. & B.) MIQ. (*Rosaceae*).

4. GONOCARYUM

MIQ. *Fl. Ind. Bat. Suppl.* 1 (1861) 343; SLEUM. *Blumea* 17 (1969) 209. — *Phlebotocalymna* GRIFF. *ex MIERS*, *Ann. Mag. Nat. Hist.* II, 10 (1852) 109, repr. in *Contr. Bot.* 1 (1852) 96, *in syn. gen. Platea* BL., *nom. inval.*; *ex BENTH.* in *Benth. & Hook. f. Gen. Pl.* 1 (1862) 353, *descr.* — Fig. 8.

Diocious, slender trees or shrubs, ± horizontally branching. *Leaves* spirally arranged, entire, penninerved; petiole yellow and always characteristically transversely wrinkled. *Inflorescences* axillary, often from defoliate parts of the branchlets, rarely from trunk. *Flowers* sessile or very shortly pedicelled, subtended by 1 or 2 bracts, collected to interrupted, solitary or fascicled, sometimes elongate spikes, or congested to axillary fascicles or glomerules. *Calyx* small, deeply imbricately 5-lobed, persistent. *Petals* 5, valvate in bud, either united up to the lower half and cup-like spreading, or connate more highly and forming a tube, tips inflexed, slightly keeled and sometimes papillose inside. — ♂ *Flowers: Stamens* 5; filaments adnate to the petals except at tips; anther cells oblong-elliptic, introrse, dorsifixed. Rudiment of *ovary* hairy, on a thin glabrous disk. — ♀ *Flowers: Stamens* 5, rudimentary. *Ovary* sessile; style short-conical; stigma rather large or small, pad-like or capitate, oblique, unilaterally incised or subbilobed. *Disk* thin-coriaceous, crenulate, sometimes inconspicuous. *Drupe* subglobose to ellip-

soid-oblongoid, sometimes obtusely 3 (or sub-5)-angular, with few to numerous longitudinal ribs; exocarp either thick and predominantly spongy, showing but a few fibres, or thinner and with more numerous fibres; endocarp either hard and with numerous longitudinal \pm sharp crests, and \pm alveolate besides, or thinner and but shallowly crested or ridged, whether or not with an inner lateral longitudinal swelling mainly in the lower part, which houses a small roundish abortive loculus. *Seed* 1, with a thin testa; endosperm copious, much corrugate-lobular or ruminant; embryo thin, with 2 foliaceous lanceolate cotyledons.

Distr. About 9 or 10 *spp.*, all in *Malesia*, eastwards to the Bismarcks, 2 *spp.* extending into SE. Asia (Burma to Kwangsi, Hainan and S. Formosa), a 10th unlocalized and cultivated in Hort. Bog., imperfectly known, and possibly 2 undescribed new *spp.*, one in New Britain, the other in Burma and Malaya. *Fig.* 7.

Ecol. In the understorey of lowland and montane, primary and occasionally secondary forest, rarely in swamp forest or mangrove, from sea-level up to 1220 m. *Fl. fr.* Jan.-Dec.

The drupes seem to be able to float, which may contribute to their dispersal.

Note. The *spp.* in the group with tubular flowers are very close to each other; with the materials at hand their discrimination remains rather unsatisfactory. It seems, that mature fruits allow to separate these species by such characters as form and size of the drupe and the structure of the exocarp and endocarp. Many fruits, however, are found without seeds, and thus possibly not or not always enough developed to show the above mentioned characters.

KEY TO THE SPECIES

1. Petals of the δ flowers almost free or united below up to the middle, cup-like expanded. Anthers as long as or longer than filaments. Drupe, as far as known, without a distinct abortive loculus*, reddish to orange at maturity; exocarp thick, almost exclusively spongy. 1. *G. crassifolium*
2. Petals of the δ flowers almost free, smooth inside, c. 2 mm. 2. *G. litorale*
2. Petals of the δ flowers united below to $\frac{1}{3}$ - $\frac{1}{2}$ their length, with papillose emergences all over the inside, (4-)5-6 mm 2. *G. litorale*
1. Petals of the δ flowers united below to about $\frac{3}{4}$, forming a tube, not papillose inside. Filaments distinctly longer than the anther cells. Drupe dark green to olivaceous or turning blackish at maturity, with a distinct abortive loculus (round in \emptyset); exocarp rather thin, spongy or predominantly fibrous. 3. *G. impressinervium*
3. Leaves suddenly narrowed at apex for c. 2 cm by 3-4 mm (at base), tip subacute, nerves, and generally also veins, much impressed above, sharply raised beneath. Mature drupe acuminate, tip acute, longitudinal ribs numerous and \pm sharply outstanding 3. *G. impressinervium*
3. Leaves less distinctly or shortly acuminate-attenuate at apex, tip \pm bluntish, nerves whether or not impressed above, veins but slightly or not so. Mature drupe short-apiculate or obtuse at apex, longitudinal ribs few to rather numerous and \pm obtuse, whether or not prominent. 4. *G. gracile*
4. δ spikes solitary in general. Mature drupe obtusely trigonous in \emptyset 4. *G. gracile*
5. Spikes (both δ and η) generally elongate, up to 30 cm. Leaves (6-)8-18(-20) by 3.5-6.5(-9.5) cm, greyish green in dry specimens. Petals 5-6 mm. 4. *G. gracile*
5. Spikes (both δ and η) relatively short, rarely up to 6 cm. Leaves 6-12 by 3-4(-5) cm, usually yellowish green especially beneath in dry specimens. Petals c. 4 mm. 5. *G. minus*
4. δ Spikes generally several in a fascicle, or flowers glomerately arranged. Mature drupe \pm round in \emptyset 6. *G. cognatum*
6. Drupe ovoid, or rarely ellipsoid-subovoid, green at maturity, with several obtuse prominent longitudinal ribs 6. *G. cognatum*
6. Drupe oblongoid to ellipsoid, or rarely subovoid-ellipsoid or -oblongoid, dark olivaceous to \pm blackish at maturity, longitudinal ribs few to numerous, all but little or hardly prominent. 7. *G. macrophyllum*
7. Ovary in the η , or rudiment of ovary in the δ flower glabrous. Leaves 15-20(-25) by (5-)6-10(-14) cm, lateral nerves generally slightly impressed above, reticulation rather weakly or not prominent above. Drupe (1.5-)2-2.5 (rarely -3) by 1-1.5 cm; exocarp 1-2 mm; endocarp thin. 7. *G. macrophyllum*
7. Ovary in the η , or rudiment of ovary in the δ flower densely to more sparsely hairy. Lateral nerves of leaves not impressed above. Drupe larger in general. 8. *G. calleryanum*
8. Leaves markedly finely and densely prominent-reticulate on both faces, or certainly above. Exocarp plus endocarp of well developed drupes 1-2 mm. 8. *G. calleryanum*
8. Leaves rather obscurely or not prominent-reticulate above, never so beneath. Exocarp plus endocarp of well developed drupes (2-)3-4 mm 9. *G. lobbianum*

(*) *Cf.* also 10. *G. melanocarpum*.

1. *Gonocaryum crassifolium* RIDL. J. Str. Br. R. As. Soc. n. 75 (1917) 18; Fl. Mal. Pen. 1 (1922) 432; SLEUM. Blumea 17 (1969) 210.

Shrub with flexuous branches, glabrous except the inflorescence. *Leaves* reminding of those of *G. litorale*, ovate to oblong, apex \pm abruptly acuminate for c. 2 cm, tip bluntish, base broadly cuneate to rounded, coriaceous, 15–17 by 5–9.5 cm, midrib strongly deepened above, sharply prominent beneath, nerves (5)–6–7 pairs, slightly impressed above, raised beneath, proper reticulation obscure, both faces of the lamina finely tubercled; petiole c. 1.5 cm by 2–3 mm. —

δ *Spikes* solitary or several from tubercles in defoliated axils of branchlets, lax-flowered, slender, 2.5–5 cm, all over shortly appressedly hairy, not yet known in fully developed state. *Calyx* lobes ovate, obtuse, c. 1.5 mm. *Petals* ovate-oblong, subacuminate, thickish, free to almost the base, glabrous and smooth inside, c. 2 mm. Rudiment of ovary hairy. ♀ *Inflorescences* and *drupe* not yet known.

Distr. Malesia: Malay Peninsula (Selangor: Sempang Mines), once found.

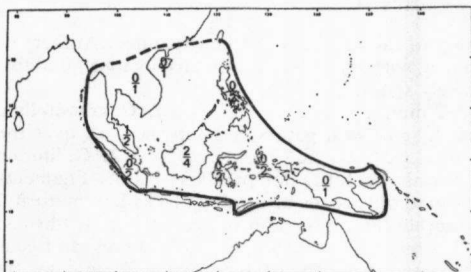


Fig. 7. Distribution of *Gonocaryum*. The figure above the hyphen indicates the number of endemic species in that island or area, the figure below the hyphen the number of non-endemic species.

2. *Gonocaryum litorale* (BL.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 233; Blumea 17 (1969) 211. — *Stemonurus* ? *litoralis* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 250; WALP. Ann. 2 (1851) 182; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 36, repr. Contr. Bot. 1 (1852) 87. — *Lasianthera* ? *litoralis* (BL.) MIQ. Fl. Ind. Bat. 1 (1856) 792; SCHEFF. Ann. Jard. Bot. Btzig 1 (1876) 14; BECC. Malesia 1 (1877) 111. — *Villaresia macrocarpa* SCHEFF. Ann. Jard. Bot. Btzig 1 (1876) 13; *l.c.* 102, *obs.* — *G. pyriforme* SCHEFF. Ann. Jard. Bot. Btzig. 1 (1876) 100; BECC. Malesia 1 (1877) 123; VALET. Crit. Overz. Olacin. (1886) 246; HOCHR. Pl. Bog. Exs. (1904) 43, *incl. var. corrugatum* HOCHR. *l.c. et var. planifolium* HOCHR. *l.c.* 44; Bull. Inst. Bot. Btzig 22 (1905) 39, *incl. var. corrugatum* HOCHR. *et var. planifolium* HOCHR.; Ann. Jard. Bot. Btzig Suppl. III, 2 (1910) 857, *incl. var. genuinum f. planifolium* (HOCHR.) HOCHR. *et f. corrugatum* (HOCHR.) HOCHR., *var. obovatum*

(HOCHR.) HOCHR., *var. fuscum* (HOCHR.) HOCHR. *l.c. et var. fusiforme* (HOCHR.) HOCHR. *l.c.* 858; BACK. Schoolfl. Java (1911) 227; KOORD. Exk. Fl. Java 2 (1912) 532 ('*piriforme*'); PULLE, Nova Guinea 8 (1912) 659; WARB. Pflanzenwelt 2 (1916) 349, f. 231 D, 1–6; SCHELLENB. Bot. Jahrb. 58 (1923) 166; WETTSTEIN, Handb. Syst. Bot. ed. 4 (1935) 842, fig. (fr., '*pyrospermum*'); AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 2; BACK. & BAKH. f. Fl. Java 2 (1965) 59. — *G. selebicum* BECC. Malesia 1 (1877) 124; VALET. Crit. Overz. Olacin. (1886) 247; KOORD. Minah. (1898) 394. — *G. affine* BECC. Malesia 1 (1878) 256; VALET. Crit. Overz. Olacin. (1886) 247; PULLE, Nova Guinea 8 (1912) 659; SCHELLENB. Bot. Jahrb. 58 (1923) 166. — *G. macrocarpum* (SCHEFF.) SCHEFF. ex WARB. Bot. Jahrb. 13 (1891) 299; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 415. — *G. fuscum* HOCHR. Pl. Bog. Exs. (1904) 42; Bull. Inst. Bot. Btzig 22 (1905) 5, 49; BACK. Schoolfl. Java (1911) 227; DAHL, J. Arn. Arb. 33 (1952) 265 (pollen). — *G. fusiforme* HOCHR. Pl. Bog. Exs. (1904) 42; Bull. Inst. Bot. Btzig 22 (1905) 50. — *G. obovatum* HOCHR. Pl. Bog. Exs. (1904) 43; Bull. Inst. Bot. Btzig 22 (1905) 4, 51; VALET. Bull. Dép. Agr. Ind. Néerl. 10 (1907) 30. — *G. sp.*, PULLE, Nova Guinea 8 (1912) 659.

Slender tree, rarely erect shrub, (2)–6–20(–30) m, rather sparsely and \pm horizontally branched; trunk with several small grooves, 3–15(–30) cm δ ; bark rather smooth, mottled, light to dark greyish-brown. Branchlets slender, practically glabrous as are the leaves. *Leaves* ovate or ovate-elliptic, sometimes elliptic and even oblong, apex shortly acuminate, top blunt, base cuneate to rounded, slightly inequilateral, subcoriaceous to coriaceous, dark green to olivaceous and shining above, paler and \pm dull beneath, (10)–12–20(–28) by 6–12(–19) cm, midrib a little depressed above, much prominent beneath, nerves (4)–5–7(–8) rather steeply curved-ascending pairs, only the upper ones somewhat looping, raised within a depression in dry specimens above, prominent beneath, reticulation rather dense, often obscure in dry specimens, or slightly depressed above, or a little raised on both faces; petiole 4–8(–10) by 1.5–2(–3) mm. — δ *Spikes* 1–4 (rarely –8) from a foliate or mostly already defoliate axil, or from tubercles on branchlets and branches, slender, (3)–5–15(–30) cm, flowers numerous, laxly arranged, sparsely appressedly short-hairy or subglabrous. *Calyx* lobes ovate, ciliate, greenish-brown, 1.5(–2) mm. *Petals* narrowly ovate-acuminate, united in the lower third or half, cup-like expanding at full anthesis, slightly keeled and all over set with papillose emergences inside, white to cream or greenish, sometimes pinkish, fragrant, (4)–5–6 by 2–2.5 mm. *Filaments* somewhat dilated towards the base, fleshy, 1.5–2 mm; anther cells elongate-oblong, 2–2.5 mm. Rudiment of ovary hairy. — ♀ *Spikes* generally shorter than the δ ones. *Calyx* less deeply lobed, (2)–3 mm. *Petals* 6–7 by 2–2.5 mm. *Anther* cells 1 mm, devoid of pollen. *Ovary* ovoid, densely fulvous-hairy; stigma rather large, pad-like. *Drupe* ellipsoid or obovoid, or obovoid-oblongoid, some-

times almost globular, often somewhat angular or laterally compressed, finally quite glabrous and shining, orange to reddish, (3-)4-5(-6.5) by 2-3(-4.5) by 2-3.5 cm; exocarp spongy, with adstringent sap, finally dissolute, *c.* 3 mm; endocarp hard, 1(-2) mm thick, with few to numerous irregular longitudinal sharp crests 1-5 mm high, \pm marked in the immature fruit by the drying process, abortive loculus practically absent. *Seed* pear-shaped or ellipsoid.

Distr. *Malesia*: Lesser Sunda Is. (Timor), Celebes incl. Buton I., Moluccas (Morotai, Halmahera, Ambon, Ceram, Kai and Tanimbar Is.), Aru, Salawati, Misoöl, New Guinea & New Britain, and Mussau I. in the Bismarcks.

Ecol. In second storey of primary rain-forest, mostly on hill slopes, also in \pm open secondary growth or sunny slopes, in coastal and swamp forest, often near creeks or temporarily inundated river flats, on clayey soil, scattered, though locally common, from sea-level up to *c.* 1200, in New Guinea up to 1650 m.

Uses. Wood hard, heavy, dark cream or yellowish or light orange, with broad rays and an oak-like grain, apparently not used due to the small dimensions.

Vern. Tanimbar Is.: *twajagunmore*, Otimmer; Celebes: *balula*, Tobela, *karo*, Buton, *kondo*, Topadu; Aru Is.: *kartomadin*; New Guinea: *akwaai*, Kawerawedja, *aria*, *rasui*, Ambai (Japan), *atile*, *ulumu*, Amele, *bisip*, *sarenki*, Dumpu, *briengbas*, Karoon, *dindo*, *gadun*, *gwanawa*, Faita, *gaun*, *mobo*, Bilia, *kaffadioma*, Menawi (Japan), *kami*, Maprik, *kawènmatak*, Maibrat, *kojari*, *sakowgo matèmkuk*, *wobrega*, *wobreika*, Manikiong, *kur-mardi*, Japan, *kwydjarak*, Kebar, *mesobas*, Hatam, *owok*, New Britain, *sabobar*, Etnabay, *sanganiet*, Tehid, *sapiat*, Biak, *sienbal*, Mooi, *ubakka*, Mata-paili.

3. *Gonocaryum impressinervium* SLEUM. *Blumea* 17 (1969) 212. — Fig. 8.

Shrub or treelet, (2-)3-8 m, trunk *c.* 5 cm ϕ ; bark smooth. Branchlets obtusangular, slender, practically glabrous. *Leaves* oblong-elliptic, apex subabruptly acuminate for *c.* 2 cm and 3-4 mm wide at base of acumen, base broadly attenuate, subinequilateral, thin-coriaceous, glabrous with age, dilutely green-olivaceous in dry specimens, (12-)15-23 by 5-10 cm, midrib, nerves and veins distinctly impressed above in dry specimens, well raised beneath, nerves 6-8 pairs curved-anastomosing and markedly looping, reticulation of veinlets dense and prominent on both faces, or sometimes almost obscure; petiole 8-10 by *c.* 2 mm. *Spikes* axillary, solitary or more rarely in twos, erecto-patent, (2-)3-8 cm, laxly many-flowered, lower flowers pedicelled up to 2 mm; rachis slender, 1 mm ϕ , puberulous. *Calyx* 5-lobed to almost the base, lobes ciliate, *c.* 2 mm. — δ *Flowers*: *Petals* connate to a tube for their lower $\frac{3}{4}$, 5-6 mm, white in fresh, reddish in dry state. *Filaments* 3 mm; anther cells 1.5 mm. Rudiment of *ovary* hirsute. — η *Flowers* only known in developed state. *Calyx* lobes 2.5 mm. *Petals* not known.

Ovary short-pubescent. *Drupe* (possibly not quite mature) obliquely elongate-ovoid, subtrigonus, slightly compressed laterally, more attenuate towards the apex than the base, acute, sparsely hairy, green with 12-15 subirregular longitudinal subacute and 1-2 mm high ribs, 5-5.5 by (2-)2.5 cm; exocarp spongy, 1-1.5 mm, with longitudinal fibres; endocarp hard, thin, longitudinally many-ribbed.

Distr. *Malesia*: Borneo.

Ecol. Forest (*Dryobalanops*), scattered though obviously locally common, on sandy loam, 50-150 m.

4. *Gonocaryum gracile* MIQ. *Fl. Ind. Bat. Suppl.* 1 (1860) 137, *nom. nud.*; *ibid.* (1861) 343; BECC. *Malesia* 1 (1877) 122; VALET. *Crit. Overz. Olacin.* (1886) 245, *excl. syn.*; SLEUM. *Blumea* 17 (1969) 213. — *G. longeracemosum* KING, *J. As. Soc. Beng.* 64, ii (1895) 120; RIDL. *Fl. Mal. Pen.* 1 (1922) 431; BAKER *f. J. Bot.* 62 (1924) *Suppl.* 21; BURK. *Dict.* (1935) 1099; DAHL, *J. Arn. Arb.* 33 (1952) 265, f. 44 & 44 A (pollen).

Shrub or small, low-branching tree, up to 12 m; trunk up to 5 cm ϕ ; bark smooth, light greyish brown. Branchlets slender, tips finely pubescent, lower parts glabrescent, striate, early covered with greyish cork. *Leaves* elliptic-oblong, sometimes subobovate-oblong, apex rather suddenly attenuate, mostly somewhat curved, tip blunt, base broadly cuneate, slightly inequilateral, subcoriaceous to coriaceous, practically glabrous with age, greyish green in dry specimens, shining above, dull and paler, sometimes tubercled beneath, (6-)8-18(-20) by 3.5-6.5(-9.5) cm, midrib slightly sunken above, much prominent beneath, nerves 4-5(-6) pairs, lower 2 or 3 pairs curved-ascending, upper ones more straight, all slightly or hardly raised above, more distinctly so beneath, reticulation of veins and veinlets dense, finely raised on both faces; petiole 8-10 by 1.5-2 mm. *Inflorescences* both from foliate and lower defoliate axils, erect, (3-)5-15(-30) cm, solitary or rarely in twos or threes, laxly many-flowered; rachis 1-1.5 mm ϕ , short-hairy as are the bracts and lower part of the calyx lobes, the latter ovate-deltoid, 1.5 mm. — δ *Flowers*: *Petals* 5-6 mm, high connate to a tube of 2 mm ϕ , greenish-white, lobes short, finally reflexed. *Filaments* as long as the tube; anther cells narrow-elliptic, 1 mm, finally a little exerted. Rudiment of *ovary* hirsute, on a thick glabrous disk. — η *Flowers*: Tube of *petals* more urceolate, 3-4(-5) mm, lobes 1-1.5 mm, reflexed. *Anther* cells much reduced in size, empty. *Ovary* ovoid-conical, densely grey-pubescent, attenuate to a short \pm unilateral style with a flattish or subcapitate bilobed stigma. *Disk* pubescent at upper margin. *Drupe* ellipsoid-oblongoid, sometimes subobovoid, green, obtusely trigonus, apex broadly attenuate or obtuse, rarely apiculate, each of the 3 faces with 2 or 3 longitudinal low obtuse ribs, (3-)3.5-4(-4.5) by 1.5-2(-2.8) cm; exocarp spongy; endocarp hard, thin, slightly longitudinally many-ribbed.

Distr. *Malesia*: Sumatra, Malay Peninsula (also P. Tioman), Banka.

Ecol. In forest, mainly in lowland, rarely up to 1000 m, in river valleys by streamside, scattered.

Uses. Poultices are said to be made from the fruit for application to the head for head-ache.

Vern. *Rambai ayam*, *r. hantu*, *ruai gajah*, *sampong bési*, *toyoh*, M.

5. *Gonocaryum minus* SLEUM. *Blumea* 17 (1969) 213.

Treelet up to 12 m, rarely tree up to 30 m, trunk

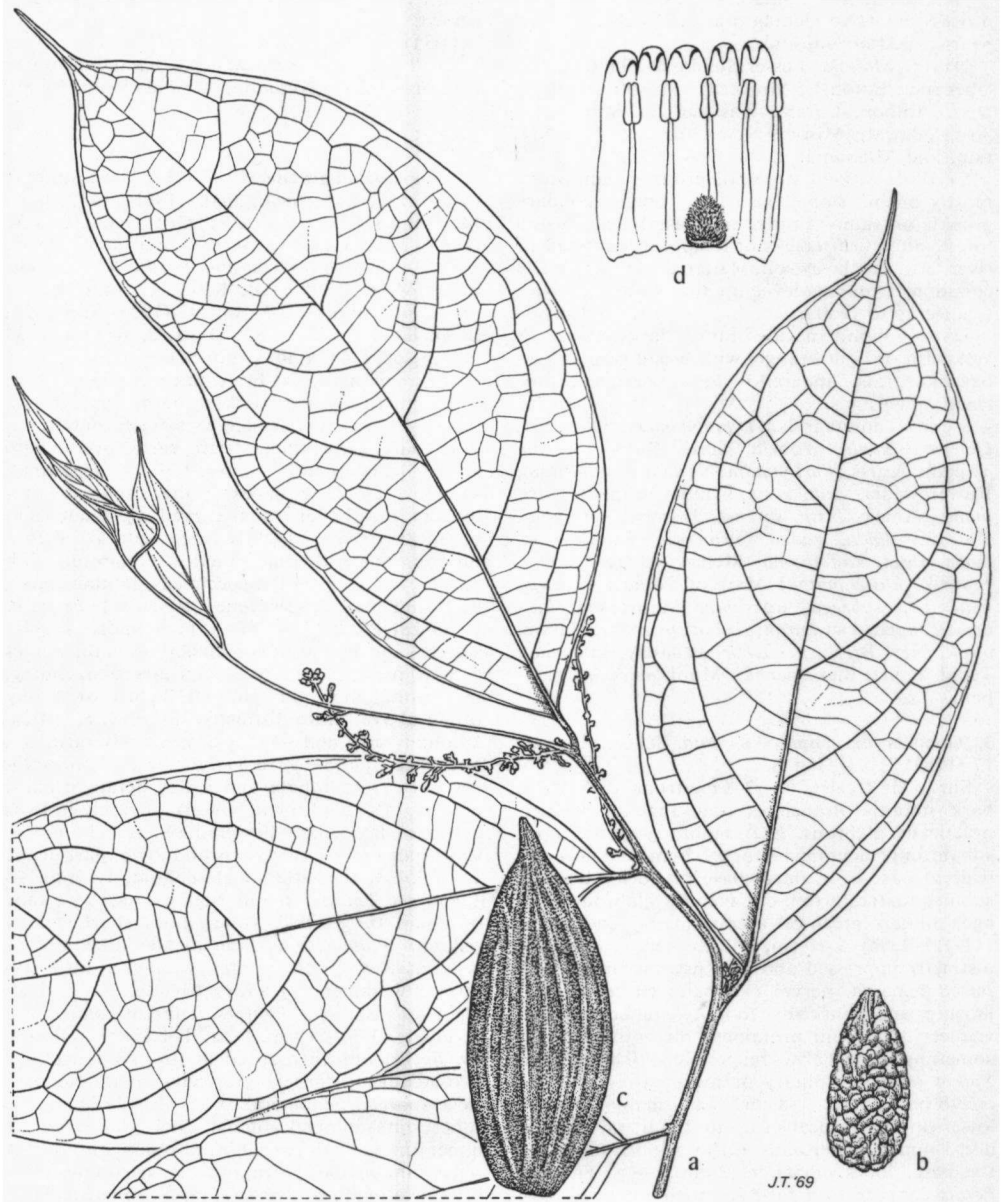


Fig. 8. *Gonocaryum impressinervium* SLEUM. a. Habit, $\times \frac{1}{2}$, b. seed, showing the ruminant endosperm, $\times 1$, c. drupe, $\times 1$, d. δ flower, from the inside, expanded, $\times 7\frac{1}{2}$ (a & d KOSTERMANS 10435 (type), b-c KOSTERMANS 10480).

up to 18 cm ø; bark smooth or minutely fissured, greenish-grey to dark brown. Branchlets obtus-angular, very slender, glabrescent. *Leaves* elliptic-oblong, subcaudate-acuminate for 5–15 mm, tip blunt, base broadly cuneate or obtuse, subcoriaceous, glabrous, paler and often yellowish-green beneath in dry specimens, 6–12 by 3–4(–5) cm, midrib slightly impressed towards the base of the lamina above, prominent beneath, nerves 4–5 irregular pairs, suberect, a little raised on both faces, reticulation of veins and veinlets dense and finely raised above, generally less so beneath; petiole c. 1 cm by 1–1.5 mm. *Spikes* axillary, solitary, lax-flowered; rachis slender, sparsely appressedly hairy, (1)–2–5(–6) cm. *Calyx* lobes ovate, ciliate, 1.5 mm. *Petals* greenish, connate to a tube 4 by 1–1.5 mm, free and erecto-patent for the distal 1 mm. — ♂ *Flowers*: *Filaments* 3 mm; anther cells 1 mm. Rudiment of *ovary* hairy. *Disk* thickish, hairy. — ♀ *Flowers*: *Petals* connate to an urceolate-cylindric tube for their lower $\frac{3}{4}$, c. 4 mm. *Ovary* ovoid, densely short-hairy; stigma capitate. *Drupe* obovoid-oblongoid, obliquely obtusely subtrigonus, apex obtuse or apiculate, green to brownish, 2.5–3.5(–4) by 1.8–2.5 cm; exocarp spongius and fibrose, 2(–3) mm; endocarp 0.5 mm, 8–10-costulate lengthwise, the ribs not much showing off in the exocarp.

Distr. *Malesia*: Borneo (northern part).

Ecol. Primary, lowland (Dipterocarp) forest, also in old secondary forest, up to 245 m, on sandy clay, on tertiary sand or sandstone, on leached soil.

Uses. Wood yellowish, soft, not used. Fruit said to be much favoured by barking deer (*kijang*).

Vern. *Kamuning, mélanin*, Dusun.

6. *Gonocaryum cognatum* ELM. Leaf. Philip. Bot. 1 (1908) 315; MERR. En. Philip. 2 (1923) 491; Pl. Elm. Born. (1929) 172; ELM. Leaf. Philip. Bot. 10 (1939) 3808; DAHL, J. Arn. Arb. 33 (1952) 265, f. 45 & 45 A (pollen); SLEUM. Blumea 17 (1969) 214. — *G. grandifolium* MERR. Philip. J. Sc. 17 (1920) 278; En. Philip. 2 (1923) 491.

Shrub or treelet, (1)–2–6 m, practically glabrous; stem 4–8 cm ø. Branchlets slender, smooth, green, older parts covered with a thin greyish-brownish longitudinally fissured cork. *Leaves* ovate- or oblong-elliptic, sometimes ovate, apex subabruptly and for 1–2 cm obtusely subacuminate or apiculate, base ± rounded, slightly inequilateral, coriaceous, lucid green above, much paler beneath, 15–20(–30) by 8–12(–18) cm, midrib grooved only in the lower part above, strongly raised beneath, nerves 4–5(–6) pairs, the lower 2 (or 3) pairs usually closer together than the upper ones and found in about the lower third of the lamina, curved-ascending and ± looping, slightly raised above, more distinctly so beneath, reticulation of veins and veinlets dense and finely prominent on both faces; petiole 8–15(–20) by c. 3 mm. — ♂ *Flowers* (B.S. 44073) glomerate on slightly supra-axillary swellings, tubercles or very short axes, sessile or almost so. *Calyx* lobes ovate, ciliate, c. 2 mm. *Petals* united to their lower $\frac{3}{4}$ into

a tube, white, c. 5 mm. *Filaments* 3 mm; anther cells elliptic, 1.5 mm. Rudiment of *ovary* cylindrical with a broadened base, glabrous as is the thick crenulate *disk*. — ♀ *Flowers* solitary or few (rarely up to 8), details not known. *Drupe* ovoid, or rarely ellipsoid-subovoid, (2)–2.5–3 by (1.5)–2–2.5 cm, round in ø, green, with c. 5 prominent obtuse ridges from base to the subtruncate or very shortly apiculate apex, and may be with a few less distinct ones between; exocarp thin, predominantly spongius; endocarp hard, 1–1.5 mm, with c. 5 obtuse longitudinal crests.

Distr. *Malesia*: E. and NE. Borneo, Philippines (Luzon: Sorsogon; Samar, Leyte, Panay, Dinagat I., Mindanao, Sulu Arch.).

Ecol. Primary, rarely secondary lowland (Dipterocarp) forest, up to 300 m, along river, apparently scattered.

7. *Gonocaryum macrophyllum* (BL.) SLEUM. Blumea 17 (1969) 214. — *Stemonurus macrophyllus* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 250; WALP. Ann. 2 (1851) 182. — *Lasianthera macrophylla* (BL.) MIQ. Fl. Ind. Bat. 1 (1856) 792; Suppl. 1 (1860) 137; BECC. Malesia 1 (1877) 111. — *G. melanocarpum* (non HOCHR.) WYATT-SMITH, J. Ecol. 41 (1953) 213, 214.

Treelet or shrub, 2–6(–10) m; bark brown. Branchlets slender, glabrous. *Leaves* elliptic to subobovate-elliptic, apex rather abruptly short-acuminate (1 cm), tip obtuse, base broadly cuneate, slightly inequilateral, coriaceous, ± dull on both faces in dry specimens, glabrous, 15–20(–25) by (5)–6–10(–14) cm, midrib slightly impressed above, strongly raised beneath, nerves 5–6(–7) pairs curved-ascending, the upper ones more distinctly looped, shallowly or not sunken above, prominent beneath, reticulation of veins and veinlets finely or hardly prominent above, hardly so beneath, or obscure on both faces; petiole 10–12 by (2)–3 mm. *Inflorescences* in foliate or defoliate axils; ♂ racemes several, sometimes very short and glomerate (galled then?), ♀ ones solitary or few; rachis 0.5–1.5 (rarely –3.5) cm, slender at anthesis, stoutish and somewhat accrescent in fruit, covered with short hairs or almost glabrous; pedicels 1 mm or less. — ♂ *Flowers* (mainly from LÖRZING 5452, Sumatra): *Calyx* lobes ovate, fleshy, ciliate, 1.5 mm. *Petals* united in their lower $\frac{3}{4}$ part to a distally slightly enlarged tube, c. 5 mm including the erect free part, fleshy, white or greenish. *Filaments* 3 mm; anther cells elongate-elliptic, 1.5 mm. Rudiment of *ovary* cylindrical, base broadened, practically glabrous, as is the flat *disk*. — ♀ *Flowers*: *Calyx* lobes and *petals* as in ♂ flowers. *Anther* cells reduced in size. *Ovary* ovoid, glabrous, style thick, 1 mm; stigma oblique, flattish-peltate. *Disk* thin or obscure. *Drupe* subovoid-ellipsoid or oblongoid, apex obtuse or apiculate, slightly longitudinally many-ridged or -keeled (generally more distinctly so on one side), blue-black, (1.5)–2–2.5 (rarely –3) by 1–1.5 cm; exocarp spongius and fibrous, 1–2 mm; endocarp hard, thin.

Distr. *Malesia*: Sumatra (Eastcoast), Mentawai

Is. (Siberut), Berhala and Jarak islets in Malacca Straits, Banka (also on Lepar I.), Borneo.

Ecol. Coastal and hillside inland lowland (also Dipterocarp) forest, sometimes on rather dry land, sandy loam soil, up to 400 m.

Vern. *Kaju napa*, Asahan, *minyak berok*, Jarak I., M.

8. *Gonocaryum calleryanum* (BAILL.) BECC. *Malesia* 1 (1877) 123; VALET. *Crit. Overz. Olacin.* (1886) 247; MERR. *Philip. J. Sc.* 3 (1908) Bot. 243, 418; BROWN, *Min. Prod. Philip. For.* 3 (1921) 203; MERR. *En. Philip.* 2 (1923) 491; BROWN, *Useful Pl. Philip.* (1950) 356; KRAEMER, *Tr. W. Pacif. Region* (1951) 208, f. 74 (wood); DAHL, *J. Arn. Arb.* 33 (1952) 265, f. 46 & 46 A (pollen); LI, *Pac. Sci.* 7 (1953) 184; LIU, SASAKI & KENG, *Quart. J. Taiwan Mus.* 8 (1955) 305; KAO, *Lc.* 345; HATUS. *Mem. Fac. Agr. Kagosh.* Un. 5, 3 (1966) 38; SLEUM. *Blumea* 17 (1969) 215. — *Phlebocalymna calleryana* BAILL. *Adansonia* 9 (1869) 147. — *G. teysmannianum* SCHEFF. *Ann. Jard. Bot. Btzg* 1 (1876) 98; BECC. *Malesia* 1 (1877) 123; VALET. *Crit. Overz. Olacin.* (1886) 245; HOCHR. *Pl. Bog. Exs.* (1904) 44, n. 91; *Bull. Inst. Bot. Btzg* 22 (1905) 51. — *G. tarlacense* VIDAL, *Sinopsis Atlas* (1883) 20, t. 30, f. C; *Rev. Pl. Vasc. Philip.* (1886) 86; CERON, *Cat. Pl. Herb. Manila* (1892) 46; MERR. *Philip. J. Sc.* 1 (1906) Suppl. 86. — *G. diospyrosifolia* HAYATA, *Ic.* 2 (1912) 106 ('*diospyrifolia*'); KANEH. *Formos. Tr.* (1917) 119; *ibid.* (1936) 400, f. 359; ITO, *Ill. Formos. Pl.* (1927) t. 12; SASAKI, *Cat. Gov. Herb. Formosa* (1930) 324.

Treelet or slender tree, 5–12-(20) m, trunk rarely up to 25 cm ø, with greyish bark. Branchlets slender, glabrous. *Leaves* elliptic to elliptic-ovate, apex obtusely apiculate, often plicate, base broadly cuneate to rounded, coriaceous, glabrous, shining above, paler and rather dull beneath in dry specimens, (7–)10–18 by (4–)5–8(–10) cm, midrib very slightly grooved above, strongly raised beneath, nerves 4–5(–6) rather steeply curved-ascending pairs, the lower 2(–3) ones closer together than the upper ones and often ± bending downwards to the petiole in a narrow angle, a little prominent above, more distinctly so beneath, reticulation of veins and veinlets rather dense and markedly raised on both faces especially above; petiole 12–20 by c. 2 mm. *Racemes* spiciform, solitary or several in a fascicle, from foliate and/or defoliate axils, slender, few- to many-flowered, laxly appressedly hairy, (1–)2(–4) cm. *Pedicels* 0.5–1.5(–2) mm. *Calyx* lobes ovate, dorsally ± glabrous, ciliate, 1.5–2(–2.5) mm. *Petals* (4–)5 mm, whitish, or light green, united to a tube for ¾ their length, lobes suberect. — ♂ *Flowers*: *Filaments* 3 mm; anther cells elliptic, 1.2–1.5 mm. Rudiment of *ovary* cylindrical, sparsely hairy, on a thick broadened glabrous *disk*. — ♀ *Flowers*: *Anther* cells rudimentary. *Ovary* ovoid-subconical, densely short-hairy, on a thick glabrous cushion-like *disk*; style hardly 1 mm; stigma peltate, oblique, attenuate towards one side. *Drupe* subovoid-oblongoid, or generally ellipsoid, apex obtuse or usually attenuate-

apiculate, 2.5–3.5(–4.5) by 1.5–2(–2.5) cm, with numerous longitudinal slightly raised lines or ribs, purplish-blackish when ripe; exocarp spongy-fibrous, 1–1.5 mm; endocarp thin-woody, with numerous longitudinal low ribs which but slightly appear as such through the exocarp, and with may be one shallow deeper lateral groove. *Seed* white, hard.

Distr. S. Formosa (incl. also Lan Yu = Botel Tobago I.); in *Malesia*: Philippines (Babyuan & Alabat Is., Luzon, and Samar), Moluccas (Morotai, Halmahera, Batjan), N. Celebes (Gorontalo), and SW. Borneo (Sampit region).

Ecol. Primary littoral or lowland (Dipterocarp) forest, also secondary growth, from sea-level up to c. 750 m, on clayey, sometimes volcanic soil.

Uses. The plant is said to be used as a cure for stomach troubles in the Philippines. Wood durable for interior work.

Vern. Philippines: *ampáleng*, *gohan*, *malagohan*, *Klg.*, *angkak*, *malatapí*, *Bik.*, *basa-basa*, *busigan*, *gozáng-kalinga*, *karasóko*, *maragauk*, *mara-gauéd*, *Ibn.*, *lunás*, *malapinggan*, *malasámat*, *rogrosó*, *saling-bato*, *taingan-bábul*, *Tag.*, *malasítum*, *Pamp.*, *uratán*, *Ilk.*, *yáya*, *Ibn.* & *Neg.*

9. *Gonocaryum lobbianum* (MIERS) KURZ, *J. As. Soc. Beng.* 39, ii (1870) 72; *Prel. Rep. For. & Veg. Pegu* (1875) 37; PIERRE, *Fl. For. Cochinch.* (1892) in *obs. sub* t. 268; CRAIB, *Fl. Siam. En.* 1 (1926) 274; SLEUM. *Blumea* 17 (1969) 215; *Fl. Thail.* 2 (1970) 80. — *Stemonurus macrocarpus* BL. *Mus. Bot. Lugd.-Bat.* 1 (1850) 250; WALP. *Ann.* 2 (1851) 182; MIERS, *Ann. Mag. Nat. Hist.* II, 10 (1852) 36, repr. *Contr. Bot.* 1 (1852) 86, non *G. macrocarpum* (SCHEFF.) SCHEFF. *ex* WARB. 1891. — *Platea lobbiana* MIERS, *Ann. Mag. Nat. Hist.* II, 10 (1852) 111, repr. *Contr. Bot.* 1 (1852) 97, t. 17. — *Platea griffithiana* MIERS, *Lc.* 110, repr. *Lc.* 97. — *Lasianthera macrocarpa* (BL.) MIQ. *Fl. Ind. Bat.* 1 (1856) 792. — *G. gracile* (non MIQ.) KURZ, *J. As. Soc. Beng.* 39, ii (1870) 72; *ibid.* 44, ii (1875) 155; *For. Fl. Burma* 1 (1877) 240; KING, *J. As. Soc. Beng.* 64, ii (1895) 120; BRANDIS, *Ind. Trees* (1906) 152. — *G. griffithianum* (MIERS) KURZ, *J. As. Soc. Beng.* 44, ii (1875) 155; *For. Fl. Burma* 1 (1877) 241; PIERRE, *Fl. For. Cochinch.* (1892) in *obs. sub* t. 268. — *Phlebocalymna lobbiana* (MIERS) MAST. in *Hook. f. Fl. Br. Ind.* 1 (1875) 590. — *Phlebocalymna griffithiana* (MIERS) MAST. *l.c.*; BRANDIS, *Ind. Trees* (1906) 152. — *G. wallichii* MAST. in *Hook. f. Fl. Br. Ind.* 1 (1875) 590. — *G. subrostratum* PIERRE, *Fl. For. Cochinch.* (1892) t. 268 B; GAGNEP. *Fl. Gén. I.-C.* 1 (1911) 828, f. 97, 5–10; CRAIB, *Fl. Siam. En.* 1 (1926) 275; GAGNEP. *Fl. Gén. I.-C. Suppl.* (1948) 755. — *G. harmandianum* PIERRE, *Fl. For. Cochinch.* (1892) t. 268 A; GAGNEP. *Fl. Gén. I.-C.* 1 (1911) 829; *Suppl.* (1948) 755. — *G. siamense* WARB. in *Fedde, Rep.* 16 (1919) 254. — *G. maclurei* MERR. *Philip. J. Sc.* 21 (1922) 348; *Lingn. J. Sc.* 5 (1927) 116; CHUN & HOW, *Act. Phytotax. Sin.* 7 (1958) 59, f. 5; CHUN & CHANG, *Fl. Hainan.* 2 (1965) 448, f. 510. — *G. sp.*, CRAIB, *Fl. Siam. En.* 1 (1926) 275. — *G. poilanei* GAGNEP. *Fl. Gén. I.-C.*

Suppl. (1948) 755. — *G. pavieanum* GAGNEP. l.c. 755, f. 89, 8–9.

Shrub or tree (2–)3–7(–15) m; bark smooth, grey to brown. Branches slender, tips puberulous, glabrescent. *Leaves* oblong to elliptic, sometimes subobovately so, apex shortly (c. 1 cm) obtusely and rather suddenly acuminate, base cuneate, rarely almost rounded, slightly inequilateral, coriaceous, glabrous, often somewhat shining above, greyish-greenish-olivaceous in dry specimens, (8–)10–16 by (2.5–)3–8(–11) cm, midrib slightly impressed above, bold below, nerves 4–6(–7) pairs, rather straight-ascending, upper ones looping, a little raised on both faces, veins and veinlets forming a coarse reticulation which is slightly raised or obscure above, mostly indistinct beneath; petiole 1–1.5 cm by c. 2 mm. *Inflorescences* axillary, solitary or 2–3(–4) in a cluster, generally rather few-flowered, sparsely appressedly hairy; rachis slender, 0.3–1.5(–3) cm. *Calyx* lobes subovate, blunt, ciliate, 1.5 mm. *Petals* greenish white, connate to a tube in their lower $\frac{3}{4}$ part, (4–)5–6(–7) by 2 mm in the ♂, and by c. 2.5 mm in the ♀ flowers. — ♂ *Flowers*: *Filaments* 3 mm; anther cells oblong-ovate, 1.2–1.5 mm. Rudiment of ovary thick-cylindric, sparsely to subdensely hairy, on a broadened almost glabrous subcrenulate disk. — ♀ *Flowers* (KERR 5832): *Anther* cells hardly 1 mm. *Ovary* ovoid, rather densely hairy especially at apex; style a little lateral, short; stigma small. *Drupe* in mature state ± oblongoid or ellipsoid, rarely subovoid-oblongoid, ± round in \emptyset , 3–4(–5) by 2–2.7(–3) cm, apex and base roundish or ± attenuate, though apex even shortly apiculate or subrostrate especially in immature or empty drupes, green for a long time, finally becoming bluish-purple or -blackish, smooth, i.e. ribs of the endocarp in the dry fruit merely showing as shallow grooves or low ribs, with one deeper apical lateral groove or flattish part opposite the lateral style rudiment; exocarp spongy-fibrous, 2–3(–4) mm; endocarp hard, 1–1.5 mm. *Seed* whitish, ovoid-acuminate.

Distr. S. China (Hainan), Burma (from Pegu southwards), Thailand, Indo-China; in *Malesia*: Malay Peninsula (Perlis), S. and SE. Borneo.

Ecol. Primary lowland rain-forest or dry evergreen forest, in mixed moist woods, woody ravines, scrub jungle, often near river-banks, rarely up to 1200 m.

Uses. Kernel of drupe bitter, much liked by wild animals, apparently not eaten by natives.

Imperfectly known

10. *Gonocaryum melanocarpum* HOCHR. Pl. Bog. Exs. (1904) 42, n. 87; Bull. Inst. Bot. Btzig 22 (1905) 49; Ann. Jard. Bot. Btzig Suppl. III, 2 (1910) 855; SLEUM. Blumea 17 (1969) 217.

Tree, 6–8 m, with ± conical crown and short trunk c. 15 cm \emptyset ; bark grey with numerous horizontal small lenticels. Branchlets brownish, glabrous. *Leaves* ovate, shortly subacutely or more bluntly acuminate, base rounded, thin-coriaceous, shining above, greenish-olivaceous when dry, 13–18 by 7–12.5 cm, midrib shallowly depressed above, much prominent beneath, nerves 5–6(–8) curved-ascending pairs, slightly prominent above, more distinctly so beneath, reticulation of veins and veinlets dense, finely raised on both faces especially above; petiole c. 1 cm by 2(–3) mm. — ♂ *Inflorescences* not known. — ♀ *Inflorescences* axillary, solitary, spike-like, nodding, flowers 6–10, spaced; rachis slender, practically glabrous, 6–11 cm by 1 mm; pedicels hairy, c. 1 mm. *Calyx* lobes ovate, subacuminate, dorsally hairy, ciliate, c. 2 mm. *Petals* 5, fleshy, green, glabrous outside, papillose inside, 6 mm, connate about halfway to a subcampanulate tube, lobes spreading. *Staminodes* void of pollen, hardly 1 mm. *Ovary* ovoid, tomentose, 3 mm; stigma large, peltate. *Drupe* ellipsoid, a little flattened on one or two sides, attenuate at both ends, apex subacute, c. 6 by 3.2 by 2.8 cm, black at full maturity, with several low longitudinal ribs; abortive loculus absent; exocarp plus endocarp c. 2 mm.

Distr. Cultivated in Hort. Bogor, but origin not known; apparently from Malesia.

Note. Certainly related to *G. litorale* in flower characters and the absence of an abortive loculus, though drupes are blackish and the leaves are more similar to those of *G. calleryanum*.

Excluded

Gonocaryum monostachyum K. SCH. & LAUT. Fl. Schutzgeb. (1900) 415; SCHELLENB. Bot. Jahrb. 58 (1923) 166; SLEUM. Blumea 17 (1969) 217.

To guess from the description, the species must be excluded from *Gonocaryum* by its very short (5–6 mm), almost terete petioles, and the very short (2 mm) petals, which besides are hairy inside, characters all absent from the genus so far known. The type specimen, which was collected in New Guinea, Sattelberg area, is apparently lost.

5. GOMPHANDRA

WALL. ex LINDL. Nat. Syst. ed. 2 (1836) 439; em. BECC. Malesia 1 (1877) 109; SLEUM. Blumea 17 (1969) 189. — *Stemonurus* BL. Bijdr. (1826) 648, p.p. — *Platea* (non BL.) MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 108, p.p. — *Lasianthera* (non P. BEAUV.) MIQ. Fl. Ind. Bat. 1 (1856) 790, p.p. — Fig. 10.

Dioecious trees, rarely shrubs. Branchlets usually slender, smooth, without lenticels. *Leaves* spirally arranged, entire, chartaceous to coriaceous, generally

dark green above and paler beneath in fresh, often olivaceous or brownish, rarely blackish in dry specimens, often tubercled on the undersurface, generally pinnate-, exceptionally tripli-nerved, midrib and nerves often a little sunk above, reticulation generally absent; petiole often somewhat decurrent on branchlet, stoutish. *Flowers* functionally unisexual, articulate with the short, often distally thickened pedicel, in cymes loose to subcapitate, these 2-3(-4)-chotomously arranged on top of a peduncle, normally in the axils of leaves, rarely (also) opposite a leaf, or from defoliate branchlets, generally many-flowered in the ♂, few-flowered in the ♀ specimens; bracts small. *Calyx* cupular, minute, 4-5-toothed to almost entire, subsistent. *Petals* 4 or 5 (rarely -7), valvate in bud, either remaining united below and forming a cup or distally dilated tube, or free to almost the base, tips inflexed, midrib on the inside rather obscure, caducous. *Disk* 0 or obscure. — ♂ *Flowers: Stamens* 4 or 5 (rarely -7), free, often exserted; filaments thick, flattened, dilated upwards, apex attenuate, generally bearing shorter papillose or longer clavate hairs in front below the cells, or (also) on the back or connective; anther cells ovate-elliptic, basifixed, cells slightly or hardly divergent downwards. Rudiment of *ovary* conspicuous. — ♀ *Flowers: Calyx* and *petals* as in the ♂ flowers, the petals sometimes absent. *Staminodes* present or absent; filaments linear, hairs shorter and less dense than in the ♂ flowers, cells reduced in size and void of pollen. *Ovary* cylindrical; stigma large, thick-discoid, slightly 4- or 5-lobed or -crenate. *Drupe* ± oblongoid or ellipsoid, sometimes shortly attenuate (beaked) distally and slightly swollen (almost apophysate) and a little asymmetrical at base, crowned by the large persistent stigma; pericarp smooth, thin, fleshy or juicy; endocarp crustaceous or hard, smooth or generally with 8-10(-14) longitudinal ridges outstanding especially in the dry fruit. *Seed* 1; embryo minute in the top of the fleshy albumen.

Distr. About 33 *spp.*, of which 6 *spp.* in SE. Asia (SW. India and Ceylon to Burma, Thailand, Indo-China, and S. China incl. Hainan); in *Malesia* 27 *spp.*, one of which extends to the Solomon and St. Cruz Is. Fig. 9.

Ecol. Primary and secondary forest, often as substage trees, both in lowland and in the montane zone up to c. 1800 m, occasionally also in mossy forest up to 2200 m (on Mt Kinabalu possibly higher), generally on clayey soil, very rarely limited to peat-swamp forest. *Fl. fr.* Jan.-Dec.

Disp. Many species have a wide range. There is no evidence yet, that the fruits are eaten by animals or of the possibility of buoyancy.

Uses. The wood is whitish-creamy and apparently not durable enough to be generally used; besides, sizes are usually small.

Note. Specific distinction is in the present state far from satisfactory, mainly due to the still rather scarce specimens collected and their incompleteness. Too many species have been described either from ♂ or fruiting specimens only, and their pertaining ♀ flowers or fruits are not yet known. Collectors should care to obtain as complete as possible materials and make ample field notes.

KEY TO THE SPECIES

1. Leaves persistently velutinous or tomentose all over the undersurface, soft to the touch (*cf.* also *G. papuana*).
2. Nerves 2(-3) pairs 1. *G. fuliginea*
2. Nerves 6-7(-8) pairs 2. *G. velutina*
1. Leaves covered with scattered hairs underneath, ± glabrescent with age, or glabrous from the beginning.
3. Ovary in ♀ flowers laxly to densely hairy. (Rudiment of ovary in ♂ flowers whether or not hairy).
4. Inflorescence conspicuously head-like, its branches (especially in the ♂ specimens) very short.
5. Leaves elliptic or oblong-, rarely ovate-elliptic, 12-20 by 4-8 cm, nerves 5-6(-7) pairs. Drupe (1.8-)2-2.4 by (0.6-)0.7-0.8 cm 3. *G. capitulata*
5. Leaves oblong, rarely ovate-lanceolate, 5-8(-9) by 1.5-3 cm, nerves 3-4(-5) pairs. Drupe 1-1.3 by 0.5-0.7 cm 4. *G. lysipetala*

4. Inflorescence (especially in the ♂ specimens) generally more loose, its branches distinct and divergent
6. Petals hairy in their upper part, 5-7(-10) mm. Rudiment of ovary in the ♂ flowers hairy on top. Drupe 3.5-4 by c. 1.5 cm 5. *G. papuana*
6. Petals glabrous or practically so, rarely up to 5 mm. Drupe much smaller.
7. Both ♂ and ♀ inflorescences many-flowered, cymes together on top of a peduncle, 1.5-2 cm (Rudiment of ovary in the ♂ flowers glabrous). Leaves coriaceous. 6. *G. simalurensis*
7. ♂ Inflorescences rather many-, ♀ ones few-flowered, cymes together on top of a generally rather short peduncle. Leaves chartaceous to coriaceous.
8. Leaves ± laxly covered underneath for a long time with appressed weak hairs, nerves 5-7 pairs.
9. Rudiment of ovary in the ♂ flowers with a tuft of hairs on top. Very base of drupe not swollen. 7. *G. cumingiana*
9. Rudiment of ovary in the ♂ flowers glabrous or practically so. Base of drupe swollen to almost apophysate for c. 1 mm 8. *G. pseudojavanica*
8. Leaves practically glabrous from the beginning. (Rudiment of ovary in the ♂ flowers glabrous).
10. Leaves with (5-)6-8 pairs of nerves. Base of drupe not swollen 9. *G. javanica*
10. Leaves with 8-10 pairs of nerves. Base of drupe distinctly swollen 10. *G. fusiformis*
3. Ovary (and rudiment of ovary in the ♂ flowers) glabrous or practically so.
11. Filaments glabrous or practically so.
12. Filaments widened upwards and relatively short, *i.e.* c. 2 times as long as are the anther cells. 11. *G. australiana*
12. Filaments elongate-linear, at least 3 times as long as are the anther cells 12. *G. pallida*
11. Filaments ventrally and/or dorsally hairy.
13. Filaments with short-clavate or papillose hairs, these never surpassing the anther cell.
14. Drupe (1.6-)1.8-2(-2.2) by 0.8-1 cm 13. *G. mappioides*
14. Drupe as far as known 1.3-1.6 by 0.5-0.6 cm.
15. Leaves practically glabrous. Calyx ± obconical, entire, glabrous 14. *G. apoensis*
15. Leaves ± densely short-pubescent all over the undersurface, especially at midrib and nerves. Calyx cup-shaped, dented, hairy 15. *G. flavicarpa*
13. Filaments with elongate-clavate ('glandular') or penicillate hairs (those from the connective often surpassing the anther cell).
16. Inflorescence very lax, peduncle and branches elongate, slender and rather few-flowered both in ♂ and ♀ specimens 16. *G. oligantha*
16. Inflorescence lax to dense, peduncle and branches relatively short at least in the ♂ specimens, generally many-, rarely few-flowered.
17. Petals ± densely appressedly hairy outside 17. *G. sawiensis*
17. Petals sparsely hairy on top (in bud), or glabrous.
18. Drupe (2-)2.5-3(-4) cm long.
19. Inflorescence rather compact, umbelliform. Drupe fusiform, 3.5-4 by 0.5-0.6 mm ♂. 18. *G. dolichocarpa*
19. Inflorescence rather lax. Drupe obovoid-oblongoid-ellipsoid, at least 0.8 cm ♂.
20. Leaves narrow-lanceolate, chartaceous to subcoriaceous, nerves 3(-4) pairs. 19. *G. lancifolia*
20. Leaves (obovate-) elliptic to oblong or lanceolate-oblong, ± coriaceous, nerves 4 or more pairs.
21. Leaves elliptic to obovate-elliptic 20. *G. luzoniensis*
21. Leaves elliptic- to lanceolate-oblong 21. *G. montana*
18. Drupe as far as known 1-2 (rarely -2.2) cm long.
22. Inflorescence (at least in the ♂ specimens) rather compact, ± umbelliform, on peduncle up to 5 mm. Leaves ± chartaceous, nerves (8-)10-12(-14) pairs. Very base of drupe swollen and smooth 22. *G. parviflora*
22. Inflorescence (at least in the ♂ specimens) with more laxly arranged and diverging branches, generally on peduncle longer than 5 mm.
23. Drupe ovoid- to oblong-ellipsoid, base generally swollen. Inflorescences (at least in the ♂ specimens) much-branched, generally many-flowered and distinctly scorpioid (*i.e.* flowers arranged on one side), rarely with fewer flowers and rather obscurely scorpioid then.
24. Leaves dark to blackish brown in dry state, and rufous- to rusty-tomentellous on midrib and nerves beneath, as are the branchlets. 23. *G. subrostrata*
24. Leaves green to greenish-brownish in dry state, and practically glabrous beneath, as are the branchlets. 24. *G. quadrifida*
23. Drupe as far as known in mature state, oblongoid-ellipsoid, base broadly attenuate and not swollen. Inflorescences never scorpioid.
25. Leaves brittle and blackish in dry specimens, nerves and veins ± obscure on both faces. Inflorescence with red-brown hairs. 25. *G. schoepffifolia*
25. Leaves greenish-brownish and generally not brittle in dry specimens, with a finely impressed reticulation above in fully mature state. 26. *G. pseudoprasina*

1. *Gomphandra fuliginea* (ELM.) MERR. En. Philip. 2 (1923) 490; SLEUM. Blumea 17 (1969) 192. — *Urandra fuliginea* ELM. Leaf. Philip. Bot. 2 (1908) 491. — *Stemonurus fuligineus* (ELM.) HOWARD, J. Arn. Arb. 21 (1940) 468.

Shrub or small tree. Branchlets with brownish-velutinous tips. *Leaves* lanceolate to obovate-elliptic, apex shortly obliquely acuminate, tip bluntish, base attenuate and a little decurrent on the petiole, slightly inequilateral, subcoriaceous, lucid and glabrous above, evenly short fuliginous-pubescent and soft to the touch beneath, 7–12(–14)

by 2.5–5 cm, nerves 2 or 3 steeply ascending pairs, the lowest pair from a little above the base, other pairs distant, slightly raised beneath; petiole pubescent, 6–10 by 1.5–2 mm. *Flowers* unknown. *Infructescence* pubescent, on 1 cm long peduncle, which bears 2 or 3 branches (3 mm). *Drupe* ± ellipsoid, slightly oblique, with 12–15 low ridges of the hard endocarp, 1.7–2 by 0.9–1.2 cm.

Distr. *Malesia*: Philippines (N. Luzon: Benguet).

Ecol. In thickets, 1400–1700 m.
Vern. *Danka*, Ig.

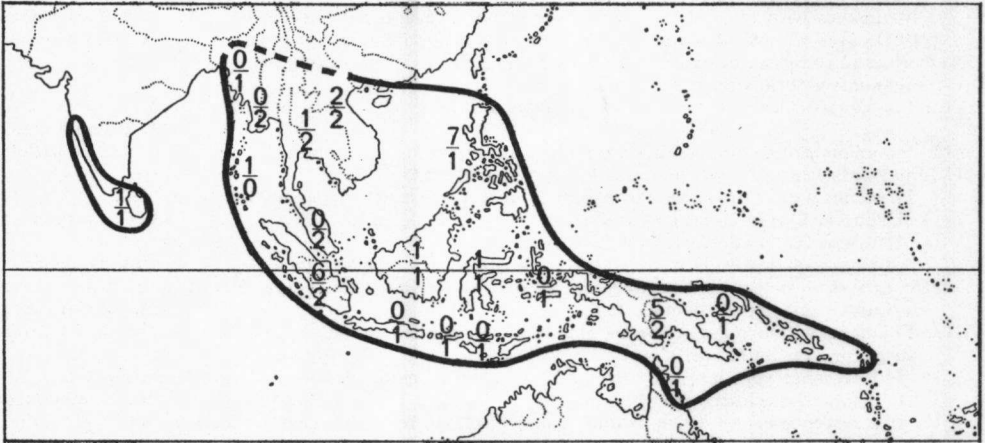


Fig. 9. Distribution of *Gomphandra*. The figure above the hyphen indicates the number of endemic species in the island or area, the figure below the hyphen the number of non-endemic species.

2. *Gomphandra velutina* SLEUM. Blumea 17 (1969) 192.

Tree c. 10 m. Branchlets fulvous-velutinous. *Leaves* lanceolate to oblong, apex shortly acutely acuminate, base cuneate, chartaceous, glabrous above, fulvous- or ferruginous-velutinous all over beneath, dark brown in dry state, 12–17 by (3–)4–6 cm, nerves 6–7(–8) curved pairs, slightly raised beneath; petiole velutinous, 8–13 by 1.5 mm. — ♂ *Flowers* in c. 15-flowered peduncled (5 mm) heads composed of several abbreviate cymes, fulvous-tomentellous, the lower $\frac{2}{3}$ of the petals excepted. *Calyx* cupular, 2.5 mm. *Petals* 5, forming a campanulate tube which slits irregularly, 4.5–5.5 mm. *Stamens* 5, hardly exerted; filaments bearded below the anther cells on the inside and dorsally at connective. Rudiment of *ovary* with erect hairs. — ♀ *Flowers*: *Calyx* and *petals* as in ♂ flowers. *Filaments* bearded distally only. *Ovary* short-tomentose. *Drupe* unknown.

Distr. *Malesia*: Central E. Celebes (Porema at base of Mt Mengkoka), one collection.

Ecol. Rain-forest, 1200 m.

3. *Gomphandra capitulata* (JUNGH. & DE VRIESE) BECC. Malesia 1 (1877) 111; SLEUM. Blumea 17 (1969) 193. — *Aralia capitulata* JUNGH. & DE

VRIESE, Ned. Kruidk. Arch. 1 (1846) 17. — *Lasianthera capitulata* (JUNGH. & DE VRIESE) MIQ. Fl. Ind. Bat. 1 (1856) 791; Suppl. 1 (1860) 137; WARB. Pflanzenwelt 2 (1916) 349, f. 231 B, 1–4. — *Stemonurus capitulatus* (JUNGH. & DE VRIESE) O. KTZE, Rev. Gen. Pl. 1 (1891) 112. — *G. nyssifolia* KING, J. As. Soc. Beng. 64, ii (1895) 114; RIDL. Fl. Mal. Pen. 1 (1922) 427; BAKER f. J. Bot. 62 (1924) Suppl. 21. — *Nyssa sessiliflora* (non HOOK.) KOORD. Pl. Jungh. ined. n. 57, cf. HALL. f. Med. Rijksherb. 1 (1910) 13. — *Stemonurus nyssifolius* (KING) HOWARD, J. Arn. Arb. 21 (1940) 468.

Tree, 5–20(–28) m, up to 40 cm ø. Branchlets slightly winged below the insertion of the petioles, tips puberulous. *Leaves* elliptic or oblong, rarely ovate-elliptic, apex shortly subabruptly and acutely acuminate, base cuneate, the very base folded and decurrent to the grooved petiole, subcoriaceous to firmly chartaceous, dark olive-brownish and the edge slightly revolute in dry specimens, glabrous, 12–20 by 4–8 cm, nerves 5–6(–7) pairs rather straight-ascending, much paler than the lamina in dry specimens beneath, transverse veins distinct beneath; petiole 7–12 by 1.5–2 mm. *Inflorences* all over short-pubescent, on top of a slender peduncle (1–2 cm), consisting of several short cymes

crowded into a kind of head or umbel, which bear up to 15 flowers in the ♂, up to 7 flowers in the ♀ ones. — ♂ *Flower*: *Calyx* cupular, ciliate, 1 mm. *Petals* 5, coherent to a narrow tube, whitish, laxly hairy distally only, c. 4 mm. *Stamens* 5, much exserted; filaments long-hairy in the upper half below the anther cells on the ventral side only. Rudiment of *ovary* short-hairy. — ♀ *Flower*: *Calyx* and *petals* as in ♂ flowers. *Staminodes* 5, hairy. *Ovary* short-hairy except the glabrous base. *Drupe* ellipsoid-oblongoid, apex shortly attenuate, slightly or not curved, the very base swollen and smooth, whilst the endocarp shows numerous outstanding ridges above, (1.8–)2–2.4 by (0.6–)0.7–0.8 cm; exocarp pale pink or greenish-white.

Distr. *Malesia*: Sumatra (incl. Simalur I.), Malay Peninsula (Perak, Pahang).

Ecol. Forest, in Sumatra at 150–915 m, in the Malay Peninsula at 1065–1370 m.

Vern. Sumatra: *simsarsimata*, Batak; Simalur: *awa suki*, *pului*, *p. pajo*, *samsam dotan*, *surin uding*, *tutun ansan d'elok*, M.

4. *Gomphandra lysipetala* STAFF, Trans. Linn. Soc. II, Bot. 4 (1894) 139; SLEUM. *Blumea* 17 (1969) 194. — *Stemonurus lysipetalus* (STAFF) MERR. En. Born. (1921) 356.

Tree up to 30 m high, trunk up to 45 cm ø; bark dark grey. *Leaves* oblong, or sometimes more ovate-lanceolate, apex shortly obtusely attenuate or subacuminate, base ± abruptly narrowed to the grooved petiole, (sub)coriaceous, glabrous at maturity, dark brown when dry, 5–8(–9) by 1.5–3 cm, nerves 3–4(–5) curved-ascending pairs, slightly raised beneath; petiole 7–10(–12) by c. 1 mm. — ♂ *Cymes* 2 or 3, very shortly peduncled, all condensed into a head-like or subumbellate inflorescence on top of a slender peduncle (5–10 mm). *Calyx* cup-shaped, minutely 5-dented, hardly 1 mm. *Petals* 5, becoming free from each other both from top and base at the same time, whitish-greyish, c. 3 mm. *Stamens* 5, hardly exserted; filaments with numerous short-papillose hairs in the middle of the ventral, glabrous on the dorsal side. Rudiment of *ovary* laxly hairy. — ♀ *Cymes* similarly arranged, though few-flowered. *Calyx* and *petals* as in ♂ flowers. *Staminodes* with numerous papillose hairs in front. *Ovary* densely set with whitish short hairs. *Drupe* ellipsoid-oblongoid, apex (sometimes a little oblique) and base gradually attenuate, 1–1.3 by 0.5–0.7 cm; exocarp thin-fleshy, cream; endocarp with several longitudinal shallow ridges.

Distr. *Malesia*: Borneo (Mt Kinabalu area).

Ecol. Primary and secondary forest, on slopes, 1220–1830 m.

5. *Gomphandra papuana* (BECC.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238; SLEUM. *Blumea* 17 (1969) 194. — *Lasianthera litoralis* (non MIQ.) F. v. M. Descr. Not. 2 (1877) 53. — *Platea papuana* BECC. *Malesia* 1 (1883) 257; VALET. Crit. Overz. Olacin. (1886) 254. — *Stemonurus puberulus* K. SCH. & LAUT. Fl. Schutzgeb. (1900) 414. — *Stemonurus zygomorphus* PULLE, Nova Guinea 8 (1912) 658; SCHELLENB. Bot. Jahrb. 58

(1923) 162. — *Stemonurus papuanus* (BECC.) SCHELLENB. l.c. 161. — *G. zygomorpha* (PULLE) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 239.

Tree, 5–10(–30) m, up to 20 cm ø; bark smooth, mottled grey-brown. Branchlets short-pubescent to tomentulose distally, glabrate below, pith hollow. *Leaves* elliptic to oblong-, rarely subovate-elliptic, apex generally shortly, rather abruptly and often obliquely acuminate, base cuneate, rarely almost rounded, stiff-chartaceous or subcoriaceous, greyish-green to pale olivaceous-brownish in the dry state, early glabrescent above, ± persistently covered with numerous short hairs and rather soft to the touch all over beneath, finally partly glabrescent there, 15–25 by (5–)6–11.5 cm, nerves 5–7(–8) curved-ascending and beneath somewhat prominent pairs, transverse veins subparallel to and distant from each other, slightly raised beneath, reticulation obsolete; petiole deeply grooved above, glabrescent, 10–12 by 2(–3) mm. — ♂ *Inflorescences* consisting of 2 or 3 short-branched 2–5-flowered cymes on top of a common peduncle (3–6 by 1 mm), all over densely covered with appressed ferruginous hairs, the lower part of the petals excepted. *Calyx* cup-shaped, green, 4(–5)-denticulate, 2 by 3 mm. *Petals* 4 or 5 (rarely 7), coherent in the lower 2/3, though partially free from each other by 1 or 2 slits, thickish, greenish to white, 5–7 mm. *Stamens* 5(–7), much exserted; filaments densely hairy both in front below the anther cells (1 mm) and dorsally on connective. Rudiment of *ovary* with erect hairs on top. — ♀ *Inflorescences* 2–3-flowered, together on 3–5 mm long peduncle. *Calyx* and *petals* (7–10 mm) as in ♂ flowers. *Staminodes* slightly exserted. *Ovary* ± laxly appressedly hairy. *Drupe* obovoid-oblongoid, strongly beaked in immature, much less so in mature state, yellow, 3.5–4 by c. 1.5 cm, somewhat hairy distally only; endocarp rather thin, with c. 8 obtuse longitudinal ridges.

Distr. *Malesia*: New Guinea.

Ecol. Primary and secondary forest, also on flooded plains, 25–450 m, locally common in undergrowth.

Vern. *Assuei*, Astrolabe Bay area, *behwah*, *sinagapa*, Orokaiva (Mumuni), *numinti*, Rawa, *sisinam*, Koropa.

6. *Gomphandra simalurensis* SLEUM. *Blumea* 17 (1969) 194.

Tree, 13–25 m. Branchlets robust, tips laxly appressedly hairy. *Leaves* elliptic, sometimes sub-ovate-elliptic, apex shortly and bluntly acuminate, base cuneate and a little decurrent on the petiole, coriaceous, dark brown when dry, glabrous at full age, 10–17(–21) by (4–)4.5–9(–11) cm, nerves 5–6(–7) pairs, lower ones rather straight, upper ones more curved-ascending, almost flat above, raised beneath, transverse veins rather obscure beneath; petiole 1–1.8(–2.3) by c. 2.5 mm. ♂ & ♀ *Inflorescences* consisting of 3–5 many-flowered cymes collected on top of a rather slender peduncle (1.5–2 cm), pale rusty-tomentelous except the petals. — ♂ *Flowers*: *Calyx* cupular, 4–5-dented, sparsely pubescent, ciliate, 1

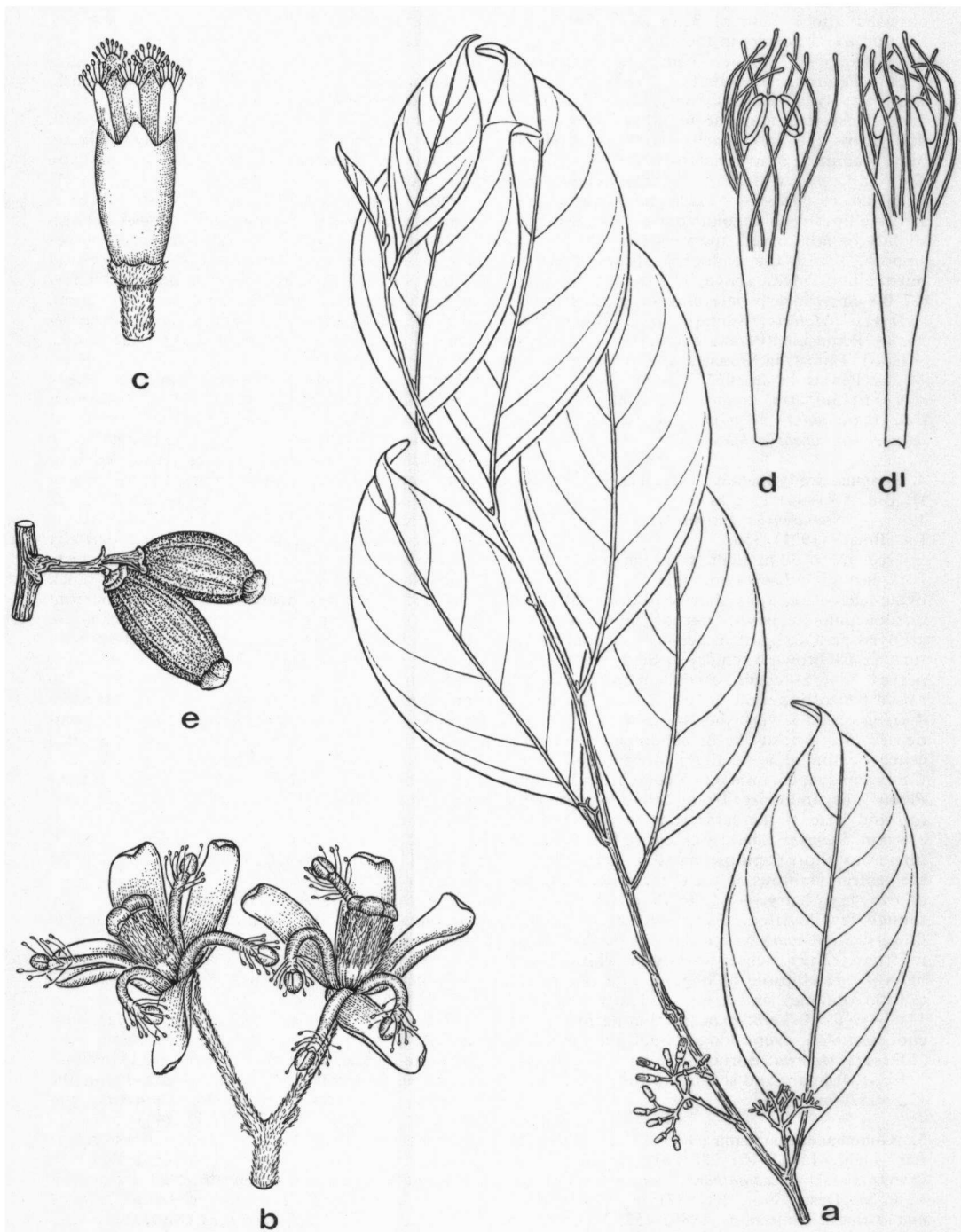


Fig. 10. *Gomphandra javanica* (BL.) VALET. *a*. Habit, with ♂ inflorescence, $\times \frac{1}{2}$, *b*. ♀ inflorescence, $\times 3\frac{1}{2}$, *c*. ♂ flower, $\times 5$, *d*. stamen, ventral side, $\times 10$, *d'*. ditto, dorsal side, $\times 10$, *e*. drupe, $\times 1$ (*a*, *c*-*d* KOSTERMANS & VAN WOERDEN 128, *b* WINCKEL 336, *e* JACOBS 4797).

mm. *Petals* 4 or 5, white or greenish, still connate at anthesis to a 4- or 5-lobed distally dilated tube, 4.5 mm. *Stamens* 4 or 5, much exserted; filaments laxly set with elongate-clavate hairs ventrally below the anther cells, and penicillate dorsally at connective. Rudiment of *ovary* glabrous. — ♀ *Flowers*: *Calyx* and *petals* as in ♂ flowers. *Staminodes* present. *Ovary* glabrous at the very base, otherwise densely set with forward directed hairs. *Drupe* oblongoid, a little oblique, slightly rostrate, pale yellow, 1.6–1.8(–2) by 0.7–0.8 cm; endocarp longitudinally 10–12-costulate.

Distr. *Malesia*: Simalur I. (off the coast of NW. Sumatra).

Ecol. Primary lowland forest.

Vern. *Bajut uding*, *rubi silai*, *tutun bahu* *alafai*, *t. b. dëlök*, *t. b. dotan*, *t. b. uding*, M.

7. *Gomphandra cumingiana* (MIERS) F.-VILL. Nov. App. (1880) 46; VIDAL, Phan. Cuming. Philip. (1885) 102; Rev. Pl. Vasc. Filip. (1886) 86; VALET. Crit. Overz. Olacin. (1886) 229; MERR. En. Philip. 2 (1923) 490; SLEUM. Blumea 17 (1969) 194. — *Stemonurus cumingianus* MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 42, repr. Contr. Bot. 1 (1852) 92; O. Ktze, Rev. Gen. Pl. 1 (1891) 112; DAHL, J. Arn. Arb. 33 (1952) 268, f. 50 & 50 A (pollen). — *Stemonurus agusanensis* ELM. Leaf. Philip. Bot. 7 (1915) 2689. — *G. agusanensis* (ELM.) MERR. En. Philip. 2 (1923) 489.

Tree (3–)5–15 m, up to 30 cm ø; bark smooth, yellowish-brown. Branchlets flexuous, tips rusty-tomentellous. *Leaves* oblong to ovate- or elliptic, rarely subobovate-oblong, apex shortly rather abruptly and sometimes obliquely acuminate, tip blunt, base broadly attenuate, slightly inequilateral, very base ± abruptly narrowed to the petiole, membranous to chartaceous, dark brown above, much paler beneath when dry, dull, glabrous above, the midrib and nerves excepted, undersurface all over set with scattered short ± appressed soft fine hairs, more densely so at midrib and nerves, (7.5–)9–16(–24) by 5–8(–10) cm, nerves in 5–7 generally strictly, or rarely more curvedly ascending pairs, slightly raised beneath, cross veins faintly prominent beneath; petiole puberulent, 1–1.5 cm by c. 1.5 mm. — ♂ *Inflorescences* composed of several divaricate few-flowered cymes, together on top of slender peduncle (0.5–1.5 cm), all over rusty-puberulent, the petals excepted. *Calyx* cup-shaped, hardly dented, ciliate, 1 mm. *Petals* (4–)5, connate to a tube for their lower 2/3, glabrous except some hairs on top in bud stage, yellowish-white, (4–)5 mm. *Stamens* 5, exserted; filaments with numerous club-shaped hairs ventrally below the anther cells and penicillate dorsally at connective. Rudiment of *ovary* with erect hairs on top. — ♀ *Inflorescences* more lax-flowered. *Calyx* and *petals* as in ♂ flowers. *Staminodes* (4–)5, penicillate. *Ovary* ferruginous-tomentellous. *Drupe* subovoid-oblongoid, either equally attenuate on both ends, or generally slightly beaked distally, still laxly pubescent for quite a while, (1.3–)1.5–1.7 (rarely –2) by 0.7–0.8 cm; whitish-yellowish, pinkish or salmon-coloured;

endocarp with 10–12 shallow longitudinal ribs. Distr. *Malesia*: Borneo, Philippines.

Ecol. Primary (also mixed Dipterocarp) forest at low and medium altitude, in the Mt: Kinabalu area up to 1525 m.

Vern. Philippines: *Baróbo*, Mang., *bayanotan*, S. L. Bis., *lambuan*, Mbo., *lipid*, Sul., *mañgoi*, Bik.

8. *Gomphandra pseudojavanica* SLEUM. Blumea 17 (1969) 195.

Tree 4–15 m. Branchlets puberulous at tips. *Leaves* oblong-elliptic, apex ± abruptly acuminate for 1–2 cm, tip bluntish, base broadly attenuate, subcoriaceous, olivaceous-brown above, paler beneath in dry state, glabrous above, sparsely set with short hairs initially, more laxly so or at the lower part of the midrib only at maturity and minutely tubercled beneath, (8–)10–16 by (4–)4.5–8(–10) cm, nerves 5–6(–7) pairs, curved-ascending, distinctly looping before the edge, slightly raised beneath; petiole puberulous initially, 1–1.5(–2) cm by 1.5–2 mm. — ♂ *Inflorescences* composed of 3 or 4 divergent, rather dense flowered cymes together on top of a slender peduncle (0.5–1.3 cm), short-hairy on peduncle and branches. *Calyx* cup-shaped, minutely 5-dented, tube glabrous, hardly 1 mm. *Petals* connate in a distally widened and shortly 5-lobed tube, whitish-greenish, glabrous, c. 3.5 mm. *Stamens* 5, exserted for c. 1 mm; filaments laxly penicillate below the anther cells ventrally and at connective dorsally. Rudiment of *ovary* glabrous or practically so. — ♀ *Inflorescences* not known. Immature infructescences 1–3-flowered, peduncle c. 5 mm, pedicels (branches of the reduced cyme) 3–5 mm. Developed *ovary* densely appressedly hairy. *Drupe* ellipsoid-oblongoid, a little curved, shortly and rather narrowly attenuate at apex, more broadly so at base, very base swollen or subapophysate for c. 1 mm, 1.7–1.9 by 0.6–0.7 cm, whitish; exocarp with few and rather low longitudinal ridges.

Distr. *Malesia*: Simalur I. (off the coast of NW. Sumatra).

Ecol. Primary lowland forest.

Vern. *Ansan dëlök*, *a. d. uding*, *bajut uding*, *bëlujan ètëm*, *pului silai*, *sosot manu*, *surimanu uding*, *tutun surimanu dëlök*, M.

9. *Gomphandra javanica* (BL.) VALET. Crit. Overz. Olacin. (1886) 217, t. 4, f. 1–9c, t. 5, f. 23a, t. 6, f. 46; K. & V. Bijdr. 5 (1900) 150; HOCHR. Bull. Inst. Bot. Btzg 22 (1905) 42; MOLL & JANS. Mikr. 2 (1908) 238, f. 106 (wood-anat.); BACK. Schooff. Java (1911) 225; KOORD. Exk. Fl. Java 2 (1912) 531; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 3; KOORD. Atlas 1 (1913) t. 116; DOCT. v. LEBUWEN, Zoocecidia (1926) 332, f. 597 (galls); AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 4; BACK. & BAKH. f. Fl. Java 2 (1965) 60; SLEUM. Blumea 17 (1969) 196. — *Stemonurus javanicus* BL. Bijdr. (1826)) 649, *incl. var.*; WALP. Rep. 1 (1842) 378; HASSK. Cat. Hort. Bog. (1844) 214; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 36, repr. Contr. Bot. 1 (1852) 86, *incl. var.*; DAHL, J. Arn. Arb. 33 (1952) 268 (pollen).

— *Stemonurus pauciflorus* BL. Bijdr. (1826) 648; WALP. Rep. 1 (1842) 378; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 35, repr. Contr. Bot. 1 (1852) 86. — *Lasianthera javanica* (BL.) MIQ. Fl. Ind. Bat. 1 (1856) 790, incl. var. *pauciflora* (BL.) MIQ. l.c. 791; Suppl. 1 (1860) 137. — *G. javanica* (BL.) VALET. var. *lanceolata* K. & V. Bijdr. 5 (1900) 151; HOCHR. Pl. Bog. Exs. (1904) 41; Bull. Inst. Bot. Btzig 22 (1905) 42; MOLL & JANS. Mikr. 2 (1908) 243 (wood-anat.); KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 4. — *G. javanica* (BL.) VALET. var. *dolichocarpa* K. & V. Bijdr. 5 (1900) 151; MOLL & JANS. Mikr. 2 (1908) 243 (wood-anat.); KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 4. — *G. comosa* (non KING) BAKER f. J. Bot. 62 (1924) Suppl. 21. — Fig. 10.

Tree, (3-)5-15 m, suberect, rarely up to 40 cm ø; bark olive green. Branchlets appressedly puberulous at tips as are the petioles and may be the young leaves. *Leaves* variable in form and size, generally elliptic to oblong, sometimes obovate-elliptic or lanceolate, apex shortly acuminate to subcaudate, base ± acutely attenuate, subcoriaceous, shining, glabrous or very early so, 5-12(-16) by 2.5-6.5 cm, nerves (5-)6-8 pairs, lower ones more erect, upper ones more spreading and mostly rather straight from the midrib, ± obscurely in-arching before the edge, moderately raised beneath, veins lax, generally obsolete; petiole 8-15 by 1-1.5 mm. — ♂ *Inflorescences* consisting of 2-3-chotomously arranged cymes, (5-)10-15-flowered, finely pubescent, on common slender peduncle 0.5-1.5 cm. *Calyx* cupular-patelliform, minutely 4-5-dented, puberulous, 1 mm. *Petals* connate to a distally widened tube, free in the upper third, a little fragrant, light green, glabrous, 4-5 mm. *Stamens* 4 or 5, a little exerted; filaments long-hairy below the anther cells ventrally, and more laxly so at connective dorsally. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* 2-3-chotomous, 3-5-flowered. *Calyx* and *petals* as in the ♂ flowers. *Staminodes* 5, hairy mainly on the ventral side below the anther cells. *Ovary* ± densely appressed-pubescent. *Drupe* narrowly to broadly ellipsoid, rather variable, gradually or more abruptly narrowed at both ends, 1.5-2 by 0.6-0.8 cm in dry state, said to measure 1.7-2 by 1-1.5 cm in fresh state; exocarp fleshy, milky-white, almost vanishing at full maturity; endocarp fibrous, longitudinal ribs numerous, low.

Distr. *Malesia*: Java and Lesser Sunda Is. (Bali, Lombok).

Ecol. Primary and secondary forest, scattered in the lowland, more frequent in montane forest, (50-)600-1200(-1700) m.

Vern. *Baröböj, harëndeuj, ki johonn, ki sêkêl, ki tangkil, mitongërrët, S, djirak ireng, J, tes katësan, Mad.*

10. *Gomphandra fusiformis* SLEUM. Blumea 17 (1969) 196.

Treelet, 3 m, stem 2-4 cm ø. Branchlets very slender, tips shortly fuscous-hairy. *Leaves* oblong, apex per 1-2 cm subabruptly and narrowly

acuminate (tip often curved and bluntish), base cuneate, chartaceous, lead-coloured greenish, but slightly brownish, dull, glabrous, 8-13 by 2.5-3.5 cm, nerves 8-10 pairs, lowest pair slightly supra-basal and high curved-ascending, upper pairs from the midrib in a wider angle, more straight and looping, forming an intramarginal nerve with the basal pair, hardly raised beneath; petiole 6-10 by c. 1 mm. — *Inflorescences* consisting of 1 or 2 few-flowered cymes, together on top of a slender peduncle (1 cm), very shortly pubescent. *Calyx* cupular, minutely 4-dented, ciliate, 1 mm. *Petals* connate for their lower ¾ part into a distally widened tube, glabrous, white, 3.5 mm. *Stamens* 4, shortly exerted; filaments penicillate on upper ventral side. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* reduced to a few-flowered, almost umbelliform and shortly peduncled cyme. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 4, laxly penicillate. *Ovary* densely shortly rusty-pubescent, the glabrous very base excepted. *Drupe* fusiform, subabruptly rostrate-attenuate at apex, more gradually so at base, very base somewhat cupuliform-inflated and quite smooth, whilst above the endocarp shows several longitudinal low ridges, (2-)2.3-2.5 by 0.6-0.7 cm.

Distr. *Malesia*: Central W. Sumatra (Mt Sago near Pajakumbuh).

Ecol. Forest, 900-1200 m.

11. *Gomphandra australiana* F. v. M. Fragm. Phyt. Austr. 6 (1867) 3; VALET. Crit. Overz. Olacin. (1886) 226, t. 4, f. 20 a-h, t. 5, f. 23b; F. M. BAILEY, Compr. Cat. Q. Pl. (1913) 93; C. T. WHITE, Proc. R. Soc. Queensl. 53 (1942) 212; SLEUM. Blumea 17 (1969) 197. — *G. axillaris* (non WALL.) BECC. Malesia 1 (1877) 110, pr. *specim. papuan.*: t. 4, f. 8-13. — *Stemonurus australianus* (F. v. M.) O. KTZE, Rev. Gen. Pl. 1 (1891) 112. — *G. polymorpha* (non WIGHT) F. M. BAILEY, Bot. Bull. Queensl. Dep. Agr. Brisbane 8 (1893) 71; Compr. Cat. Q. Pl. (1913) 93. — *Stemonurus ramuensis* LAUT. in K. Sch. & Laut. Nachtr. (1905) 305; SCHELLENB. Bot. Jahrb. 58 (1923) 163; BIRNIE, Nova Guinea 14, 2 (1926) 275. — ? *Stemonurus viridis* SCHELLENB. Bot. Jahrb. 58 (1923) 163. — *G. ramuensis* (SCHELLENB.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238. — ? *G. viridis* (SCHELLENB.) SLEUM. l.c. 239.

Tree, 6-25 m, sometimes with buttresses up to 3 m high. Branchlets generally quite glabrous. *Leaves* oblong- to ovate-elliptic, apex shortly, bluntly and gradually, more rarely ± abruptly acuminate, base broadly cuneate to almost rounded slightly inequilateral, coriaceous, practically glabrous, (6-)10-17(-20) by 5-7(-8) cm, dull greenish-olivaceous when dry, the undersurface often minutely tubercled, nerves (4-)5-6 curved-ascending pairs, hardly depressed above, slightly prominent beneath, veins lax, rather obscure; petiole (0.7-) 1-1.5 cm by 1.5-2 mm. — ♂ *Inflorescences* consisting of 2 or 3 divaricate (3-)5-7-flowered cymes, together on peduncle 0.5-1 cm, covered with short substrigose hairs, the petals excepted. *Calyx* cup-shaped, hardly dented, 1-1.3 mm. *Petals* white

or greenish, coherent in the lower $\frac{2}{3}$ for a long time into a narrow-campanulate tube 2.5–3 mm. *Stamens* hardly or not exerted; filaments widened upwards, 2–2.3 mm, glabrous; anther cells 1 mm. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* with 2–4 flowers on top of slender peduncle (c. 1 cm). *Calyx* and *petals* as in ♂ flowers. *Staminodes* present. *Ovary* glabrous. *Drupe* ellipsoid, obtuse at both ends, pale reddish, with 12–15 rather marked longitudinal ridges down to the very base, 1.8–2 (–2.3) by 1–1.2 cm.

Distr. Australia (North Queensland); in *Malesia*: Kai Is. and New Guinea.

Ecol. Primary forest, scattered from the lowland up to 500 m.

12. *Gomphandra pallida* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238; *Blumea* 17 (1969) 197. — *Stemonurus gracilis* SCHELLENB. Bot. Jahrb. 58 (1923) 164, non *G. gracilis* KING, 1895.

Shrub or treelet, 5–7 m. Branchlets quite glabrous. *Leaves* oblong-elliptic or elliptic, apex subabruptly acuminate for 1–2 cm, base broadly cuneate, slightly inequilateral, subcoriaceous or firmly chartaceous, glabrous, dull olivaceous in dry state, minutely tubercled beneath, 8–18 by (3.5–)4–6(–7) cm, nerves 4–5(–6) curved-ascending pairs, a little raised beneath only, veins and veinlets faintly prominent-reticulate in fully mature leaves; petiole 1–1.5 cm by 1–1.5 mm. — ♂ *Inflorescences* with 2 or 3 few-flowered cymes together on top of slender peduncle (0.5–1 cm), very shortly pubescent, the petals excepted. *Calyx* cup-shaped, hardly dented, 0.5 mm. *Petals* 5, thin, white, connate in the lower $\frac{2}{3}$ to a slightly dilated tube, 3.5 mm. *Stamens* 5, widely exerted; filaments elongate-linear, glabrous, 4.5 mm; anther cells 0.5 mm. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* few-flowered; flowers unknown. Juvenile *drupe* glabrous.

Distr. *Malesia*: New Guinea (Sepik Distr.), twice found.

Ecol. Swampy alluvial forest, 20–50 m.

13. *Gomphandra mappioides* VALET. Crit. Overz. Olacin. (1886) 227, f. 21, a–f; SLEUM. *Blumea* 17 (1969) 198. — *Stemonurus mappioides* (VALET.) O. KTZE, Rev. Gen. Pl. 1 (1891) 112. — *G. australiana* F. v. M. var. *celebica* VALET. in Koord. Minah. (1898) 392; Ic. Bog. 1 (1908) t. 89; HOLTH. & LAM, *Blumea* 5 (1942) 205. — *G. ? javanica* [non (BL.) VALET.] HOLTH. & LAM l.c. 205.

Tree, up to 25 m, up to 45 cm σ ; bark olive green. Branchlets appressedly puberulous in their younger parts, as are petioles and inflorescences. *Leaves* lanceolate to oblong-lanceolate or elliptic, rarely oblong-elliptic, apex attenuate-acuminate, tip acutish, base \pm broadly narrowed, firmly subcoriaceous, dark olivaceous and a little shining above, paler, more brownish and dull beneath in dry specimens, glabrous above, shortly appressedly hairy all over the undersurface initially, finally glabrescent there, the midrib excepted, finely tubercled underneath, (10–)12–16 by (2.5–)3–4.5(–8) cm, nerves 4–6(–8) spreading to rather steeply

ascending pairs, obscurely inarching before the edge, reticulation obsolete; petiole 1–1.5 cm by c. 1 mm. — ♂ *Inflorescences* with (2–)3 or 4 cymes together on top of slender peduncle (1–2 cm), each cyme expanded and \pm recurved, dense flowered, very shortly branched distally, the flowers rather laxly arranged. *Calyx* widely cup-shaped, subtruncate or shortly 5-dented, laxly hairy, 1–1.5 mm. *Petals* 5, connate for c. $\frac{3}{4}$ their length to a subcampanulate tube, white, glabrous, 3 mm. *Stamens* 5, slightly exerted; filaments densely set with rather short glandular hairs below the anther cells ventrally and dorsally at the connective, the hairs not exceeding the anther cells. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* with 3–5 cymes on top of a slender peduncle (0.5–1 cm), each cyme reduced to a single flower, the latter pedicelled for 3–5 mm and arranged in a kind of umbel. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 5, short-hairy below the void anther cells. *Ovary* cylindrical, becoming ovoid, glabrous. *Infructescences* with 2–3(–5) branches (0.5–1 cm) together on top of a peduncle (1–1.5 cm) *Drupe* subovoid-ellipsoid or ellipsoid, yellowish, (1.6–)1.8–2(–2.2) by 0.8–1 cm, apex broadly attenuate and slightly curved, rounded, rarely attenuate; endocarp with numerous longitudinal low ribs.

Distr. *Malesia*: Lesser Sunda Is. (Sumba, Flores, Wetar, Timor), Celebes, Moluccas (Morotai, Talaud, Halmahera, Ternate, Tidore, and Tanimbar Is.).

Ecol. Forests, from lowland to the montane region, occasionally up to 1600 m.

Vern. Flores: *saka*, Endeh, *te-ù*, Manggarai; Celebes: *danoan*, *makapojáan*, *makuranga* (Ts.), *sansalan*, Minahasa (Tl.), *lowa putè*, *taluha*, Malili (Tb.), *tohaka*, Makassar, *benu*, Buton; Moluccas: *anuwuka*, Talaud, *mali mali*, Tidore, *mador*, Morotai, *momodja*, *obu banga*, Ternate.

14. *Gomphandra apoensis* (ELM.) MERR. En. Philip. 2 (1923) 490; SLEUM. *Blumea* 17 (1969) 198. — *Stemonurus apoensis* ELM. Leaf. Philip. Bot. 7 (1915) 2690; HOWARD, J. Arn. Arb. 21 (1940) 487, t. 1, f. 11–14; DAHL, *ibid.* 33 (1952) 268 (pollen).

Tree, 15–20 m, trunk up to 45 cm σ . Branchlets puberulent distally. *Leaves* oblong, apex short-acuminate, tip often bluntish, base broadly attenuate to roundish, subcoriaceous, rather dark brown when dry especially above, initially sparsely set with short \pm appressed pale hairs at midrib and nerves beneath, glabrous with age, 6–13 by 2.5–4.5 cm, nerves 5–7 pairs, rather straight, obscurely inarched before the edge, slightly raised beneath, net of veins coarse and rather obscure; petiole c. 1 cm by 1–1.5 mm. — ♂ *Inflorescences* 2(–3) cm long, consisting of 2 or 3 shortly branched cymes on top of common peduncle (0.5–1 cm), subdensely 5–12-flowered, short-hairy except calyx and petals. *Calyx* \pm obconical, entire or almost so, 1.5(–2) mm. *Petals* 5, connate for the lower $\frac{2}{3}$ to a narrowly campanulate tube, white or yellowish green, 3.5–4 mm. *Stamens* 5, a little or hardly exerted; filaments with short-clavate or papillose

hairs both in front below the anther cells and on connective. Rudiment of ovary glabrous. — ♀ *Inflorescences* and *drupe* unknown.

Distr. *Malesia*: Philippines (Luzon, Negros, Mindanao; possibly also Bohol).

Ecol. Primary forest on slopes and along streams, 900 m.

Vern. *Marumai*, Bag.

15. *Gomphandra flavicarpa* (ELM.) MERR. En. Philip. 2 (1923) 490; SLEUM. *Blumea* 17 (1969) 198. — *Stemonurus flavicarpus* ELM. Leaf. Philip. Bot. 7 (1915) 2691; DAHL, J. Arn. Arb. 33 (1952) 268 (pollen).

Shrub-like or slender tree, 3–5 m, 2–10 cm ♂; bark smooth, brown. Branchlets short-pubescent. *Leaves* almost distichous, oblong to obovate-oblong, apex shortly and ± bluntly acuminate, base broadly attenuate to almost rounded, firmly chartaceous to subcoriaceous, dark brown above, much paler beneath when dry, initially sparsely hairy along lower part of the midrib, with age practically glabrous above, shortly subappressedly pubescent all over the undersurface especially on midrib and nerves (though less obviously than in *G. cumingiana*), 8–14 by 2.5–4(–5.5) cm, nerves 5–6 ascendingly curved and obscurely inarching pairs, slightly raised beneath, net of veins coarse, faintly prominent beneath; petiole puberulent, 0.8–1 cm by 1 mm. *Inflorescences* from foliate and defoliate axils, both ♂ and ♀ ones composed of 2(–3) few-flowered cymes on common peduncle (c. 5 mm), short-brownish-pubescent, the petals excepted. — ♂ *Flowers*: *Calyx* cup-shaped, 4(–5)-denticulate, 1 mm. *Petals* 4 or 5, united for the lower 2/3 to a subcampanulate tube, white or cream, 3–4 mm. *Stamens* 4 or 5, exerted for 1.5–2 mm; filaments with rather few papillose hairs in front below the anther cells and at connective. Rudiment of ovary glabrous. — ♀ *Inflorescences* 2–3-flowered. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 4 or 5, papillose. *Ovary* glabrous. *Drupe* oblongoid-fusiform, apex slightly oblique and a little beaked, base gradually attenuate, pale yellow when fresh, 1.3–1.6 by 0.5–0.6 cm; endocarp thin, with several slightly outstanding longitudinal ribs.

Distr. *Malesia*: Philippines (Mindanao).

Ecol. Montane, also mossy forest, (700–)1200–2200 m.

Vern. *Mantangali*, Manobo, *maramai*, *mata-matá*, Bag.

16. *Gomphandra oligantha* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238; *Blumea* 17 (1969) 199. — *Urandra pauciflora* MERR. Philip. J. Sc. 3 (1908) Bot. 243. — *G. pauciflora* (MERR.) MERR. En. Philip. 2 (1923) 491, non CRAIB, 1914.

Small tree, glabrous except the slightly puberulent tips of branchlets, the young petioles and the inflorescences. *Leaves* almost distichous, ovate to ovate-elliptic, or elliptic, apex ± abruptly narrowed to a subcaudate bluntish acumen (1–2 cm), base broadly cuneate, the very base often contracted and a little decurrent on the

petiole, membranous to subchartaceous, dark olive-brownish when dry, 6–10 by 2.5–5 cm, nerves 5–6 moderately curved-ascending pairs, minutely raised beneath, veins ± obscure; petiole 5–10 by hardly 1 mm. Both ♂ and ♀ *inflorescences* very lax, slender as are the peduncles (2–3 cm) and the branches. — ♂ *Flowers* (ELMER 12508) in a 3–5-flowered very lax cyme; pedicels in fully developed inflorescences 2–3 mm. *Calyx* cup-shaped, base truncate, laxly ciliate, hardly 4-dented, 1 mm. *Petals* 4, glabrous, coherent in the lower 3/4, glabrous, 3 mm. *Stamens* 4; filaments glabrous on the ventral, and with a few penicillate hairs on the dorsal side at the connective. Rudiment of ovary glabrous or maybe with a few hairs along edges. — ♀ *Flowers* in 2 or 3 very lax cymes, each cyme reduced to one flower; branches (simulating pedicels) 1–2 cm. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 4; filaments laxly long-hairy on ventral side immediately below the anther cells and at connective. *Ovary* sparsely hairy in upper part, practically glabrous. Submature *drupe* ovoid-oblongoid, apex very shortly subabruptly attenuate and maybe very sparsely hairy, base rounded, seen up to 1.3 by 0.7 cm; endocarp thin, with numerous low longitudinal ridges.

Distr. *Malesia*: Philippines (Mindoro, Sibuyan).

Ecol. Primary forest at low altitudes.

17. *Gomphandra sawiensis* (BIRNIE) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238; *Blumea* 17 (1969) 199. — *Stemonurus sawiensis* BIRNIE, Nova Guinea 14, 2 (1926) 275.

Tree, c. 6 m. Branchlets fulvous-tomentellous at tips. *Leaves* oblong, apex shortly acuminate or sometimes obtuse, base cuneate, chartaceous, initially sparsely appressedly long-hairy all over especially beneath, at maturity practically glabrous, brownish when dry, with numerous pale tubercles on both faces, 10–15(–18) by 3–5(–7) cm, nerves 7–8(–9) pairs, spreading and rather straight, raised beneath, transverse veins visible, no reticulation; petiole descending on the branchlet as a slight ridge to the next leaf, 1–1.5 cm by 1.5–2 mm. — ♂ *Inflorescences* few-flowered cymes on very short common peduncle, all over densely appressedly fulvous-pubescent, 1–1.5 cm long in all. *Calyx* widely cup-shaped, base truncate, edge subentire, 2 mm. *Petals* 4, remaining connate for their lower 2/3 at anthesis, ± densely appressedly hairy outside, 5–5.5 mm. *Stamens* 4, a little exerted; filaments densely clavate-hairy in the upper half on the ventral, less so on the dorsal side. Rudiment of ovary glabrous. — ♀ *Inflorescences* and *drupe* unknown.

Distr. *Malesia*: West New Guinea (Hollandia), once found.

Ecol. Forest, 100 m.

18. *Gomphandra dolichocarpa* MERR. Pap. Mich. Ac. Sc. 23 (1938) 183; SLEUM. *Blumea* 17 (1969) 199. — *Stemonurus dolichocarpus* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 468; DAHL, *ibid.* 33 (1952) 268 (pollen).

Tree or treelet. Branchlets densely short-hairy in youngest parts. *Leaves* oblong, rarely elliptic-oblong, apex rather suddenly narrow-acuminate for 1–2 cm, tip bluntish, base cuneate to the petiole, a little inequilateral, firmly chartaceous to subcoriaceous, olivaceous to brown above, paler beneath when dry, (12–)16–25 by 5–8 cm, glabrous above, hairy at midrib and nerves, glabrous otherwise beneath, nerves 10–12 pairs, the lowest pair generally more steeply ascending than the other ones, all nerves markedly looping before the edge, generally a little impressed above, raised beneath, transverse veins finely prominent beneath, no reticulation; petiole hairy initially, c. 1 cm by 1.5–2 mm. — ♂ *Inflorescences* composed from several short few-flowered cymes on top of a peduncle (5–8 mm), densely fuscous short-hairy all over, the petals excepted. *Calyx* cup-shaped, base truncate, obscurely 4–5-dented, 1.5 mm. *Petals* forming a narrow-campanulate tube 4–5-lobed halfway or partly further down, glabrous, 3.5 mm. *Stamens* 4(–5), slightly exserted; filaments with penicillate hairs in upper half of the ventral, less densely so on dorsal side. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* bearing 3–4 flowers clustered on top of peduncle (5 mm). *Calyx* and *petals* as in ♂ flowers. *Staminodes* not seen. *Ovary* glabrous. *Drupes* 2 or 3 per infructescence, known only in submature state, fusiform, 3.5–4 by 0.5–0.6 cm, the much attenuate distal rostrate and the basal part each c. 5 mm.

Distr. *Malesia*: Sumatra (Eastcoast).

Ecol. Apparently in montane forest, no altitude given by the collectors.

Vern. *Kaju atimang, k. barik, k. rawet, M.*

19. *Gomphandra lancifolia* MERR. Philip. J. Sc. 17 (1920) 277; En. Philip. 2 (1923) 490; SLEUM. *Blumea* 17 (1969) 199. — *Stemonurus lancifolius* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 468.

Tree, c. 6 m, practically glabrous. *Leaves* narrow-lanceolate, apex subcaudate-acuminate, tip bluntish, base acuminate-attenuate to the petiole, chartaceous to subcoriaceous, brown when dry, 7–10.5 by (1.5–)2–2.8 cm, nerves 3(–4) pairs, the lowest pair from c. 5 mm above the base and steeply ascending halfway the blade, upper ones more curved and shorter, all slightly raised beneath; petiole c. 1 cm by 1.5 mm. *Inflorescences* not known. *Drupe* 1 or 2 per infructescence, each on 5–10 mm long branches, these on a common robust almost glabrous peduncle (5 mm), obovoid-oblongoid, 2.5–3 cm by c. 1 cm; fleshy exocarp salmon; endocarp with several coarse longitudinal ridges.

Distr. *Malesia*: Philippines (Luzon: Mt Dingalang in Tayabas Prov.), once found.

Ecol. Primary forest, 200 m.

Vern. *Paranuyog, Neg.*

20. *Gomphandra luzoniensis* (MERR.) MERR. En. Philip. 2 (1923) 490; SLEUM. *Blumea* 17 (1969) 199. — *Elaeocarpus? integrifolius* BLANCO, Fl. Filip. ed. 2 (1845) 306; *ibid.* ed. 3, 2 (1878) 202, non LAMK, 1788. — *Urandra luzoniensis* MERR. Philip. J. Sc.

3 (1908) Bot. 242; Spec. Blanc. (1918) 237. — *Stemonurus luzoniensis* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 468; DAHL, *ibid.* 33 (1952) 268 (pollen).

Tree, (5–)12–30 m, up to 40 cm ø. Branchlets usually reddish-brown in dry specimens, glabrous. *Leaves* elliptic to obovate-elliptic, apex ± abruptly acuminate for c. 1 cm, tip generally bluntish, base gradually cuneate-acuminate to the petiole, coriaceous, dark brown and shining above when dry, practically glabrous with age, 7–15 by 4–6(–8) cm, nerves c. 5 (rarely –7) pairs, rather straight in the lower, curved ascending in the distal part, slightly raised beneath, reticulation almost obsolete; petiole strongly grooved above, 1–1.5 cm by 1.5–2 mm. — ♂ *Inflorescences* with 3–5 cymes on a common stoutish peduncle (1–3 cm), the rather numerous flowers ± scorpioidly arranged along the branches (5–10 mm), subdensely set with rusty appressed hairs on peduncle and branches. *Calyx* widely cup-shaped, base truncate, edge minutely 5-dented (sometimes more deeply disrupted), subglabrous, 1–1.5 mm. *Petals* 4, greenish-whitish, glabrous, connate in their lower 2/3 part, 4–5 mm. *Stamens* 5, finally somewhat exserted; filaments with long clavate-penicillate hairs on the inner side below the anther cells and on the connective. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* more lax and with fewer flowers. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 5, less densely hairy than in ♂ flowers. *Ovary* glabrous. *Drupe* oblongoid to broadly ellipsoid, very apex a little oblique, otherwise equally rounded at both ends, 2–2.5 by (0.8–)1–1.2 cm; exocarp thin-coriaceous, becoming blackish when dry; endocarp with numerous longitudinal low ridges down to the very base, thin-woody.

Distr. *Malesia*: Philippines (Luzon, Mindoro, Marinduque, Panay, Palawan).

Ecol. Primary forest under partial shade or forest edge, at low altitudes, rarely up to 850 m, locally common.

Vern. *Bibisldkin, Imus, rogrogsó, Ilk., bitlag, mabúnót, manankálau, Tag., maratúba, Ikn.*

21. *Gomphandra montana* (SCHELLENB.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238; *Blumea* 17 (1969) 200. — *Stemonurus montanus* SCHELLENB. Bot. Jahrb. 58 (1923) 162. — *G. carrii* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 239. — *G. sp.*, WALKER, For. Fl. Br. Solomon Is. (1948) 127.

Shrubby treelet or tree, 3–20 m, up to 25 cm ø; bark smooth, light grey to creamy brown. Branchlets appressedly hairy at tips. *Leaves* elliptic to lanceolate-oblong, apex short-acuminate to subcaudate (2–3 cm), tip acutish, base attenuate, thin-coriaceous, glabrous above, laxly short-hairy initially and early glabrescent beneath, dark to olivaceous-brown, dull and often minutely tubercled above, paler and usually more greenish-olivaceous beneath in dry specimens, (8–)10–16 (–18) by (3.5–)4–6 (rarely –8) cm, nerves 5–6(–7) rather straight ascending pairs, raised beneath, no reticulation; petiole 1–1.5 cm by c. 2 mm. — ♂ *Inflorescences* consisting of 2 or 3(–4) few-

to many-flowered cymes, together on a rather stoutish peduncle (1–2 cm by 1 mm), fulvous-puberulous. *Calyx* widely cup-shaped, subtentire, mostly laxly hairy, 1–1.5 mm. *Petals* 5, remaining connate to a subcampanulate tube for their lower $\frac{3}{4}$ part, greenish-whitish, glabrous (maybe with a few hairs at apex), (3–)4–5 mm. *Stamens* 5, exerted for 1–2 mm; filaments set with few to numerous longish hairs ventrally below the anther cells, much less or not so dorsally at connective. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* with 3 or 4 one-flowered branches (3–6 mm) on top of a common peduncle (c. 1 cm). *Calyx* and *petals* as in ♂ flowers. *Staminodes* 5, laxly or not hairy. *Ovary* glabrous. *Drupe* subelliptic-oblongoid, slightly asymmetrical, ± obtuse at both ends, base sometimes slightly (or unilaterally) swollen, pale yellowish green, sometimes with reddish or orange tinge, 2–2.5 (rarely –3.2) by (0.9–)1–1.2(–1.5) cm, ribs of endocarp marked and down to or almost to the very base.

Distr. Melanesia (New Britain, New Ireland, Solomon Is. and Santa Cruz Group); in *Malesia*: New Guinea.

Ecol. Primary lowland and montane, also swampy, sometimes secondary or devastated forest, usually in understorey, locally not rare, from sea-level up to 1675 m.

Uses. Wood creamy to whitish, rays prominent, no use known, apparently due to its small dimensions.

Vern. *Aiyalo*, Kwara'ae.

Note. Difficult to separate from *G. australiana* F. v. M. in leaf and fruit characters, though certainly different in flower structure.

22. *Gomphandra parviflora* (BL.) VALET. Crit. Overz. Olacin. (1886) 218, t. 4, f. 10 & 11; SLEUM. Blumea 17 (1969) 200. — *Stemonurus parviflorus* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 250; WALP. Ann. 2 (1851) 182; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 36, repr. Contr. Bot. 1 (1852) 87; O. KTZE, Rev. Gen. Pl. 1 (1891) 112. — *Lasianthera parviflora* (BL.) MIQ. Fl. Ind. Bat. 1 (1856) 791; Suppl. (1860) 137.

Treelet. Branchlets with minutely pubescent tips. *Leaves* oblong to elliptic-oblong, rarely lanceolate or oblanceolate-oblong, apex shortly rather abruptly acuminate for 1–2 cm, base broadly cuneate and slightly inequilateral, firmly membranous to subchartaceous, glabrous, greenish-greyish to olivaceous and dull in dry specimens, (10–)15–22(–30) by 4–8 cm, nerves (8–)10–12(–14) rather straight and spreading pairs, ± parallel to each other and looping before the edge, the lowest pair in part of the leaves (in the same specimen!) ascending in a more acute angle from the midrib, reticulation none; petiole often yellowish as is the midrib beneath in dry specimens, 1–1.3 cm by 1.5 mm. — ♂ *Inflorescences* with 2(–3) few-flowered cymes, these ± umbellately arranged on top of a slender peduncle (c. 5 mm), shortly appressedly rusty-pubescent on peduncle and branches. *Calyx* cup-shaped, base truncate, laxly short-hairy, minutely 5-dented,

1 mm. *Petals* 5, united to a cup-shaped tube for their lower $\frac{2}{3}$, glabrous, c. 3 mm. *Stamens* 5, slightly exerted; filaments practically glabrous ventrally, but set with penicillate hairs dorsally at connective. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* with 2 or 3 shortly pedicellate flowers on top of a common peduncle (3–5 mm). *Calyx*, *petals* and *staminodes* not known. *Ovary* glabrous. *Drupe* subfusiform-oblongoid, apex broadly attenuate and a little oblique, base more slenderly narrowed, very base cup-like swollen for c. 1.5 mm and smooth, i.e. the rather low longitudinal ridges of the endocarp ending there, 1.7–2(–2.2) by 0.6 cm.

Distr. *Malesia*: Central W. Sumatra (Mt Singgalang area), twice found.

23. *Gomphandra subrostrata* MERR. Pap. Mich. Ac. Sc. 19 (1934) 164, t. 27; SLEUM. Blumea 17 (1969) 200. — *Stemonurus subrostratus* (MERR.) HOWARD J. Arn. Arb. 21 (1940) 469.

Treelet or tree, 2.5–7 m. Branchlets rusty- to rufous-tomentellous at the younger parts, as are the petiole and midrib and nerves of mature leaves beneath, older parts glabrate. *Leaves* oblong to elliptic-oblong, apex gradually or more abruptly acuminate (often slightly falcate) for 1–3 cm, base broadly attenuate to rounded, a little inequilateral, firmly chartaceous, dark brown to blackish brown and somewhat shining above, paler and dull beneath in dry specimens, 15–25 by 4.5–9 cm, nerves 8–10 pairs, rather straight below, more curved and ± obscurely inarching before edge, raised beneath, veins obsolete; petiole 5–8(–10) by 2 mm. — ♂ *Inflorescences* with 2 or 3 ± scorpioid several-flowered cymes together on top of peduncle (0.5–1 cm), peduncle and branches rusty-tomentellous except the uppermost part of branches (or pedicels) immediately below the calyx which is glabrous and black in dry specimens. *Calyx* (LÖRZING 6690) cup-shaped, base truncate, sparsely short-hairy in upper half, ciliate, 4–5-dented, 1.3 mm. *Petals* 4 or 5 connate about halfway to a narrow-campanulate tube, glabrous, whitish or greenish, 3.5 mm. *Stamens* 4 or 5, exerted for c. 1 mm; filaments penicillate both below the anther ventrally and dorsally. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* with 1 or 2 few-flowered cymes on top of a common peduncle (c. 5 mm). *Calyx* and *petals* as in ♂ flowers. *Staminodes* not observed. *Ovary* glabrous. Submature *drupe* oblong-ovoid, apex shortly rather abruptly attenuate or subrostrate (beak erect), base rounded, 10–15 by 5–6 mm; exocarp glaucous, paler on both ends of drupe; endocarp with very low longitudinal ridges.

Distr. *Malesia*: Sumatra (Eastcoast).

Ecol. Primary forest, rare, 350–850 m.

24. *Gomphandra quadrifida* (BL.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 238; Blumea 17 (1969) 200; Fl. Thail. 2 (1970) 78. — *Stemonurus quadrifidus* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 249; WALP. Ann. 2 (1851) 182; MIERS, Ann. Mag. Nat. Hist.

II, 10 (1852) 36, repr. *Contr. Bot.* 1 (1852) 86. — *Stemonurus prasinus* BL. *Mus. Bot. Lugd.-Bat.* 1 (1850) 249; WALP. *Ann.* 2 (1851) 182; MIERS, *Ann. Mag. Nat. Hist.* II, 10 (1852) 36, repr. *Contr. Bot.* 1 (1852) 86; O. KTZE, *Rev. Gen. Pl.* 1 (1891) 112. — *Stemonurus penangianus* MIERS, *Ann. Mag. Nat. Hist.* II, 10 (1852) 39, repr. *Contr. Bot.* 1 (1852) 90; KURZ, *J. As. Soc. Beng.* 44, ii (1875) 155; *For. Fl. Burma* 1 (1877) 239; O. KTZE, *Rev. Gen. Pl.* 1 (1891) 112. — *Lasianthera javanica* (BL.) MIQ. *var. quadrifida* (BL.) MIQ. *Fl. Ind. Bat.* 1 (1856) 790. — *Lasianthera prasina* (BL.) MIQ. *l.c.* 791; *Suppl.* 1 (1860) 137. — *Lasianthera ? ovalifolia* MIQ. *Fl. Ind. Bat. Suppl.* 1 (1860) 137, 342; BECC. *Malesia* 1 (1877) 111. — *G. penangiana* WALL. *Cat.* (1832) n. 7204, *nom. nud.*; ex MAST. in Hook. *f. Fl. Br. Ind.* 1 (1875) 587; VALET. *Crit. Overz. Olacin.* (1886) 223; KING, *J. As. Soc. Beng.* 64, ii (1895) 113; BRANDIS, *Ind. Trees* (1906) 151; RIDL. *Fl. Mal. Pen.* 1 (1922) 427; BURK. *Dict.* (1935) 1096. — *G. prasina* (BL.) BECC. *Malesia* 1 (1877) 110; VALET. *Crit. Overz. Olacin.* (1886) 228, *incl. var. ovalifolia* (MIQ.) VALET. *l.c.* 225, t. 4, f. 17, a-b. — *G. oppositifolia* PIERRE ex GAGNEP. *Not. Syst.* 1 (1910) 198; *Fl. Gén. I.-C.* 1 (1911) 825. — *G. puberula* RIDL. *J. Fed. Mal. St. Mus.* 6 (1915) 142. — *G. affinis sensu* RIDL. *Fl. Mal. Pen.* 1 (1922) 427, *incl. var. floribunda* RIDL.; BURK. *Dict.* (1935) 1096; DAHL, *J. Arn. Arb.* 33 (1952) 268 (pollen). — *G. maingayi* KING *var. pubescens* RIDL. *Fl. Mal. Pen.* 1 (1922) 429. — *G. lanceolata* (MAST.) KING *var. tenuifolia* CRAIB, *Fl. Siam. En.* 1 (1926) 273. — *Stemonurus oppositifolius* (PIERRE ex GAGNEP.) HOWARD, *J. Arn. Arb.* 21 (1940) 469. — *G. scorpioidea* GAGNEP. *Not. Syst.* 13 (1947) 133; *Fl. Gén. I.-C. Suppl.* (1948) 749, f. 89, 7.

See for further synonyms under the varieties.

KEY TO THE VARIETIES

1. Leaves oblong to elliptic-oblong, rarely elliptic or subovate-oblong, 10-15(-25) by 4-6(-11) cm, nerves 6-8(-10, rarely more) pairs, ± markedly looping before the edge.
 1. *var. quadrifida*
1. Leaves often smaller, nerves (3-)-4-5(-6) pairs.
 2. Leaves with a pair of slightly suprabasal, high curved-ascending 'melastomaceous' nerves, other nerves ± rectangularly from the midrib faint or obscure. 2. *var. triplinervis*
 2. Leaves with more numerous, straight or more curved pairs of nerves subparallel to each other.
 3. Leaves narrowly oblong-lanceolate, sometimes almost linear, 5-12(-18) by (0.5-)-0.8-2 cm 3. *var. angustifolia*
 3. Leaves lanceolate to oblong, rarely subovate-lanceolate, (4-)-5-10(-14) by (1.5-)-2-4 cm.
 4. Nerves ± spreading except the basal pair, generally obscurely looping before the edge.
 4. *var. ovalifolia*

4. Nerves all steeply ascending, prominent and markedly looping before the edge.
 5. *var. maingayi*

1. *var. quadrifida*.

Shrub or treelet, 0.7-5 m. Branchlets often yellowish in dry specimens, tips only appressedly short-hairy. *Leaves* oblong to elliptic-oblong, rarely elliptic or subovate-oblong, apex subacutely or obtusely and rather abruptly acuminate for 1-2 cm, base broadly attenuate, generally slightly inequilateral, membranous to chartaceous, green or greenish brownish and rather dull in the dry state, glabrous, 10-15(-25) by (3-)-4-6(-11) cm, nerves 6-8(-10, rarely more) pairs, rather straight and subparallel below, markedly looping before the edge, a little raised beneath, veins subinconspicuous, reticulation obscure or generally none; petiole 10(-15) by 1.5 mm. — ♂ *Inflorescences* consisting of 3-6 (rarely more) shortly peduncled and repeatedly branched ± scorpioid cymes, these subumbellately collected on top of a rather slender short-hairy peduncle (1-2 cm), each cyme rarely few-, generally rather many-flowered, the flowers in the latter case more distinctly inserted on one side. *Calyx* widely cup-shaped, shortly 4-5-dented, hardly 1 mm. *Petals* 4(-5), connate to a tube for the lower ¾ part, white or cream, glabrous, (3-)-4(-5) mm. *Stamens* 4(-5), slightly to more manifestly exerted; filaments densely covered with longish clavate hairs ventrally below the anther cells and dorsally at connective. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* similar to the ♂ ones, though generally less branched and few-flowered. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 4(-5), hairy. *Ovary* glabrous. *Drupe* in immature state ± ovoid, its apex markedly attenuate and the base suddenly contracted into a kind of (very) short foot, in mature state ellipsoid to subovoid-ellipsoid, rarely more oblongoid-ellipsoid, apex gradually attenuate or subapiculate, base broadly narrowed, the very base generally distinctly swollen and smooth, whilst the upper part of the endocarp bears several longitudinal ribs, 0.8-1 (-1.2, -1.4) by 0.6-0.7(-0.8) cm.

Distr. Lower Burma, Thailand, and Indo-China; in *Malesia*: Sumatra (incl. also Mentawai Is.) and Malay Peninsula.

Ecol. Primary, also swampy forest, from lowland up to 900 (in S. Thailand up to 1200) m, occasionally on limestone, locally common.

Uses. A decoction of the root is used in Malaya after childbirth (BURKILL & HANIFF, *Gard. Bull. S. S.* 6, 1930, 184), as is that of *var. angustifolia*.

Vern. Sumatra (Asahan): *kaju barik barik, k. minak minak, k. topu lisak, k. si topu minak*; Malaya: *akar taring pelandok, hēmpedu jawa, ulan hitam, M.*

2. *var. triplinervis* (KING) SLEUM. *Blumea* 17 (1969) 202. — *G. lanceolata* (MAST.) KING *var. triplinervis* KING, *J. As. Soc. Beng.* 64, ii (1895) 112; RIDL. *Fl. Mal. Pen.* 1 (1922) 428.

Leaves oblong to elliptic, rarely subovate-oblong, 10–15(–18) by 2–4(–6) cm, with a slightly suprabasal nerve on either side of the midrib, steeply ascending to almost the top of the blade, other lateral nerves straight from the midrib, numerous and subparallel, obscure above, rather faint beneath.

Distr. *Malesia*: Sumatra (W. Indragiri), Malay Peninsula (Kedah incl. also Langkawi, Penang, Perak, Trengganu).

Ecol. Primary lowland (Dipterocarp) forest, up to 150 m.

3. var. angustifolia (KING) SLEUM. *Blumea* 17 (1969) 202; Fl. Thail. 2 (1970) 79. — *G. lanceolata* (MAST.) KING var. *angustifolia* KING, J. As. Soc. Beng. 64, ii (1895) 113; RIDL. Fl. Mal. Pen. 1 (1922) 428. — *G. salicifolia* RIDL. Fl. Mal. Pen. 1 (1922) 429; BURK. Dict. (1935) 1097. — *Stemonurus salicifolius* (RIDL.) HOWARD, J. Arn. Arb. 21 (1940) 469.

Shrub or small tree (rarely up to 20 m tall) with wiry branches. *Leaves* narrowly (oblong-) lanceolate, sometimes almost linear, thinly subcoriaceous, 5–12 (rarely –18) by (0.5–)0.8–2 cm, nerves 4–5 pairs rather inconspicuous beneath. *Flowers* and *drupe* apparently slightly smaller than in var. *quadrifida*.

Distr. S.Thailand; in *Malesia*: Malay Peninsula.

Ecol. Lowland and mainly montane forest, often along riverside, 100–1220 m.

Vern. *Daun ekur bukit dërimba*, M.

4. var. ovalifolia (RIDL.) SLEUM. *Blumea* 17 (1969) 203; Fl. Thail. 2 (1970) 79. — *G. lanceolata* (MAST.) KING var. *ovalifolia* RIDL. Fl. Mal. Pen. 1 (1922) 428. — *Stemonurus affinis* MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 44, repr. Contr. Bot. 1 (1852) 94, t. 15. — *G. affinis* (MIERS) MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 586. — *Lasianthera lanceolata* MAST. l.c. 585. — *Stemonurus ? tomentellus* VALET. Crit. Overz. Olacin. (1886) 237. — *G. lanceolata* (MAST.) KING, J. As. Soc. Beng. 64, ii (1895) 112; RIDL. Fl. Mal. Pen. 1 (1922) 428; BURK. Dict. (1935) 1096. — *G. pubescens* RIDL. Fl. Mal. Pen. 1 (1922) 429. — *G. ophirensis* RIDL. l.c. 427, nom. illeg.

Small tree or shrub. *Leaves* lanceolate to oblong- or subovate-lanceolate, firmly membranous to subcoriaceous, sometimes sparingly pubescent beneath, (5–)8–14 by 2–4 cm, nerves (3–)4–5(–6) ± spreading and generally obscurely looping pairs. *Inflorescence* mostly with less numerous flowers than and not as manifestly scorpioid as in var. *quadrifida*, with which it shares the characters of flowers and fruits.

Distr. Thailand; in *Malesia*: Malay Peninsula.

Ecol. Primary rain-forest, and also rather dry *Dryobalanops* forest, from lowland up to 1200 (–1525) m, locally not rare.

Uses. A decoction of the roots is said to be administered for rheumatism, and wood-tar, made from the stems, to be used to chacken teeth.

Vern. *Bëdara*, *buas* *puteh*, *chëmpërai ayam*, *ch. batu*, *ch. hitam*, *Kayu gërang jantan*, *k. kësturi hutan*, *k. mënghilang api*, *k. mërësëk hitam*, *k.*

sërëndah, *lada lada*, *lambas*, *lëmpëdu tanah jantan*, *pokok lilan hitam*, *sëbasah paya*, M.

5. var. maingayi (MAST.) SLEUM. *Blumea* 17 (1969) 203. — *Lasianthera maingayi* MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 585. — *Stemonurus ? maingayi* (MAST.) VALET. Crit. Overz. Olacin. (1886) 236. — *Urandra maingayi* (MAST.) O. KTZE, Rev. Gen. Pl. 1 (1891) 113. — *G. maingayi* (MAST.) KING, J. As. Soc. Beng. 64, ii (1895) 114; RIDL. Fl. Mal. Pen. 1 (1922) 429.

Leaves lanceolate to subovate-lanceolate, apex subcaudate, subcoriaceous, nerves c. 6 steeply ascending pairs, shallowly or hardly impressed above, raised beneath, manifestly looping before the edge, the veins more visible than in var. *ovalifolia*, (4–)5–8 by (1.5–)2–3(–4) cm. *Flowers* and *drupe*s apparently matching those of var. *quadrifida*.

Distr. *Malesia*: Malay Peninsula (Penang).

Ecol. Forest on hillsides, 900–1500 m.

25. Gomphandra schoepfiifolia SLEUM. Notizbl. Berl. — Dahl. 15 (1940) 241; *Blumea* 17 (1969) 204.

Tree, 7–20 m, trunk 10–30 cm ø. Branchlets puberulent at tips, becoming blackish in dry state. *Leaves* oblong, apex rather abruptly acuminate for c. 1 cm, tip bluntish, base cuneate, firmly chartaceous to subcoriaceous, blackish above, brownish-blackish beneath, dull and brittle in dry specimens, 6–9(–10) by 2–4 cm, nerves 5(–6) pairs, curved-ascending, a little raised beneath, no reticulation; petiole 6–8 by 1 mm, glabrescent. — ♂ *Inflorescences* with 3–4(–5) branches (0.5–1 cm) together on top of slender peduncle (1–1.5 cm), each branch bearing a 3–5-flowered cyme, densely covered with minute red brown appressed hairs. *Calyx* obconical, minutely 5-dented, laxly hairy, 1.5 mm. *Petals* 5, firm in texture, whitish, remaining connate in the lower ¾ part, glabrous, c. 4 mm. *Stamens* 5, hardly or not exerted; filaments with rather few longish hairs ventrally below the anther cells. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* shorter than ♂ ones and with less numerous flowers. *Calyx* and *petals* as in ♂ flowers. *Staminodes* 5, subglabrous. *Ovary* glabrous. *Drupe* elongate-ellipsoid, known only in immature state.

Distr. *Malesia*: New Guinea (Central & Morobe Distr.).

Ecol. In montane rain-forest, 1500–1950 m.

26. Gomphandra pseudoprasina SLEUM. Notizbl. Berl.–Dahl. 15 (1940) 240; *Blumea* 17 (1969) 204. — *G. prasina* [non (BL.) BECC.] WARB. Bot. Jahrb. 13 (1891) 299. — *Stemonurus prasinus* (non BL.) K. SCH. & LAUT. Fl. Schutzgeb. (1900) 414; SCHELLENB. Bot. Jahrb. 58 (1923) 163.

Tree, 5–10 m. Branchlets practically glabrous. *Leaves* oblong, apex shortly acuminate, subacute, base ± broadly cuneate, coriaceous, olivaceous-brownish and dull in dry specimens, glabrous except some sparse hairs on midrib and finely tubercled beneath, 10–17(–22) by 4–6(–8) cm, nerves 5–6 curved or more straight pairs, obscurely or not anastomosing, a little raised beneath, gen-

erally no reticulation visible, though fully mature leaves show a very fine impressed reticulation above; petiole 0.7–1 cm by 1.5–2 mm. — ♂ *Inflorescences* composed of several few-flowered shortly branched cymes together on a stoutish peduncle, 1.5–2.5 cm long in all, covered with minute rusty hairs. *Calyx* cup-shaped, 5-denticulate, 1.5 mm. *Petals* 5, free only in their upper part at full anthesis, fleshy, very laxly short-hairy to practically glabrous, 4 mm. *Stamens* 5, a little exserted; filaments hairy ventrally below the anther cells. Rudiment of *ovary* glabrous. — ♀ *Inflorescences* with 3–4 one-flowered branches (c. 5 mm) together on top of stoutish peduncle (1–1.5 cm). *Calyx* and *petals* as in ♂ flowers. *Staminodes* 5. *Ovary* glabrous. *Drupe* subovoid-ellipsoid in submature state, apex ± abruptly attenuate and a little curved, almost beaked, base attenuate, the endocarp slightly ribbed longitudinally, c. 1.9 by 0.9 cm, probably somewhat longer and more markedly ribbed in fully mature state.

Distr. *Malesia*: New Guinea (Morobe & Madang Distr.: Sattelberg and Kani Mts).

Ecol. Montane rain-forest, 600–1500 m.

Imperfectly known

27. *Gomphandra oblongifolia* MERR. Philip. J. Sc. 17 (1920) 276; En. Philip. 2 (1923) 491; SLEUM. *Blumea* 17 (1969) 206. — *G. sorsogonensis* ELM. Leaf. Philip. Bot. 10 (1939) 3748. — *Stemonurus oblongifolius* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 469.

Tree or treelet, up to 10 m. Branchlets pu-

berulent at tips. *Leaves* oblong to oblong-elliptic, apex shortly acute to acuminate, base subequally narrowed, subacute to obtuse, firmly chartaceous to subcoriaceous, glabrous, brownish, shining and with flattish tubercles above, paler and dull beneath when dry, (6–)7–15 by (2.7–)3.5–6 cm, nerves 4–5(–6) pairs, curved-ascending, the upper ones obscurely anastomosing, slightly raised beneath, no reticulation; petiole c. 1 cm by 1.5 mm. *Inflorescences* not known. *Infructescences* sparingly pubescent, with 2 or 3 cymose branches (0.5–1 cm, each with 1 or 3, rarely 3 fruits) on a common stoutish peduncle (1–1.5 cm). *Drupe* oblongoid-ellipsoid to slightly obovoid-ellipsoid, i.e. the base more attenuate than apex, very base swollen, 1.5–1.8 by 0.7–0.9 cm; endocarp with low longitudinal ridges which end before the smooth swollen base.

Distr. *Malesia*: Philippines (Luzon: Camarines and Sorsogon Prov.; Catanduanes; Mindanao: Davao).

Ecol. Primary, also Dipterocarp forest at low altitude.

Vern. *Laing*, Bik.

Note. Possibly related to *G. quadrifida* (BL.) SLEUM.

Excluded

Gomphandra impressa RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 29. — *Stemonurus impressus* (RIDL.) SCHELLENB. Bot. Jahrb. 58 (1923) 163 = *Pittosporum ramiflorum* (Z. & M.) ZOLL. ex MIQ. (*Pittosporaceae*).

6. RHYTICARYUM

BECC. *Malesia* 1 (1877) 120, t. 5, f. 18–25 (*'Ryticaryum'*); *ibid.* (1878) 256, corr.: *Rhyticaryum*; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 415 (*'Rhytidocaryum'*); SLEUM. *Blumea* 17 (1969) 249. — *Pocillaria* RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 28. — Fig. 12.

Dioecious shrubs or trees. *Leaves* spiral, entire, not rarely with sparse appressed (strigose) hairs, midrib raised on both faces, nerves ± markedly looping before the edge. *Flowers* in axillary spikes, these rarely also composed to panicles in the same specimen, or very rarely reduced to such extent that the (few) flowers seem to be fascicled, small, sessile, each subtended by a small bract. *Calyx* cup-shaped, subentire or 4–5-dented to various degree. *Petals* 4 or 5, connate $\frac{1}{2}$ to $\frac{3}{4}$ their length to a ± open, sometimes campanulate cup, free part or lobes valvate, apex inflexed. — ♂ *Flowers*: *Stamens* 4 or 5, free, fixed to the connate part of the tube; filaments short, anthers basifixed, oblong-elliptic to subsagittate, introrse. Rudiment of *ovary* ovoid or more cylindrical, always hairy. — ♀ *Flowers*: *Staminodes* very small, often absent, no anther cells. *Ovary* conical to subglobose, densely set with erect hairs; stigma sessile, flattened. *Drupe* generally ovoid-ellipsoid, much compressed laterally and almond-like, with a sharp crest, and sometimes another less marked crest on the flattened side; exocarp fleshy, thin, red to orange; endocarp thin-woody, rather coarsely reticulate-alveolate or -lacunose. *Seed* 1, testa thin; albumen fleshy; embryo almost of the length of the albumen, with broad flat cordate cotyledons.

Distr. About 12 *spp.* in all, in NE. Australia (Queensland: Cape York Peninsula) 1 *sp.*, Melanesia (Solomons, Bismarcks: New Britain, New Ireland, Admiralty Is.) 1 *sp.*, and *East Malesia*: New Guinea and Moluccas, 12 *spp.* Fig. 11.

Ecol. Primary, rarely also secondary forests in the substage, scattered, from the lowland up to c. 2500 m.

Uses. The leaves are locally cooked and eaten by the people as a vegetable.

Note. Species are rare and still inadequately known and difficult to delimit; several types are lost.

KEY TO THE SPECIES

1. Flowers both in axillary (rather lax-flowered) spikes and panicles composed of such spikes in the same specimen. 1. *R. novoguineense*
1. Flowers exclusively in axillary spikes (these sometimes very short in ♀ specimens, the flowers seemingly fasciated then).
 2. Both ♂ and ♀ inflorescences very laxly appressedly hairy, *i.e.* practically glabrous to the naked eye.
 3. Leaves becoming purplish when dried. ♂ Spikes longer than 20 cm. 2. *R. purpurascens*
 3. Leaves becoming brownish or blackish-green, or remaining green-yellowish when dried. ♂ Spikes usually shorter than 20 cm.
 4. Base of leaves properly rounded. 3. *R. rotundatum*
 4. Base of leaves attenuate, rarely almost rounded and cuneate in the same specimen.
 5. Drupe 3.5–4.3 by 2.5–3 by c. 1.5 cm. 4. *R. macrocarpum*
 5. Drupe much smaller, rarely up to 2.6 by 1.5 cm.
 6. Leaves blackish-green and hardly reticulate above in the dry state, nerves 6–7 pairs. ♀ Spikes lax-flowered, laxly hairy. 5. *R. lucidum*
 6. Leaves greenish-yellowish, or maybe greenish-greyish in the dry state, reticulation generally distinct (at least slightly prominent) above.
 7. Flowers laxly arranged, *i.e.* (much) spaced. Basal pair of nerves curved-ascendent, upper pairs ± rectangularly from the midrib and straight. 6. *R. elegans*
 7. Flowers (sub)densely arranged. Nerves of leaves all ± distinctly curved-ascendent.
 8. Leaves membranous to chartaceous, with a very fine and very dense prominent reticulation on both faces, nerves (10–)12–14 pairs. 7. *R. oleraceum*
 8. Leaves subcoriaceous to thin-coriaceous, reticulation more coarse, nerves 6–8(–10) pairs. 8. *R. oxycarpum*
 2. Both ♂ and ♀ inflorescences ± densely set with brownish substrigose hairs (tomentose in juvenile state) to the naked eye.
 9. ♂ Flowers ± distant from each other along the rachis.
 10. Rachis filiform. Leaves with 6–8 pairs of nerves. 9. *R. gracile*
 10. Rachis slender. Leaves with 8–10 pairs of nerves. 10. *R. racemosum*
 9. ♂ Flowers close to each other along the ± stoutish rachis.
 11. Spikes very short (c. 6 mm), the few flowers together almost in a fascicle. Leaves thin. 11. *R. fasciculatum*
 11. Spikes longer to elongate (rachis at least 1 cm) and with numerous flowers. Leaves firm. 12. *R. longifolium*

1. *Rhyticaryum novoguineense* (WARB.) SLEUM. *Blumea* 17 (1969) 250. — *Buchanania novoguineensis* WARB. Bot. Jahrb. 13 (1891) 363. — *Rhyticaryum sp.*, LAUT. *ibid.* 56 (1921) 349.

Treelet or small shrub. Branchlets slender, tips appressedly sparsely hairy, older parts early glabrous and covered with greyish cork and bearing whitish-brownish elliptic prominent lenticels. *Leaves* oblong, apex slenderly cuspidate-acuminate (acumen 1.5 by 0.5 cm at base, tip subacute or bluntish, generally slightly curved), chartaceous, with substrigose hairs here and there on midrib and nerves beneath, practically glabrous, dark green when fresh, greyish-green and a little shining when dry, 9–14(–16) by (2.5–)3–4.5(–5.5) cm, nerves 8–10(–12) pairs, the intercalary ones included, slightly raised above, rather sharply prominent beneath as is the rather coarse reticulation to a minor degree; petiole hairy initially,

8–10(–13) by 1–1.5 mm, transversely lenticelled with age. ♂ *Spikes* axillary, both solitary and composed to panicles (each of the pertaining spikes with a basal subtending bract), pendent, 4–10 cm in all, lower branches 3–5 cm; rachis ± densely set with yellowish appressed setulose hairs, slender (0.5 mm ø), the flowers markedly distant from each other. — ♂ *Flowers* (NGF 8386): *Calyx* cupular, 1 mm, 5-lobed halfway, tips sparsely strigose. *Petals* 5, connate halfway, forming an open cup, pale brownish, 2–2.5 mm, lobes ± reflexed. *Filaments* 1–1.5 mm; anthers subsagittate, 0.8–1 mm. Rudiment of *ovary* hirsute. — ♀ *Flowers* unknown. *Drupe* (*ex* WARBURG) ovoid-rhomboid, compressed laterally, 1.7 by 1.5 by 0.5 cm; exocarp fleshy, thin, red.

Distr. *Malesia*: E. New Guinea (Madang & Morobe Distr.), thrice found.

Ecol. Primary forest, 600 and 1645 m.

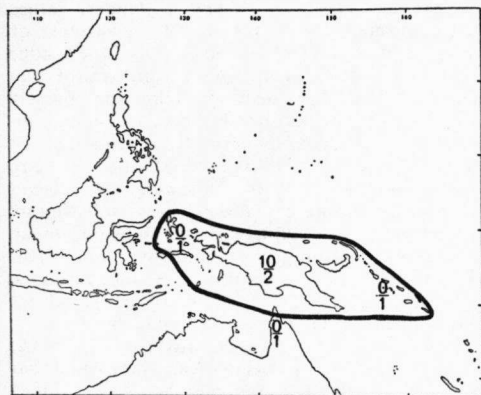


Fig. 11. Distribution of *Rhyticaryum*. The figure above the hyphen indicates the number of endemic species in the island or area, the figure below the hyphen the number of non-endemic species.

2. *Rhyticaryum purpurascens* SCHELLENB. Bot. Jahrb. 58 (1923) 172; SLEUM. Blumea 17 (1969) 251.

"Shrub, 2–3 m. Branchlets glabrous. *Leaves* elliptic, apex gradually acuminate for 1.5–2 cm, tip obtuse, base narrowed to the petiole, pergamaceous, glabrous, shining above, blackish-green with pale midrib in fresh, purplish in dry specimens, 15.5–20 by 5–9.5 cm, nerves c. 10 pairs, impressed above, raised beneath, reticulation very fine; petiole glabrous, 1.5–2 cm. ♂ *Spikes* 1 or 2 per axil, lax-flowered, 20 cm long or more, peduncle and rachis minutely and very laxly hairy (lens!). *Flowers* yellow when fresh, purplish when dry, 1.5 mm. *Calyx* glabrous, ciliolate. *Petals* connate ± halfway, minutely very laxly hairy outside. Otherwise unknown."

Distr. *Malesia*: New Guinea (Sepik Distr.: Leonhardt Schultze R. area), once found.

Ecol. Alluvial riverine forest at 20–50 m.

Note. Translation of the original Latin description, as the type material is lost.

3. *Rhyticaryum rotundatum* SCHELLENB. Bot. Jahrb. 58 (1923) 172; SLEUM. Blumea 17 (1969) 251.

"Treelet. Branchlets glabrous or a little hairy. *Leaves* oval, apex broadly and gradually acuminate, tip bluntish, base rounded, thick-pergamaceous, glabrous, shining, green in dry state above, paler beneath, 10–16.5 by 4–8 cm, nerves c. 6 pairs, looping, not much prominent, reticulation fine. ♂ *Spikes* solitary, lax-flowered, 3.5 cm; peduncle (5 mm) and rachis minutely and very laxly hairy (lens!). ♂ *Flowers* yellow, 4–5-merous, 1.5 mm. *Calyx* and *petals* obscurely hairy, the latter connate halfway. Otherwise unknown."

Distr. *Malesia*: New Guinea (Sepik R. area), once found.

Ecol. Alluvial riverine forest, 20–30 m.

Note. Translation from the original Latin description, as the type material is lost.

4. *Rhyticaryum macrocarpum* BECC. Malesia 1 (1878) 256; VALET. Crit. Overz. Olacin. (1886) 257; SCHELLENB. Bot. Jahrb. 58 (1923) 173; SLEUM. Blumea 17 (1969) 251.

Erect shrub or small tree, up to 13 m, up to 18 cm ø; bark grey-green, with numerous brown pustular lenticles. Tips of branchlets obtusangular, very laxly strigose, older parts terete, glabrous. *Leaves* elliptic-oblong, or elliptic, apex rather abruptly acuminate for 1–1.5 cm, tip blunt, base narrowed and a little decurrent to the slender petiole, chartaceous, glabrous, with numerous pellucid fine points against strong light, brownish especially beneath when dry, (12–)15–20 by 4–7(–9) cm, nerves 8–10 pairs, curved-ascending and anastomosing, slightly raised mainly beneath, reticulation very dense and finely prominent on both faces; petiole striate lengthwise, glabrous, 1–1.5 cm by c. 1 mm. — ♂ *Spikes* (BW 11366) 10–13 cm, rachis c. 1 mm ø, glabrous except some strigose hairs, flowers for their majority distant from each other. *Calyx* broadly cup-shaped, 5-dented, hardly 0.5 mm. *Petals* 5, fleshy, glabrous except some strigose hairs outside distally, connate about halfway, c. 2 mm. *Stamens* 5; filaments short. Rudiment of *ovary* hairy. — ♀ *Spikes* very laxly strigose, (2–)3–7 cm, lax-flowered, rachis slender, practically glabrous in fruiting time. ♀ *Flowers* to judge from specimen with developed *ovary* (NGF 3816): *Calyx* and *petals* as in ♂ flowers. *Ovary* subdensely hairy. *Drupe* almond-like, a little oblique, broadly attenuate towards the base, the very base obtuse, apex broadly attenuate, much compressed laterally, the two main crests rather sharp, with one or two less pronounced crests on the flattish sides, 3.5–4.3 by 2.5–3 by c. 1.5 cm; exocarp red or orange red, practically glabrous; endocarp ligneous, irregularly shallowly reticulate-costulate outside. Seed elliptic, compressed, 2.5–3 cm.

Distr. *Malesia*: New Guinea.

Ecol. Second storey of primary lowland, also swampy forest, apparently scattered, up to 475 m. Vern. *Paitjerak*, Kebar.

5. *Rhyticaryum lucidum* SCHELLENB. Bot. Jahrb. 58 (1923) 175; SLEUM. Blumea 17 (1969) 251.

"Treelet, 4–5 m, bark greyish. Branchlets laxly or hardly strigose. *Leaves* elliptic, apex gradually attenuate to a bluntish acumen for 1.5–2 cm, base cuneate, rigidly chartaceous, glabrous, blackish-green above, paler beneath, shining on both faces, 9–15 by 2.7–5.5 cm, nerves 6–7 pairs, curved, distinctly raised beneath, reticulation obscure above; petiole 4–10 mm. ♂ *Flowers* not known. ♀ *Spikes* lax-flowered, c. 6 cm incl. the peduncle (7 mm), rachis laxly hairy (lens!). *Flowers* yellowish, c. 2 mm. *Calyx* lobes barbulate. *Petals* connate less than halfway, hairy outside. *Ovary* subglobose, densely set with erect hairs. *Drupe* c. 2.3 by 1.5 cm; endocarp tessellate-rugose."

Distr. *Malesia*: E. New Guinea (Hunstein Mts), once found.

Ecol. Mossy forest at 1300 m.

Note. Description a translation of the original Latin diagnosis, as the type specimen is lost.

6. *Rhyticaryum elegans* SCHELLENB. Bot. Jahrb. 58 (1923) 174; BIRNIE, Nova Guinea 14, 2 (1926) 276; DAHL, J. Arn. Arb. 33 (1952) 276 (pollen); SLEUM. Blumea 17 (1969) 251.

Shrub, 1–3 m. Branchlets slender, tips sparsely setulose, older parts early covered with greyish or brownish cork, lenticels elliptic. *Leaves* oblong- or elongate-elliptic, apex (rather) abruptly narrowed to a slender bluntish or subacute, often curved acumen (1–3 cm by 5–8 mm at base), base cuneate to almost rounded, olivaceous-brownish when dry, generally shining on both faces, practically glabrous, 8–16 by 3–5(–7) cm, nerves (6–)8–10 pairs, the lower pair curved-ascending, the upper ones \pm rectangularly from the midrib and straight, all looping and a little prominent above, sharply so beneath, reticulation fine and dense, generally slightly raised on both sides, sometimes rather obscure above; petiole (4–)7–10 by 1 mm. δ & ♀ *Spikes* solitary, rarely in twos, lax-flowered, (4–)5–7 (in the δ ones up to 14) cm, rachis c. 1 mm \varnothing , very sparsely strigose, or glabrous. — δ *Flowers*: *Calyx* low, cup-shaped, 4- or 5-dented, edge strigose, 1 mm. *Petals* 4 or 5, fleshy, yellowish, sparsely strigose distally or glabrous, connate in the lower $\frac{1}{2}$ – $\frac{3}{4}$ to a campanulate cup, 3–4 mm. *Filaments* 1 mm; anthers subovate, 1 mm. Rudiment of *ovary* strigose. — ♀ *Flowers*: *Calyx* and *petals* as in δ flowers. *Ovary* ovoid-conical, with large stigma, densely strigose, 2 mm. Immature *drupe* compressedly ovoid, apex obtuse, laxly strigose, 1.7 by 0.8 by 0.6 cm; endocarp wrinkled.

Distr. *Malesia*: New Guinea.

Ecol. Montane forest undergrowth, scattered, 800–2300 m.

7. *Rhyticaryum oleraceum* BECC. Malesia 1 (1877) 121, t. 4, f. 18–21; VALET. Crit. Overz. Olacin. (1886) 257; SCHELLENB. Bot. Jahrb. 58 (1923) 173; SLEUM. Blumea 17 (1969) 251. — *R. parviflorum* PULLE, Nova Guinea 8 (1912) 659; SCHELLENB. Bot. Jahrb. 58 (1923) 173. — *R. oncocarpum* (non K. SCH. & LAUT.) BIRNIE, Nova Guinea 14, 2 (1926) 276.

Shrub or treelet, 0.7–5 m. Branchlets laxly strigose, early glabrescent and covered with cork. *Leaves* elliptic or usually lanceolate-elliptic or oblong-lanceolate, apex rather gradually or more abruptly and slenderly acuminate for 1–1.5 cm, tip bluntish, base attenuate or rarely obtuse, thinly to firmly chartaceous green or yellowish-green when dry, shining and glabrous on both faces except some strigose hairs which may occur on midrib and nerves, 15–25 by 4–7(–10) cm, nerves (10–)12–14 pairs, curved-ascending, slightly raised above, more distinctly so beneath, looping, reticulation very fine and very dense, conspicuously raised on both faces; petiole 0.8–1.5

cm by c. 1.5 mm. — δ *Spikes* slender, rather dense-flowered, 3–7(–10) cm, laxly substrigose or glabrescent. *Calyx* a low cup, hardly lobed, edge hairy. *Petals* 4 or 5, connate for a little more than halfway, fleshy, greenish or yellowish, sparsely hairy distally outside or glabrous, c. 2 mm. *Stamens* 4 or 5; filaments very short. Rudiment of *ovary* hirsute. — ♀ *Spikes* more stoutish, 1–3 cm. *Calyx* and *petals* as in δ flowers. *Staminodes* whether or not present. *Ovary* ovoid, substrigose, 1.5 mm. *Drupe* obliquely ovoid-ellipsoid, much compressed laterally, crest bluntish, other ridges on flat side irregular and less pronounced, orange red, glabrous, (1.7–)2–2.3(–2.6) by (1–)1.5 by 1 cm; endocarp coarsely reticulate-lacunose.

Distr. *Malesia*: Moluccas (Morotai; Sula Is.: Mangoli I.; Ceram, Batjan, Amboina, Tanimbar Is.: Jamdena I.; Kai Is.) and W. New Guinea (Geelvink Bay and Southcoast).

Ecol. Primary lowland forest, rarely montane forest, up to 1900 m, scattered.

Uses. BECCARI noted the young shoots are eaten as a vegetable in the Kai Is. and VORDERMAN recorded the same for Batjan.

Vern. *Dodofó*, Morotai (Alfur.), *sajor mam-bos*, Batjan.

8. *Rhyticaryum oxycarpum* K. SCH. & LAUT. Fl. Schutzgeb. (1900) 416; SCHELLENB. Bot. Jahrb. 58 (1923) 175; SLEUM. Blumea 17 (1969) 251. — *R. pulchrum* SCHELLENB. Bot. Jahrb. 58 (1923) 173. — *R. urophyllum* SCHELLENB. l.c. 174.

Shrub or slender tree, 6–8(–20) m; bark grey or brownish. Branchlets sparsely strigose. *Leaves* elliptic-oblong, sometimes elliptic, apex rather abruptly acuminate for 1–1.5 cm, tip bluntish, base cuneate, slightly inequilateral, pergamaceous or firmly chartaceous, greenish-brownish when dry, glabrous except some scattered hairs on midrib and nerves underneath, (7.5–)9–15(–20) by 3.5–5.5(–7) cm, nerves 6–8(–10) pairs, patently arcuate and ascending (though sometimes rather straight below), looping, the lowest pair very close to the edge, prominent beneath, reticulation dense, usually finely raised on both faces; petiole 8–13 by 1(–1.5) mm. — δ *Spikes* (LEDERMANN 7564) dense-flowered, slender, laxly strigose or subglabrous, up to 18 cm. *Calyx* a low cup, 0.5 mm, its 4 or 5 tooth barbate. *Petals* 4 or 5, connate \pm halfway, 2 mm, lobes laxly strigose outside. *Stamens* 4 or 5; filaments short. Rudiment of *ovary* hairy. — ♀ *Spikes* (LEDERMANN 10211), *calyx* and *petals* as in δ flowers. *Ovary* hairy. *Drupe* (LAUTERBACH 2502) ovoid-ellipsoid, much compressed laterally, 1.8–2.2 by 1.2–1.4 by 0.6–0.7 cm, coarsely reticulate-lacunose.

Distr. *Malesia*: New Guinea (April and Ramu R. area).

Ecol. Lowland and montane, also swampy and secondary forest, on alluvial soil, scattered, up to 1000 m.

9. *Rhyticaryum gracile* SCHELLENB. Bot. Jahrb. 58 (1923) 170; SLEUM. Blumea 17 (1969) 252.

Divaricate shrub, 1–1.5 m. Branchlets very

slender, tips and petioles subdensely to more sparsely strigose, older parts early covered with greyish cork. *Leaves* elliptic-, or sometimes slightly obovate-oblong, abruptly narrowed to an acumen, 1.5–2 cm by 3–5 mm at base, tip subacute, base cuneate, thin-pergamaceous, green when dry, a little shining, laxly covered with long pale strigose hairs along midrib, nerves and maybe veins on the undersurface of younger leaves, glabrescent, 9.5–22 by (3.5–)5–7.5 cm, nerves 6–8 pairs, curved-ascending, hardly raised above, distinctly so beneath, reticulation very dense and finely raised above, more coarse or less prominent beneath, petiole 5–7 by 1 mm. ♂ *Spikes* known in juvenile state only, solitary, the flowers spaced a little, hirsute all over, rachis filiform, 4 cm (or maybe more in fully developed state). *Flowers* 5-merous, too young for description. Otherwise unknown.

Distr. *Malesia*: New Guinea (Sepik-April R. area), twice found.

Ecol. Forest at 200 and 1000 m.

10. *Rhyticaryum racemosum* BECC. *Malesia* 1 (1877) 121, t. 4, f. 22 & 23; VALET. Crit. Overz. Olacin. (1886) 257; SCHELLENB. Bot. Jahrb. 58 (1923) 168, as to type; SLEUM. Blumea 17 (1969) 252.

Shrub or treelet, c. 1 m, up to 5 cm ø. Branchlets slender, laxly short-strigose. *Leaves* oblong to subobovate-oblong, apex ± abruptly acuminate for 1–2 by 0.5 cm at base, tip subacute, base cuneate and a little decurrent to the petiole, membranous to thin-pergamaceous, greenish to yellowish when dry, sparsely setulose at midrib and part of the nerves beneath, otherwise glabrous, somewhat shining on both faces, (12–) 15–24 by (4–)5–9 cm, nerves 8–10 pairs, curved-ascending and looping, hardly raised above, distinct beneath, reticulation rather coarse, finely raised on both faces; petiole setulose, 1–1.5 cm by 1.5 mm. — ♂ *Spikes* (PLEYTE 574) slender, subdensely strigose, 3–5 cm incl. the short peduncle, the flowers spaced. *Calyx* cupular, 0.5 mm, densely strigose. *Petals* 5, connate in the lower 2/3, greenish, laxly strigose at apex outside, 1.5–2 mm. Rudiment of *ovary* subcylindric, hairy. — ♀ *Inflorescence* only known in fruiting stage: rachis subdensely strigose, 3–4(–5) cm, slender (hardly 1 mm ø), *drupes* laxly arranged. Remnants of *calyx* densely, of *petals* laxly strigose. *Drupe* ovoid-ellipsoid, much compressed laterally, lateral crests rather sharp, laxly setulose, 1.5 by 1–1.3 by 0.8–1 cm in dry, said to measure 4 by 2 cm in fresh state; exocarp fleshy, yellow with orange hue, or reddish.

Distr. *Malesia*: W. New Guinea (Vogelkop Peninsula).

Ecol. Primary forest, also along creek in periodically flooded forest dominated by *Inocarpus*, from sea-level up to 45 m.

11. *Rhyticaryum fasciculatum* BECC. *Malesia* 1 (1877) 121, t. 4, f. 24 & 25 (fl. ♀); VALET. Crit. Overz. Olacin. (1886) 257; SCHELLENB. Bot.

Jahrb. 58 (1923) 168; SLEUM. Blumea 17 (1969) 252.

Shrub, 1–2 m. Branchlets slender, youngest parts densely yellowish-substrigose. *Leaves* oblong to subovate-oblong, apex abruptly acuminate for 1, rarely up to 2 cm, tip rather blunt, base broadly cuneate, membranous to chartaceous, laxly to very laxly strigose on midrib and nerves, rarely also on veins beneath, glabrous otherwise, green or yellowish when dry, shining on both faces, 12–24 by 5–9 cm, nerves 8(–10) curved-ascending and looping pairs, prominent mainly on the undersurface, reticulation fine and rather dense, moderately raised on both sides; petiole strigose, 6–12 by 1.5 mm. — ♂ *Inflorescence* unknown. — ♀ *Flowers* 3–5(–7) very close to each other along a stout c. 6 mm long rachis, seemingly fascicled, densely strigose in all parts. *Calyx* cup-shaped, 1 mm incl. the short teeth. *Petals* fleshy, connate almost halfway, 1.8 mm. *Ovary* subconical, densely strigose, 1.5 mm. *Drupe* ± obliquely subovoid-ellipsoid, much flattened laterally and distinctly crested, laxly strigose, red, (1.3–) 1.7–2 by (1–)1.5 by 0.7–0.9 cm; endocarp irregularly coarsely reticulate-alveolate.

Distr. *Malesia*: W. New Guinea (Vogelkop Peninsula).

Ecol. Lowland forest, apparently rare.

12. *Rhyticaryum longifolium* K. SCH. & LAUT. Fl. Schutzgeb. (1900) 415; Nachtr. (1905) 306; SLEUM. Blumea 17 (1969) 252. — *R. oncocarpum* K. SCH. & LAUT. Fl. Schutzgeb. (1900) 416; SCHELLENB. Bot. Jahrb. 58 (1923) 171. — *R. ? oxycarpum* (non K. SCH. & LAUT.) VALET. Bull. Dép. Agr. Ind. Néerl. 10 (1907) 30. — *Pocillaria pubescens* RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 28. — *R. bullatum* SCHELLENB. Bot. Jahrb. 58 (1923) 169. — *R. oblongum* SCHELLENB. l.c. 169. — *R. elongatum* SCHELLENB. l.c. 170. — *R. ovale* SCHELLENB. l.c. 171. — *R. racemosum* (non BECC.) SCHELLENB. l.c. 168; BIRNIE, Nova Guinea 14, 2 (1926) 276. — *Antidesma megalocarpum* Sp. MOORE, J. Bot. 61 (1923) Suppl. 46. — *R. pubescens* (RIDL.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 250. — Fig. 12.

Sprawling shrub or small tree, 1–5 (rarely up to 15) m; bark greyish-brownish. Branchlets with laxly to subdensely strigose tips. *Leaves* oblanceolate, or oblong, or obovate-, sometimes elliptic-oblong, apex rather suddenly acuminate for 1–2 cm by 5 mm at base, tip acute or mostly bluntish, base cuneate to almost rounded, firmly chartaceous to subcoriaceous (more stiff at higher altitudes), usually olivaceous-green and somewhat shining on both faces in the dry state, glabrous except maybe some scattered appressed hairs on midrib and nerves of the undersurface, (6.5–) 8–17(–25) by (2.5–)3–7(–10) cm, nerves 6–8(–10) pairs, curved-ascending and generally markedly looping, a little raised above, more distinctly so beneath, not rarely raised within a shallow depression above (the lamina not properly bullate, as the veins are never sunken above too), reticulation rather dense, considerably or usually

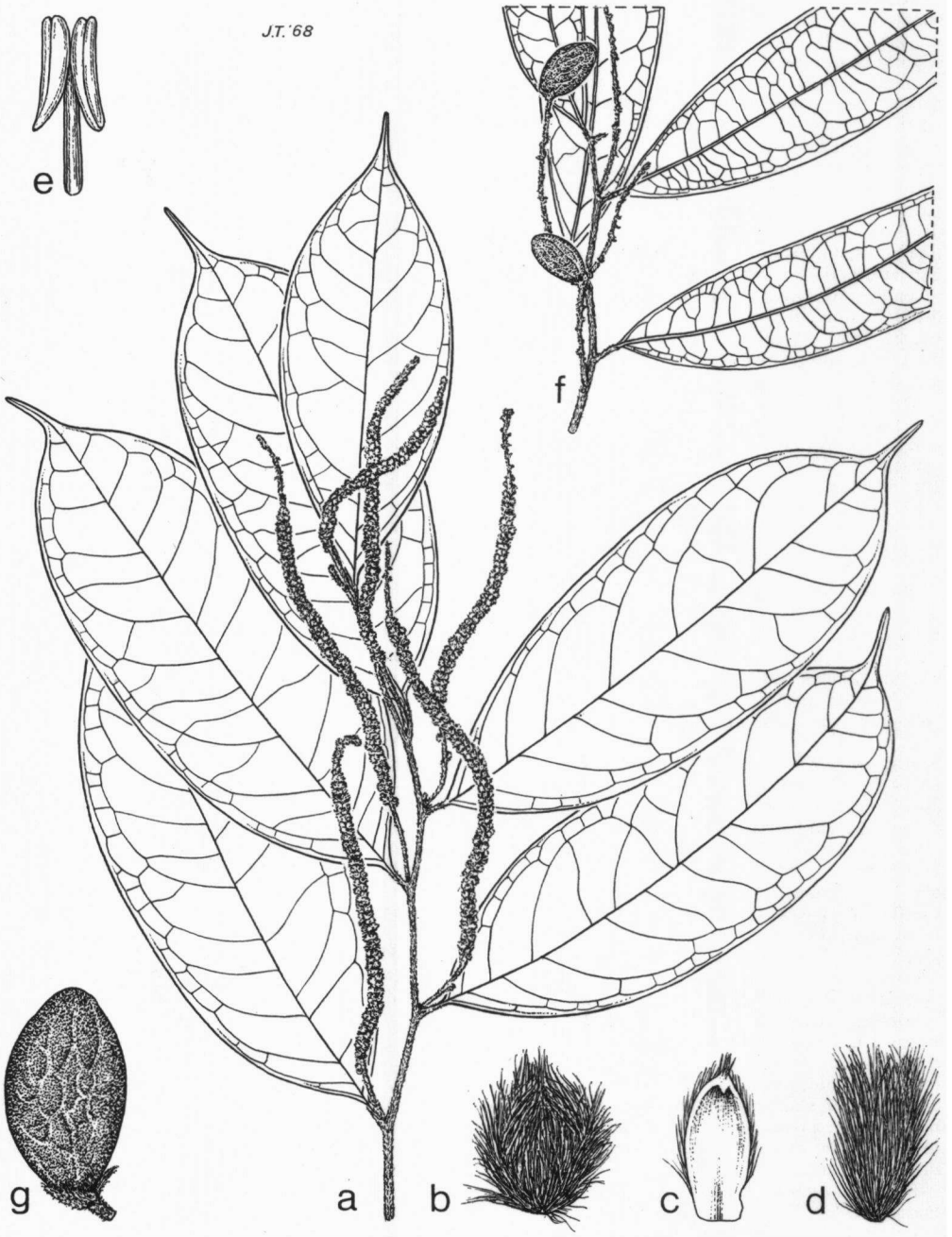


Fig. 12. *Rhyticaryum longifolium* K. SCH. & LAUT. *a.* Habit, ♂ specimen, $\times \frac{1}{2}$, *b.* ♂ flower bud, $\times 20$, *c.* petal from inside, $\times 20$, *d.* ♂ more developed flower, $\times 20$, *e.* stamen, $\times 30$, *f.* habit of ♀ specimen with fruits, $\times \frac{1}{2}$, *g.* fruit, $\times 1\frac{1}{2}$ (*a-e* BW 10666, *f-g* VAN ROYEN & SLEUMER 6136).

more slightly raised on both faces; petiole (4-)6-17 by c. 1.5 mm. — ♂ *Spikes* solitary or sometimes few from the same axil, rather dense-flowered, (2-)4-10(-18) cm, in juvenile state all over pale rusty tomentose, in later stages densely short-strigose; rachis slender to more stoutish. *Calyx* cupular, 5-dented, low. *Petals* 4 or 5, connate halfway, yellow or greenish, sparsely to more densely strigose in the upper half outside, c. 2 mm. *Stamens* 4 or 5; filaments short. Rudiment of ovary with erect hairs. — ♀ *Spikes* generally shorter than the ♂ ones, and the rachis more stoutish. *Calyx* and *petals* as in ♂ flowers. *Ovary* ovoid-conical, densely strigose. *Drupe* ovoid-ellipsoid, much compressed laterally and crested,

2-2.3(-2.5) by 1.5(-1.7) by 0.8-1 cm, red to orange; endocarp hard, coarsely lacunose-reticulate.

Distr. NE. Australia (Queensland: Cape York Peninsula), Melanesia (Solomons); in *Malesia*: New Guinea.

Ecol. Substage of primary, sometimes also secondary forest, from lowland up to 1800 (-2500?) m, scattered.

Uses. The leaves are cooked and eaten by the natives in the Solomon Is.

Vern. *Aicaruar*, Wandammen, *badzhekiziwo*, Orokaiva, *beniros*, Wagau, *hahamen*, Kole, *kame game*, Kaugel, *kamokum*, Enga, *namsi*, Orne. In the Solomon Is.: *aiavea*, Kwara'ae.

7. HARTLEYA

SLEUM. *Blumea* 17 (1969) 218. — Fig. 13.

Dioecious tree. *Leaves* spirally arranged, entire, coriaceous, penninerved, petioled. *Inflorescences* axillary, 3-5 peduncled cymes arranged to a panicle. — ♂ *Flowers* unknown. — ♀ *Flowers* subsessile, crowded at the apex of the ultimate branches of the inflorescence; bracts minute, caducous. *Calyx* cup-shaped, 4-6-lobed halfway, lobes valvate. *Petals* 4, valvate, smooth inside. *Staminodes* 4, of the habit of apparently normal stamens, but without pollen; filaments flattened, glabrous; anther cells elliptic, medifixed, the connective between not produced beyond them. *Ovary* with a lateral gibbosity; stigma sessile, subcapitate, papillose, clearly set off from the ovary, subbilobed or depressed to one side. *Disk* unilateral, free, opposite the gibbosity of the ovary, a semiorbicular low truncate or subcrenate fleshy scale. *Drupe* curved, ovate-acuminate when seen from one side, exocarp thin, endocarp with numerous prominent nerves on the concave, and a thick median rib on the convex side, the latter covered with a fleshy appendage, the very apex excepted, and with a low semiorbicular fleshy free scale opposite the appendage, subtended by the remnants of the calyx. *Seed* not yet known.

Distr. Monotypic; in *Malesia*: New Guinea.

Ecol. Montane forest.

Note. Closely allied to *Gastrolepis* TIEGH., a monotypic genus from New Caledonia, from which it differs by the subcapitate stigma, clearly set off from the ovary (in *Gastrolepis* rather small and on top of the gradually attenuate ovary), the large midrib on the concave side of the endocarp (which is not present in *Gastrolepis*), the squamular disk which is adnate only to the very base of the ovary, and otherwise free (adnate at base and both sides such as to form a pocket in *Gastrolepis*), and the unisexual flowers and glabrous filaments (bisexual and with numerous hairs in *Gastrolepis*).

1. *Hartleya inopinata* SLEUM. *Blumea* 17 (1969) 218. — Fig. 13.

Tree, 20-35 m, spreading, 60-120 cm ø; bark grey-brown, fissured lengthwise. Branchlets rather short, irregular, early corticate, 3-8 mm ø. *Leaves* elliptic or oblong-elliptic, apex short-acuminate, or obtuse, base cuneate to the petiole, subequal, coriaceous, brittle and brownish-blackish in dry specimens, dark shiny green above, yellowish-green or pale glaucous beneath in fresh state, glabrous, 5-8 by 2.5-4.5 cm, edge a little revolute, midrib slightly impressed above, bold beneath, nerves 5-6 pairs rather obscure on both faces, no

reticulation; petiole 1 cm by 2 mm. *Inflorescences* paniced, branches (c. 1 cm) rather straight-horizontal, each ending with a cluster of cymosely arranged flowers, 3-4 cm, the short peduncle included, subdensely yellowish-pubescent especially apically. *Flowers* subsessile, ♀ only known. *Calyx* c. 1 mm. *Petals* oblong, glabrous, yellowish green, c. 3 mm. *Stamens* seemingly well-developed, but anther cells without pollen, 1 mm; filaments glabrous, c. 3 mm. *Ovary* ovoid, glabrous, with a lateral gibbosity, and a fleshy subtruncate semi-orbicular free scale. *Drupe* curved, ovate-acuminate seen from one side, c. 1 cm by 4-5 mm;

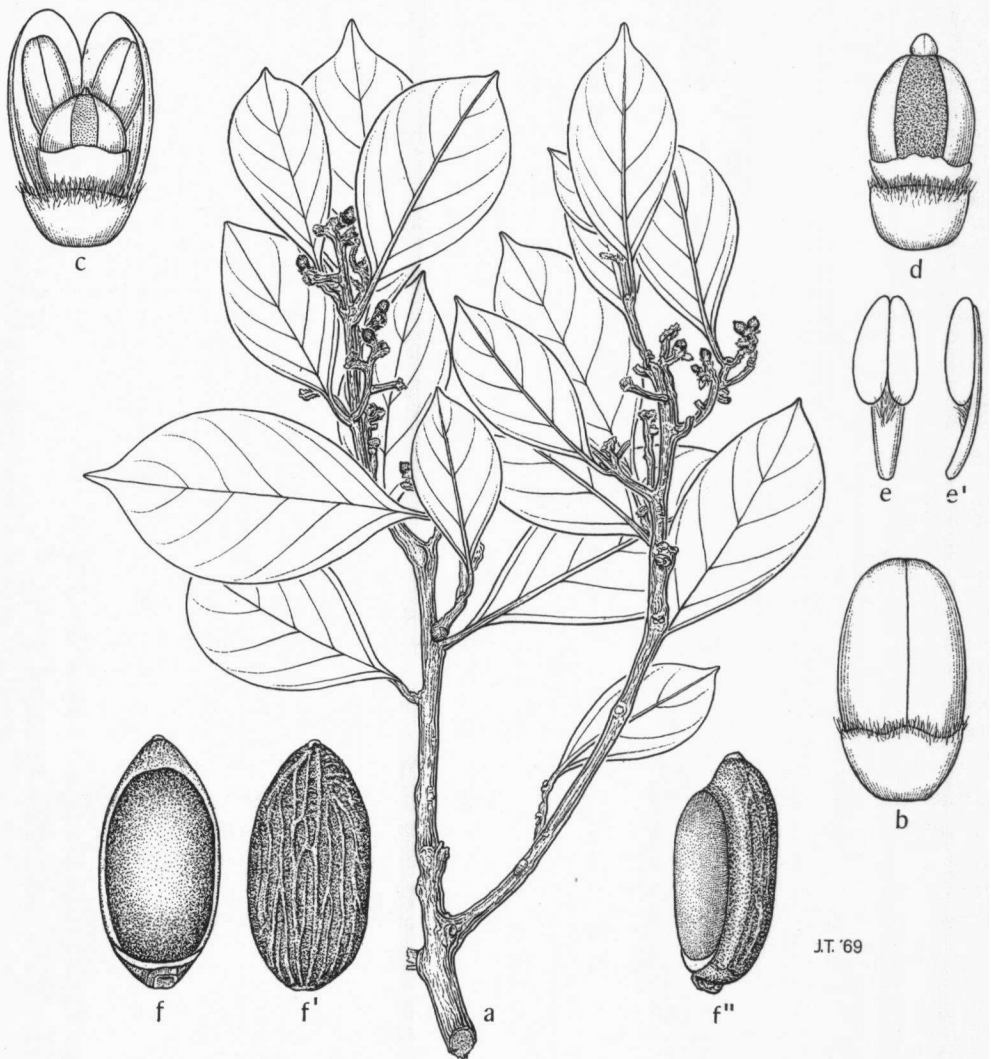


Fig. 13. *Hartleya inopinata* SLEUM. a. Habit, $\times \frac{1}{2}$, b. flower bud, $\times 7$, c. ditto, with 2 petals removed, $\times 7$, d. developed ovary, showing the vertical fleshy appendix and the basal scaly disk, $\times 5$, e. sterile stamen from adaxial side, e'. ditto, laterally seen, $\times 7$, f. submature fruit, adaxial view with large fleshy appendix, f'. ditto, dorsal view, f''. ditto, laterally seen, $\times 3$ (a-e HARTLEY 12501 (type), f HARTLEY 11836).

exocarp thin, becoming blackish; endocarp with numerous longitudinal prominent nerves on the convex, and a strong median rib on the concave side, the latter almost completely covered with a fleshy flattened appendix, subtended at base by the lateral scale and the remnants of the calyx.

Distr. *Malesia*: New Guinea (Morobe Distr., twice found; possibly present in the Vogelkop Peninsula (sterile specimens only known)).

Ecol. Montane (also mossy) rain-forest, 1830-2400 m.

8. CODIOPARPUS

HOWARD, *Brittonia* 5 (1943) 53, f. 2, 3 e-f; SLEUM. *Blumea* 17 (1969) 188. — Fig. 14.

Dioecious tree. *Leaves* spirally arranged, entire, penninerved. *Inflorescence* axillary, generally solitary, the one-bracteate peduncle with several dichotomously branched distal branches, each branchlet with a several-flowered compact cyme of sessile small flowers, which are articulated at the base of the calyx. *Calyx* cup-shaped, shortly 5(-6)-dented. *Petals* 5(-6), valvate, apex minutely inflexed, shorter in the ♀ flower. — ♂ *Flowers: Stamens* 5(-6), exserted; filaments filiform, glabrous; anthers versatile, the cells oblong, slightly diverging below, dehiscing introrsally. Rudiment of *ovary* present. — ♀ *Flowers: Staminodes* 5(-6); filaments shorter than ovary; anthers much reduced in size, cells empty. *Ovary* subcylindric (upper part curved and contracted), with a lateral oblong swelling; stigma disk-like, obscurely 3-lobed. *Drupe* oblong, attenuate upwards, flattened, slightly curved; sarcocarp thin; endocarp thin, hard, with 3-5 (or more) ridges running the length of the convex surface, and a longitudinal median furrow, *i.e.* the funiculus with a pair of woody ribs on either side of the funiculus on the concave surface, both funiculus and ribs surmounted by an oblong fleshy appendix extending over the whole length of the fruit, or even surpassing it a little. *Seed* 1, with copious endosperm and a minute embryo.

Distr. Two very closely related *spp.*, one in the Andaman and Nicobar Is., the other in *Malesia*: Philippines (Mindoro, Palawan). Fig. 15.

Ecol. Lowland primary forest.

1. *Codiocarpus merrittii* (MERR.) HOWARD, *Brittonia* 5 (1943) 56, f. 2, 3 e-f (wood anat.); DAHL, *J. Arn. Arb.* 33 (1952) 267, f. 47 & 47 A (pollen); SLEUMER, *Blumea* 17 (1969) 189. — *Stemonurus merrittii* MERR. *Philip. J. Sc.* 3 (1908) Bot. 240. — *Tylecarpus merrittii* (MERR.) SLEUMER, *Notizbl. Berl.-Dahl.* 15 (1940) 237. — *Medusanthera merrittii* (MERR.) SLEUMER, *ibid.* (1941) 364. — Fig. 14.

Tree, 5-15(-30) m, up to 25 cm σ , sometimes fluted. Branches horizontally spreading. Branchlets and petioles (1-2 cm) shortly appressedly yellowish-pubescent, glabrate. *Leaves* oblong-elliptic to elliptic, apex shortly rather abruptly acuminate, tip obtuse, base broadly cuneate to rounded, slightly inequilateral and decurrent on the petiole, thin-coriaceous to almost chartaceous, glabrous above, finely appressedly yellowish-hairy beneath, ultimately glabrate, lower surface often minutely tuberculate in dry, apparently yellowish-green in fresh specimens, with numerous fine pellucid points against strong light, 15-20(-28) by 5-10 cm, midrib grooved above, much raised beneath, nerves 8-10 rather straight to curved-ascending pairs, obscurely inarching before the edge, generally prominent beneath; petiole (1.5-)-2-2.5 cm by 2-2.5 mm. *Inflorescence* with a rather thick peduncle 1-2.5 cm, 2-3-chotomous, the branches short, thickish, each with several cymosely and compactly arranged sessile flowers, all over covered with yellowish-greyish and \pm appressed hairs. *Calyx* c. 1.5 mm, lobes very short. *Petals* oblong, a little fleshy, white, hairy outside and at the thickened inflexed apex inside, otherwise glabrous, 4-5 mm in the ♂, c. 3 mm in the ♀ flowers. — ♂ *Flowers: Filaments* c. 5 mm; anthers c. 1 mm. Rudiment of *ovary*

elongate-conical, c. 2 mm. — ♀ *Flowers: Staminodes* a little shorter than the ovary; filaments weak; anther cells much reduced in size, empty. *Ovary* subcylindrical, glabrous. *Drupe* oblong, though narrowed gradually upwards, (1.8-)-2-2.5 by 0.6-0.8 cm, greenish-whitish, with 3-5 prominent longitudinal and several oblique short ribs on the dorsal convex, and a creamy-white fleshy oblong appendage on the much deepened ventral surface.

Distr. Malesia: Philippines (Mindoro, Palawan). Fig. 15.

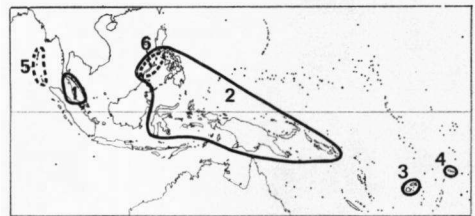


Fig. 15. Distribution of the species of *Medusanthera* (—) and *Codiocarpus* (---). 1. *M. gracilis* (KING) SLEUMER, 2. *M. laxiflora* (MIERS) HOWARD, 3. *M. samoensis* (REINECKE) HOWARD and *M. ovata* HOWARD, 4. *M. vitiensis* SEEM., 5. *C. andamanicus* (KURZ) HOWARD, 6. *C. merrittii* (MERR.) HOWARD.

Ecol. Dense lowland forest, under partial shade up to 200 m, on clayey soil or fertile humus. *Fl. fr.* Jan.-Dec.

Uses. Wood dense and hard, yellowish-white, used for house posts.

Vern. Palawan: *apitong*, *kalas-kalas*, *panabá*, *tibalao*, Tagb.

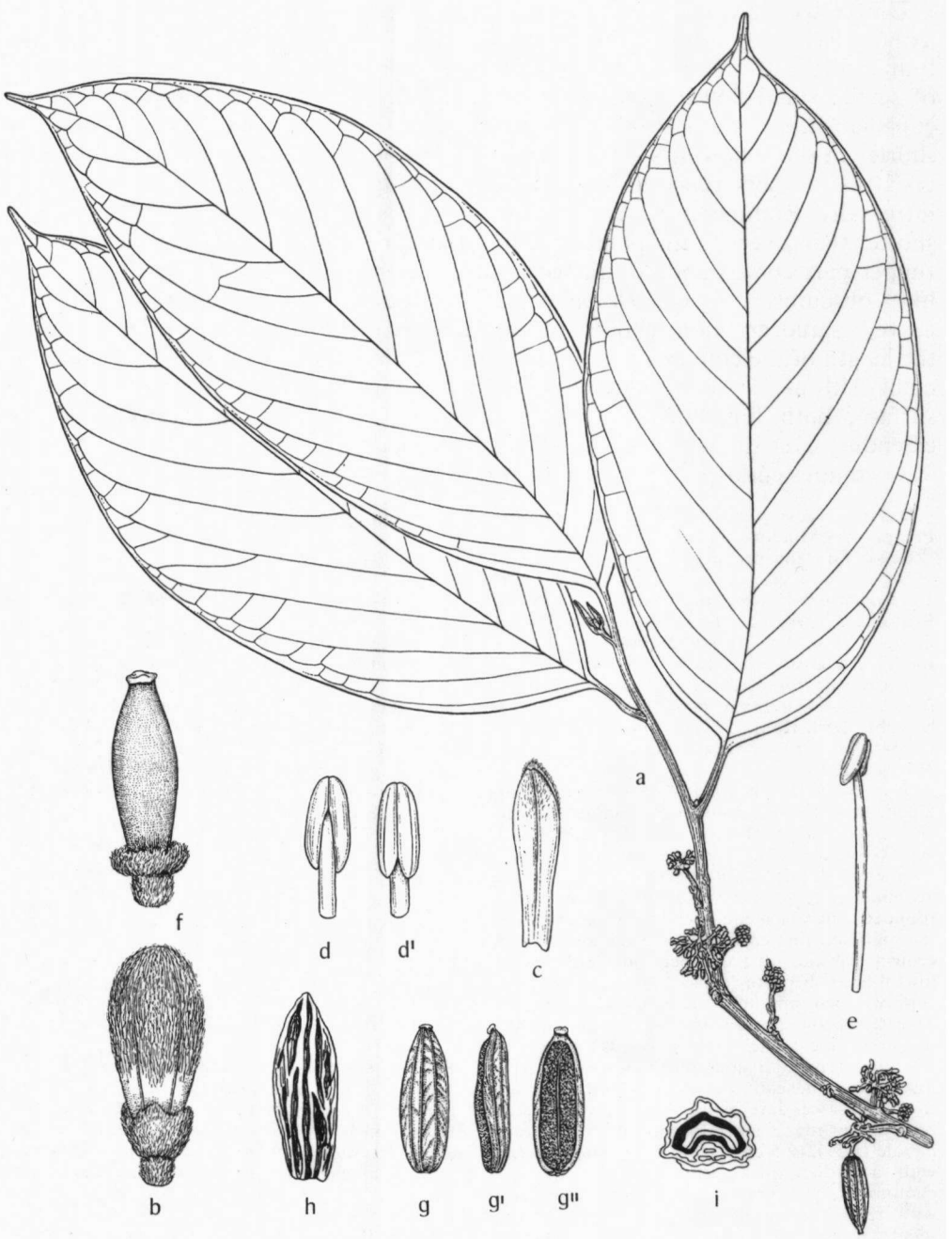


Fig. 14. *Codiocarpus merrittii* (MERR.) HOWARD. *a.* Habit, $\times \frac{1}{2}$, *b.* flower bud, $\times 7\frac{1}{2}$, *c.* petal inside, $\times 7\frac{1}{2}$, *d.* anther, dorsal side, $\times 10$, *d'*. anther, ventral side, $\times 10$, *e.* stamen, $\times 7\frac{1}{2}$, *f.* ovary, $\times 7\frac{1}{2}$, *g.* drupe, dorsal side, $\times 1$, *g'*. drupe, lateral view, $\times 1$, *g''.* drupe, ventral side with fleshy appendage, $\times 1$, *h.* endocarp (exocarp removed) showing the two free ribs on the ventral side, $\times 1\frac{1}{2}$, *i.* drupe in cross-section, showing the two free ribs of the ventral side covered by the appendage, $\times 1\frac{1}{2}$ (*a-f* EIMER 12622, *g-i* ELMER 12842).

9. MEDUSANTHERA

SEEM. J. Bot. 2 (1864) 74; HOWARD, J. Arn. Arb. 21 (1940) 469; Lloydia 6 (1943) 133; SLEUM. Blumea 17 (1969) 226. — *Tylecarpus* ENGL. in E. & P. Nat. Pfl. Fam. 3, 5 (1893) 247; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 413 (*'Tylecarpus'*); SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 246; in E. & P. Nat. Pfl. Fam. ed. 2, 20b (1942) 362, f. 103, A & B. — Fig. 16.

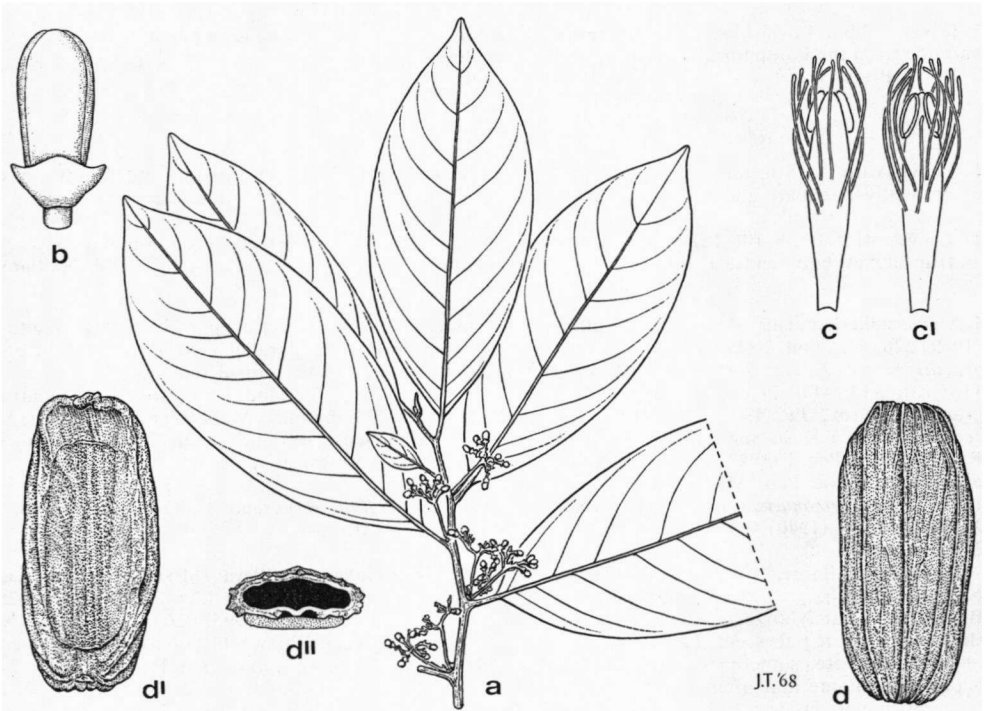


Fig. 16. *Medusanthera laxiflora* (MIERS) HOWARD. a. Habit, $\times \frac{1}{2}$, b. δ flower bud, $\times 7\frac{1}{2}$, c. stamen, dorsal view, $\times 10$, c'. ditto, ventral view, $\times 10$, d. drupe in dry state, dorsal view, showing the prominent ribs of the endocarp, $\times 2\frac{1}{2}$, d'. ditto, ventral view with large appendage, $\times 2\frac{1}{2}$, d''. ditto, cross-section, showing a low rib on either side of the median depression of the ventral side covered by the appendage, $\times 2\frac{1}{2}$ (a-c BSIP 61 WALKER & WHITE, d-d'' BW 3686 KALKMAN).

Dioecious trees. *Leaves* spirally arranged, subdistichous, entire, penninerved. *Panicles* 1-2(-3) per axil, 2-3-chotomized, the branches cymose, peduncled; pedicels short, articulated with the calyx. *Calyx* cupular, small, obscurely 5-toothed. *Petals* 5, valvate, lanceolate-oblong, apex inflexed. — δ *Flowers*: Flower bud clavate. *Stamens* 5; filaments flattened and fleshy, rather abruptly narrowed to the connective, at least the ones of the functional stamens bearing few to numerous long-clavate hairs dorsally at the connective and ventrally below the anther; anthers elliptic-oblong, slightly surpassing the connective, the cells diverging below. *Ovary* rudimentary, with a generally rather distinct lateral swelling. — η *Flowers*: Flower bud cucullate. *Staminodes* with filaments reduced in size and generally glabrous, the anther cells minute, void of pollen. *Ovary* subcy-

lindrical, early curved, with a distinct lateral swelling; stigma sessile, umbilicate-subcapitate, lobes 3-5, very short. *Drupe* oblong to elliptic, rounded-truncate at both ends, or subovate and attenuate upwards, flattened and curved, the concave side with a large oblong pulviniform fleshy appendage superficial to the sarcocarp, the latter rather thin, also filling the groove on the concave side of the tenuous or almost woody thin endocarp, which bears 1-3(-5) prominent longitudinal ridges on the convex and maybe two fainter ones on the concave or flat side. *Seed* 1; endosperm abundant; embryo apical, minute.

Distr. About 4 or 5 *spp.*, 2 (or 3) in Fiji and Samoa, in *Malesia* 2 *spp.*, one in Sumatra and Malaya and one from the Philippines and Celebes to the Carolines, Bismarcks and Solomons. Fig. 15.

Ecol. Primary and secondary lowland (also coastal) and lower montane rain-forest.

KEY TO THE SPECIES

1. Leaves with (4-)5-6 (rarely -8) pairs of lateral nerves. Petals 2-2.5 mm. *Drupe* subovate-oblong, apex gradually attenuate and subacute, base obtuse-truncate, 1.2-1.5 by 0.5-0.6(-0.7) cm. 1. *M. gracilis*
1. Leaves with (6-)8-10(-12) pairs of lateral nerves. Petals 3-4 mm. *Drupe* broad-oblong, obtuse-truncate at both ends, 1-1.5(-2) by 0.6-0.8(-1) cm. 2. *M. laxiflora*

1. *Medusanthera gracilis* (KING) SLEUM. *Blumea* 17 (1969) 226; *Fl. Thail.* 2 (1970) 77. — *Gomphandra gracilis* KING, *J. As. Soc. Beng.* 64, ii (1895) 115; RIDL. *Fl. Mal. Pen.* 1 (1922) 429, *incl. var. gracillima* RIDL. *l.c.* 430. — *Gomphandra lanceolata* (MAST.) KING *var. angustifolia* KING *ap.* RIDL. *Fl. Mal. Pen.* 1 (1922) 429, *p.p.* — *Gomphandra yatesii* MERR. *Pap. Mich. Ac. Sc.* 19 (1934) 165, t. 28. — *Stemonurus yatesii* (MERR.) HOWARD, *J. Arn. Arb.* 21 (1940) 469; DAHL, *ibid.* 33 (1952) 268 (pollen).

Shrub or small tree, rarely up to 10 m and 20 cm ø; bark smooth, grey-green. Branches hanging. Branchlets striately-angular, early corticate, tips slender and short-pubescent. *Leaves* lanceolate or oblong-lanceolate, sometimes oblong, apex subacutely acuminate and often falcate for 2-3 cm, base much narrowed, membranous, light green, dull, glabrous or sometimes with sparse fine short hairs on the undersurface and/or the midrib, showing numerous fine pores against strong light, the undersurface mostly set with fine tubercles, (5-)8-13(-20) by (1-)2-4(-8) cm, variable in size, edge subentire, midrib distinctly, nerves slightly impressed above, prominent beneath, nerves (4-)5-6 (rarely -8) spreading pairs, reticulation practically obscure; petiole slender, (0.6-)1-1.5 cm. Peduncles axillary and pseudoterminal, very slender, 2-4(-7) cm, short-hairy as are the partial inflorescences, these cymose, ultimate ones umbellate and few-flowered, pedicels very short. — ♂ *Flowers*: Buds obovate. *Calyx* cupular, 1 mm. *Petals* oblong, finally reflexed, glabrous, greenish-whitish, 2(-2.5) mm. — ♀ *Flowers*: Buds subglobose. *Calyx* and *petals* as in ♂ flowers. *Ovary* oblongoid, 2 mm. *Drupe* subovate-oblong, flat and curved, base obtuse-truncate and hollow, apex gradually attenuate and subacute, 1.2-1.5 by 0.5-0.6(-0.7) cm, glossy, with a fleshy oblong whitish appendage on the

much depressed ventral, and a marked longitudinal distinct rib parallel with a few lateral less distinct ones on the dorsal (convex) face.

Distr. S. Thailand; in *Malesia*: Sumatra (Eastcoast, Tapanuli), Malay Peninsula. Fig. 15.

Ecol. Dense lowland jungle or hillside, also open bamboo forest, rarely up to 1840 m. *Fl. fr.* Jan.-Dec.

Vern. *Kaju si gorga*, Asahan, *sampin kris*, Kelantan, M.

2. *Medusanthera laxiflora* (MIERS) HOWARD, *J. Arn. Arb.* 21 (1940) 470; *Lloydia* 6 (1943) 142; DAHL, *J. Arn. Arb.* 33 (1952) 269, f. 53 and 53 A (pollen); SLEUM. *Blumea* 17 (1969) 227. — *Platea laxiflora* MIERS, *Ann. Mag. Nat. Hist.* II, 10 (1852) 111, repr. *Contr. Bot.* 1 (1852) 98, t. 16; VALET. *Crit. Overz. Olacin.* (1886) 255. — *Stemonurus laxiflorus* MIERS, *Ann. Mag. Nat. Hist.* II, 10 (1852) 111, repr. *Contr. Bot.* 1 (1852) 98, *nom. event.*; MERR. *Philip. J. Sc.* 3 (1908) Bot. 240. — *Cissus flexuosa* TURCZ. *Bull. Soc. Nat. Moscou* 31, i (1858) 415; PLANCH. in DC. *Monogr. Phan.* 5 (1887) 624. — *Lasianthera papuana* BECC. *Malesia* 1 (1877) 108, t. 3; VALET. *Crit. Overz. Olacin.* (1886) 240; BOERL. *Handl.* 1, 1 (1890) 212. — *Gomphandra laxiflora* (MIERS) ROLFE, *J. Bot.* 23 (1885) 211; VIDAL, *Phan. Cuming. Philip.* (1885) 25, 103; *Rev. Pl. Vasc. Filip.* (1886) 86; MERR. *En. Philip.* 2 (1923) 490. — *Tylecarpus papuanus* (BECC.) ENGL. in E. & P. *Nat. Pfl. Fam.* 3, 5 (1893) 247, f. 138, A & B; K. SCH. & LAUT. *Fl. Schutzgeb.* (1900) 413; SCHELLENB. *Bot. Jahrb.* 58 (1923) 159; BIRNIE, *Nova Guinea* 14, 2 (1926) 275. — *Tylecarpus sp.*, PULLE, *Nova Guinea* 8 (1912) 658. — *Gomphandra glabra* MERR. *Philip. J. Sc.* 17 (1920) 277; *En. Philip.* 2 (1923) 490. — *Gomphandra carolinensis* KANEH. *Fl. Micron.* (1933) 198 (*japon.*) f. 85, *nom. seminud.*; *Bot. Mag. Tokyo* 47 (1933) 673; *J. Dep.*

Agr. Kyushu Imp. Un. 4 (1935) 358. — *Tylecarpus carolinensis* (KANEH.) KANEH. & HATUS. Bot. Mag. Tokyo 50 (1936) 605. — *M. glabra* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 469, t. 2, f. 8-15; Lloydia 6 (1943) 140, t. 11, f. 1-4; Brittonia 5 (1943) 55, f. 3 a (wood anat.); DAHL, J. Arn. Arb. 33 (1952) 269, f. 55 & 55 A (pollen). — *M. carolinensis* (KANEH.) HOWARD, J. Arn. Arb. 21 (1940) 469; Lloydia 6 (1943) 142; WALKER, For. Fl. Br. Solomon Is. (1948) 127; DAHL, J. Arn. Arb. 33 (1952) 269, f. 56 & 56 A (pollen). — *M. papuana* (BECC.) HOWARD, J. Arn. Arb. 21 (1940) 469; SLEUM. in E. & P. Nat. Pfl. Fam. ed. 2, 20b (1942) 363, f. 103, A & B; HOWARD, Lloydia 6 (1943) 137; DAHL, J. Arn. Arb. 33 (1952) 269, f. 52 (pollen). — *Tylecarpus coriifolius* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 236. — *Tylecarpus peekelii* SLEUM. l.c. 237. — *M. coriifolia* (SLEUM.) SLEUM. *ibid.* (1941) 364; HOWARD, Lloydia 6 (1943) 138. — *M. peekelii* (SLEUM.) SLEUM. Notizbl. Berl.-Dahl. 15 (1941) 364; HOWARD, Lloydia 6 (1943) 138. — Fig. 16.

Tree, rarely shrub, (3-)7-15(-27) m, bole straight, terete, 5-25(-30) cm ϕ , branches spreading \pm horizontally; buttresses generally absent, rarely up to 1.2 m; bark smooth, with shallow longitudinal cracks, greenish-grey to brownish. Branchlets and petioles sparsely appressed-hirsutulous to glabrate. *Leaves* elliptic to oblong or obovate-elliptic, apex generally shortly and \pm abruptly acuminate, rarely obtuse, base cuneate to rounded, thin-coriaceous to chartaceous, dark green and glossy above, greyish-green below when fresh, with very numerous round minute pellucid pores against strong light, lower surface minutely granular in dried specimens, glabrous, (9-)12-21 by (3-)4.5-8 cm, midrib sulcate above, prominent and maybe sparsely appressedly hairy beneath, nerves (6-)8-10(-12) pairs (with some shorter additional sometimes between them), rather straight to curved-ascending, \pm distinctly anastomosing before the edge, sunken above, slightly raised beneath, veins rather obscure; petioles 1-1.5(-2) cm. *Panicles* generally solitary and with a slender peduncle (0.5-3 cm), 2-3-chotomized, each branch bearing one to several cymes, all over \pm densely appressedly hirsutulous, the calyx and petals generally excepted. Pedicels slender, short. *Calyx* cup-shaped, tube \pm contracted at base, 1 mm, limb spreading, 1 mm, minutely 5-dented. *Petals* oblong, 3-4 by c. 1 mm, sordid-white to greenish. — *Flowers*: *Filaments* 2-3 mm, persistently clavate-hairy to barbate in the

upper part; anthers c. 1 mm. Rudiment of *ovary* conical. — ♀ *Flowers*: Sterile *stamens* frequently glabrate, not much smaller than in the ♂ flowers; cells empty. *Ovary* subcylindrical, c. 3 mm, curved, with a basal minute swelling; stigma subcapitate, with 2-3 minute rounded lobes initially, and numerous very short lobules in later stages. *Drupe* broad-oblong obtuse at both ends, curved, base hollow, 1-1.5(-2) by 0.6-0.8(-1) cm, sarcocarp thin, green to purplish, bearing on the convex side an oblong fleshy white to pinkish (rarely yellowish or purplish) pad for almost the entire length, which is thin in the dry state; endocarp thin, hard, bearing at the concave side 3(-5) longitudinal ridges \pm sharply prominent in the dry fruit.

Distr. Micronesia (Carolines: Palau) and Melanesia (Solomons); in *Malesia*: Philippines (S. Luzon, Mindoro, Leyte, Samar, Mindanao, Palawan), Central & SE. Celebes, Moluccas (Halmahera, Obi and Kai Is.), and all over New Guinea. Fig. 15.

Ecol. Understorey of lowland primary and secondary rain-forest, also in coastal plain forest and swamp forest, on sandy and clayey soil, on limestone and coral, 0-300(-900) m, once found in the Western Highlands at 1740 m. *Fl. fr.* Jan.-Dec.

Disp. The fruits are reported to be favoured by cassowary.

Uses. The wood is whitish to yellowish, medium hard and heavy, with coarse prominent rays, apparently used only as firewood. The leaves are used orally by natives against malaria in New Guinea (Tufi Distr.).

Vern. Celebes: *tambai*, Tobela; Moluccas: *modo*, Halmahera; New Guinea: *assi*, Ramu, *balapi*, Dumpu, *bieroo*, Kebar, *bobowè*, Manikiong, *guarom*, *sukumisip*, Sepik, *kenè*, Biak, *labak*, *Mooi*, *mont*, *Faita*, *nodag*, Bilia, *siganapa*, Orokaiva (Mumuni), *sisimal*, Amele, *surupa*, Baruba, *turin*, Onjob (Naukwate), *wagewageia*, *wanigela*, Minufia, (Kabubu), *wom*, Numfur, *wugatep*, Sepik (Maprik); New Britain: *lamoro*; Solomon Is.: *aialo*, *aikunu*, *aimaemae*, *aimalmal*, *mae mae*, Kwara'ae; Bougainville: *diroka*, *diroma*, *guam*, *kiana*, *yemollew*.

Note. The species is understood here in a wide sense as the great amount of specimens at hand effaces differences formerly regarded as sufficient for the discrimination of species. *M. glabra* was based on a specimen with unripe fruits.

10. APODYTES

E. MEYER *ex* ARN. in Hook. J. Bot. 3 (1840) 155; SLEUM. Blumea 17 (1969) 184. — Fig. 17.

Trees. *Leaves* spirally arranged, entire, penninerved, nigrescent. *Flowers* bisexual, in terminal and axillary corymbs (in Mal.), small, cylindric in bud, articulate with the short pedicel. *Calyx* cup-shaped, (4-)5-denticulate, persistent. *Petals* (4-)5, free or a little coherent at base, valvate in bud, finally spreading,

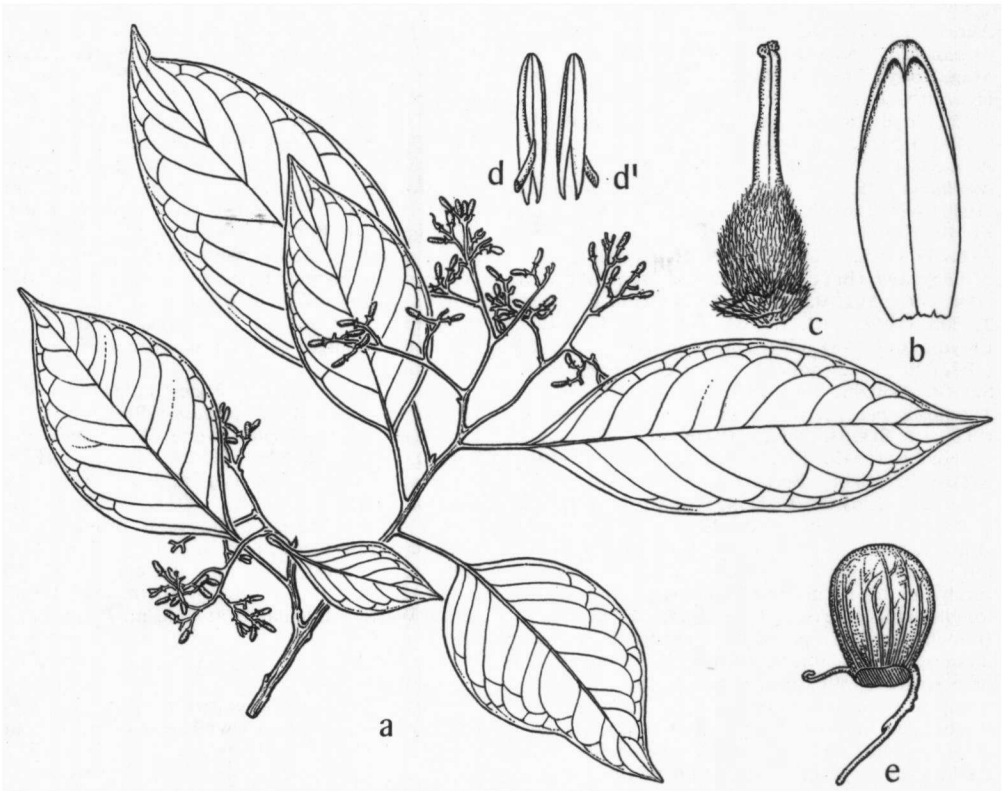


Fig. 17. *Apodytes dimidiata* E. MEYER ex ARN. a. Habit, $\times \frac{2}{3}$, b. petal inside, $\times 6\frac{2}{3}$, c. ovary, $\times 6\frac{2}{3}$, d. anther, back side, $\times 3\frac{1}{3}$, d'. anther, front side, $\times 3\frac{1}{3}$, e. drupe, $\times 1\frac{1}{3}$ (a-d KOSTERMANS c.s. 289, e BON 4861).

linear, glabrous, obscurely keeled on the inner side, with a shortly inflexed apex. *Stamens* 5, almost as long as the petals; filaments subulate, glabrous; anther cells linear-oblong, sagittate below, introrse, medifixed, dehiscing by lateral slits. *Disk* absent. *Ovary* oblique, with an unilateral swelling; style thick, \pm excentric, ending in a small slightly oblique stigma. *Drupe* \pm unilaterally developed, obliquely ellipsoid and \pm compressed, the style finally lateral to almost basal and the lateral appendage large and succulent; endocarp crustaceous; embryo in the top of the albumen, small. *Seed* 1, compressed, ovate-reniform, testa thin.

Distr. Two spp., one in Queensland, one from *Malesia* through SE. Asia to Africa.

1. *Apodytes dimidiata* E. MEYER ex ARN. in Hook. J. Bot. 3 (1840) 155; BENTH. Trans. Linn. Soc. 18 (1841) 680, 683, t. 41, *sens. lat.*; SLEUM. Blumea 17 (1969) 185 (with synonyms of spp. in S. and SE. Asia); Fl. Thail. 2 (1970) 81. — *A. cambodiana* PIERRE, Fl. For. Cochinch. (1892) t. 267, f. A; GAGNEP. Fl. Gén. I.-C. 1 (1911) 834; KOORD. Atlas 1 (1913) t. 117; MERR. J. Arn. Arb. 6 (1925) 136; CRAIB, Fl. Siam. En. 1 (1926) 273; SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 243;

HOWARD, J. Arn. Arb. 23 (1942) 73; GAGNEP. Fl. Gén. I.-C. Suppl. (1948) 756; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 5; DAHL, J. Arn. Arb. 33 (1952) 263, f. 36 & 36 A (pollen); BACK. & BAKH. f. Fl. Java 2 (1965) 61. — *A. javanica* K. & V. Bull. Inst. Bot. Btzg 2 (1899) 3; Bijdr. 5 (1900) 159; KOORD. Nat. Tijds. N. I. 60 (1901) 383; Jungh. Gedenkb. (1910) 175; BACK. Schoolf. Java (1911) 226; KOORD. Exk. Fl. Java 2 (1912) 531; KOORD.-SCHUM. Syst. Verz. 1,

Fam. 162 (1912) 5. — *Mappia philippinensis* MERR. Philip. J. Sc. 26 (1925) 467; En. Philip. 4 (1926) 249. — *Neoleretia philippinensis* (MERR.) BAEHNI, Candollea 7 (1936) 180. — *Nothapodytes philippinensis* (MERR.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 247. — *A. sp.*, ENDERT, Med. Proefst. Boschw. Ned. Ind. 20 (1928) 211, 216. — Fig. 17.

Tree, (10-)15-30 m, bole clear, crown high and lax, trunk (20-)40-70 cm ø; bark rough, dark grey to brown, thin. Branchlets with sparse oblong small lenticels. *Leaves* oblong- to ovate-elliptic, apex mostly shortly acutely acuminate, rarely obtuse, base often unequal, acute or unilaterally obtuse-rounded, a little decurrent on the petiole, herbaceous to thin-coriaceous, dark green and shining when fresh, brownish-blackish when dry, with fine ± appressed and crisped yellowish hairs on midrib above, petioles and inflorescences, otherwise practically glabrous, entire, (5-)6-13 by (2.5-)3-6 cm, midrib slightly impressed above, prominent beneath, nerves 6-10 spreading pairs, a little raised beneath only, the finest veins mostly ending with free ends within the network of finer nerves; petiole 1-2 cm. *Corymbs* many-flowered, 3-8 cm incl. the 1-3 cm long peduncle, their branches in a ± right angle. Flower buds oblong. *Calyx* cup-shaped, almost glabrous, c. ¾ mm, teeth short, pubescent outside. *Petals* oblong, white to yellowish, fragrant, 5-6 mm. *Filaments* 1.5 mm; anther cells oblong, yellow, 3.5 mm. *Ovary* narrow-ovoid, ± densely pubescent; style thick, white, 2.5 mm. *Drupe* obliquely ellipsoid, compressed, veined, first dark purple, in fully mature state blackish and shining, c. 5 by 9 mm, with a lateral juicy greenish, finally scarlet appendage, and the lateral style almost at its base.

Distr. Tropical and subtropical NE. to S. Africa & Angola, Madagascar, Comores, Réunion, Mauritius, Ceylon, S. India, Annam, Burma, Thailand, Indo-China, Hainan, Yunnan; in *Malesia*: Sumatra (Eastcoast), Malay Peninsula,

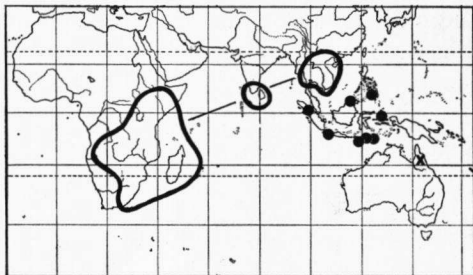


Fig. 18. Distribution of *Apodytes*. *A. dimidiata* E. MEYER ex ARN.: — approximate area in Africa and SE. Asia, ● localities in Malesia. × *A. brachystylis* F.v.M.

Java (extreme western part), Lesser Sunda Is. (E. Sumba, Flores, W. Timor), N. Borneo (Mt Kinabalu, Mt Trusmadi), Philippines (Mindanao: Bukidnon), Moluccas (Batjan: Mt Sibela). Fig. 18.

Ecol. Primary rain-forest, on steep slopes or in ravines, edge of stream, on rich maybe volcanic soil, rare, 800-2000 m. *Fl.* Febr.-Sept., *fr.* April-Nov.

Uses. The leaves are of a bitter and adstringent taste. Wood light brown or yellowish, used in Indo-China for cabinet work, described by MOLL & JANSSONIUS, Mikr. 2 (1908) 244, f. 107 (*A. javanica*).

Vern. *Ki badak*, S, *kakomba*, Sumba, *simarbilalang*, Batak.

Note. The species is conceived here in a broad sense. The special form occurring in Malesia, described above, is almost matched by forms or varieties found in Africa and Madagascar. Pending a revision of the genus, it seems advisable not to give a proper name on the varietal level to the Malesian specimens.

11. MERRILLIODENDRON

KANEH. Bot. Mag. Tokyo 48 (1934) 920, f. 7; *l.c.* 956 (*japon.*); SLEUM. Blumea 17 (1969) 228. — *Peekeliodendron* SLEUM. Notizbl. Berl.-Dahl. 13 (1937) 509. — Fig. 19.

Shrub or generally tree. *Leaves* spiral, entire, penninerved. *Flowers* bisexual, arranged in lax cymes to elongate panicles, these 1-3 in foliate or defoliate axils, or from older branches resp. from trunk. Pedicels articulated with calyx. *Sepals* (3-)4-5, connate to a cup in the lower, free (and not imbricate) in the upper half. *Petals* (4-)5, free, valvate, tip inflexed, villous inside, reflexed in anthesis, early caducous. *Stamens* 5; filament dilated, short, glabrous; anthers elliptic, cells introrsely and longitudinally dehiscent, exceeded by the connective in form of subulate glabrous apiculus. *Ovary* ovoid, tapering to a thick-filiform style; stigma punctiform. *Drupe* large; exocarp thin-coriaceous, smooth, early decaying; endocarp first coriaceous and hard, becoming corky and irregularly ± longi-

tudinally lacunose in its outer, and woody (not hollowed) in its inner part in later stages. *Seed* 1, large; endosperm copious, fibrous, starchy; embryo foliaceous.

Distr. Monotypic, scattered over Micronesia, Melanesia, and *E. Malesia*. Fig. 20.

1. *Merrilliodendron megacarpum* (HEMSL.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 243; in *E. & P. Nat. Pfl. Fam. ed. 2*, 20b (1942) 366, f. 104 (fr.); BALGOOY in Steen. & Balgooy, *Pac. Pl. Areas 2* (1966) 176 (distr. map); SLEUM. *Blumea* 17 (1969) 228. — *Stemonurus? megacarpus* HEMSL. in Hook. *IC. Pl. 24* (June 1895) t. 2398; Kew Bull. (June/July 1895) 133; K. SCH. & LAUT. *Fl. Schutzgeb.* (1900) 414; SCHELLENB. *Bot. Jahrb.* 58 (1923) 164.

— *Mangifera xylocarpa* LAUT. *Bot. Jahrb.* 56 (1921) 354. — *M. rotense* KANEH. *Bot. Mag. Tokyo* 48 (1934) 920, f. 7; *l.c.* 956 (*japon.*); J. Dep. Agr. Kyushu Imp. Un. 4 (1935) 359; KANEH. & HATUS. *Bot. Mag. Tokyo* 54 (1940) 435, f. 82 & 83 (phot., fl. & fr.); HOSOKAWA, J. *Jap. Bot.* 16 (1940) 540; MERR. & PERRY, J. *Arn. Arb.* 27 (1946) 324; DAHL, *ibid.* 33 (1952) 265 (pollen). — *Peckelioidendron missionariorum* SLEUM. *Notizbl. Berl.-Dahl.* 13 (1937) 510. — Fig. 19.

Shrub, or generally tree, (3)6–15(–25) m, bole straight, sometimes fluted, up to 55 cm \varnothing ; bark green-grey to light brown, smooth, shed in irregular soft flakes; blaze yellow with orange streaks. *Leaves* oblong to oblong-ovate, apex shortly attenuate, mostly blunt, rarely acutish, base broadly cuneate to rounded, thin-coriaceous, glabrous, showing numerous minute pellucid points against strong light, (15)–20–30 by 7–11(–16) cm, in suckers or young shoots up to 36 by 17 cm, entire, midrib strongly obtusely prominent beneath, nerves (8)–10–12 curved-ascending pairs faintly looping before the edge, veins obliquely transverse, reticulation rather indistinct; petiole 1.5–2 cm. *Panicles* composed of short lateral cymes, laxly many-flowered, 1–3 in foliate or already defoliate axils, or from the wood of old branches and/or trunk, 7–20 cm, lower branches up to 9 cm, upper ones 2–4 cm; peduncle 2–5 cm, with a basal swelling, glabrous or sparsely appressedly and coarsely hairy, slender in anthesis, stout (2 mm \varnothing) in fruiting stage as is the rachis. Pedicels slender and 4–6 mm in anthesis, stoutish and c. 1 cm in fruit. *Sepals* suborbicular, connate in the lower half, lobes 1–1.5 mm. *Petals* ovate-oblong, a little fleshy, dull cream or yellow to purplish, 3–4 by 1.5 mm, glabrous outside, \pm densely yellowish-villous inside. *Stamens* 2–3 mm; filaments c. 0.7 mm; connective hairy, exceeding the oblong anther cells (1.5 mm) by c. 0.8 mm. *Ovary* 2.5 mm. *Drupe* pendulous, oblongoid to ellipsoid, rarely ovoid-oblongoid, slightly laterally or subquadrangularly compressed, (4)–6–10 by (2)–3–6 cm, exocarp coriaceous, whitish or yellow to purplish when fresh and already fully ripe, becoming purplish to blackish in older stages or when dry, smooth, thin, early dissolved; endocarp remaining woody and massive in the inner part (1–2 mm), becoming corky or spongy and irregularly longitudinally grooved and/or lacunose-excavated in the outer part (3–5 mm) when exposed to sea-water. *Seed* starchy, 4–6 by 2–2.5 cm.

Distr. Micronesia (Marianas: Rota & Guam; Carolines: Kusaie), in Melanesia scattered on New Ireland, New Britain, the Solomons, and the Santa Cruz Is. (Vanikoro I.); in *Malesia*: Philippines (once in Palawan), SE. Celebes (Muna I.),

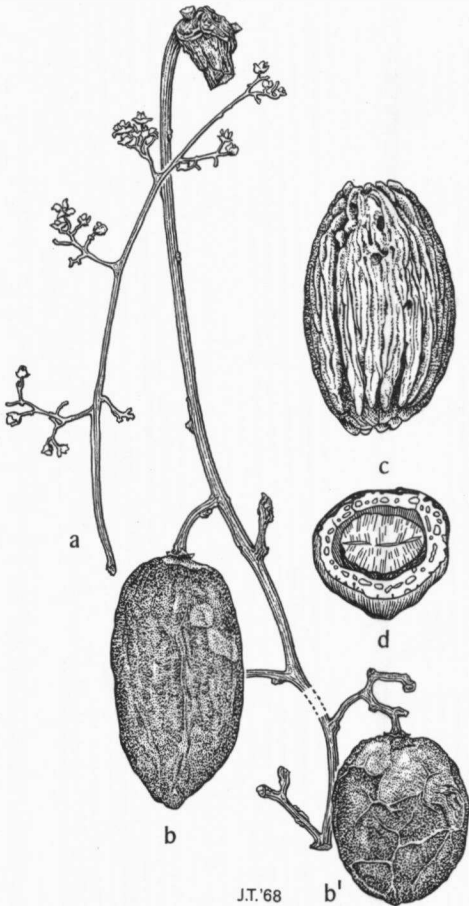


Fig. 19. *Merrilliodendron megacarpum* (HEMSL.) SLEUM. a. Inflorescence, b & b'. infructescence, the drupes still covered with the thin-leathery exocarp, c. old weatherbeaten fruit, showing the spongy endocarp, d. ditto, transverse section, all $\times \frac{1}{2}$ (a BSIP 2017, b BSIP 4827, b' NGF 27224, c-d NGF 10925).

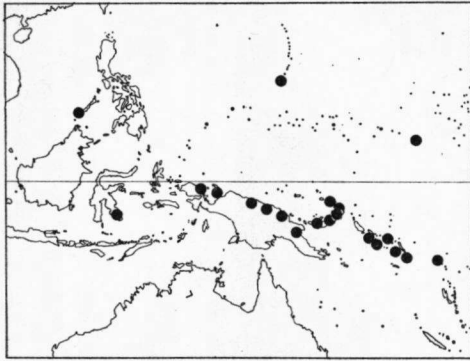


Fig. 20. Distribution *Merrilliodendron megacarpum* (HEMSL.) SLEUM.

and scattered in Northern New Guinea. Fig. 20. Ecol. Generally coastal and lowland partly

swampy rain-forest, at 3–30 m (on Japen I. said to occur at 700 m), on the inland edge of mangrove, on sandy or coral beaches, also on volcanic soil, in moist places, often near streams or in freshwater swamp forest, locally not rare, though apparently scattered in general. *Fl. fr.* Jan.–Dec.

Disp. The corky or spongy part of the endocarp gives the fruit its power of buoyancy, and dispersal is obviously effected or facilitated by sea-currents and freshwater streams.

Uses. Wood yellowish, straight-grained, apparently not used. For wood anatomy cf. SLEUM. Notizbl. Berl.-Dahl. 13 (1937) 511. Fruit said to be edible.

Vern. Celebes: *pake-saukatibu*, Muna; New Guinea: *mangaresi*, Japen (Ambai), *semna wen*, Sekoli (Kemtuk); New Britain: *vabilii*; New Ireland: *idalu*, Pala, *varunatun*, Uquana; Solomon Is.: *abu*, *aibo*, *aiebo*, *aiembuembe*, *sasa su*, Kwara'ae.

12. CANTLEYA

RIDL. *Fl. Mal. Pen.* 1 (1922) 436; HOWARD, *J. Arn. Arb.* 21 (1940) 479, t. 2, f. 1–7; SLEUM. *Blumea* 17 (1969) 186. — Fig. 21–23.

Tree. *Leaves* spirally arranged, entire, inconspicuously penninerved. *Cymes* axillary and solitary; peduncle completely covered with obtuse small thick spirally arranged bracts forming alveoli, from the upper 2 or 3 of which rise short branches, these articulated with the peduncle and branched dichotomously, each branch bearing at the end a cluster of 3–5(–8) sessile bisexual flowers. *Calyx* thick-cupular, shortly subimbricately 5-parted. *Petals* (4–)5, valvate, oblong, with a longitudinal ridge and the apex inflexed inside. *Stamens* (4–)5; filaments fleshy, broadened upwards, with a dense clavate-penicillate pubescence distally; anther cells almost horseshoe-shaped, diverging at the base, introrsely and longitudinally dehiscent, affixed at the apex. *Ovary* elongate-conical; stigma a fleshy reversed cup; ovules 2, pendent from near the apex of the cavity. *Fruit* fusiform; exocarp thin, pulpy; endocarp rather thin though firm, fibrous-corky, extending as a thick longitudinal pad (similar to a second cavity) inside, finally with a lengthwise split from the base up to the middle. *Seed* 1.

Distr. Monotypic; in *Malesia*. Fig. 24.

1. *Cantleya corniculata* (BECC.) HOWARD, *J. Arn. Arb.* 21 (1940) 479, t. 2, f. 1–7; DAHL, *ibid.* 33 (1952) 270, f. 61 & 61 A (pollen); BROWNE, *For. Tr. Sarawak & Brunei* (1955) 199; SMYTHIES, *Common Sarawak Trees* (1965) 71; SLEUM. *Blumea* 17 (1969) 186. — *Platea corniculata* BECC. *Malesia* 1 (1877) 117; VALET. *Crit. Overz. Olacin.* (1886) 254. — *Urandra sp.*, FOXW. *Philip. J. Sc.* 4 (1909) Bot. 492, 542, f. 47. — *Urandra corniculata* (BECC.) FOXW. *Philip. J. Sc.* 6 (1911) Bot. 179; MERR. *En. Born.* (1921) 356; MEAD, *Emp. For. J.* 4 (1925) 95; DEN BERGER, *Hand. 4e N. I. Wet. Congr. Batavia* 1926 (1927) 401

(wood anat.); FOXW. *J. Mal. Br. R. As. Soc.* 5, 2 (1927) 339; *Mal. For. Rec.* 3 (1927) 173; *ibid.* 8 (1930) 13; BURK. *Dict.* (1935) 2205; HEYNE, *Nutt. Pl.* 1 (1950) 986. — *C. johorica* RIDL. *Fl. Mal. Pen.* 1 (1922) 436. — *Stemonurus corniculatus* (BECC.) RIDL. *ibid.* 5 (1925) 297; BURGESS, *Timbers of Sabah* (1966) 320. — Fig. 21–23.

Tree, 15–40 m, trunk straight, slender, terete, 30–60(–150) cm \varnothing , expanded at base, buttresses generally not distinct, rarely up to 150 by 50 cm; crown high, dense, with numerous small branches; bark grey or greenish to brownish, sometimes with brightly coloured patches, rather smooth,



Fig. 21. *Cantleya corniculata* (BECC.) HOWARD. a. Habit, $\times \frac{1}{2}$, b. peduncle with bracts, $\times 1\frac{1}{2}$, c. petal inside, $\times 10$, d. stamen, front side, $\times 10$, d'. ditto, back side, $\times 10$, e. calyx and ovary, $\times 7\frac{1}{2}$ (a-e ENDERT 56 E. 2 P. 664).

finely, shallowly and rather irregularly fissured lengthwise. Branchlets striate-angular when dry. *Leaves* elliptic to subobovate, rarely almost oblong-elliptic, shortly rather abruptly subacutely acuminate, base cuneate to rounded, slightly inequilateral, coriaceous, glabrous, minutely papillose beneath, drying dark brown, edge slightly revolute, 5-9(-13) by 3-4(-5) cm, midrib narrowly sunken above, strongly raised beneath, nerves 8-10 pairs, straight and parallel to each other, rather indistinct; petiole 8-13(-20) mm. *Inflorescence* 1-3.5 cm; flowers crowded at the end of short dichotomous branches, these 2 or 3 on top of a 1-2(-3) cm long peduncle which is covered all over with short obtuse thickish bracts (each forming an alveole), sessile, small, greenish to white or yellowish, pale puberulent except the petals. *Calyx* c. 1 mm. *Petals* oblong, green, 4-5 by 2 mm, fragrant to almost fetid and of a bitter taste. *Stamens* c. 4 mm, finally a little exerted, caducous as are the petals; filaments 3-4 mm, glabrous below, upper part penicillate by subclavate white hairs; anther cells c. 1 mm. *Ovary* glabrous, 2 mm. *Fruit* fusiform, more attenuate

distally, first green, later brown to blackish, c. 3.5 by (0.6-0.8-1) cm; exocarp thin, pulpy, of an acid and astringent taste; endocarp fibrous-corky, c. 1 mm, finally splitting from below on one side up to the middle, extending as a thick pad for the whole length inside. *Seed* 1, oblong, c. 2.5 cm.

Distr. Malesia: Sumatra, Malay Peninsula (Johore, Singapore), Riouw & Lingga Arch., Banka, Borneo (not yet known N of the line Labuan-Tarakan). Fig. 24.

Ecol. Drier parts of primary freshwater swamp forest, or drier hill forest, from sea-level to c. 300 m, apparently local and scattered, on marshy or sandy soil. *Fl. fr.* Jan.-Dec.

Uses. Timber highly valued, much sought and marketed, heavy and hard, brownish-yellow, close grained, fragrant and therefore used as a substitute for sandal wood, very durable in the ground. Used for house and ship building, heavy constructions, likely to shrink and warp and suitable for furniture or turnery only if fully seasoned. The fruit can be eaten, but is said to be of a rather poor quality. Fig. 22-23.

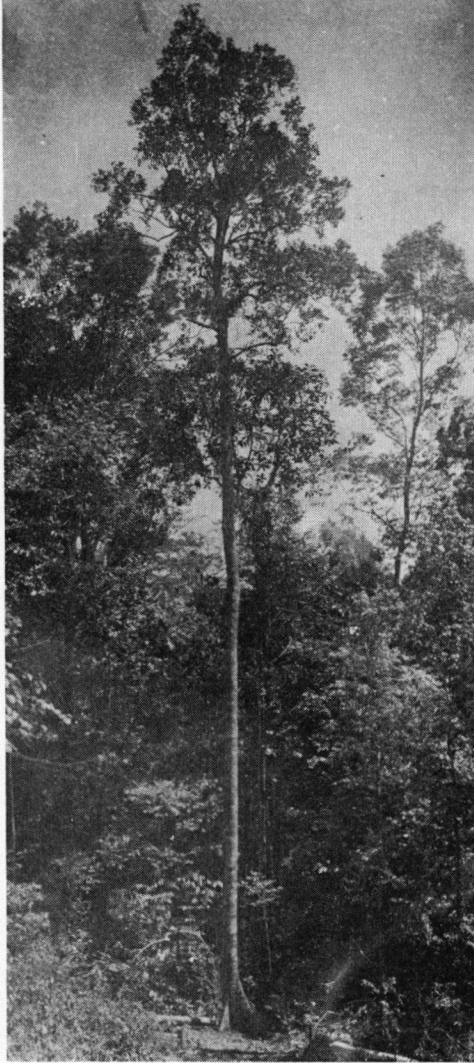


Fig. 22. *Cantleya corniculata* (BECC.) HOWARD. Tree-shape, with buttresses. S. Sumatra (Palembang) (Photogr. ENDERT).

Vern. Generally known as *bédaru*, *daru*, *dédaru*, *éndaru*, *garu*, *pédaru*, *tempilai*, M; local names in Sumatra: *garu bétina*, *g. buaja*, *tarai pahang*, Indragiri, *tulang*, Kedongong, *tusam*;

on Banka known as *mëndaru*; Borneo: *kaddo*, *mérore*, Dajak, *kakal*, Sampit, *pérupok*, Iban, *samala*, Brunei (Kedayan), *séranai tjëndana*, Berau.

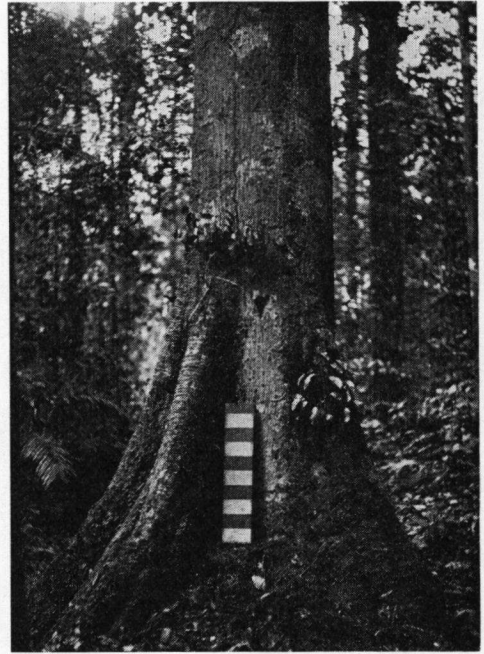


Fig. 23. *Cantleya corniculata* (BECC.) HOWARD. Stem-base. S. Sumatra (Palembang) (Photogr. ENDERT).

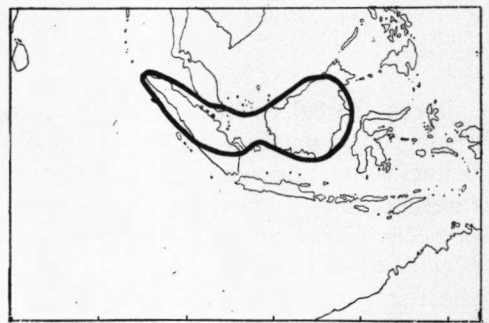


Fig. 24. Distribution of *Cantleya corniculata* (BECC.) HOWARD.

13. NOTHAPODYTES

BL. Mus. Bot. Lugd.-Bat. 1 (1850) 248; HOWARD, J. Arn. Arb. 23 (1942) 66; SLEUM. Blumea 17 (1969) 232. — *Mappia* JACQ. sect. *Trichocrater* MIERS, Ann. Mag. Nat. Hist. II, 9 (1852) 395, repr. Contr. Bot. 1 (1852) 64. — *Mappia* JACQ.

sect. Nothapodytes (BL.) O. KTZE in Post & Ktze, Lex. Gen. Phan. (1904) 350. — *Neoleretia* BAEHNI, C. R. Soc. Phys. Hist. Nat. Genève 53, 1 (1936) 33; *Candollea* 7 (1936) 177. — Fig. 25.

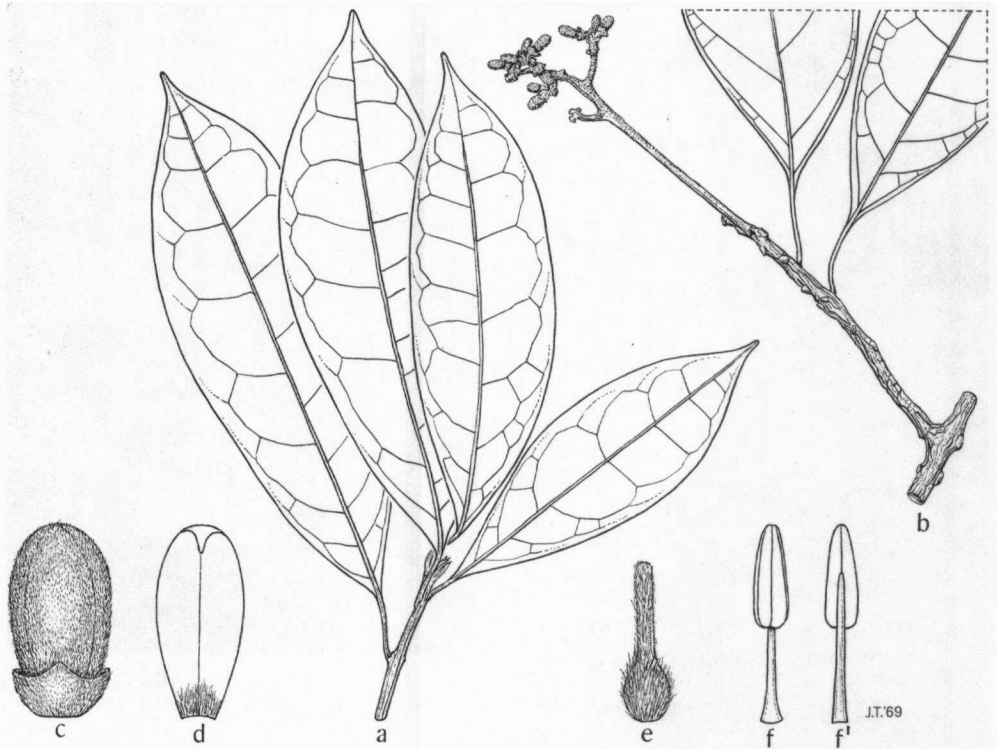


Fig. 25. *Nothapodytes montana* BL. a. Habit, $\times \frac{1}{2}$, b. inflorescence, $\times 1$, c. flower bud, $\times 5$, d. petal, $\times 5$, e. ovary, $\times 7\frac{1}{2}$, f. stamen, adaxial side, $\times 7\frac{1}{2}$, f'. ditto, dorsal side, $\times 7\frac{1}{2}$ (a-f KOSTERMANS & KUSWATA 53).

Trees or treelets. Branches usually angular, with large leaf-scars. *Leaves* spirally arranged or partly (the upper ones) subopposite, entire, appearing very finely pellucid-punctate against strong light, penninerved. *Flowers* bisexual, in terminal, rarely axillary cymes collected to corymbs, articulate with the short ebracteate pedicels. *Calyx* cupular, 5-lobed or sinuate-dented to about $\frac{1}{3}$, persistent. *Petals* 5, valvate in bud, linear-oblong, a little cohering at base, apex slightly inflexed, short-strigose without, villose or rarely almost glabrous within. *Stamens* 5, free, \pm as long as the petals; filaments fleshy, somewhat flattened below, more slender distally, glabrous; anther cells subovate- to elliptic-oblong, diverging at base, introrse, with a basal abaxial reflexed pulviniform appendage \pm cohering to the filament, medifixed; connective as long as the cells. *Disk* cup-shaped, shallowly 5- or 10-crenulate, fleshy to foliaceous, glabrous without, generally with some hairs within and on the edge. *Ovary* symmetrical, hirsute, ovoid to subconical, tapering to a short stoutish or more slender, slightly elongate, hairy or glabrous (apparently slightly dimorphic) style; stigma subcapitate, truncate or mostly

oblique, sometimes slightly bilobed or concave. *Drupe* ± ellipsoid, exocarp thin, juicy; endocarp thin-crustaceous, smooth or rugose. *Seed* 1, albuminous; embryo large, almost as long as the albumen.

Distr. Four *spp.*, 3 of which in S. India, Ceylon, Assam, Burma, Thailand, Cambodia, Tonkin, SW. to SE. China incl. also Hainan, on Lan Yu I. (= Botel Tobago or Kōtōyōsyo) SE. of Formosa, Ryu Kyu Is. (Yaeyama group); in *Malesia* 2 *spp.*, of which *N. foetida* has a wide distribution in SE. Asia, and *N. montana* is very close to *N. pittosporoides* (OLIV.) SLEUM. in SW. and Central China. Fig. 26.

Ecol. Primary and secondary rain-forest, also mixed deciduous forest, from sea-level to c. 2000 m.

KEY TO THE SPECIES

- 1. Leaves ± unequal at base; petiole (2-)3-6 cm. Petals densely to more sparsely whitish-villose within. 1. *N. foetida*
- 1. Leaves ± equal at base; petiole 1-2 (rarely, -2.5) cm. Petals glabrous or with few hairs in the lower half within. 2. *N. montana*

1. *Nothapodytes foetida* (WIGHT) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 247; HOWARD, J. Arn. Arb. 23 (1942) 70; DAHL, *ibid.* 33 (1952) 273 (pollen); SLEUM. *Blumea* 17 (1969) 232 (with extra-Malesian synonyms and literature); Fl. Thail. 2 (1970) 82. — *Stemonurus foetidus* WIGHT, Ic. 3 (1845) t. 955. — *Neoleretia foetida* (WIGHT) BAEHNI, *Candollea* 7 (1936) 177, t. 4, f. 2, D-F.

Tree or treelet, (5-)10-15 m, 10-20 cm ø. Branchlets conspicuously angled, early covered with straw cork (wrinkled in dry specimens), large leaf-scars, youngest parts laxly to densely covered with yellowish appressed ± substrigose or more softer hairs as are the petioles, the undersurface of the leaves, the inflorescences and the fruit, the tomentum however, variable in density or fading early. *Leaves* variably elliptic-ovate to -oblong, apex short-acuminate, base broadly cuneate to rounded, unequal, membranous (and subglabrous in the Philippines), or chartaceous (and tomentulose beneath in Sumatra), 9-22 by 4-12 cm, nerves (5-)6-10(-12) pairs rather steeply curved-ascending, raised beneath, reticulation ± obscure; petiole slender to stoutish, (2-)3-6 cm. Corymbosely arranged *cymes* long peduncled, many-flowered, 5-10 cm across, peduncles and axes ± flattened or angled, all over crisped-to substrigose-hairy. Pedicels 1(-2) mm. *Calyx* c. 1.5 mm incl. the short subacute lobes. *Petals* oblong-linear, subacuminate, white, densely to more sparsely hairy within, 4-5(-6) by c. 1.5 mm. *Filaments* (2-)3-4 mm, apparently accrescent during anthesis; anther-sacs 1-1.3 mm. *Ovary* ovoid to pear-shaped, hirsute, gradually narrowed to the stouter or more slender, short or up to 3 mm elongate style, which sometimes is completely glabrous. *Drupe* oblong-ovoid or ellipsoid, 1-2 by 0.8-1 cm, black, generally short-pubescent; endocarp thin-woody, shallowly rugose to lacunose-reticulate; endosperm with a fetid odor.

Distr. S. India, Ceylon, Assam, Burma, Cambodia, Thailand, Lan Yu I. (SE. of Formosa), Ryu Kyu Is. (Yaeyama group); in *Malesia*: W. Sumatra (once on Mt Sago near Pajakumbuh), Philippines (N. Luzon: Ilocos Norte & Isabela Prov.). Fig. 26.

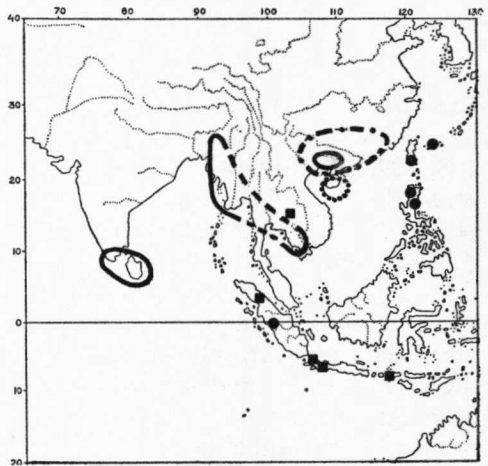


Fig. 26. Distribution of *Nothapodytes*. *N. foetida* (unbroken line and dots), *N. montana* (squares), *N. obtusifolia* (.), *N. pittosporoides* (-.-.-).

Ecol. Rain-forest, on Mt Sago at c. 1000 m, in the Philippines between 100 and 300 m (outside Malesia up to 2000 m, occurring also in mixed deciduous forest). *Fl.* Febr.-March, *fr.* June (Malesia).

2. *Nothapodytes montana* BL. Mus. Bot. Lugd.-Bat. 1 (1850) 248; SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 247; HOWARD, J. Arn. Arb. 23 (1942) 67; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 6; BACK. & BAKH. f. Fl. Java 2 (1965) 61; SLEUM. *Blumea* 17 (1969) 233; Fl. Thail. 2 (1970) 83. — *Mappia montana* (BL.) MIERS, Ann. Mag. Nat. Hist. II, 9 (1852) 398, repr. Contr. Bot. 1 (1852) 67; MIQ. Fl. Ind. Bat. 1 (1856) 790; Suppl. 1 (1860) 136; BECC. Malesia 1 (1877) 118; VALET. Crit. Overz. Olacin. (1886) 183, t. 5, f. 28 (fl.); K. & V. Bijdr. 5 (1900) 143; BACK. Schooffl. Java (1911) 226; KOORD. Exk. Fl. Java 2 (1912) 532. — Fig. 25.

Tree or treelet, 5–8(–20) m, 10–15(–20) cm ø; bark smooth, light brown. Branchlets slender, obtusangular, early covered with pale brown cork and wrinkled in dry specimens. *Leaves* lanceolate to obovate-oblong, apex obliquely acuminate (1–2 cm), subacute, base cuneate, ± equilateral, herbaceous to chartaceous, shining above, practically glabrous, often laxly tubercled beneath, 8–16 by 3–6.5 cm, midrib raised beneath, nerves in 6–9 pairs, curved or more strict, widely patent, rather indistinctly looping before the edge, reticulation of veinlets rather dense, finely raised on both faces; petiole slender, 1–2 (rarely –2.5) cm. *Corymbs* rather few-flowered, 2–4 cm across, peduncle slender, 2–4 cm, densely appressedly yellowish hairy in all outer parts. *Calyx* 1.5–2 mm incl. lobes. *Petals* oblong-linear, subacuminate distally, finally recurved, a little fleshy, greenish-

white, glabrous or with few hairs in the lower half within, 4–5 by 1.5–2(–3) mm. *Filaments* linear below, filiform above, 3–4 mm; anther cells elliptic, 1.5 mm. *Ovary* ovoid, gradually tapering to a shorter or more slender style (c. 2 mm) which at least in its lower half is appressedly hairy as is the ovary; stigma oblique. *Drupe* ellipsoid, greenish-brown when fresh, blackish when dry, rather smooth, c. 1.5 by 1 cm.

Distr. Thailand (Prachinburi); in *Malesia*: Sumatra (Eastcoast: Karo Highlands), extreme W. and SW. Java, Lesser Sunda Is. (W. Sumbawa, W. Flores). Fig. 26.

Ecol. Primary and secondary forest, almost from sea-level to c. 1650 m, also on coral limestone. *Fl.* Jan.–Aug., *fr.* April.

Vern. *Kihadji*, S.

14. STEMONURUS

BL. Bijdr. (1826) 648, *p.p. lectotyp.*; HASSK. Cat. Hort. Bog. (1844) 214 ('*Stemonura*'); BL. Mus. Bot. Lugd.-Bat. 1 (1850) 249, *p.p.*; *em.* BECC. Malesia 1 (1877) 108, 109, 111; SLEUM. Blumea 17 (1969) 255. — *Urandra* THW. in Hook. J. Bot. Kew Misc. 7 (1855) 211. — *Lasianthera* (*non* P. BEAUV.) MIQ. Fl. Ind. Bat. 1 (1856) 790, *p.p.*; KING, J. As. Soc. Beng. 64, ii (1895) 116. — Fig. 28–31.

Trees, sometimes with buttresses or with pneumatophores, glabrous except a fine subglandular puberulence on the inflorescences, the petals excluded. Branchlets and buds often vernicose. *Leaves* spiral, entire, coriaceous to various degrees, dark green to yellowish green above, paler beneath, sometimes tubercled on the undersurface, midrib narrowly sunken above, bold beneath, nerves pinnate, looping; petiole robust. *Umbels* axillary and generally solitary, peduncled, each branch of the umbel bearing the flowers either distally and crowded, or uni- or biserially (scorpioid) along its upper, mostly ± recurved part; bracteoles at the base of the umbel conspicuous, sometimes persistent. *Flowers* bisexual, sessile, white to yellowish, fragrant. *Calyx* cup-shaped, base ± truncate, limb truncate or 5-lobed to various degree, persistent. *Petals* (4–)5, valvate in bud, connate at base only, oblong, apex inflexed, midrib or keel often raised on both faces, caducous. *Stamens* (4–)5; filaments fleshy, flat, widened upwards, shortly bearded below the anther on the ventral side, and long-penicillate distally on the backside, the penicilli inflexed in bud, at full anthesis erect and much exerted; cells ovate-elliptic, basifixed, a little diverging downwards. *Disk* rim-like or patellar, or mostly a short, whether or not shallowly lobed cup, surrounding the very base of the ovary, the latter ovoid-conical much attenuate towards the very short slender style and the punctiform stigma, unilocular, with 2 pendant ovules. *Drupe* ovoid, ellipsoid or oblongoid-fusiform; exocarp thin, the lower 1/3 part dark red to purple, the upper part white to cream or greenish; endocarp firm, coriaceous to woody, its outer part fibrous. *Seed* 1; embryo small, in the top of the albumen.

Distr. About 12 *spp.*, 2 of which in Cochinchina and Annam, 1 in Ceylon; in *Malesia* 9 *spp.*, one of which extends to the Solomon and Palau Is. Fig. 27.

Ecol. In dry hilly land or in peat swamp forest (part of the species apparently restricted to the latter), mostly scattered, though widespread in lowland, rarely up to 1750 m.

Disp. The ripe fruits with their fibrous outer and hard inner endocarp are apparently able to float. This may explain the wide area of distribution of *S. ammui* (Palau Is., northcoast of New Guinea, New Britain, Solomon Is.) which occurs both in lowland hillside and in coastal swamp forest, even in the mangrove.

Uses. Wood aromatic, not durable and no commercial use known in Malesia (ENDERT, Med. Proefst. Boschw. Ned. Ind. 20, 1928, 198, 199, 201).

Note. The genus comprises two groups of species, one with uni- or biserially arranged flowers around *S. secundiflorus* BL. (W. Malesia incl. Celebes), the other with flowers crowded at the end of the branches of the umbel around *S. umbellata* BECC. (W. to E. Malesia, Solomon and Palau Is.). Within these two groups the species must be distinguished mainly by calyx and fruit characters, as their leaf and other flower characters overlap to rather great extent.

KEY TO THE SPECIES

1. Flowers uni- or biserial along the whole or at least the upper (in *S. grandifolius* thickened) part of the branches of the umbel, generally 5-12 per branch.
 2. Bracts at the base of the umbel persistent for a while during anthesis, (3-)4-5 by c. 1 mm.
 3. Leaves (18-)26-36 by 7-11(-13) cm, very coriaceous, generally a little shining above only in the dry state, nerves 15-20 pairs generally very slightly or hardly raised on both faces, veins ± obscure. Drupe ellipsoid-ovoid, 2-2.4 by 1.2-1.5 cm. 1. *S. grandifolius*
 3. Leaves 11-23(-30) by 6-9(-11) cm, coriaceous, generally shining on both faces in the dry state, nerves 15-20 pairs slightly though markedly raised on both faces as are the rather lax veins. Drupe ovoid-ellipsoid, 4.5-5.5(-6.5) by 2-2.5(-3) cm. 2. *S. scorpioides*
 2. Bracts at the base of the umbel early caducous, 1-2 by c. 0.5 mm.
 4. Inflorescences robust, peduncle c. 3 mm ø. Calyx shallowly lobed or almost entire. Petals 5-6(-7) mm. Drupe ovoid to oblong-ovoid, 2.5-3(-4) by (1.6-)2 cm. 3. *S. celebicus*
 4. Inflorescences relatively slender, peduncle 1-2 mm ø. Calyx lobed ± halfway. Petals c. 4 mm. Drupe oblong-ellipsoid, 4.5-5.5 by 1-1.5 cm. 4. *S. secundiflorus*
1. Flowers clustered at the end of the branches of the umbel or even at the end of the peduncle when the branches of the umbel are very short. (Bracts at the base of the umbel generally small, fugacious or rarely subsistent).
 5. Drupe subovoid-oblongoid to almost fusiform, at least 2 times as long as (or mostly longer than) across. (Leaves generally smooth on the undersurface, maybe except some tubercles found close to and along the midrib).
 6. Calyx rather deeply obtusely lobed. Petals (2.5-)3(-4) mm. Disk cup-shaped. Drupe 4.5-5 by (1-)1.5-2.2 cm. 5. *S. malaccensis*
 6. Calyx shallowly lobed. Petals (4-)5 mm. Disk low, almost patellar. Drupe (4.3-)4.5-5 by 1.5-1.7 cm. 6. *S. ammui*
 5. Drupe ovoid to ellipsoid-ovoid, up to c. 2 times as long as across.
 7. Leaves practically smooth on the undersurface; petiole (2-)2.5-3 cm. Calyx rather distinctly lobed. 7. *S. gitingensis*
 7. Leaves generally rather ± densely tubercled all over the undersurface or at least in a broad stripe along the midrib; petiole 1-2 (very rarely up to 3) cm.
 8. Calyx ± distinctly obtusely lobed. Petals 3(-4, very rarely -4.5) mm. 8. *S. monticolus*
 8. Calyx truncate or very shallowly (apiculate) lobed. Petals (4-)5(-6) mm. 9. *S. umbellatus*

1. *Stemonurus grandifolius* BECC. Malesia 1 (1877) 114, t. 5, f. 1; VALET. Crit. Overz. Olacim. (1886) 235; MERR. En. Born. (1921) 356; SLEUM. Blumea 17 (1969) 257. — *Urandra grandifolia* (BECC.) O. KTZE, Rev. Gen. Pl. 1 (1891) 113. — *S. dolichophyllus* MERR. Un. Calif. Publ. Bot. 15 (1929) 171. — *Urandra dolichophylla* (MERR.) HOWARD, J. Arn. Arb. 21 (1940) 468; DAHL, *ibid.* 33 (1952) 270 (pollen).

Tree, (7-)25-30(-40) m, bole (6-)10-15 m, 10-30(-40) cm ø; crown dense; bark greyish to brownish, smooth or superficially fissured, yellow-brown mottled. Branchlets robust (5-10 cm ø), often finely warted and vernicose. *Leaves* lanceolate or elliptic-oblong, apex very shortly acuminate, or merely ± abruptly apiculate, base broadly cuneate to rounded, very coriaceous, stiff, a little shining above in the dry state, dull beneath,

(18-)26-36 by 7-11(-13) cm, the extreme margin slightly and narrowly revolute, nerves 15-20 pairs, generally very slightly raised on both faces, veins ± obscure; petiole rugulose, 1.5-2(-3) by 0.3-0.5 cm. Peduncle of the *umbel* 3-5 cm by 2-3 mm, with 4-8(-12) shorter or longer (c. 10 mm) robust and a little flattened branches, which bear 3-4(-5) flowers crowded at the thickened end of each branch, or, as normally more (up to 8) flowers are present, these close together and uni- or biserial on the recurved and thickened upper part of the respective branch. Bracteoles at base of the umbel broad-subulate, (3-)4-5 by 1 mm, ± persistent. *Calyx* cup-shaped, 2 mm, lobed to 1/3. *Petals* c. 5 by 2 mm, light yellow or white. *Drupe* ellipsoid-ovoid, apex gradually attenuate, obtuse, 2-2.4 by 1.2-1.5 cm.

Distr. Malesia: Borneo.

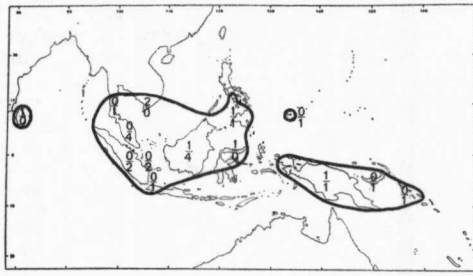


Fig. 27. Distribution of *Stemonurus*. The figure above the hyphen indicates the number of endemic species in the island or area, the figure below the hyphen the number of non-endemic species.

Ecol. Primary lowland (Dipterocarp) forest, on hills or low ridges, not rare on sandstone or sandy soil, or coastal kerangas, never in peat swamp, from sea-level-100(-680, a form with narrower leaves in *Tristania* forest on Mt Kinabalu at 1220) m. *Fl. fr.* Jan.-Dec.

Uses. The pale brown wood is apparently not used.

Vern. *Baru tuas*, Bulungan, *kambong*, Kina-batangan, *kapal-kapal*, Kedayan, *katak*, Dusun, *mersaut*, Kutei.

2. *Stemonurus scorpioides* BECC. *Malesia* 1 (1877) 113, t. 6; VALET. *Crit. Overz. Olacin.* (1886) 234; HOCHR. *Bull. Inst. Bot. Btzg* 22 (1905) 6 (*var.*); MERR. *En. Born.* (1921) 356 (*'scorpiurus'*); RIDL. *Fl. Mal. Pen.* 5 (1925) 296; BURK. *Dict.* (1935) 2074; HEYNE, *Nutt. Pl.* 1 (1950) 986; ANDERSON, *Gard. Bull. Sing.* 20 (1963) 166; SLEUM. *Blumea* 17 (1969) 257. — *Urandra scorpioides* (BECC.) O. KTZE, *Rev. Gen. Pl.* 1 (1891) 113 (*'scorpioides'*); DAHL, *J. Arn. Arb.* 33 (1952) 270, f. 58 & 58 A (pollen). — *Lasianthera secundiflora* [non (BL.) MIQ.] KING, *J. As. Soc. Beng.* 64, ii (1895) 177, *p.p.* — *S. secundiflorus* (non BL.) RIDL. *Fl. Mal. Pen.* 1 (1922) 430, *p.p.* — Fig. 28.

Tree 10-30(-35) m, clear bole up to 24 m and 15-30(-60) cm ø; bark thin, whitish to greyish brownish, smooth or pustular. Blunt asparagus-like pneumatophores sometimes present. Branchlets robust, often vernicose as are the buds. *Leaves* elliptic-oblong, apex shortly and ± abruptly acuminate, or apiculate, tip bluntish, base broadly cuneate, coriaceous, stiff, dark green above, paler beneath, glossy on both faces also in the dry state, the very margin often slightly revolute, 11-23(-30) by 6-9(-11) cm, nerves 15-20 subregular pairs, slightly though distinctly raised on both faces as are the rather lax veins, veinlets finely and prominently reticulate above only; petiole 1.5-2 cm by c. 3 mm. *Scorpioid cymes* 4-6 in an umbel on a robust 3-5(-6) cm long axillary peduncle, branches of the umbel 3-5 cm, each with 6-10 sessile flowers biserial on each side; bracts at base of umbel several, subulate,

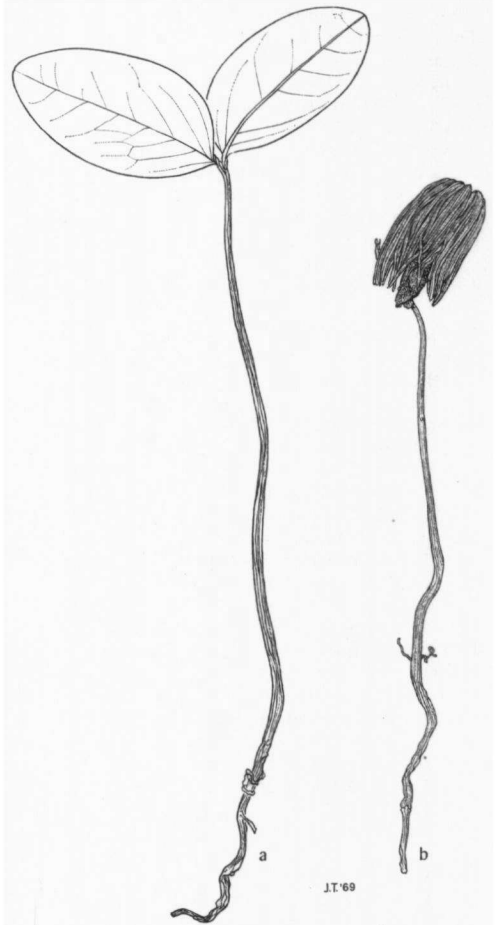


Fig. 28. *Stemonurus scorpioides* BECC. Seedling, a. with the first leaves, b. preceding stage with the cotyledons still enclosed by the longitudinal fibres of the endocarp, both $\times \frac{1}{2}$ (KEP 99938).

rather persistent, (3-)-4-5 by 1 mm. *Calyx* cup-shaped, 1.8 mm, obtusely lobed in the upper spreading $\frac{1}{3}$. *Petals* (4-)-5 by 1.5 mm, white to cream or greenish. *Drupe* ovoid-ellipsoid, obliquely attenuate towards the apex, 4.5-5.5(-6.5) by 2-2.5(-3) cm, whitish above, dark green-purplish in the lower third, with numerous slight vertical grooves, able to float when dry.

Distr. Malesia: Sumatra (incl. also Simalur I.), Lingga and Riouw Arch., Banka, Malay Peninsula, Borneo.

Ecol. In *Shorea albida* peat swamp forest in Borneo, generally in maybe seasonally swampy, also in secondary vegetation, on peaty or sandy soil, locally frequent, in lowland up to 45 m. *Fl. fr.* Jan.-Dec.

Uses. Timber soft, not durable, cracking,

locally used for planks and household utensils. Pounded bark used as medicine. The fruit is said to be edible.

Vern. *S. scorpioides* has remarkably numerous native names in the Malay; part of them, however, are used also for other species of the genus, and the name *bédaru* is commonly in use for *Cantleya corniculata* (BECC.) HOWARD outside North Borneo. — Sumatra: *kaju longgaha*, *k. pasir*, *sitobal*, Eastcoast, *sebungku*, *siburuk*, P. Bengkalis, *sibungku*, Indragiri, *setebal*, Djambi, *bahuhu-étém*, Simalur, *banol*, Banka, *daru daru daun lebar*, P. Singkep; Malay Peninsula: *bungkok*, *pérépat paya*, Pahang; *batang torong*, Manggu; Borneo: *ampasir*, W. Borneo, *bedaru*, *hantu burok*, *katok*; *medang katuk*, *m. telor* (Benuni); N. Borneo & Brunei, Sarawak: *entaburok*, Iban, *jerumit*, Milanau, *katop*, Dusun, *semburok*; *kaju malam*, Kuching, *pasir-pasir*, Pontianak.

3. *Stemonurus celebicus* VALET. in Koord. Minah. (1898) 394; Ic. Bog. 1 (1901) t. 88; HOCHR. Pl. Bog. Exs. (1904) 45; Bull. Inst. Bot. Btztg 22 (1905) 48; SLEUM. Blumea 17 (1969) 258. — *Urandra celebica* (VALET.) HOWARD, J. Arn. Arb. 21 (1940) 468.

Tree, 20–30 m tall, up to 45 cm ø. Branchlets robust, smooth or finely rugulose, vernicose, 5–12 mm ø. *Leaves* elliptic to obovate-elliptic, apex broadly subacuminate-attenuate or obtusely apiculate, sometimes rounded, base broadly cuneate, coriaceous, a little glossy above, dull beneath when dry, (10–)12–16(–22) by 5–8(–10.5) cm, edge somewhat revolute in dry specimens, nerves 10–14(–16) erecto-patent pairs, slightly or hardly raised on both faces, veins ± obscure; petiole 1.5–2 cm by c. 2.5 mm. *Umbels* solitary, robust, on peduncle 3–5 cm by 3 mm, branchlets of the umbel (4–)5–7, more slender, though thickened distally, (2–)3–4 cm, their basal bracts ovate, obtuse, 2 mm, early caducous. *Flowers* sometimes only 3 or 4 and crowded at the apex, generally 5–6(–8), close together and biseriate in the upper half of each branchlet of the umbel, secund. *Calyx* broadly cup-shaped, 2 mm, shallowly lobed or almost entire. *Petals* 5–6(–7) by 2.5 mm, keeled, white-greenish. *Drupe* ovoid to oblong-ovoid, apex gradually attenuate, obtuse, 2.5–3(–4) by (1.6–)2 cm, darker in the lower 2/3. *Seed* oblong, a little flattened.

Distr. *Malesia*: NE. and Central Celebes.

Ecol. Primary forest, rarely in swamps, 20–1000 m. Fl. April–July, fr. June–Nov.

Vern. *Bilulang*, Luwu, *palontanggasi*, Padu, *simbelan*, Minahasa (TI.), *simpaga tanru*, Bugin., *woliausa*, Tobela.

4. *Stemonurus secundiflorus* BL. Bijdr. (1826) 649; WALP. Rep. 1 (1842) 378; HASSK. Cat. Hort. Bog. (1844) 214; BL. Mus. Bot. Lugd.-Bat. 1 (1850) fig. 45; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 36, repr. Contr. Bot. 1 (1852) 86; SCHNIZL. Ic. 3 (1866/70) t. 223; BECC. Malesia 1 (1877) 112, t. 4, f. 16–17; VALET. Crit. Overz. Olacin. (1886) 234; K. & V. Bijdr. 5 (1900) 145; HOCHR. Pl. Bog.

Exs. (1904) 46, incl. var. *valetonii* HOCHR.; Bull. Inst. Bot. Btztg 22 (1905) 41, incl. var. *valetonii* HOCHR.; MOLL & JANS. Mikr. 2 (1908) 234, f. 105 (wood anat.); BACK. Schooff. Java (1911) 226; KOORD. Exk. Fl. Java 2 (1912) 531; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 3; KOORD. Atlas 1 (1913) t. 121; RIDL. Fl. Mal. Pen. 1 (1922) 430, p.p.; BAKER f. J. Bot. 62 (1924) Suppl. 21; RIDL. Fl. Mal. Pen. 5 (1925) 296; BURK. Dict. (1935) 2074; DOCT. v. LEEUWEN, Ned. Kruidk. Arch. 51 (1941) 175, f. 48 (gall); AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 5; BACK. & BAKH. f. Fl. Java 2 (1965) 60; SLEUM. Blumea 17 (1969) 258. — *Croton laurifolius* NOR. Verh. Bat. Gen. 5 (1790) ed. I Art. IV, 13, nom. nud. — *Lasianthera secundiflora* (BL.) MIQ. Fl. Ind. Bat. 1 (1856) 792, incl. var. *sumatrana* MIQ. l.c. (1858) 1097; Suppl. 1 (1860) 137, incl. var. *sumatrana*; *ibid.* (1861) 342, incl. f. *sumatrana* MIQ. l.c., t. 2; KING, J. As. Soc. Beng. 64, ii (1895) 177, p.p. — *Urandra secundiflora* (BL.) O. KTZE, Rev. Gen. Pl. 1 (1891) 113; ENGL. in E. & P. Nat. Pfl. Fam. 3, 5 (1893) 248; HEYNE, Nutt. Pl. 1 (1950) 987. — *S. pauciflorus* RIDL. Kew Bull. (1926) 61, non BL. 1826; HOWARD, J. Arn. Arb. 21 (1940) 481, in text. — *S. ridleyanus* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 243.

KEY TO THE VARIETIES

1. Leaves (subcoriaceous to coriaceous) generally oblong to elliptic- or obovate-oblong, nerves (8–)10–12(–14) pairs, ± distant from each other, slightly or hardly raised, veins ± obscure.

1. var. *secundiflorus*

1. Leaves with 14–16(–18) pairs of nerves, these ± close together and generally a little raised on both faces as are the lax veins.

2. Leaves elliptic, rigidly coriaceous.

2. var. *hosel*

2. Leaves lanceolate-oblong or -elliptic, coriaceous. 3. var. *lanceolatus*

1. var. *secundiflorus*.

Tree, 10–24(–32) m, trunk cylindrical, up to 40 cm ø, sometimes with pneumatophores in swampy places; bark rather smooth, whitish grey-green. Branches ± horizontal. Tips of branchlets and buds vernicose. *Leaves* rather variable in shape and size, oblong-obovate, sometimes elliptic-oblong or oblong, apex obtusely apiculate or short-acuminate, base acutely or more rarely obtusely cuneate, subcoriaceous to coriaceous, shining above, much paler beneath, (6–)10–17(–20) by (3–)4–8.5 cm, nerves (8–)10–12(–14) slender and ± distantly subparallel, rather indistinctly inarching pairs, slightly or hardly raised on both faces, veins ± obscure; petiole 1.5–2(–3) cm. *Cymes* arranged in an solitary umbel, rarely in two umbels per axil, peduncle rather slender, c. 3 cm by 1–2 mm, branchlets of the umbel 3–5, slender, ± recurved, 2–2.5 cm, bearing in the upper part 3–5(–7) flowers close together in a row on each side; bracts at base of the umbel ovate or oblong,

minute, early caducous, leaving blunt scars. *Calyx* cupular, 2–2.5 mm, obtusely lobed almost half-way. *Petals* c. 4 by 1.5 mm, white or yellowish, fragrant. *Drupe* oblongoid-ellipsoid, attenuate towards the bluntish apex, 4.5–5.5 by 1–1.5 cm.

Distr. *Malesia*: Sumatra (incl. also Simalur, Mentawai & Enggano Is.), Banka, Billiton, Malay Peninsula, W. Java.

Ecol. Rain-forest, 30–700(–1000) m, sometimes in peat swamp forest or seasonal swamp forest near sea-level, scattered. *Fl. fr.* Jan.–Dec.

Uses. Timber light brown, of inferior quality, used in places under the house-roof. Medicinal use for the cure of swellings doubtful. Seeds have a bitter taste and are edible only after repeated cooking.

Vern. Sumatra: *lokan*, Westcoast, *sěbungku*, Eastcoast, *ganggaram*, P. Bengkalis, *katur*, *sěbonku*, *si bėnjiet*, Indragiri, *sěhring*, Bencoolen, *bahuu uding*, *suwaha uding*, Simalur, *mangguguk*, Mentawai, *kaju bėmban*, Enggano, *gėlam kataju*, Minangkabau; *saběr bubu*, Banka, *krikis ayěr*, Billiton; Malay Peninsula: *bėrlat*, Pahang, M., *kalapa siong*, *kimeong*, *sintok lantjang*, S.

2. var. *hosel* SLEUM. *Blumea* 17 (1969) 259. — *S. labuanensis* STAFF, *Kew Bull.* (1906) 71, *p.p.*; MERR. *En. Born.* (1921) 356, *p.p.*

Leaves elliptic, very shortly acuminate, stiff-coriaceous, nerves close together and numerous (c. 18 pairs), slightly prominent on both faces as is the net of veins. *Inflorescence* as in var. *lanceolatus*. Branchlets of the umbel 3 or 4. *Fruit* not known.

Distr. *Malesia*: Borneo (Baram R. area in Sarawak), once found.

3. var. *lanceolatus* (BECC.) SLEUM. *Blumea* 17 (1969) 259. — *S. lanceolatus* BECC. *Malesia* 1 (1877) 114, t. 5, f. 2–4; VALET. *Crit. Overz. Olacin.* (1886) 235; MERR. *En. Born.* (1921) 356. — *Urandra lanceolata* (BECC.) O. KTZE, *Rev. Gen. Pl.* 1 (1891) 113; HOWARD, *J. Arn. Arb.* 21 (1940) 468, t. 1, f. 1–6. — *Urandra 'secundiflora'*, DAHL, *J. Arn. Arb.* 33 (1952) 270, f. 57 & 57 A (pollen). — *S. umbellatus* (non BECC.) ANDERSON, *Gard. Bull. Sing.* 20 (1963) 166.

Tree; bark greyish brown. *Leaves* lanceolate-oblong to narrowly elliptic, coriaceous, nerves 14–16 pairs, slightly raised on both faces as is the lax network of veins. *Umbels* with 2 or 3 branches. *Drupe* similar to that of var. *secundiflorus*, oblongoid, 3.5–4.5 by 1–1.5 cm, apex attenuate and slightly curved.

Distr. *Malesia*: Borneo.

Ecol. Generally mixed swamp or peat swamp forest, or border of swamp forest with *Agathis* forest, low country. *Fl. fr.* Jan.–Dec.

Vern. *Entaburok*, Iban, *kepot bėdjuku*, Dajak, *sėmantėn*, Sampit, *ėnsurok*, *sėmburok*, M.

5. *Stemonurus malaccensis* (MAST.) SLEUM. *Notizbl. Berl.-Dahl.* 15 (1940) 243; *Blumea* 17 (1969) 260; *Fl. Thail.* 2 (1970) 85. — *Lasianthera apicalis* (THW.) BENTH. in MAST. in Hook. *f.*

Fl. Br. Ind. 1 (1875) 584, as to the Labuan plant only. — *Lasianthera malaccensis* MAST. in Hook. *f. Fl. Br. Ind.* 1 (1875) 584; BECC. *Malesia* 1 (1883) 257; KING, *J. As. Soc. Beng.* 64, ii (1895) 118. — *S. capitatus* BECC. *Malesia* 1 (1877) 114, t. 5, f. 7–11; VALET. *Crit. Overz. Olacin.* (1886) 236; MERR. *En. Born.* (1921) 355; RIDL. *Fl. Mal. Pen.* 1 (1922) 431; CRAIB, *Fl. Siam. En.* 1 (1926) 272; BURK. *Dict.* (1935) 2074. — *Urandra capitata* (BECC.) O. KTZE, *Rev. Gen. Pl.* 1 (1891) 113. — *S. labuanensis* STAFF, *Kew Bull.* (1906) 71, *p. p. lectotyp.*; MERR. *En. Born.* (1921) 356, *p. p.* — *Urandra nitida* HOWARD, *Lloydia* 6 (1943) 147, t. 1, f. 3–6. — Fig. 29.

Treelet or tree, (2.5–)6–15(–20) m, bole up to 10 m and 20 cm \varnothing ; bark smooth, brownish-grey, shallowly lengthwise fissured. Branchlets with pustules on older parts. *Leaves* variable in shape and size, oblong to subobovate-oblong, sometimes obovate, short-acuminate or obtusely apiculate, rarely rounded, base cuneate, subcoriaceous to coriaceous, smooth, *i.e.* practically not tubercled, a little shining above, dull beneath both in the fresh and dry state, (6–)8–12.5(–14) by (2–)2.5–4 (rarely –7) cm, nerves c. 15 pairs, with other shorter ones between, rather straight and sub-parallel, very slightly prominent on both faces, or not rarely almost obscure beneath, similar to those of *S. secundiflorus* var. *secundiflorus*, reticulation of veins faintly visible above only, or obscure at all; petiole 1–1.5(–1.8) cm by (1–)1.5–2 (rarely –2.5) mm. Peduncle of the umbel-like *inflorescence* generally rather slender (1 mm, rarely up to 2 mm \varnothing), 1–2 cm long, with 3–5 branchlets of the umbel (2–)3–10 mm long, each bearing (3–)4–6 flowers crowded at the very end, the flowers seemingly on top of the peduncle when the branches of the umbel are very short; bracts at the base of the umbel ovate-oblong or broadly linear, obtuse, persisting during anthesis only, c. 2 by 2 mm. *Calyx* cup-shaped, c. 2 mm, rather deeply and obtusely lobed. *Petals* (2.5–)3(–4) mm, white-yellowish to dull pink, fragrant. *Disk* cup-shaped. *Drupe* subovoid-oblongoid, attenuate and sometimes a little curved distally, 4.5–5 by (1–)1.5–2.2 cm, pink or pale brown below, merging into pale green in the upper part.

Distr. Lower Burma, southern Peninsular Thailand; in *Malesia*: Malay Peninsula, Borneo.

Ecol. Primary rain-forest, also bamboo forest, generally in lowland up to 150 m, more rarely on hillside or ridge tops up to 1370 m, never in peat swamp forest, apparently on fertile soil, but once reported from *Shorea materialis* heath forest in Trengganu; scattered. *Fl. fr.* Jan.–Dec.

Uses. Apparently not used, possibly due to the small size of the trees, contrary to most other species of the genus, which reach fair dimensions.

Vern. *Alau daan*, Murut Bokan, *gigi buntol*, Selangor, *baruas*, *pasir pasir*, Kinabatangan, *pėropot*, Dusun, *pėtom*, Pahang, *tarung pėlاندok*, Perak, M.

6. *Stemonurus ammui* (KANEH.) SLEUM. *Blumea* 17 (1969) 260. — *Urandra elliptica* SCHELLENB. *Bot.*



Fig. 29. *Stemonurus malaccensis* (MAST.) SLEUM. a. Habit, $\times \frac{1}{2}$, b. flower, $\times 5$, c. petal inside, $\times 5$, d. stamen, $\times 5$, e. calyx and ovary, $\times 7\frac{1}{2}$, f. fruit, $\times \frac{3}{4}$ (a N. BORNEO FOR. DEP. 7685, b-e SAN 30985, f KEP 76124).

Jahrb. 59 (1924) 17, non MERR. 1910. — *Urandra ammui* KANEH. Bot. Mag. Tokyo 45 (1931) 293; Fl. Micron. (1933) 199, f. 86; J. Dep. Agr. Kyushu Imp. Un. 4 (1935) 359. — *S. ellipticus* (SCHELLENB.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 242.

Tree, 10–24(–33) m, sometimes with buttresses or slenderly cylindrical pneumatophores, bole straight, 10–25(–30) cm \varnothing ; bark smooth or with fine longitudinal fissures or pustules, whitish-grey to pale or dark brown. *Leaves* oblong- to obovate-elliptic, apex shortly (1–2 cm) \pm abruptly and obtusely acuminate, sometimes rounded, very rarely slightly emarginate, coriaceous, shining above, rather dull beneath in dry specimens, margin slightly revolute, 9–16(–19) by 4–8(–9) cm, smooth on both faces or practically so (a few tubercles maybe present along the midrib underneath), nerves 12–14(–18) slightly curved pairs, generally a little raised or at least visible above, much less or hardly so beneath, reticulation of veins faint and above only; petiole 1.5–2 cm by c. 2 mm. Peduncles of umbel-like inflorescence 3–5 cm, stoutish, bearing 5–7 (rarely 9) branches, these 1–1.5 cm long, each with a subulate subsistent basal bract c. 1 by 0.5 mm. *Calyx* cup-shaped, 2 mm, shallowly subacutely lobed. *Petals* (4–)5 by 2 mm, slightly keeled outside, yellowish-white, with a strong lemon scent. *Disk* low, almost patellar, slightly or hardly lobed. *Drupe* oblongoid-subfusiform, much attenuate at both ends, (4.3–)4.5–5 by 1.5–1.7 cm.

Distr. Micronesia (Palau Is.), Melanesia (New

Britain, Solomons); in *Malesia*: eastern part of New Guinea.

Ecol. Primary forest, generally on well-drained hilly slopes up to 200 m, occasionally in freshwater swamp forest or mangrove along the coast. *Fl. fr.* Jan.–Dec.

Vern. *Aikunu, ailalo, aimarako, ainunura, mala sata*, Solomon Is. (Kwara'ae), *ammui*, Palau Is.

7. *Stemonurus gitingensis* (ELM.) SLEUM. *Blumea* 17 (1969) 261. — *Urandra gitingensis* ELM. *Leaf.* Philip. Bot. 4 (1912) 1476. — *S. secundiflorus* (non BL.) MERR. *En. Philip.* 2 (1923) 489.

Tree, 13 m or higher, up to 60 cm \varnothing ; bark thick, yellowish or greyish, brittle, rough with lenticels. *Leaves* elliptic or obovately so, apex rounded, base broadly attenuate and obtuse, or sometimes rounded, dark green and shining above, dull and much paler beneath, coriaceous and rather stiff, smooth, i.e. practically not tubercled beneath, edge a little revolute, 7–13 by 4–7 cm, nerves (12–)15–17 (rarely more) pairs, rather straight, subparallel and close together, slightly raised above, hardly so beneath, reticulation obscure; petiole stout, (2–)2.5–3 cm. *Inflorescence* not known. *Infructescence* an umbel of 3–4 branches (c. 1 cm) on a robust peduncle (2–4 cm), bracts at base of the umbel according to the scars small and apparently early caducous. *Flowers*, as seen from the left scars, 2–4 clustered at the end of each branch of the umbel, certainly not in a row as in *S. secundiflora*. *Calyx* on immature fruit

cup-shaped, 2 mm, rather distinctly lobed. *Drupe* ovoid-ellipsoid, short-apiculate, 3.2–3.7 by 2–2.3 cm. *Seed* said to be surrounded with a soft white sourish tasting layer.

Distr. Malesia: Philippines (Sibuyan: Mt Gitingting; after MERRILL also on Panay).

Ecol. Primary forest at 750–1750 m. *Fr.* March–April.

Vern. *Tugbak*, P. Bis.

8. *Stemonurus monticolus* (SCHELLENB.) SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 243 ('*monticola*'); *Blumea* 17 (1969) 261. — ? *Urandra scorpioides* [non (BECC.) O. KTZE] PULLE, Nova Guinea 8 (1912) 659; SCHELLENB. Bot. Jahrb. 58 (1923) 165. — *Urandra monticola* SCHELLENB. Bot. Jahrb. 58 (1923) 164. — *Urandra umbellata* (non BECC.) PULLE, Nova Guinea 8 (1912) 658; SCHELLENB. Bot. Jahrb. 58 (1923) 165. — *Urandra brassii* HOWARD, Lloydia 6 (1943) 146, t. 1, f. 1 & 2; DAHL, J. Arn. Arb. 33 (1952) 270 (pollen).

Tree, 10–30(–40) m, bole up to 18 m and 10–30 (–60) cm \varnothing ; bark grey to pale brown, smooth, maybe with a few longitudinal fissures, a little or not peeling; buttresses sometimes present, up to 1.5 by 1 by 0.1 m. *Leaves* elliptic to obovate, sometimes lanceolate- or oblong-elliptic, apex shortly obtusely acuminate, or mostly blunt, sometimes rounded and maybe a little emarginate, base \pm broadly attenuate, coriaceous, dark green to yellowish green above, paler beneath, generally rather dull on both faces, smooth above, \pm densely tubercled all over the undersurface, or at least so in a broad stripe along the midrib, very rarely smooth beneath, the edge a little recurved in dry specimens, (5–)6–10(–18) by (2.5–)3–6(–9) cm, nerves (12–)14–16 rather straight pairs, looping before the edge, very slightly or hardly raised or visible above and/or beneath, generally obscure beneath; petiole (1–)1.5–2 cm by 1–2 mm. Umbel-like *inflorescences* peduncled (2–4, rarely 4 cm by 1–1.5 mm), branches 4–6 rather slender, each bearing 3–4(–5) flowers crowded distally; bracts at the base of the umbel ovate-subacuminate, 1–2 by 1 mm, subsistent during anthesis. *Calyx* cup-shaped, 2 mm, \pm distinctly obtusely lobed. *Petals* 3(–4, rarely 4.5) by 1.5 mm. *Disk* a flattish slightly 5-lobed cup. *Drupe* subellipsoid-ovoid, 3–3.5 by 1.6 cm, apex subabruptly attenuate or apiculate.

Distr. Malesia: New Guinea.

Ecol. Primary (and occasionally also secondary) rain-forest or forest substage, on slopes, from sea-level to 850(–1000) m, on clayey or sandy soil, sometimes on limestone with clay cover, locally common. *Fl. fr.* Jan.–Dec.

Uses. Wood yellowish or light orange, apparently not used. Scrapings of bark heated in hot ashes are used for wounds in the Vogelkop Peninsula.

Vern. *Bëram*, *bramsos*, *ëmpam*, *keferan maper*, *mansëran*, *sandawer*, *sapuduper*, *Biak*, *duwilli*, *Kapauku*, *harihoh*, *korappi*, *korowapi*, *ukipi*, *wapapi*, *Japen*, *karmuk*, *karmu-u*, *lakobiliem*, *lobak*, *Moosi*, *kuwat*, *Amberbaken*, *nikoboa*, *Kebar*,

perme, *pirmir*, *Asmat*, *sakokohom*, *sakokom*, *Manikiong*, *tafus*, *Berik*, *tifus*, *Mander*, *weijan*, *Meosnum* (Wanapi).

9. *Stemonurus umbellatus* BECC. *Malesia* 1 (1877) 115, t. 5, f. 5 & 6, *incl. var. ovalifolius* BECC. *I.c.* t. 4, f. 14 & 15; VALET. *Crit. Overz. Olacin.* (1886) 235; RIDL. *Fl. Mal. Pen.* 1 (1922) 431, *p.p.*; BURK. *Dict.* (1935) 2074, *p.p.*; SLEUM. *Blumea* 17 (1969) 262. — *Urandra umbellata* (BECC.) O. KTZE, *Rev. Gen. Pl.* 1 (1891) 113; DAHL, *J. Arn. Arb.* 33 (1952) 270, f. 59 & 59 A (pollen). — *Lasianthera umbellata* (BECC.) KING, *J. As. Soc. Beng.* 64, ii (1895) 117, *excl. specim. cit.* = *S. malaccensis*; MERR. *En. Born.* (1921) 355, *incl. var. ovalifolia* (BECC.) MERR. — *S. evenius* STAFF, *Kew Bull.* (1906) 71; MERR. *En. Born.* (1921) 355. — *Urandra hallieri* MERR. *Philip. J. Sc.* 5 (1910) Bot. 194; DAHL, *J. Arn. Arb.* 33 (1952) 270 (pollen). — *S. hallieri* (MERR.) MERR. *En. Philip.* 2 (1923) 489. — *Urandra evenia* (STAFF) HOWARD, *J. Arn. Arb.* 21 (1940) 468. — *S. intercedens* HEINE in Fedde, *Rep.* 54 (1951) 237; Pfl. d. Samml. Clemens Kinabalu (1953) 57, 114. — *Fig.* 30–31.

Tree, (8–)12–24(–37) m, (15–)20–35 cm \varnothing ; bark smooth or finely cracked or hooped, sometimes patchy, whitish-greyish to greenish or greyish-brownish. Branchlets dark by resinous

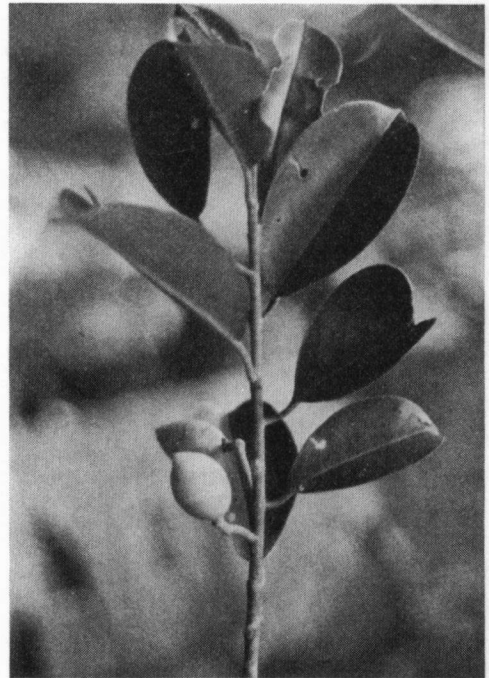


Fig. 30. *Stemonurus umbellatus* BECC. Fruiting twig, Mt Blumut, Johore (FRI 8841) (WHITMORE, 1968).

excretion. *Leaves* oblong to obovate, sometimes elliptic, apex generally rounded or obtusely apiculate, sometimes slightly retuse, rarely shortly bluntly acuminate, base cuneate, coriaceous, sometimes very stiffly so, shining above, rather dull beneath, the whole undersurface or at least the parts closer to the midrib set with fine epidermal tubercles, margin a little revolute, (6-)7-12(-16) by (3-)4-7(-9) cm, nerves numerous (20-25) straight subparallel pairs, generally slightly raised above only, rather obscure though visible beneath, reticulation, if any, remarkable above only; petiole 1.2-2 (very rarely -3) cm by 2(-3) mm. *Cymes* arranged in an umbel, its peduncle robust, 1-2(-3) cm by 2 mm, the (4-)5-6(-8) branches (3-)5-8 mm long and c. 1.5 mm ϕ , each branch bearing (1-)3-4(-5) distally crowded flowers; bract at base of umbel ovate-subulate, c. 2 mm, subpersistent. *Calyx* broadly obconical, 3 mm, base rugulose, margin truncate or very shallowly (apiculately) lobed, the very edge almost pellucid and ciliate (lens!). *Petals* broad-oblong, slightly keeled, (4-)5(-6) by 2(-2.5) mm, white or light brown, scented. *Disk* cup-shaped and shallowly lobed. *Drupe* ovoid, very apex rather abruptly attenuate, lower half glossy green, upper one dull grey, 3-3.5(-4) by 1.5-2.2 cm, the fibrous part of the endocarp 1 mm thick.

Distr. Malesia: Malay Peninsula, Borneo.

Ecol. Primary forest, generally on hillside or high level alluvium, occasionally in swamp between hills, also in peat swamp forest, in coastal and high inland kerangas, on padang and on cliffs, generally in lowland up to 900 m, in the Cameron Highlands up to 1465 m, on Mt Murud in Sarawak at 1700 m, and on Mt Pagon Periok in Brunei at 1800 m; on Mt Kinabalu up to 1220 m, on sandy, maybe waterlogged soil (*Agathis* forest), sandy peat soil or sandy loam, rarely on sandstone. *Fl. fr.* Jan.-Dec.

Uses. Wood pale orange-brown or honey-coloured, apparently not used, the value of the timber not known.

Vern. *Sampin kris, sampit kris*, M; Borneo: *djadjar*, Dajak (Tajan), *éntaburok, sěmburok*, Iban, *kakuli*, Dusun; Philippines: *malatadu*, Mbo.



Fig. 31. *Stemonurus umbellatus* BECC. Stem, Mt Blumut, Johore (FRI 8841) (WHITMORE, 1968).

15. WHITMOREA

SLEUM. *Blumea* 17 (1969) 263. — Fig. 32.

Tree. *Leaves* spirally arranged, entire, coriaceous, penninerved, petioled. *Flowers* bisexual, generally pedicelled, uni- or biseriate towards the \pm recurved end of secondary peduncles, the latter 3 or 4 as a cross-like umbel on top of a common axillary and solitary peduncle. *Calyx* cup-shaped, entire, persistent and \pm flattened below fruit. *Petals* (4-)5, oblong, valvate, free in the uppermost part, remaining connate below at full anthesis, apex inflexed, with a conspicuous midrib inside, caducous. *Stamens* (4-)5, inserted at the very base of the petals; filaments linear, fleshy, with longish subclavate white hairs below the anther cells inside and at the connective outside; anther cells linear, thecae diverging below, basifixed. *Disk* annular, flat, rather obscure. *Ovary* ovoid-conical, apex truncate, *i.e.* inverted there and forming a kind of cup, with the small hardly bilobed unilateral stigma on its inner edge. *Drupe* oblong-ellipsoid, smooth and reddish in the lower $\frac{3}{4}$,

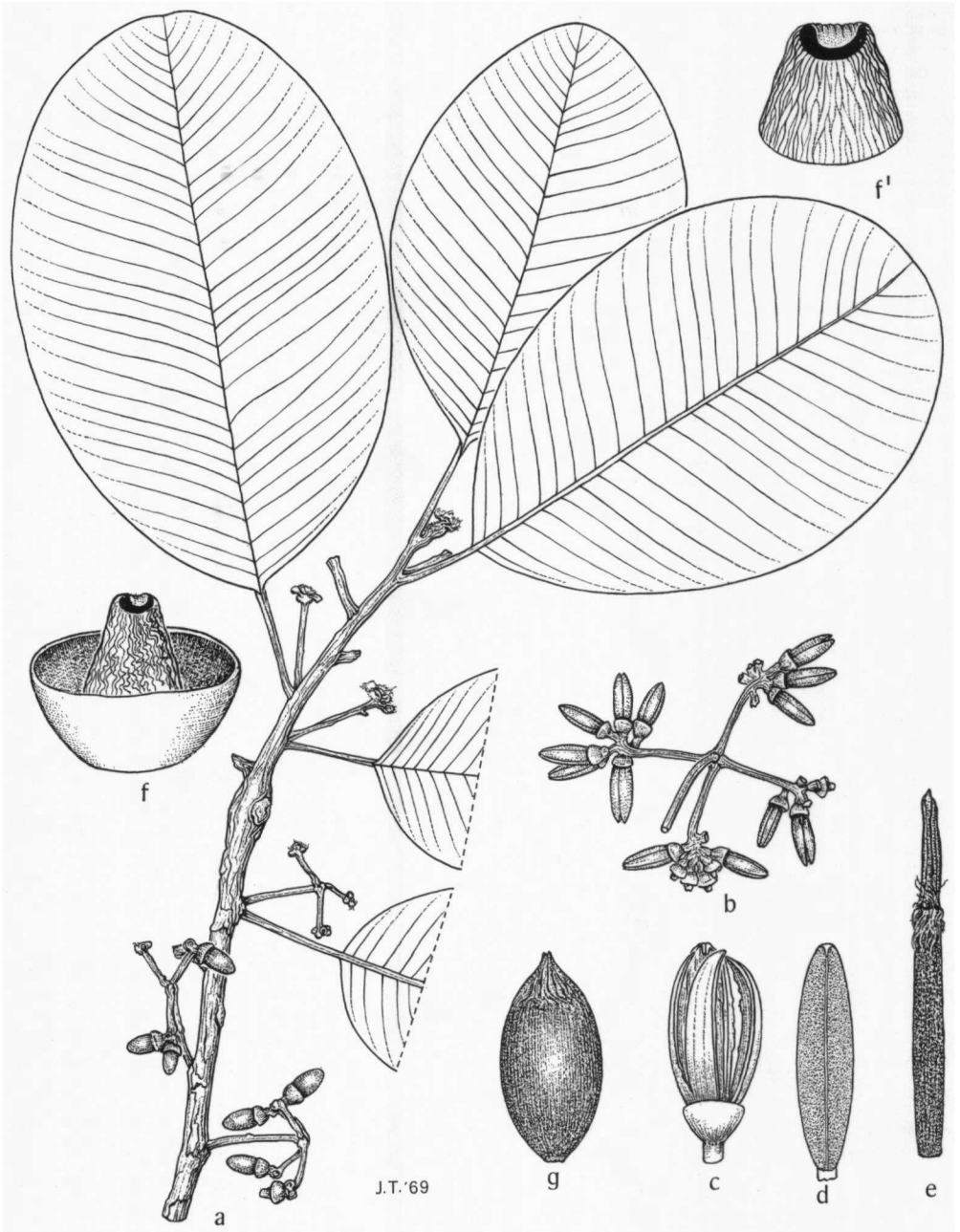


Fig. 32. *Whitmorea grandiflora* SLEUM. a. Habit, $\times \frac{1}{2}$, b. inflorescence, $\times \frac{1}{2}$, c. open flower, $\times 1\frac{1}{2}$, d. petal inside, $\times 2$, e. stamen, $\times 4$, f. ovary and calyx, $\times 5$, f'. upper part of ovary obliquely seen from above to show the stigma turned inside the apical cavity of the ovary, $\times 10$, g. submature fruit, $\times \frac{3}{4}$ (a-f BRASS 3418A, g BSIP 5212 WHITMORE, type).

papillose and greyish-yellowish in the upper $\frac{1}{4}$ part, exocarp thin, with an outer fibrous, and an inner crustaceous layer. *Seed* 1, ellipsoid-subquadrangular, with a lengthwise depression around the middle; embryo small, in the apex of the copious albumen.

Distr. Monotypic, hitherto only known from the Solomon Islands.

1. *Whitmorea grandiflora* SLEUM. *Blumea* 17 (1969) 264. — *Urandra umbellate* [non (BECC.)] O. KATZEJ WALKER, For. Fl. Br. Solomon Is. (1948) 127. — Fig. 32.

Spreading canopy tree, 6–25(–30) m, bole straight, up to 12 m, up to 50 cm ϕ , with slender and weak pneumatophores in wet places; bark grey to brown, smooth or cracked. Branchlets robust, often covered with resinous exudation as are the inflorescences. *Leaves* elliptic or oblong-elliptic, apex obtuse or slightly emarginate, base broadly cuneate to rounded, coriaceous, firm, shining green above, dull and greyish or yellowish green beneath, glabrous, 14–22 by 4–8(–12) cm, nerves in 20–25 pairs, straight and parallel to each other, slightly raised on both faces, reticulation dense, visibly raised above only; petiole 2–3(–4) cm by 2(–3) mm, minutely transversely wrinkled. *Inflorescences* axillary, solitary, with 3 or 4 secondary peduncles (1–3 cm) crosswise and umbellately spreading from top of main peduncle (2.5–4 cm by 1.5–2 mm), flowers several, close together, scorpioid, uni- or biseriata, on the upper \pm recurved part of the secondary peduncles, thick-pedicelled for 0.5–2(–3) mm; bracts at base of secondary peduncles knob-like, rather obscure. *Calyx* obconical-cupular, maybe suddenly narrowed at base for 1–2 mm to a kind of foot for

1–2 mm, rugose, persistent and more spreading or almost patellar under the ripe fruit, 4–5 by 6–7 mm. *Petals* chartaceous, glabrous, veined lengthwise, becoming free only in uppermost part, remaining connate for the rest, oblong, white with cream centre or greenish-yellowish, with sweet smell, (12–)13–15 by 3–4 mm. *Filaments* linear, fleshy, 9–10 by 1 mm, with longish white hairs below the anthers inside and at connective outside; anthers linear, thecae spreading below, 4 by 1 mm. *Ovary* ovoid-conical, truncate, hollow at apex, its edge folded in dry specimens, 3.5–4 by 2–2.5 mm. *Drupe* oblong-ellipsoid, apiculate, reddish and smooth in the lower $\frac{3}{4}$, papillate and greyish-yellowish in the upper $\frac{1}{4}$ part, 3.5–4 by 2–2.5 cm.

Distr. Melanesia: Solomon Is. (Bougainville to San Cristobal).

Ecol. Primary and secondary rain-forest, both on well drained slopes or ridge top and in swampy valley bottoms, though locally not rare, from lowland up to 950 m.

Uses. Wood rather hard, moderately heavy, cream to brownish, used for planting sticks, suitable for not too heavy constructions.

Vern. *Aialo*, *aikuma*, *aikuni*, *aikunu*, *arifanatia*, *Kwara'ae*, *duleke*, Kolombangara, *porutolo*, Faro I.

16. POLYPORANDRA

BECC. Malesia 1 (1877) 125; SLEUM. *Blumea* 17 (1969) 248. — Fig. 33.

Dioecious climber, whether or not with extra-axillary or intrapetiolar tendrils. *Leaves* opposite, entire, penninerved. Panicles axillary, composed of short cymes. *Flowers* small, 5–6(–7)-merous. Pedicels articulated with calyx. — δ *Flowers*: *Calyx* cup-shaped, shortly dented. *Petals* valvate, inflexed appendiculate distally inside in bud. *Stamens* sessile; anthers thick, clavate-subglobose, with numerous small pollen-bearing alveoles, each of which is covered with a caducous membrane. Rudiment of *ovary* conical. — ♀ *Flowers*: *Calyx* deeply dented. *Petals* very short, connate in the lower $\frac{1}{3}$. *Stamens* 0. *Ovary* subglobose-cylindric, stigma large, disk-shaped, the centre depressed, crenulate or very shortly many-lobed in later stages. *Fruit* compressed-ellipsoid; exocarp thin; endocarp firm, irregularly foveolate-reticulate outside when the exocarp is gone, wrinkled inside. *Seed* 1; cotyledons foliaceous.

Distr. Monotypic, Solomon Is. and East Malesia. Fig. 34.

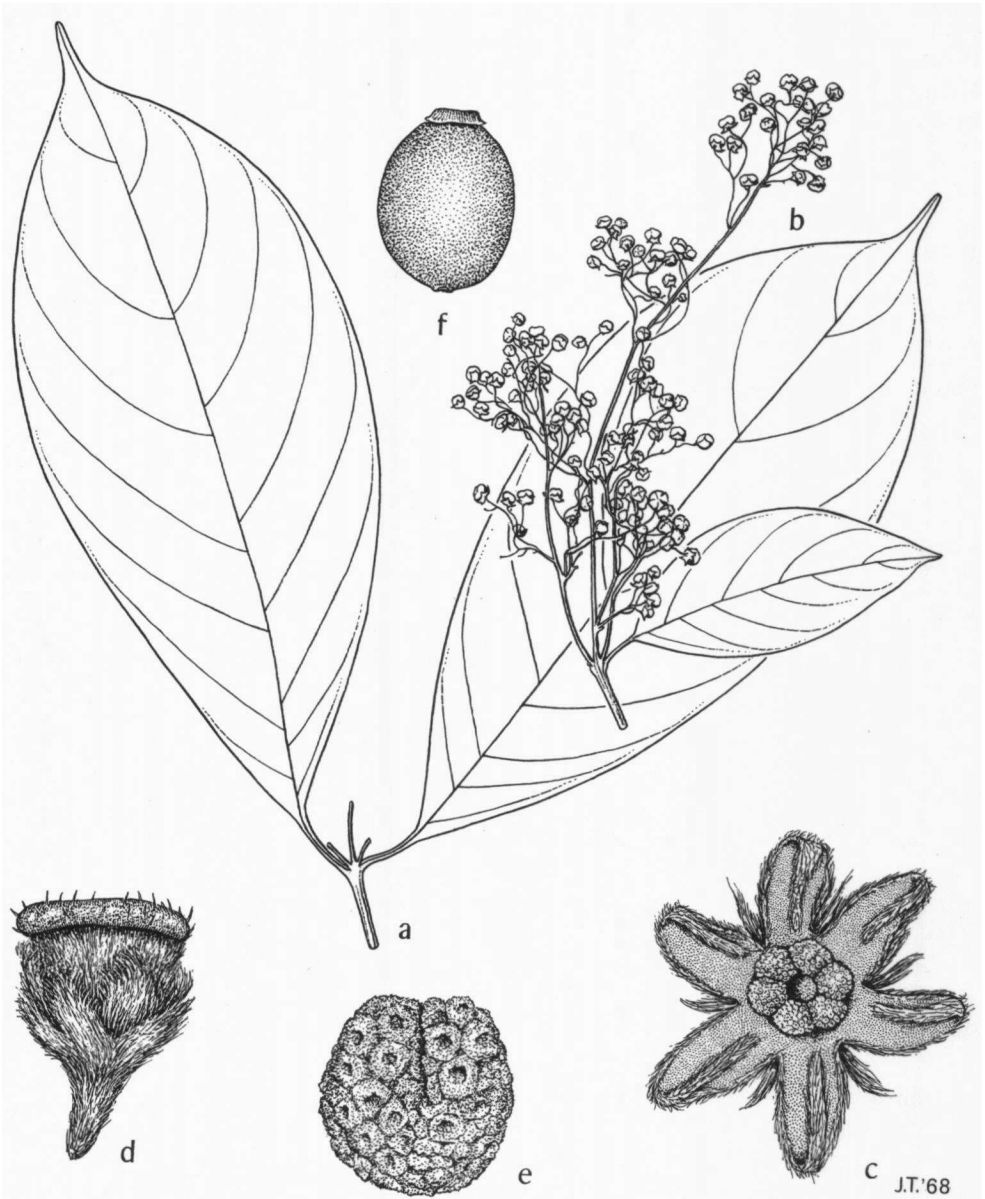


Fig. 33. *Polyporandra scandens* BECC. a. Habit, $\times \frac{1}{2}$, b. δ inflorescence, $\times \frac{1}{2}$, c. δ flower, $\times 5$, d. f flower $\times 10$, e. anther, $\times 20$, f. drupe, $\times 1$ (a, c, e VAN ROYEN & SLEUMER 6696, b ditto 6830, d CARR 12610 f ditto 16435).

1. *Polyporandra scandens* BECC. Malesia 1 (1877) 125, t. 7; PULLE, Nova Guinea 8 (1912) 660; SCHELLENB. Bot. Jahrb. 58 (1923) 176; BIRNIE, Nova Guinea 14, 2 (1926) 277; WHITE, J. Arn. Arb. 10 (1929) 235; SLEUM. in E. & P. Nat. Pfl. Fam. ed. 2, 20b (1942) 379, f. 109; DAHL, J. Arn. Arb. 33 (1952) 275, f. 70 (pollen); STEEN. Nova Guinea, Bot. n. 23 (1965) 495; SLEUM.

Blumea 17 (1969) 248. — ? *Iodes ovalis* (non BL.) WARB. Bot. Jahrb. 13 (1891) 299. — *P. hansemanni* ENGL. Bot. Jahrb. 16, Beibl. 39 (1893) 13 ('hansemanni'); in E. & P. Nat. Pfl. Fam. 3, 5 (1895) 253; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 418. — *Iodes sogerensis* BAKER f. J. Bot. 61 (1923) Suppl. 10. — Fig. 33.

Scandent shrub or branched liana, climbing to

35 m, stem up to 8 cm ø. Branchlets slender, divaricate, pubescent initially; nodes thickened; internodes 4–10 cm. *Leaves* opposite, ovate to elliptic, apex shortly ± abruptly acuminate to cuspidate, base broadly attenuate to rounded, slightly inequilateral, chartaceous to subcoriaceous, glabrous above, covered with scattered short appressed hairs all over beneath, 7–15(–17) by 3.5–9 cm, margin slightly revolute, entire, midrib a little impressed above, strongly prominent beneath, nerves (4–)6–8 curved-ascending pairs, prominent beneath only as is the rather dense network of veins; petiole 8–15(–20) mm; tendrils whether or not present at the upper axils, elongate, bifurcate. *Panicles* 1–3 from the same axil, few- to many-flowered, (2–)3–9 cm, ascending or recurved, all over covered with short appressed hairs. Peduncle 1–3 cm, bearing several few-flowered cymes. Pedicels slender in the ♂, thicker in the ♀ flowers. — ♂ *Flowers*: *Calyx* tube short, lobes ovate-acuminate, c. 1 mm. *Petals* ovate-caudate, ± expanded, white to cream or yellow, 4–5(–6) mm, acumen abruptly narrowed, ± inflexed, glabrous, 2 mm, tip blunt. *Anthers* c. 1 mm ø. Rudiment of *ovary* hardly 1 mm. — ♀ *Flowers*: *Calyx* as in ♂ flowers. *Petals* only 1–1.5 mm. *Stamens* 0. *Ovary* densely hairy, c. 1.3 mm. *Fruit* compressed-ovoid-ellipsoid, c. 2 by 1.5 by 1.5 cm, appressed-pubescent; exocarp rather soft and smooth, 1 mm, apparently going early; endocarp hard, 0.5 mm, coarsely reticulate-foveolate.

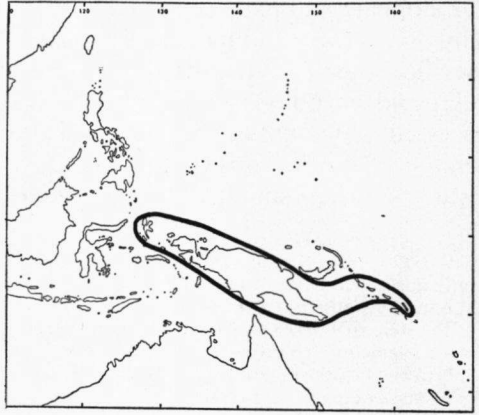


Fig. 34. Distribution of *Polyporandra scandens* BECC.

Distr. Solomon Is.; in *Malesia*: New Guinea, Moluccas (Halmahera, Batjan). Fig. 34.

Ecol. Climber over shrubs or high liana in primary and secondary rain-forest, from sea-level to 700 (possibly to 1000) m. *Fl. fr.* Jan.–Dec.

Uses. On Bougainville young leaves are cooked and eaten or added to taros to give these a flavor. Vern. *Dodofu*, Halmahera.

17. IODES

BL. Bijdr. (1825) 29 ('*Iödes*'); SLEUM. Blumea 17 (1969) 219. — *Mappianthus* HAND.-MAZZ. Anz. Ak. Wiss. Wien M.-N. Kl. 58 (1921) 150; SLEUM. Blumea 17 (1969) 225. — Fig. 36.

Diocious climbing shrubs or lianas. Branchlets hairy, generally bearing shortly bifid tendrils at or closely to the nodes (but not axillary!). *Leaves* decussate, entire, apiculate by a somewhat projecting midrib, penninerved, with ± appressed and strigose and/or softer, erect or obliquely spreading coarse hairs on midrib, nerves, veins and veinlets, and sometimes besides with a tomentum of very short fine substellate hairs which covers the intervenium beneath. *Inflorescences* in peduncled cymes which may be combined to panicles, axillary, supra-axillary or a little lateral from the nodes, sometimes terminal, solitary, the ♂ ones often elongate and many-flowered, the ♀ ones generally shorter and rather few-flowered; lower peduncles often sterile and becoming tendrils. *Flowers* small, white to cream or yellowish, fragrant. Pedicels articulate with the calyx and often dilated distally; bracts and bracteoles minute. *Calyx* cup-shaped, 4- or 5-lobed halfway or up to $\frac{3}{4}$ of its total length (Malesia), persistent in ♀. *Petals* 4 or 5, or sometimes wanting in ♀, valvate in bud, generally connate at base only, rarely and only in ♂ connate to $\frac{1}{2}$ to $\frac{3}{4}$ of their length into a tube, only the reflexed lobes free, a little keeled inside, tips sometimes narrowed and inflexed already in bud, persistent in ♀. — ♂ *Flowers*: *Stamens* (3–)4 or 5; filaments very short and fixed either to the base of the (then shortly connate) petals or to the end of the corolla tube between the lobes,

or elongate and fixed to the base of the corolla tube; anther cells almost basifixed, introrse. *Ovary* rudimentary. — ♀ *Flowers*: *Staminodes* sometimes present. *Ovary* sessile; stigma sessile, discoid, cut on one side, or faintly 2–5-lobed. *Drupe* ovoid-ellipsoid or oblong-obovoid (Malesia), or almond-like, generally laterally compressed and longitudinally grooved or crested; exocarp thin, fleshy, yellow to red; endocarp crustaceous to thin-woody, irregularly ribbed or reticulately lacunose, or warty outside, smooth inside. *Seed* 1, albuminous; cotyledons large, foliaceous.

Distr. About 16 *spp.* in tropical Africa (and Madagascar), 3 *spp.* in SE. Asia (Assam and Burma to SW.–SE. China, Hainan, Indo-China, and Thailand), throughout *Malesia* (7 *spp.*), but in New Guinea only questionably known from a single old collection; 2 Malesian *spp.* also known from SE. Asia. Fig. 35.

A nat. ROBINSON (Ann. Inst. Bot. Btzg 8, 1890, 111, t. 18 & 19, f. 1–5) has investigated the anatomy of the stem of *I. cirrhosa* TURCZ. Vascular strands are formed here also in the pith, though the bast and wood elements are inverted.

Notes. For the determination of the various species the indumentum plays an important role. The use of a lens is necessary, and only leaves of ± the same state of maturity should be investigated or compared.

Mappianthus differs from *Iodes* only by rather vague characters such as filaments rather long in proportion to the length of the petals and a drupe with a finely grooved and tubercled exocarp. It is regarded here as congeneric, a point of view already expressed by BAILLON, who, however, created for *I. hookeriana* a proper *sect. Lasiodes* (*Adansonia* 10, 1872, 268).

KEY TO THE SPECIES

1. Petals in the ♂ flowers practically free, *i.e.* united only at the base.
2. Indument on the undersurface of ± mature leaves consisting almost exclusively of rather sparse to more dense manifestly appressed stiff hairs.
3. Flowers 5-merous. Pedicels of the ♂ flowers swollen and ± plate-like dilated distally when the flower has gone. ♀ Flowers without staminodes. Veinlets of leaves rather faintly reticulate.
 1. *I. ovalis*
3. Flowers 4-merous. Pedicels of ♂ flowers not swollen distally. ♀ Flowers whether or not with 4 staminodes. Veinlets of leaves strongly reticulate. 2. *I. yatesii*
2. Indument on the undersurface of ± mature leaves consisting exclusively either of numerous fine and soft ± erect hairs, or of both such hairs and more robust, stiff and generally ± appressed (rarely obliquely spreading) hairs of various density.
4. Flowers 4-merous. Hairs on undersurface of leaves rather sparse. Petals present in ♀ flowers. Drupe 2.5–3 by 1.5 by 1 cm. 3. *I. reticulata*
4. Flowers 5-merous. Hairs on undersurface of leaves (rather) dense. Petals absent in ♀ flowers. Drupe up to 2 by 1.2(–1.5) by 1 cm. 4. *I. cirrhosa*
1. Petals in the ♂ flowers united into a tube for about their lower ¾ (the tube at least 3 mm long).
5. Drupe oblong-ellipsoid, ± obtuse at both ends, 1.2–1.5 by 0.8–1.2 by 0.8–1 cm. 5. *I. philippinensis*
5. Drupe larger.
6. Drupe oblong-ovoid, apex broadly obtuse, base narrowed, 2.8–3.3 by 1.3–1.5 by 0.8–1.2 cm; crustaceous endocarp laxly coarsely lacunose. 6. *I. velutina*
6. Drupe almond-like, 2.3–3.5(–4.5) by 1.6–2 by 0.7–1 cm; crustaceous endocarp with several longitudinal shallow furrows and numerous flattish warts. 7. *I. hookeriana*

1. *Iodes ovalis* BL. Bijdr. (1825) 30; MIQ. Fl. Ind. Bat. 1 (1856) 795, *p.p.*; BAILL. *Adansonia* 3 (1863) 364 *in text*, *p.p.*; in DC. Prod. 17 (1873) 22, *incl. var. genuina* BAILL. *l.c.* 23, *p.p.*; BECC. *Malesia* 1 (1877) 124, *p.p.*; SCHEFF. Ann. Jard. Bot. Btzg 1 (1876) 14; HALL. *f. Med. Rijksherb.* 1 (1910) 13; BACK. *Schoolfl. Java* (1911) 230 & Addenda; KOORD. Exk. Fl. Java 2 (1912) 532; KOORD.-SCHUM. *Syst. Verz.* 1, Fam. 162 (1912) 5; AMSH. in Back. *Bekn. Fl. Java* (em. ed.) 6 (1948) fam. 135, p. 7; BACK. & BAKH. *f. Fl. Java* 2 (1965) 61; SLEUM. *Blumea* 17 (1969) 220. — *I. horsfieldii* BAILL. *Adansonia* 10 (1872) 267; in DC. Prod. 17 (1873) 24. — *Polyporandra jughuhnii* KOORD. Kon. Ak. A'dam Versl. Verg. Wis- & Natuurk. 17 (1909) 780. — *I. oblonga*

PLANCH. in MAST. in Hook. *f. Fl. Br. Ind.* 1 (1875) 597; KING, *J. As. Soc. Beng.* 64, ii (1895) 128; RIDL. *Fl. Mal. Pen.* 1 (1922) 435.

Slender shrub, scandent with tendrils, up to 5 m. *Leaves* oblong-lanceolate to -elliptic or -obovate, apex acuminate to rounded, though minutely cuspidate by the protruding midrib, base rounded to subcordate, slightly inequilateral, thin chartaceous, glabrous above the midrib excepted, which is covered on both faces with a pale rusty short villous tomentum equally found on the branchlets and petioles, undersurface ± densely covered with stiff appressed hairs on nerves, veins and veinlets, the proper intervenium glabrous, (5–)6–15 by (2.5–)3–6.5 cm, midrib and nerves generally slightly impressed above, prominent

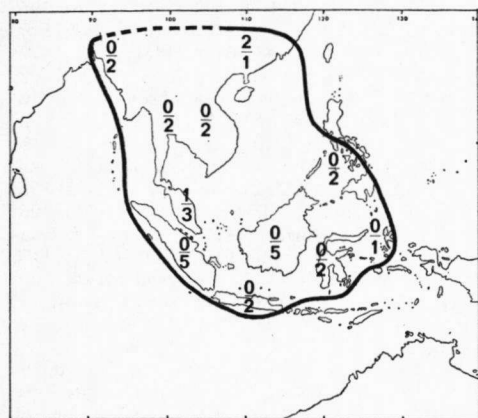


Fig. 35. Distribution of *Iodes* (incl. *Mappianthus*). The figure above the hyphen indicates the number of endemic species in the island or area, the figure below the hyphen the number of non-endemic species.

beneath, nerves 6–8 pairs, curved-ascending and inarching, reticulation of veins rather coarse, that of the veinlets more dense though rather faintly raised beneath; petiole 3–15 mm. *Inflorescences* all over covered with both rusty short strigose and softer hairs, the ♂ ones repeatedly dichotomous, many-flowered, up to 10 cm, the ♀ ones consisting of 8–16-flowered cymes and only 1.5–4 cm (incl. peduncle). Pedicels slender, swollen distally, the very end finally plate-like dilated when the flower has gone, 1–3 mm. *Calyx* 5-lobed to $\frac{1}{2}$ – $\frac{2}{3}$, c. 1.5 mm. *Petals* 5, oblong, white or light yellow, tip extended and inflexed, c. 2.5 mm in the ♂, lanceolate and acute (not inflexed) and c. 2 mm in the ♀ flowers, laxly appressed-strigose outside as is the calyx. — ♂ *Flowers: Stamens* 5; filaments slender, c. 0.6 mm; anthers subovate-oblong, c. 1 mm, cells with crenate-lobed margin. Rudiment of ovary hairy. — ♀ *Flowers: Stamines* 0. *Ovary* thick-cylindric, all over densely appressed hairy, 2 mm; stigma discoid, wider than the ovary, deeply incised on one side, margin crenulate, glabrous. *Drupe* inequally ovoid-compressed, said to be scarlet and to attain 1.5–2.5 cm in length (seen in immature state only up to 1 cm); endocarp with slightly prominent, not properly keeled ribs.

Distr. Malesia: Sumatra (Eastcoast), Malay Peninsula (Penang to Singapore), W. Java, Central Java (Pekalongan; Margasari, once).

Ecol. Along border of woods, in shrubberies, along roads or riversides, often in secondary vegetation, once in teak-forest (Margasari), sometimes on limestone, 50–300(–800) m. *Fl. fr.* Jan.–Dec.

Notes. What has been understood as *I. ovalis* in numerous floras of SE. Asia and Malesia, belongs partly to other species of the genus, mainly to *I. cirrhosa* TURCZ., *I. philippinensis* MERR. and *I. vitiginea* HANCE.

I. ovalis BL. was mentioned by K. SCH. & LAUT. Fl. Schutzgeb. (1900) 417 and SCHELLENB. Bot. Jahrb. 58 (1923) 176 for New Guinea (Morobe Distr., once found by WARBURG), but the specimen is lost and its identity remains uncertain. There is no recent record of *Iodes* from New Guinea.

2. *Iodes yatesii* MERR. Pap. Mich. Ac. Sc. 19 (1934) 165; SLEUM. Blumea 17 (1969) 221.

var. yatesii.

Scandent shrub. Branchlets weak, sparsely pubescent; tendrils up to 15 cm. *Leaves* ovate- or oblong-elliptic, apex abruptly acuminate for 1–1.5 cm, tip acute, base rounded to subcordate, chartaceous, ± shining on both sides, glabrous above, the midrib excepted, subdensely covered beneath with appressed strigose hairs on veins and veinlets, and besides with softer hairs on midrib and nerves, the proper intervenium hairless, (5–)7–12 by 3–6 cm, midrib a little sunken above, much prominent beneath, nerves 5–6 curved-ascending and inarching pairs, raised beneath, veins coarsely reticulated and but little prominent beneath, reticulation of veinlets dense, finely raised on both surfaces; petiole slender, subdensely hairy, 0.5–1.2 cm. *Cymes* 3–8 cm incl. peduncle, few- to many-flowered, very slender, all over covered with short substrigose and brownish softer hairs. Pedicels slightly dilated distally in the ♀, hardly so in the ♂ flowers, very slender, 2–5 mm. *Calyx* c. 0.8 mm, 4-lobed to $\frac{2}{3}$, lobes spreading. *Petals* 4, oblong-acuminate, tip not extended and hardly inflexed, appressedly strigose outside as is the calyx, glabrous inside, c. 1.2 mm. — ♂ *Flowers: Stamens* 4; filaments 0.6 mm; anther cells ovate, margin not crenulate, c. 0.4 mm. Rudiment of ovary subglobose, hairy, minute. — ♀ *Flowers: Sepals* and *petals* as in ♂ flowers, persistent. *Staminodes* 4. *Ovary* ovoid, densely hairy; stigma flat, subglabrous. *Drupe* elongate-oblong-ovoid, laterally compressed, brownish-substrigose-tomentose, 2.5–3 by 1.5 by 1.3 cm, slightly keeled; endocarp shallowly and coarsely reticulate-impressed on both faces.

Distr. Malesia: Sumatra (Eastcoast; Riouw; Indragiri Uplands).

Ecol. Forest (also secondary) along river or roadside. *Fl. fr.* March–Nov.

var. glabrescens (RIDL.) SLEUM. Blumea 17 (1969) 221. — *I. reticulata* KING *var. glabrescens* RIDL. Kew Bull. (1931) 35.

Appressed hairs on the undersurface of leaves sparse. ♀ *Flowers* without staminodes.

Distr. Malesia: Borneo (Sarawak; Kuching), once found.

3. *Iodes reticulata* KING, J. As. Soc. Beng. 64, ii (1895) 126; RIDL. Fl. Mal. Pen. 1 (1922) 434; SLEUM. Blumea 17 (1969) 221.

Woody climber, up to 9 m. Branchlets slender, striate, with a broad line of dilutely ferruginous tomentum on one side, changing sides at the nodes;

tendrils up to 15 cm. *Leaves* ovate-elliptic, sometimes subovate, apex abruptly acuminate for 0.5–1.5 cm, acute, base generally slightly cordate, a little inequilateral, thin-coriaceous, glabrous and shining above, the hairy midrib excepted, all over the undersurface covered with rather sparse obliquely or patently spreading hairs, soft to the touch, 5–12 by 3–6.5 cm, midrib and nerves slightly impressed above, boldly prominent beneath, nerves 4–5 curved high-ascending and looping pairs, reticulation of veins and veinlets finely raised above, strongly so beneath; petiole densely hairy, 1–1.5 mm. *Cymes* lax, the ♂ many-flowered and usually exceeding the leaves in length, the ♀ ones few-flowered and generally shorter, ± patently soft-rusty-pubescent in all outer parts. Pedicels very slender in the ♂, thicker and swollen distally only in the ♀. — *Flowers*: *Calyx* cup-shaped, 1 mm, 4-lobed to $\frac{1}{2}$ – $\frac{2}{3}$. *Petals* 4, ovate-acuminate, a little fleshy, densely hairy outside, glabrous inside, 0.8 mm. *Stamens* 4, subsessile; anther cells subcordate, 0.2 mm. Rudiment of ovary minute, glabrous. — ♀ *Flowers*: *Calyx* as in ♂ flowers. *Petals* 4, subovate-oblong, united at the very base, tip acute, hairy outside as is the calyx, reflexed, 2–2.5 mm. *Staminodes* 0. *Ovary* thick-cylindrical or barrel-shaped, all over densely appressedly hairy, 1.5 mm; stigma discoid, deeply cut on one side, margin hardly crenulated. *Drupe* ellipsoid, compressed, base narrowed, ferruginous-velvety, 2.5–3 by 1.5 by 1 cm, on stoutish pedicel, 5–8 mm; endocarp bony, coarsely furrowed outside.

Distr. *Malesia*: Malay Peninsula (Perak, Pahang, Negri Sembilan).

Ecol. Open jungle, at low altitudes up to 250 m. *Fl.* May–Nov., *fr.* May–June.

4. *Iodes cirrhosa* TURCZ. Bull. Soc. Nat. Moscou 27, ii (1854) 281; SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 250; HEINE, Pfl. d. Samml. Clemens Kinabalu (1953) 58; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 7; HEINE in Fedde, Rep. 54 (1951) 238; BACK. & BAKH. f. Fl. Java 2 (1965) 62 ('*cirrosa*'); SLEUM. Blumea 17 (1969) 221; Fl. Thail. 2 (1970) 86. — *I. ovalis* (non BL.) HASSK. Cat. Hort. Bog. (1844) 172; R. BR. in Benn. & Brown, Pl. Jav. Rar. (1852) 243, t. 48; MIQ. Fl. Ind. Bat. 1 (1856) 795, p.p.; BAILL. Adansonia 3 (1863) 364, in text, p.p.; in DC. Prod. 17 (1873) 22, incl. var. *genuina* BAILL. l.c. 23, p.p. et var. *miquelii* BAILL. l.c. 23; MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 596; BECC. Malesia 1 (1877) 124, p.p.; KING, J. As. Soc. Beng. 64, ii (1895) 128; HOCHR. Pl. Bog. Exs. (1904) 18; Bull. Inst. Bot. Btzg 19 (1904) 40; *ibid.* 22 (1905) 106 (as var. *genuina*); BRANDIS, Ind. Trees (1906) 154; GAGNEP. Fl. Gén. I.–C. 1 (1911) 844, incl. var. *cochinchinensis* PIERRE ex GAGNEP. l.c. 845; MERR. En. Born. (1921) 356; RIDL. Fl. Mal. Pen. 1 (1922) 435; CRAIB, Fl. Siam. En. 1 (1926) 276; GAGNEP. Fl. Gén. I.–C. Suppl. (1948) 757; DAHL, J. Arn. Arb. 33 (1952) 274 (pollen). — *Natsiatum oppositifolium* PLANCH. in Hook. Lond. J. Bot. 5 (1846) 247, *nom. nud.* —

I. tomentella MIQ. Fl. Ind. Bat. 1 (1856) 796; KURZ, J. As. Soc. Beng. 44, ii (1875) 137; For. Fl. Burma 1 (1877) 243; BECC. Malesia 1 (1877) 124, p.p.; KOORD. Minah. (1898) 393; BACK. Schooffl. Java (1911) Addenda ad p. 229; KOORD. Exk. Fl. Java 2 (1912) 532; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 5; DAHL, J. Arn. Arb. 33 (1952) 274 (pollen). — *I. brandisii* KURZ, J. As. Soc. Beng. 41, ii (1872) 298; *ibid.* 44, ii (1875) 156; MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 596; KURZ, For. Fl. Burma 1 (1877) 243. — *I. horsfieldii* BAILL. Adansonia 10 (1872) 267; in DC. Prod. 17 (1873) 24. — *I. floribunda* MERR. Pap. Mich. Ac. Sc. 19 (1934) 166, t. 29; DAHL, J. Arn. Arb. 33 (1952) 274, f. 65 (pollen). — Fig. 36a–d.

Woody climber, 5–10(–18) m tall, stem up to 8 cm ø. Branchlets slender, rusty-tomentellous. *Leaves* ovate to ovate-elliptic, rarely oblong- or obovate-elliptic, apex shortly acuminate and acute by the slightly protruding midrib, base rounded or subcordate, firmly chartaceous, upper surface glabrous except midrib and nerves which bear rather dense soft yellowish erect or obliquely spreading hairs as are found all over the undersurface on midrib, nerves, veins and veinlets (the proper intervenium hairless), forming a velutinous tomentum, 5–15(–18) by 3.5–8(–11.5) cm, nerves 4–6 curved and rather steeply ascending pairs, prominent beneath as are midrib and the transverse veins, reticulation of veinlets dense, a little raised beneath only; petiole 1–2(–3.5) cm, tomentellous. *Inflorescence* all over covered with a short soft rusty tomentum, the ♂ in much branched and many-flowered, rather lax cymes, 5–15 cm incl. the peduncle (1.5–5 cm), the ♀ ones shorter and mostly rather few-flowered, 2–12 cm incl. the peduncle (1–4 cm). — ♂ *Flowers* not rarely transformed into globular hirsute galls (2–3 mm ø). Pedicels slender, 1–2 mm, not swollen distally towards the end of anthesis. *Calyx* 5-lobed to almost the base, densely set with substrigose hairs outside, lobes narrow-lanceolate, $\frac{1}{2}$ – $\frac{3}{4}$ mm. *Petals* oblong-lanceolate, tip filiform and inflexed, thin, white or yellowish, fragrant, laxly substrigose-pubescent outside, 2–3 by 0.8 mm. *Stamens* 5; anthers practically sessile, ovate-elliptic, margin entire, 0.6–0.8 mm. Rudiment of ovary cylindrical, hairy, 0.5 mm. — ♀ *Flowers*: Pedicels thickish, c. 1 mm, accrescent in fruit to c. 3 mm, hardly dilated distally. *Calyx* as in ♂ flowers, lobes c. 1 mm. *Petals* 0. *Staminodes* 0. *Ovary* cylindrical, densely substrigose-hairy, 1 mm; stigma a dark bilobed or subreniform pad, hairy, glabrescent in later stages. *Drupe* obliquely ovoid, laterally compressed and crested, shortly ± appressedly rusty- or rufous-tomentose, 1.2–1.5(–2) by 1–1.2(–1.5) by 0.7–1 cm; exocarp thin, reddish; endocarp hard, coarsely lacunose-reticulate outside, smooth inside.

Distr. SE. Asia (Khasia, Burma, Thailand, Indo-China); in *Malesia*: Sumatra (East & West-coast, Padang), Banka, Malay Peninsula (Perak, Selangor, Johore, Malacca), W. & E. Java, Borneo (Sarawak, W. & N. Borneo), Philippines

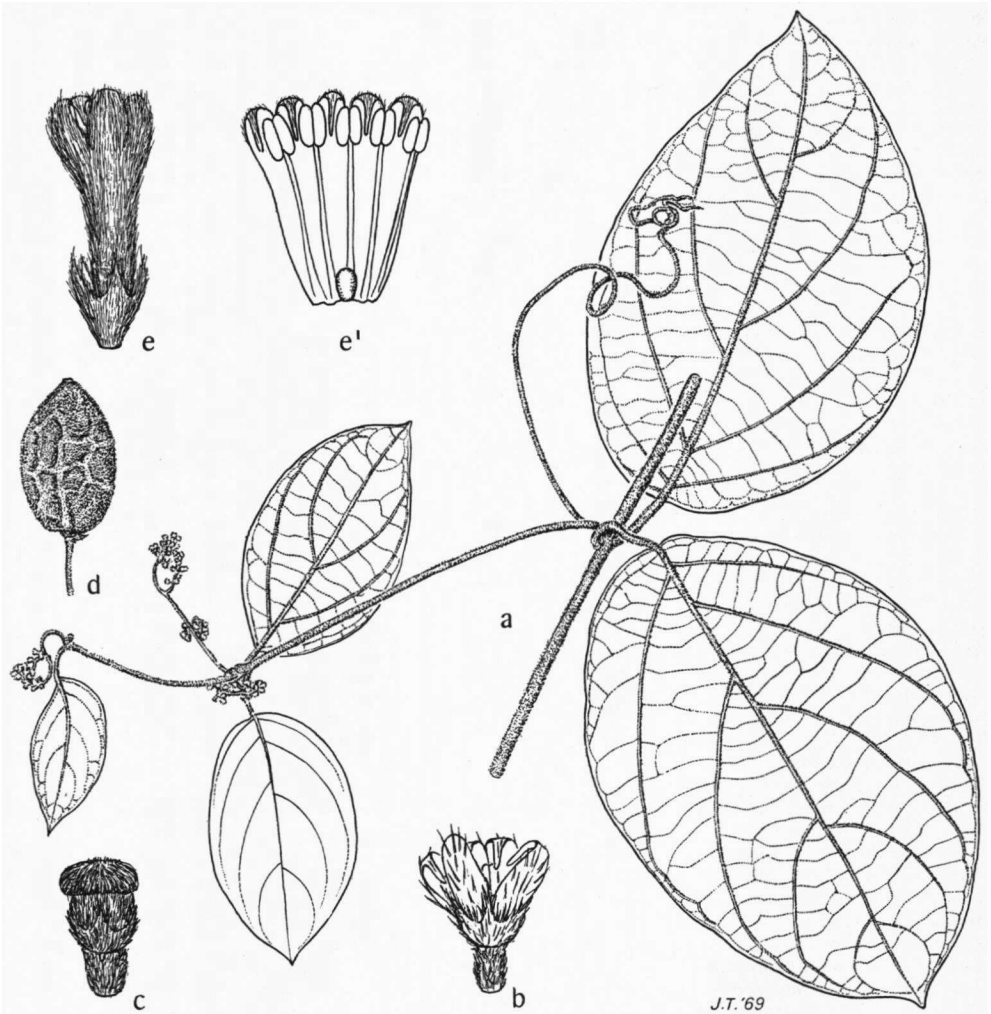


Fig. 36. *Iodes cirrhosa* TURCZ. a. Habit, $\times \frac{1}{2}$, b. ♂ flower, $\times 5$, c. ♀ flower, $\times 5$, d. drupe, $\times 1$. — *I. philippinensis* MERR. e. ♂ flower from the outside, $\times 5$, e'. ditto from the inside, expanded, $\times 5$ (a–b SINCLAIR 9875, c VAN STEENIS 12717, d KING'S Coll. 6783, e–e' SANTOS 4356).

(Palawan), Celebes, possibly in the Moluccas.

Ecology. Light primary and often secondary forest, forest borders, shrubberies, scattered, also in open vegetation on limestone rocks, sometimes rather dry places, in Java in regions with at least 20 or more rainy days in the 4 consecutive driest months, 10–1100 m. Fl. fr. Jan.–Dec.

Vern. *Akar mengkunyit* (Selangor), M, *arey balilandak*, *ki kurip*, S, *jagal kédang*, *jungetan*, J, *sasir kètè*, Minahasa.

5. *Iodes philippinensis* MERR. Philip. J. Sc. 3 (1908) Bot. 241; C. B. ROB. *ibid.* 6 (1911) Bot. 209; HOLTH. & H. J. LAM, *Blumea* 5 (1942) 205; DAHL, J. Arn. Arb. 33 (1952) 274, f. 68 (pollen);

SLEUM. *Blumea* 17 (1969) 224. — *I. ovalis* (non BL.) BAILL. in DC. Prod. 17 (1873) 22, *quoad Philip.*; F.-VILL. Nov. App. (1880) 46; VIDAL, Phan. Cuming. Philip. (1885) 103; Rev. Pl. Vasc. Filip. (1886) 86; MERR. Philip. J. Sc. 30 (1926) 408; HOLTH. & H. J. LAM, *Blumea* 5 (1942) 205. — *I. tomentella* (non MIQ.) BECC. Malesia 1 (1877) 124, *quoad Philip.* — *I. oblonga* PLANCH. ex MAST. var. *moluccana* HOCHR. Pl. Bog. Exs. (1904) 18; Bull. Inst. Bot. Btzg 19 (1904) 40; *ibid.* 22 (1905) 107; Ann. Jard. Bot. Btzg Suppl. III, 2 (1910) 855. — Fig. 36e–e'.

Woody climber, up to 6 m. Branchlets slender, striate, soft villous by ferruginous fine rather short hairs as are the petioles; tendrils slender, up

to 15 cm. *Leaves* ovate-elliptic to -oblong, apex short acuminate, the midrib hardly projected beyond the lamina, base rounded or mostly slightly cordate, thin chartaceous, upper surface finally glabrous except the midrib, undersurface all over soft tomentose, more densely so on midrib and nerves, the hairs being of two markedly different types, *i.e.* stoutish substrigose \pm appressed, and much finer, soft and \pm erect ones, the latter sometimes rather scarce, the space between the veinlets hairless, (3-)5-9 by 2.5-5(-7) cm, midrib and 4-6 pairs of ascendent and \pm looping nerves plain above, \pm strongly raised beneath, less so the veins, reticulation of veinlets not very distinct; petiole 0.6-1(-1.5) cm. — δ *Inflorescences*: Panicle; composed of several cymes, rather lax and relatively few-flowered, 2-4(-5) cm incl. the long peduncle, covered with \pm crisped and appressed rusty substrigose hairs. Pedicels slender, 1-2 mm, the end glabrous and a little dilated when the flower is gone. *Calyx* cup-shaped, 1.5 mm, acutely 5-lobed halfway. *Petals* subglobose in bud, rapidly accrescent to 6-7(-8) mm at full anthesis, united into a narrow tube for the lower $\frac{2}{3}$, free at the 5 lobes, the latter acuminate, narrow, tip inflexed in bud stage, ultimately reflexed or spreading, hairy outside and at the mouth inside, white or cream. *Stamens* 5, inserted at the end of the tube, alternating with the lobes; filaments flattened, very short; anther-sacs narrowly subovate-oblong, not crenulate, 0.8-1 mm. Rudiment of *ovary* cylindrical, glabrous, *c.* 1.5 mm. — δ *Inflorescences* 3-5 (rarely -12)-flowered, 2-3 cm incl. the peduncle, hairy as are the δ ones. Pedicel slender, 3(-4) mm, not swollen distally. *Calyx* cup-shaped, 1.8 mm, 5-lobed halfway or a little more. *Petals* (4-)5, narrow-oblong, connate at the base, white or cream, thin, finally reflexed, glabrous inside, 2.5-3 by 0.6-0.8 mm. *Staminodes* 0. *Ovary* cylindrical, all over clad with stiff forward directed hairs, 2 mm; stigma thick, bilobed, glabrous. *Drupe* obliquely oblongoid-ellipsoid, laterally compressed and rather sharply crested, \pm obtuse at both ends, red to orange, 1.2-1.5 by 0.8-1.2 by 0.8-1 cm, densely rusty hairy; endocarp coarsely reticulate-lacunose; pedicels stoutish, 2-5 mm, a little swollen distally. *Sepals* and *petals* persistent on the fruit for a long time.

Distr. Malesia: N. Borneo, Philippines (all islands), Central E. Celebes (once found), Moluccas (Talaud, Morotai, Halmahera, Ternate, Ambon).

Ecol. Edge of forests or thickets, also secondary growths, in the lowland up to 200 m, but ascending in the foothills of Mt Kinabalu up to 1525 m, often near rivers.

Vern. Kogopusut, Dusun (Sambunan).

6. *Iodes velutina* KING, J. As. Soc. Beng. 64, ii (1895) 127; RIDL. Fl. Mal. Pen. 1 (1922) 434; BURK. Dict. (1935) 1245; SLEUM. Blumea 17 (1969) 224.

var. velutina.

Climber, similar in leaves and flowers to *I.*

philippinensis. Branchlets shortly rufous-pubescent especially so on one side; tendrils glabrescent. *Leaves* ovate, apex short acuminate and subacute by a glandular tip, *i.e.* the protruding midrib, base rounded or generally subcordate, firmly chartaceous, upper surface initially \pm densely short pubescent, soft to the touch, glabrescent except the midrib, undersurface velvety by numerous \pm appressed substrigose and even more numerous softer \pm erect hairs, the tomentum rusty-olivaceous in dry, said to be whitish in fresh specimens, the intervenium, *i.e.* the proper space between the veinlets glabrous and thus green, (3-)4-10 by 2-5.5(-8) cm, nerves 4-5 rather steeply curved-ascendent pairs, a little raised beneath only, veins and reticulation of veinlets \pm hidden by the tomentum underneath; petiole slender, tomentose, 0.5-1.5(-2) cm. — δ *Inflorescences*: Cymes few- to rather many-flowered, all over rusty-pubescent, 2-4 cm (incl. peduncle). Pedicels slender, 2-3 mm, finally a little swollen distally and glabrous at the very tip. *Calyx* cup-shaped, *c.* 1.3 mm, 4- or 5-lobed for $\frac{1}{3}$ to almost $\frac{1}{2}$. *Petals* 4 or 5, bud club-shaped, at full anthesis 5-7 mm and connate to a tube in the lower $\frac{2}{3}$, lobes finally reflexed, their tip inflexed, subdensely \pm appressed hairy outside as is the calyx, long-hairy at the throat inside. *Stamens* 4 or 5, inserted at the throat; filaments laxly hairy, *c.* 1 mm; anther-sacs ovate-oblong, 0.8-1 mm. Rudiment of *ovary* conical-cylindric, glabrous, 0.5 mm. — δ *Inflorescences*: Cymes 2-5-flowered, 2-3 cm incl. the rather robust peduncle. Pedicels rather slender and 3-5 mm in anthesis, a little accrescent and more robust in fruit. *Calyx* cup-shaped, *c.* 1 mm, 4- or 5-lobed halfway, appressed hairy as are the petals outside. *Petals* 4 or 5, subobovate-oblong, free to almost their base, 4-5 mm. *Staminodes* 0. *Ovary* cylindrical, densely hairy; stigma slightly 4- or 5-lobed. Ripe *drupe* oblong-ovoid, apex broadly obtuse, base attenuate, much compressed laterally and manifestly crested, with a less obvious crest on each of the flat sides, tomentose initially, finally subglabrous, 2.8-3.3 by 1.3-1.5 by 0.8-1.2 cm, the thin-exocarp blackish when dry; endocarp laxly coarsely lacunose; stigma slightly 5-lobed, 2 mm σ . *Seed* solitary, compressed.

Distr. Malesia: Malay Peninsula (Perak, Negeri Sembilan, Malacca, Singapore).

Ecol. Woods and hedges, at low elevation. *Vern. Akar china bukit, a. salupat, M.*

var. subvillosa SLEUM. Blumea 17 (1969) 224. — *I. tomentella* (non MIQ.) SCHELLENB. Bot. Jahrb. 58 (1923) 176.

Undersurface of leaves covered with a felt of small substellate hairs (and thus greyish) on the space between the veinlets. In flower and fruit characters not distinguishable from *var. velutina*.

Distr. Malesia: Sumatra (Eastcoast, Bencoolen), Borneo (Amai Ambit and area S. of Kuching). Questionable for New Guinea by an old specimen said to have been collected by ZIPPELIUS.

Ecol. Primary forest both on sand- and lime-

stone in Borneo, 100–1000 m. *Fl. fr.* Aug.

7. *Iodes hookeriana* BAILL. *Adansonia* 10 (1872) 268; in DC. *Prod.* 17 (1873) 23; MAST. in Hook. *f. Fl. Br. Ind.* 1 (1875) 596; KURZ, *J. As. Soc. Beng.* 44, ii (1875) 157; *For. Fl. Burma* 1 (1877) 244; BRANDIS, *Ind. Trees* (1906) 154; KANJILAL *c.s. Fl. Assam* 1 (1936) 254. — *I. thomsoniana* BAILL. *Adansonia* 10 (1872) 270; in DC. *Prod.* 17 (1873) 25; MAST. in Hook. *f. Fl. Br. Ind.* 1 (1875) 596; BRANDIS, *Ind. Trees* (1906) 154. — *L. reticulata* KING *var. glabrescens* RIDL. *Kew Bull.* (1931) 35. — *Mappianthus borneensis* MERR. *Webbia* 7 (1950) 317. — *Mappianthus hookerianus* (BAILL.) SLEUM. *Blumea* 17 (1969) 225.

Fairly large woody climber, sometimes with tendrils, branchlets, undersurface of leaves along nerves and midrib, petioles and inflorescences subdensely clothed with substrigose, appressed hairs. *Leaves* elliptic- to ovate-oblong, apex abruptly shortly (maybe bluntly) acuminate, or almost cuspidate, base ± rounded, rarely subcordate, thin-coriaceous, shining on both faces, margin slightly revolute, entire (seemingly crenulate or denticulate in dry specimens with crisped edge), (8–)10–15 (–20) by (3.5–)5–8 cm, midrib narrowly impressed above, strongly raised beneath, nerves 7–8(–9) pairs, moderately curved-ascending and inarching before the edge, faintly raised above, distinctly so beneath as are the ± transverse veins, reticulation of veinlets dense and finely raised on both faces; petiole 1–1.5 cm. *Inflorescences* slightly extra-axillary dichasia, the ♂ ones rather many-, the ♀

ones few-flowered, often reduced in the lower axils to tendrils. Pedicels *c.* 1 mm, slender in the ♂, stoutish in the ♀ flowers. *Calyx* cup-shaped, *c.* 1 mm, edge minutely 5-dented to almost entire. — ♂ *Flowers: Petals* oblong, fleshy, *c.* 3 mm, connate to *c.* ¾, densely and shortly yellowish-substrigose outside, glabrous inside. *Filaments* filiform, *c.* 2 mm; anther cells linear-oblong, *c.* 1.8 mm. Rudiment of *ovary* cylindrical, all over shortly strigose-tomentose. — ♀ *Flowers* unknown. *Drupe* almond-like, 2.3–3.5(–4.5) by 1.6–2 by 0.7–1 cm, on thick pedicel *c.* 2 mm; stigma rather small, faintly 5-lobed; exocarp fleshy, orange red, appressedly short-strigose; endocarp crustaceous, outside with several longitudinal shallow furrows and numerous flattish warts, inside smooth.

Distr. SE. Asia (Assam, E. Bengal); in *Malesia: Sumatra* (once found, Westcoast) and *Borneo* (Sarawak: Kuching area; N. Borneo: foothills of Mt Kinabalu, *c.* 900 m, twice found).

Ecol. Forests. *Fr.* Sept.–Nov.

Note. Closely related to and possibly conspecific with *Mappianthus iodoides* HAND.-MAZZ. (N. of Tonkin and adjacent China, eastwards to Hunan and Fukien).

Excluded

Iodes ferruginea K. SCH. & LAUT. *Fl. Schutzgeb.* (1900) 418; SCHELLENB. *Bot. Jahrb.* 58 (1923) 176, *nota sub I. tomentella*; SLEUM. *Blumea* 17 (1969) 225 = *Alangium villosum* (BL.) WANG. (*Alangiaceae*).

18. SARCOSTIGMA

W. & A. Edinb. *New Phil. J.* 14 (1833) 299; SLEUM. *Blumea* 17 (1969) 253. — Fig. 38.

Dioecious climbers. *Leaves* spirally arranged, entire, penninerved, strongly reticulate; petiole curved or twisted, lengthwise striate and transversely wrinkled, leaving a raised elliptic white scar. *Flowers* sessile or sometimes pedicellate (♀ only), clustered (or fascicled) or solitary along the rachis of long, pendulous interrupted or spike-like racemes, these simple or composed to panicles, (4–)5(–6)-merous. *Calyx* small, cupular, shortly dented, persistent. *Petals* shortly connate at base, valvate in bud, afterwards recurved, oblong, persistent in ♀ flowers. — ♂ *Flowers: Stamens* 5, exerted; filaments linear; anthers small, elliptic, medifixed, cells slightly divergent downwards. Rudiment of *ovary* hirsute. — ♀ *Flowers: Staminodes* filiform, whether or not present. *Ovary* ovoid-oblongoid, hirsute; stigma almost sessile, thick, umbonate. *Drupe: exocarp* coriaceous, thin; endocarp woody, thin, smooth or slightly verrucose and covered with a white membrane inside, sometimes a little reticulate-foveolate outside in fully mature fruits. *Seed* 1, testa thin; albumen none; cotyledons fleshy.

Distr. Two *spp.*, India (Western Ghats from N. Kanara to Travancore), Lower Burma, Andamans, Cochinchina, Annam; in *Malesia: Sumatra*, Malay Peninsula, Java, Borneo, Philippines. Fig. 37.

KEY TO THE SPECIES

- 1. Flowers in interrupted spikes; rachis stout. Petals 3–4 mm. 1. *S. kleinii*
- 1. Flowers in slender panicles. Petals *c.* 2.5 mm. 2. *S. paniculata*

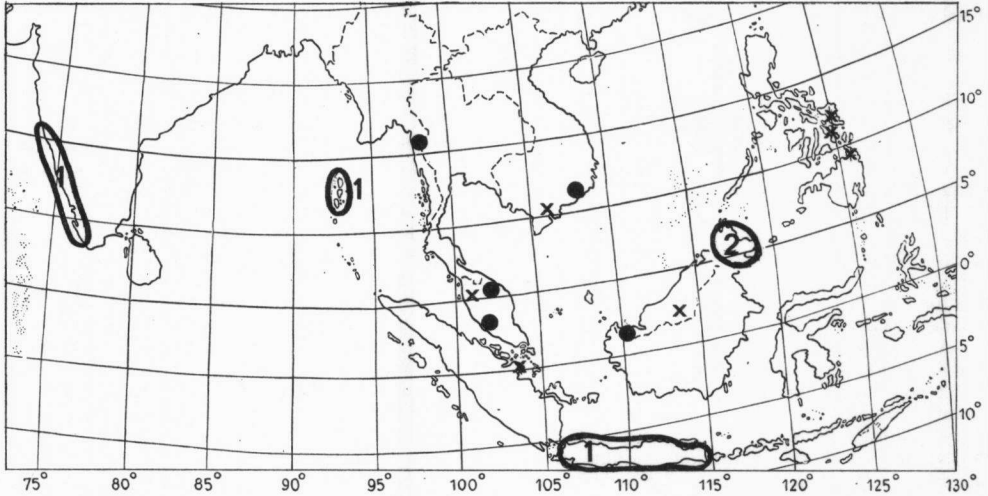


Fig. 37. Distribution of *Sarcostigma*. 1 and dots *S. kleinii*, 2 and crosses *S. paniculata*.

1. *Sarcostigma kleinii* W. & A. Edinb. New Phil. J. 14 (1833) 299; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 116, repr. Contr. Bot. 1 (1852) 103, t. 18; SLEUM. Blumea 17 (1969) 254 (with further synonyms). — *S. horsfieldii* R. BR. in Benn. & Brown, Pl. Jav. Rar. (1852) 241, t. 47; MIERS, Ann. Mag. Nat. Hist. II, 10 (1852) 118, repr. Contr. Bot. 1 (1852) 105; MIQ. Fl. Ind. Bat. 1 (1856) 795; SCHNIZL. Ic. 3 (1857/65) t. 172, f. 32 & 33; HASSK. Retzia ed. nov. (1858) 360; BAILL. in DC. Prod. 17 (1873) 16; BECC. Malesia 1 (1877) 125; HOCHR. Bull. Inst. Bot. Btzg 19 (1904) 39; Pl. Bog. Exs. (1904) 16; KOORD. Jungh. Gedenkb. (1910) 175; BACK. Schooff. Java (1911) 229; KOORD. Exk. Fl. Java 2 (1912) 533; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 5; AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 7; DAHL, J. Arn. Arb. 33 (1952) 276 (pollen); BACK. & BAKH. f. Fl. Java 2 (1965) 62.

Much branched liana, up to 26 m, stem up to 8 cm \varnothing , sometimes leafless during anthesis; wood hard. Branchlets slender. *Leaves* oblong to oblong-obovate or -elliptic, rarely lanceolate, apex shortly rather abruptly and generally bluntly acuminate, or obtuse, base broadly cuneate to rounded, subcoriaceous to coriaceous, glabrous on both sides, or rarely with some hairs beneath, yellowish-green when dry, (7-)9-25 by 4-7(-11.5) cm, midrib slightly depressed above, strongly raised beneath, nerves (4-)6-8 pairs, curved-ascending and inarching before the edge, prominent beneath, reticulation dense and very prominent (sometimes almost foveolate) on both faces, or more distinct beneath; petiole 1-1.5(-2) cm, often recurved, striate as is the midrib beneath and transversely wrinkled in dry specimens. *Spikes* usually 1-3(-5), fascicled, slightly supra-axillary from partly already defoliate axils, or from old

wood, pendent, densely shortly brown-hairy to -hirsutulous, δ 15-25, φ up to 40 cm, the flowers in numerous clusters or fascicles with flowerless parts of the rachis between, generally sessile, rarely (only in the φ) pedicelled (0.5-1.5, in fruit up to 5 mm), fetid. *Calyx* 1-1.5 mm, obtusely lobed halfway, hairy below. *Petals* linear-oblong, subacute, densely brown-hairy outside, glabrous and with a slight median ridge inside, greenish-yellow, 3-4 mm. — δ *Flowers*: *Filaments* strap-shaped, glabrous, c. 5 mm; anthers elliptic, c. 0.8 mm. Rudiment of *ovary* elongate-conical, hirsute. — φ *Flowers*: *Staminodes* whether or not present. *Ovary* ellipsoid-obovoid, hirsute; stigma a reversed subconical or flattish cup. *Drupe* unequally sub-ovoid-ellipsoid or -oblongoid, laterally compressed and almond-like, 2.5-3.5 by 1.7-2 by 1-1.5 cm, very base suddenly contracted and hidden by the persistent calyx and petals, apex crowned by the thickish small (1 mm) stigma; exocarp very thin, with numerous vertical thick lines standing out in the dry fruit, bright orange red or yellow, brownish-hirsute, glabrescent at length; endocarp thin, 0.5 mm, hard, a little reticulate-lacunose outside, smooth or faintly verrucose and shiny white in the fresh state inside. *Seed* 1, with a thin edible sweetish pulp round the nut inside.

Distr. India (Western Ghats S. to Travancore), Lower Burma, Andamans, Indo-China (Annam); in *Malesia*: Malay Peninsula, W. & E. Java, Borneo (Sarawak; Semengoh F. R.). Fig. 37.

Ecol. Forests (also teak-forests), scattered, in Java largely under seasonal climatic conditions, up to 550 m. *Fl. fr.* Febr.-Oct.

Uses. In India the oil of the seeds is highly esteemed in the treatment of rheumatism; this use is not known from *Malesia*.

Vern. *Kamaras, tangkilan, J, buah pelay tedong, M.*

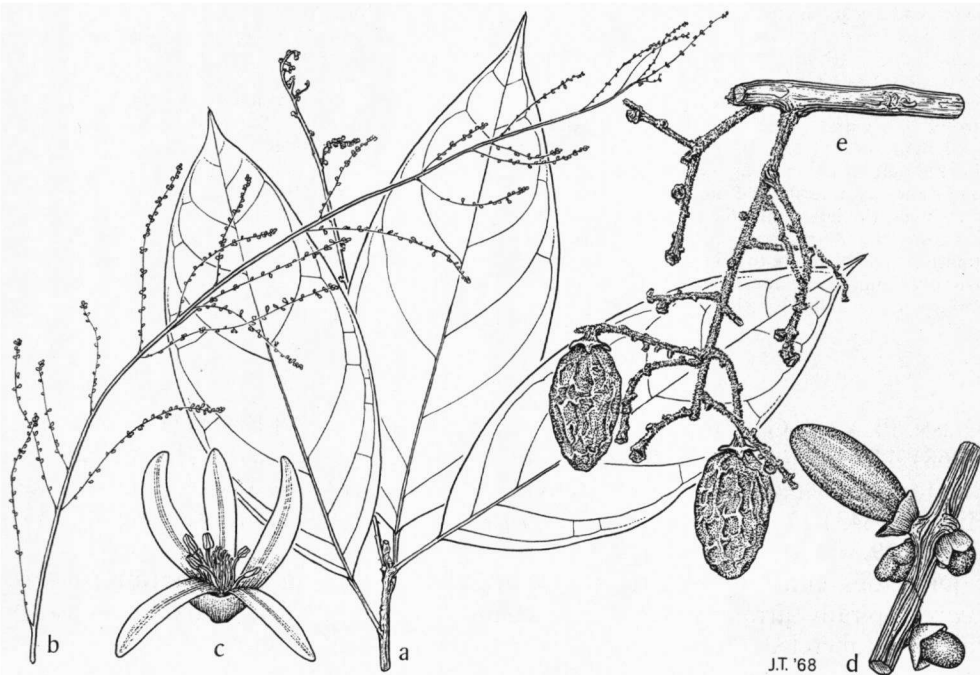
2. *Sarcostigma paniculata* PIERRE, Bull. Soc. Linn. Paris 2 (1897) 1319; GAGNEP. Fl. Gén. I.-C. 1 (1911) 841, f. 102, 1-3, incl. var. *angustifolia* (PIERRE) GAGNEP. l.c. 842; RIDL. Fl. Mal. Pen. 5 (1925) 298; SLEUM. Blumea 17 (1969) 254. — *S. angustifolia* PIERRE, Bull. Soc. Linn. Paris 2 (1897) 1320. — *S. philippinensis* MERR. Philip. J. Sc. 10 (1915) Bot. 276; En. Philip. 2 (1923) 492; DAHL, J. Arn. Arb. 33 (1952) 276, f. 71 (pollen). — *S. surigaoensis* ELM. Leaf. Philip. Bot. 10 (1939) 3749; DAHL, J. Arn. Arb. 33 (1952) 277 (pollen). — Fig. 38.

Climbing to 30 m, stem up to 10 cm ϕ , crooked, branched toward top and forming hanging masses; wood very soft, coarsely porous, \pm yellow in the centre, watery, with a large whitish pith; bark grey to brown, smooth, rather thin. Branches divaricate, laxly rebranched, the free ends pendent. *Leaves* scattered along the slender branchlets, oblong or ovate- to elliptic-oblong, rarely lanceolate, apex broadly attenuate, bluntly subacuminate or obtuse, base broadly cuneate to rounded, thin-coriaceous, paler (greyish) green beneath, glabrous, shining on both faces, (8-)12-20 by (2.5-)4-9 cm, midrib slightly raised above, prominent and longitudinally striate beneath, nerves 4-6 pairs, steeply curved-ascending, rather obscurely looping, raised beneath, reticulation dense, finely tessellate on both sides; petiole 1.5-2(-4) cm. — δ *Panicles* axillary or terminal, descending, slender and flexible, much-branched and many-flowered,

tomentose initially, early glabrate, 30-60 cm, the lower branches up to 16 cm; flowers 3-5 per cluster, these spicately arranged at intervals of 5-15 mm, with brownish appressed hairs on rachis and more densely around the clusters. *Calyx* widely cup-shaped, membranous, indistinctly denticulate, 0.6 mm. *Petals* narrowly oblong, apex attenuate and slightly inflexed inside, thin, whitish or yellow, practically glabrous, with 3 longitudinal veins, c. 2.5 mm. *Filaments* slender, glabrous, 1-1.5 mm; anthers elliptic-ovate, 0.7 mm. Rudiment of *ovary* columnar, hairy. — ♀ *In-florescences* (PNH 14563) panicle, glabrate. Flowers sessile, spaced along a rather slender rachis. *Calyx* cup-shaped, hardly dented, 0.8 mm. *Petals* oblong, subglabrous, 3 mm. *Staminodes* 1 mm, no anthers. *Ovary* oblongoid, densely hairy, 2 mm; stigma a large pad depressed in centre. *Infructescence* paniculate, stoutish, hairy, c. 10 cm, lower branches up to 4 cm; pedicels c. 2 mm long and across. *Drupe* (subovoid-)ellipsoid, maybe somewhat compressed, laxly hairy, glabrescent, 3-3.5 by 1.5-2 cm; exocarp blackish-brownish and wrinkled on dry fruit; endocarp thin, woody, smooth inside. *Seed* 1, white-coated.

Distr. Cochinchina; in *Malesia*: Sumatra (Riouw), Malay Peninsula (Perak), Borneo, Philippines (Leyte, Samar, Mindanao). Fig. 37.

Ecol. Primary lowland forest, from sea-level up to 500 m (twice found at 1065 m in Mindanao), on sandy loam, scattered. *Fl. fr.* Jan.-Dec.



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Fig. 38. *Sarcostigma paniculata* PIERRE, a. Habit, $\times 1/2$, b. δ inflorescence, $\times 1/2$, c. δ flower, $\times 10$, d. δ flower bud, $\times 10$, e. fructification with almost mature fruits in dry state, $\times 1/2$ (a-d SAN 24459, e SAN 17107).

19. PYRENACANTHA

WIGHT in Hook. Bot. Misc. 2, 4 (1830) 107, Suppl. t. 9 & 10, *nom. cons.*; SLEUM. Blumea 17 (1969) 249. — *Freeria* MERR. Philip. J. Sc. 7 (1912) Bot. 292.

Dioecious scandent shrubs or lianas. *Leaves* spirally arranged, glandular-repand-dentate and penninerved. *Flowers* small, sessile, bracteate, in lax supra-axillary spikes. *Sepals* or *calyx* 0. *Petals* connate at base, valvate in bud, persistent in ♀ flowers. — ♂ *Flowers: Stamens* (3)–4(–5); filaments very short; anthers minute. Rudiment of *ovary* present. — ♀ *Flowers: Staminodes* very short or absent. *Ovary* sessile; stigma sessile, thick, truncate. *Drupe* laterally compressed; exocarp fleshy; endocarp crustaceous, punctate outside, verrucose-papillose inside, the papillae projecting into the interstices of the deeply ruminant and pitted albumen. *Seed* 1.

Distr. About 20 *sp.*, most of them in tropical and subtropical Africa & Madagascar, 1 *sp.* (*P. volubilis* WIGHT) in S. India and Ceylon, Indo-China and Hainan; in *Malesia*: 1 *sp.* in the Philippines.

1. *Pyrenacantha repanda* (MERR.) MERR. En. Philip. 2 (1923) 492; SLEUM. Blumea 17 (1969) 249; SHAW, Kew Bull. 23 (1969) 113. — *P. sp.*, CERON, Cat. Pl. Herb. Manila (1892) 46. — *Freeria repanda* MERR. Philip. J. Sc. 7 (1912) Bot. 292. — *Tragia luzoniensis* MERR. Philip. J. Sc. 16 (1920) 564.

Woody vine, up to 8 m. Branchlets slender, minutely verrucose, the growing parts short-pubescent. *Leaves* oblong to oblong-lanceolate, apex slenderly acuminate, bluntish, base narrowed, very base cordate, subcoriaceous, glabrous and smooth above (though very finely papillate under the lens), set with scattered appressed strigose hairs (whose rounded bases are partly pellucid against strong light) and scabrid to the touch beneath, 6–14 by 1.5–4(–5) cm, margin ± repand with a short glandular tooth at the excurrent end of each lateral nerve, midrib and nerves prominent on both faces, the latter in 5–6 curved-ascending and anastomosing pairs, reticulation rather lax and slightly raised on both sides; petiole usually strongly curved, glabrescent, 5–15(–30) mm. *Spikes* supra-axillary, slender, minutely sub-

strigose-pubescent, (2)–4–8 cm; flowers scattered in the upper half or less, each flower subtended by an oblong acuminate small bracteole. *Petals* 4, ovate-oblong, pubescent outside, 1.5–2 mm. — ♂ *Flowers: Filaments* very short; anther cells ovate-elliptic, hardly 0.5 mm. Rudiment of *ovary* hirsute, subglobose. — ♀ *Flowers: Staminodes* minute. *Ovary* ellipsoid, densely pubescent, 1 mm; stigma round, truncate, minutely papillate. *Drupe* elliptic-oblong, laterally compressed to rather sharp edges, glabrous, yellowish or red, 1.8–3 by 1–1.5 by c. 0.8 cm; exocarp pulpy or fleshy, rather thin, wrinkled in dry fruits. *Seed* 1; endosperm ruminant, yellow, oily, externally deeply pitted by the protuberances on the inside of the thin endocarp.

Distr. *Malesia*: Philippines (Luzon: Ilocos Norte, Bulacan, Tayabas, Sorsogon; Samar, Mindanao).

Ecol. Primary forest at low altitudes, scattered. *Fl.* March–May, *fr.* Sept.

Note. Apparently close to *P. volubilis* Hook. and to certain species from Madagascar in leaf-characters, distinguishable from the first by its larger fruits.

20. MIQUELIA

MEISN. Pl. Vasc. Gen. 1 (Sept. 1838) 152; *ibid.* 2 (Sept. 1838) 109; SLEUM. Taxon 17 (1968) 449 *et ibid.* 18 (1969) 479, *nom. cons. prop.*; Blumea 17 (1969) 229, *non* BL. June 1838 (= *Stauranthera* BENTH. 1835). — *Jenkinsia* GRIFF. Calc. J. Nat. Hist. 4 (1843) 231; *ibid.* (1844) t. 12, *non* HOOK. Gen. Fil. (1842) text opp. t. 75 b. — Fig. 39.

Dioecious climbing or twining shrubs, the wood with large porous vessels. *Leaves* spirally arranged, entire or coarsely lobed (Mal.), generally minutely papillose-tubercled on both faces, nerves palmate to pinnate. *Flowers* sessile, arranged in heads or umbels; these on ± elongate, distally ± thickened peduncles, from defoliate or foliate axils; inflorescences solitary or several in lax racemes, panicles or fascicles. *Calyx* small, ± deeply 4- or 5-lobed. — ♂ *Flowers: Petals* 4

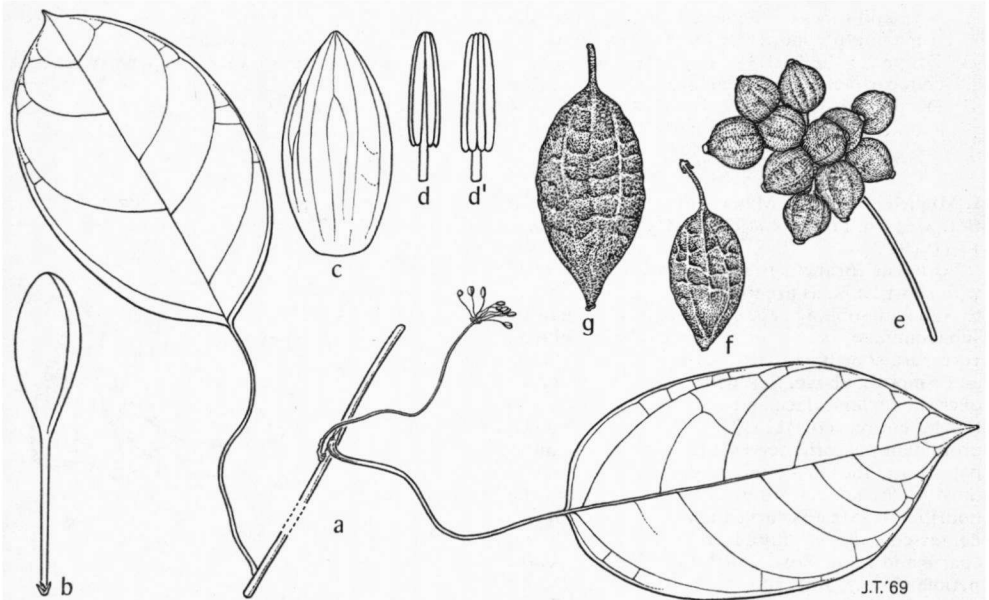


Fig. 39. *Miquelia celebica* BL. a. Habit, $\times \frac{1}{2}$, b. σ flower bud, $\times 5$, c. petal, $\times 7\frac{1}{2}$, d. & d'. stamen, $\times 7\frac{1}{2}$, e. submature infructescence, $\times \frac{1}{2}$, f. mature fruit, with remnants of the petals at the very base, $\times 1$. — *M. caudata* KING. g. Fruit, $\times 1$ (a-d ELMER 9894, e KRUYFF 23, f KOORDERS 19594, g CLEMENS 27608).

or 5, united into a short or mostly elongate-filiform tube adnate to the flower axis, upper part or lobes free, valvate in bud, apex a little inflexed, patent or \pm reflexed in anthesis. *Stamens* 4 or 5; filaments short-linear; anthers elongate-linear-oblong to (sub)sagittate, exceeding the filaments in length, dorsifixed a little above the base, introrse. Rudiment of *ovary* minute. — σ *Flowers*: *Calyx* and lobes of the petals either distant from each other by the elongate flower axis, or close together, i.e. practically no flower axis present. *Staminodes* flattish, very short. *Ovary* thick-cylindric, hairy; stigma sessile, disk-shaped, its centre a little depressed. *Drupe* oblongoid to subovoid-ellipsoid, laterally compressed, whether or not narrowed into a stalk-like base, either sessile or on a pedicel-like flower-axis; mesocarp thin; endocarp crustaceous, rugose or shallowly lacunose, \pm manifestly verrucose inside, the warts causing small pits in the flattened ovoid *seed* which is surrounded by a juicy pulp; testa thin; albumen fleshy, rugulose; cotyledons elliptic, thick-foliaceous.

Distr. About 8 *spp.* in SE. Asia (India: Western Ghats; Assam, Burma?, Thailand, Laos); in *Malesia*: 4 *spp.* (Sumatra, Malay Peninsula, Borneo, Philippines, Celebes). Fig. 40.

Ecol. Mainly lowland forest, rarely up to 1980 m (Mt Kinabalu).

KEY TO THE SPECIES

1. Calyx and lobes of the petals distinctly spaced both in the σ and σ flowers by the elongate flower-axis (= the basal connate tube-like part of the petals). *Drupe* 'pseudopedicelled' by this axis (and besides much narrowed towards the base into a kind of stalk). 1. *M. reticulata*
2. Leaves oblong to subovate-oblong, (10-)12-17 by 4-6.5 cm; inner basal pair of nerves ascending to the lower third of the lamina. Umbels c. 10-flowered. 1. *M. reticulata*
2. Leaves ovate, 7-11 by 5-9 cm; inner basal pair of nerves ascending to $\frac{1}{2}$ or $\frac{3}{4}$ the length of the lamina. Umbels c. 5-flowered. 2. *M. philippinensis*

1. Calyx and lobes of the petals close to each other in the ♀ flowers and drupe, spaced in the ♂ flowers. Drupe not 'pseudopedicelled' (but much narrowed towards the base into a kind of stalk).
3. Drupe 2.3–3.3 by 1.3–1.8 by 0.7–1 cm, narrowed at apex into a shorter or longer rather slender beak; endocarp coarsely lacunose. 3. *M. caudata*
3. Drupe (0.8–)1–1.2(–1.7) by 0.7–0.8(–1.2) by 0.6 cm, shortly and rather gradually narrowed at apex; endocarp more finely lacunose. 4. *M. celebica*

1. *Miquella reticulata* MERR. Philip. J. Sc. 9 (1914) Bot. 312; En. Philip. 2 (1923) 493; SLEUM. Blumea 17 (1969) 230.

Scandent. Branchlets slender, sparingly hirsute with short hairs, as are the petioles. *Leaves* oblong to subovate-oblong, apex gradually attenuate or subacuminate, base rounded and a little oblique, very base shortly cordate, membranous, glabrous and smooth above, set with scattered hairs all over the undersurface and somewhat rough to the touch, entire, (10–)12–17 by 4–6.5 cm, midrib prominent beneath, nerves 2 basal pairs, the outer pair short, the inner one ascending to the lower third of the lamina, other higher nerves from the midrib 3–4(–5) pairs curved-anastomosing, slightly depressed above, raised beneath, reticulation coarse and faint above, a little prominent beneath; petiole (1–)1.5–2.5(–5.5) cm by 1–2 mm. — *Inflorescences* unknown. — ♀ *Flowers* umbellately arranged on top of a slender peduncle, the latter either solitary and axillary, or mostly 2–4 peduncles from a short thickened rachis on defoliate stem, 3–10 cm, with about 10 flowers per umbel. *Calyx* 4-lobed to almost the base, lobes hairy, c. 1 mm. *Petals* 4, greenish-yellow, fleshy, lobes elongate-oblong, subacuminate, laxly puberulous outside, glabrous inside, c. 3 by 1.5 mm, tubular basal part of the petals 5–7 mm at full anthesis. *Stamens* 4, flattened, very short. *Ovary* hairy, crowned by a thick pad-like stigma. *Drupe* narrowly ovoid in general, somewhat compressed, c. 2 by 1.3 by 0.8 cm, wrinkled when dry, suddenly attenuate at the very base into a kind of stipe (5–8 mm), on the base of which the lobes of the petals persist for some time; flower-axis below these lobes 6–8 mm, slightly more slender than the basal stipe of the drupe; exocarp thin, densely hairy; endocarp thin, coarsely foveolate outside, finely tubercled inside.

Distr. *Malesia*: Philippines (Camiguin and Bohol Is.), twice found. Fig. 40.

Ecol. Forest at low altitudes, up to 600 m.

2. *Miquella philippinensis* MERR. Philip. J. Sc. 14 (1919) Bot. 416; En. Philip. 2 (1923) 493; SLEUM. Blumea 17 (1969) 230.

Scandent shrub. Branchlets slender, laxly hirsute with shorter and longer hairs, as are the petioles. *Leaves* ovate, apex broadly subacuminate-attenuate, base rounded and very shallowly or hardly cordate, membranous, glabrous and olivaceous in dry state above, rather laxly and finely short-hairy on the undersurface, entire, somewhat repand or shortly (c. 5 mm) 1–2-lobed on each side, 7–11 by 5–9 cm, midrib and nerves faint above, a little raised beneath, 2 pairs of basal nerves, the outer pair rather short, the inner one

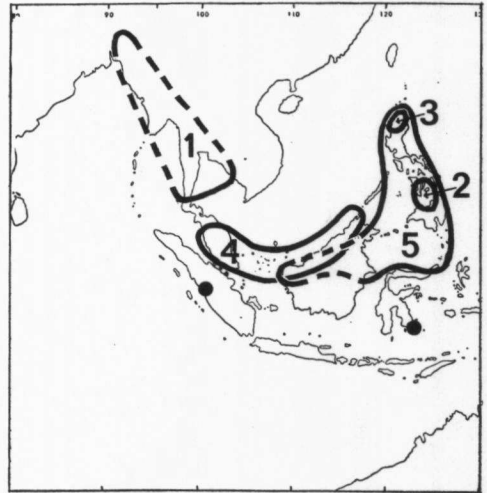


Fig. 40. Distribution of *Miquella*. 1. *M. kleinii*, 2. *M. reticulata*, 3. *M. philippinensis*, 4. *M. caudata*, 5 and 2 dots *M. celebica*.

ascending to $\frac{1}{2}$ – $\frac{3}{4}$ the length of the lamina, upper lateral ones c. 3 pairs, curved-anastomosing, reticulation coarse and faint, less obvious than in *M. reticulata*; petiole 2–3 cm by 0.5–1 mm. — ♂ *Inflorescence* unknown. — ♀ *Inflorescence* axillary, solitary peduncles c. 3 cm, each bearing c. 5 umbellately arranged flowers. *Calyx* lobes ovate-acuminate, hairy, 1–1.5 mm. *Petals* united below into a c. 5 mm long tube, free lobes oblong, subglabrous, 2.5 mm. Submature *drupe* oblongoid-ellipsoid, slightly hairy, 1–1.3 cm long, narrowed downwards to a slender stalk as long as the fruit proper.

Distr. *Malesia*: Philippines (Luzon: Ilocos Norte Prov.), once found. Fig. 40.

Ecol. Forest at low altitude.

3. *Miquella caudata* KING, J. As. Soc. Beng. 64, ii (1895) 124; RIDL. Fl. Mal. Pen. 1 (1922) 433; BURK. Dict. (1935) 1478; SLEUM. Blumea 17 (1969) 230. — Fig. 39g.

A slender climber up to 6 m. Branchlets pale, striate, early glabrescent and corticate, 2–5 mm ϕ . *Leaves* oblong-lanceolate to elliptic-oblong, apex shortly, sometimes rather abruptly acuminate, base broadly cuneate to rounded, thin-chartaceous to membranaceous, glabrous above, laxly puberulous all over the surface and soft to the touch beneath, glabrescent, entire, (10–)12–20 by

(4-)5-8 cm, midrib and nerves moderately raised beneath, nerves 1 or 2 basal and 5-6 upper pairs, equally curved-ascending and rather obscurely anastomosing, reticulation generally lax and but slightly prominent; petiole pubescent, 1.2-3(-4) cm. — Umbels of ♂ inflorescences solitary or mostly several, in fascicles or along a short rachis from hairy tubercles of foliate or defoliate axils of the branchlets; peduncle filiform, 1.5-3 cm, the whole inflorescence set with short almost scabrid hairs. *Calyx* cup-shaped, 1 mm, 4(-5)-lobed halfway. *Petals* 4 (or 5) united to a filiform elongate basal tube-like (4-10 mm), free in the upper oblong and ± spreading part (2 mm), white. *Stamens* 4 or 5; filaments short; anther cells elongate-linear, subsagittate, 1.5 mm. Rudiment of *ovary* hirsute. — ♀ *Flowers* 8-15 together in capitules on top of axillary, solitary stoutish peduncles, these glabrescent and accrescent in fruiting stage up to 11 cm. *Calyx* as in ♂ flowers. *Petals* without a markedly elongate basal part, i.e. close to the calyx, somewhat leathery and glabrous, 2.5 mm. *Ovary* tomentose; stigma discoid, wider than the ovary. *Drupe* broadly ovoid, laterally much compressed, rounded at base in general, though abruptly narrowed to a slender stipe for 5-7 mm, at the base of which the remnants of the petals and calyx are found, tapering upwards to a tail or beak for (5-)6-10 mm, crowned by a small stigma, 2.3-3 (-3.3) by 1.3-1.8 by 0.7-1 cm; exocarp thin, rusty-pubescent, ripening to a tomato or orange red; endocarp bony, rather deeply (1-2 mm) and coarsely reticulate-lacunose outside, tubercled all over inside.

Distr. *Malesia*: Malay Peninsula, Borneo. Fig. 40.

Ecol. Primary forest, also mossy forest, from the lowland up to 1980 m on Mt Kinabalu.

Uses. The stem holds a reservoir of potable water. VAUGHAN-STEFFENS stated that the red fruits are added to *Antiaris* latex in making 'sakai (pangan)' dart-poison (RIDL. Agr. Bull. Mal. Pen. 8, 1898, 209), but no confirmation of this has been available.

Vern. *Pisang-pisang bulu*, *M*, *sĕlowung*, Pangan.

4. *Miquelia celebica* BL. *Rumphia* 4 (1849) 37; *Mus. Bot. Lugd.-Bat.* 1 (1849) 42, f. 8; WALP. *Ann.* 2 (1851) 22; MIQ. *Fl. Ind. Bat.* 1 (1856) 798; SCHNIZL. *ic.* 3 (1857/65) t. 172, f. 22-31; BAILL. in *DC. Prod.* 17 (1873) 14; BECC. *Malesia* 1 (1877) 124; KOORD. *Minah.* (1898) 393; SLEUM. *Blumea* 17 (1969) 231. — *M. cumingii* BAILL. *Adansonia* 10 (1872) 278; in *DC. Prod.* 17 (1873) 14; VIDAL, *Phan. Cuming Philip.* (1885) 103; *Rev. Pl. Vasc. Filip.* (1886) 86; MERR. *En. Philip.* 2 (1923) 492; DAHL, *J. Arn. Arb.* 33 (1952) 275, f. 74 (pollen).

— *M. rostrata* MERR. *Pl. Elm. Born.* (1929) 172. — Fig. 39a-f.

High climbing shrub, much ramified. Branchlets slender, green-olivaceous when dry, striate, subglabrous. *Leaves* elliptic, sometimes ovate, rarely lanceolate-oblong, apex shortly acuminate, tip submucronate by the protruding midrib, base a little oblique, broadly cuneate to truncate-rounded, sometimes shallowly cordate, thin-chartaceous, entire, or rarely obsolete repand to coarsely few-lobed, initially with scattered rather scabrid short hairs (also found on the inflorescence) underneath, early glabrescent, 9-15(-20) by 4-7.5(-10) cm, midrib and nerves slightly raised beneath only, lateral nerves 1-2 basal and 4-6 higher pairs, all curved-ascending and rather obscurely in-arching before the edge, no proper reticulation; petiole slender, 1.5-5(-7) cm. — ♂ *Umbels* subglobose, many-flowered, slenderly long-peduncled, axillary or slightly supra-axillary, rarely cauline, either solitary or 2-3 very laxly racemously arranged on a rachis of 1-3 cm by c. 2 mm. *Calyx* shortly 4(-5)-lobed, very small. *Petals* 4(-5), united for 5-7 mm to a filiform tube below, free for the uppermost 2 mm, greenish yellow. *Stamens* 4(-5); filaments 1 mm; anther cells linear-oblong, base slightly divergent, 1.5 mm. Rudiment of *ovary* 4-gibbous, glabrous. — ♀ *Flowers* arranged to many- and dense-flowered subglobose heads, these generally solitary from the axil on a slender peduncle 5-10 cm, rarely 2 or 3 laxly racemously arranged along a short rachis, each head then very slenderly elongately peduncled. *Calyx* very small. *Petals* 4, not elongate into a tube below as in the ♂, oblong, thickish, 2 mm. *Staminodes* 4. *Ovary* subcylindric, densely hairy, crowned by the thick stigmatic pad. *Drupe* obliquely ellipsoid-ovoid, laterally compressed, (0.8-)1-1.2(-1.7) by 0.7-0.8(-1.2) by 0.6 cm, apex shortly and rather gradually attenuate, base suddenly narrowed to a kind of stipe 5-7 by 1 mm (bearing the persistent petals on its base); exocarp thin, laxly set with short strigose hairs, yellow to reddish; endocarp crustaceous, outside with numerous vertical low ridges and transverse connections, shallowly lacunose-reticulate in the dry fruit, inside with numerous low warts which leave their mark in the thus pitted seed.

Distr. *Malesia*: W. Sumatra (Padang, once found), Borneo, Philippines (Luzon to Mindanao), Celebes (Minahasa, Buton I.). Fig. 40.

Ecol. Primary forest, sometimes along streams, generally in the lowland, rarely up to 700 m, in Buton I. on coralline limestone, apparently scattered or rare.

Vern. *Lalai in tasik*, *sumbilan makanteh*, Minahasa (Tt.).

21. PHYTOCRENE

WALL. *Pl. As. Rar.* 3 (1831) 11, t. 16; SLEUM. *Taxon* 17 (1968) 448 *et ibid.* 18 (1969) 479, *nom. cons. prop.*; *Blumea* 17 (1969) 234. — *Gynocephalum* BL. *Bijdr.* (1825) 483; ENDL. *Gen.* (1837) 281 ('*Gynocephalum*'); REICHB. *Nom.* (1841)

67 ('*Gyrocephalum*'); HASSK. Cat. Hort. Bog. (1844) 78 ('*Gynaecocephalum*'); BL. Rumphia 4 (1849) 36, *nota* ('*Gynocephalum*'); BENTH. in Benth. & Hook. f. Gen. Pl. 1 (1862) 354 ('*Gynocephala*'). — Fig. 42.

High climbing dioecious shrubs or lianas, sometimes with a robust stem, younger parts of the latter usually hairy and prickly, youngest parts slender and striate, sometimes rolled-in, and simulating tendrils, which are wanting. *Leaves* remotely spirally arranged, entire or palmately 3–7-lobed, subpalmately 3–7-nerved; petiole from a thickened and depressedly cup-like part of the stem, \pm torted, never swollen basally or distally. — δ *Flowers* in globose clusters, these either solitary at the end of an axillary peduncle, or several spaced and racemously arranged then, or generally very numerous in long repeatedly branching spike-like racemes or panicles both axillary and/or stem-borne. *Calyx* segments 3–5, \pm free. *Petals* 3–4, \pm united below, valvate, alternating with the calyx lobes. *Stamens* 3–4 (rarely –6), finally exserted; filaments filiform, \pm connate at base into a column which bears the hirsute rudiment of the ovary; anther cells ovate-elliptic, small. — ♀ *Flowers* in large solitary either cauline or mostly axillary peduncled globose heads. *Calyx* segments 3–5, free to almost the base. *Petals* 3–4(–5) as in the δ flowers. *Staminodes* absent. *Ovary* subovoid-columnar, tapering to an equally thick and short columnar style with several 2-lobed stigmas which form a kind of funnel. *Drupes* numerous, collected in generally large, globose heads, each drupe tipped by the style, \pm reversely setulose by brittle irritant hairs; exocarp thin, larger than the endocarp and \pm hollow in the upper extended part at full maturity; endocarp rather thick, ligneous, pitted to deeply lacunose outside, smooth or warty inside. *Seed* 1, large, with a thin almost juicy coat which exudes a kind of clear gum; endosperm fleshy, strongly furrowed or lobulated; cotyledons very large, flat, foliaceous, double-folded or tortuous.

Distr. About 11 *spp.*, of which 4 both in SE. Asia and Malesia, and 7 confined to Malesia from Sumatra to New Guinea. Fig. 41.

Ecol. Scattered in primary and secondary lowland forest, occasionally up to 1200 m, also in open places, as rarely found on limestone rocks.

Uses. The wood has very large porous vessels which contain water, used by the natives, hence the generic name; for its anatomy see the comprehensive study made by TIMMERMANS, Ann. Jard. Bot. Btzg 41 (1931) 65–104, t. 23–34, and the review given by SLEUMER in E. & P. Nat. Pfl. Fam. ed. 2, 20b (1942) 332–336, f. 90–93.

Note. Leaves of *Phytocrene* are similar in shape and nervation to those of various genera in the *Menispermaceae*; besides the petiole emerges from a shallow cup-like thickening of the stem which also occurs often in *Menispermaceae*. In the latter, however, generally the petiole is swollen in the uppermost and maybe also in its basal part, which is never the case in *Phytocrene*.

KEY TO THE SPECIES

1. δ Flower heads solitary, each on top of an axillary or slightly supra-axillary peduncle (as is always the case with the ♀ ones) on younger foliate parts of the branchlets. 1. *P. anomala*
1. δ Flower heads several together, composed to an inflorescence, the latter either from foliate or defoliate axils, or from tubercles on the stem.
 2. δ Flower heads rather few, composed to a true raceme, *i.e.* the peduncled heads spaced along a rachis. 2. *P. racemosa*
 2. δ Flower heads numerous, composed to a spike-like panicle.
 3. δ Flower heads in fascicles or glomerules, these markedly spaced at least in the lower half of the rachis.
 4. Leaves broadly oblong, base slightly cordate, flat in dry specimens. 3. *P. interrupta*
 4. Leaves ovate, base rounded, \pm bullate by impressed nerves and veins in dry specimens. 4. *P. malacothrix*
3. δ Flower heads in short-peduncled cymes, secondary racemes or panicles, these generally close together (rarely spaced) along the rachis.

5. Bracts in the ♂ inflorescences persistent, markedly plumed by ± spreading hairs.
6. Basal part of bracts hardly or not widened. 5. *P. trichura*
6. Basal part of bracts widened up to 5 mm. 6. *P. borneensis*
5. Bracts in the ♂ inflorescences wanting (already gone in full anthesis), or if persistent, filiform to narrow-subulate, and not markedly plumed.
7. ♂ Inflorescences rather short, 2.5–5 by (0.5–)1–1.5 cm. Leaves normally oblong or oblong-lanceolate, early glabrescent. 7. *P. oblonga*
7. ♂ Inflorescences elongate to caudate, *i.e.* markedly longer and at least 2 cm ø. Leaves oblong to ovate-cordate, or palmate, generally tardily or hardly glabrescent.
8. Leaves normally palmate, *i.e.* deeply and narrowly (3–)5(–7)-lobed in flowering specimens. 8. *P. palmata*
8. Leaves normally entire or ± broadly 3-lobed in flowering specimens (sometimes palmate in sterile juvenile specimens).
9. ♂ Inflorescences slender, *c.* 2 cm ø. Bracts ± persistent, numerous, much exerted beyond the partial inflorescences. Drupe 4.5–8 by 1.5–2.3 cm incl. the hollow beak of the exocarp. 9. *P. bracteata*
9. ♂ Inflorescences thickish, (2.5–)3 cm or more ø. Bracts, if persistent, rather few and less exerted.
10. Mature drupe 3–4(–4.5) by 1.5–2 cm incl. the hollow short beak of the exocarp; hard endocarp (2–)2.5–3(–3.5) cm long. 10. *P. hirsuta*
10. Mature drupe (5.5–)6–10(–13) cm long incl. the hollow elongate beak of the exocarp. 11. *P. macrophylla s.l.*

1. *Phytocrene anomala* MERR. J. Str. Br. R. As. Soc. n. 86 (1922) 325; SLEUM. Blumea 17 (1969) 235.

Woody vine. Branchlets (slender, up to 5 mm ø, their distal part often curved and similar to a tendril), petioles, peduncles and leaves (mainly on the nerves of the undersurface) hirsute by short greyish and longer (1–2 mm) rufous and more spreading hairs, ultimately glabrescent. Leaves oblong to broadly oblong, or lanceolate, apex short-acuminate, subacute, base slightly cordate, chartaceous, olivaceous, glabrous or almost so except the hirsute midrib above, the tomentum on the undersurface rather soft to the touch, denticulate by protruding veins in young, entire in mature leaves, 10–22(–30) by (2.5–)3–10 cm, nerves 6–8(–10) pairs, two of them ± basal, short and spreading, the other ones curved-ascending, raised beneath only as is the coarse net of veins and veinlets; petiole 1–2(–3) cm by 2–3(–4) mm. — ♂ Inflorescences in globular peduncled heads, solitary, from a little above the axils of subsequent leaves of the distal part of a branchlet; peduncle slender, *c.* 1 cm; heads covered with a pale ferruginous tomentum of short bristly hairs, 5–8 mm ø. Calyx segments 4 or 5, linear-spathulate, *c.* 2.5 mm. Petals 4, elongate-obovate, connate halfway to ¾, hirsute dorsally, *c.* 3 mm. Stamens 4; filaments 1.5–2 mm; anther cells subovate-elliptic, 1 mm. — ♀ Inflorescences as the ♂ ones on young branchlets in axillary solitary heads, on peduncle *c.* 2 cm by 2 mm. Calyx segments and petals as in ♂. Ovary ovoid, short-attenuate to a conical very shortly lobed stigma, hirsute. Drupes collected to heads of *c.* 4 cm ø, each drupe ovoid, hirsute by simple bristly hairs all of the same type, known up to 2.5 by 1.5 cm, apparently larger at full maturity, accrescent petals seen up to 6 mm. Form, size and type of pits of the endocarp not yet known.

Distr. *Malesia*: Borneo (Upper Baram R. and Sandakan area, Berau).

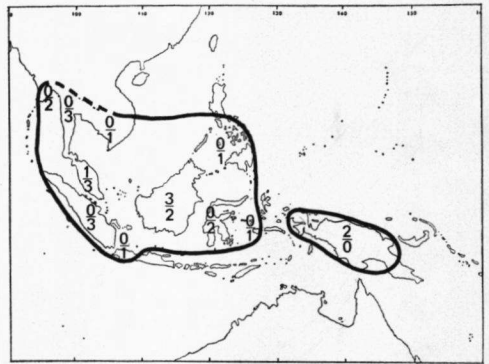


Fig. 41. Distribution of *Phytocrene*. The figure above the hyphen indicates the number of endemic species in the island or area, the figure below the hyphen the number of non-endemic species.

Ecol. Primary and secondary lowland forest, apparently rare.

2. *Phytocrene racemosa* SLEUM. Blumea 17 (1969) 236. — Fig. 42.

Tall woody climber, up to 40 m, stem *c.* 1.5 cm ø covered with thin longitudinally striate and finely fissured brown bark which bears a few transverse linear lenticels; branchlets and petioles with a short fawn tomentum. Leaves oblong-obovate, apex abruptly (*c.* 1.5 cm) acuminate, acutish, base broadly cuneate and shallowly cordate, chartaceous to subcoriaceous, glabrous except the nerves which are hairy in their basal part above, ± densely set with short subappressed or more spreading pale rusty hairs especially on nerves and veins and soft to the touch beneath, edge slightly sinuate-denticulate, or entire, 18–32 by 7–20 cm, nerves

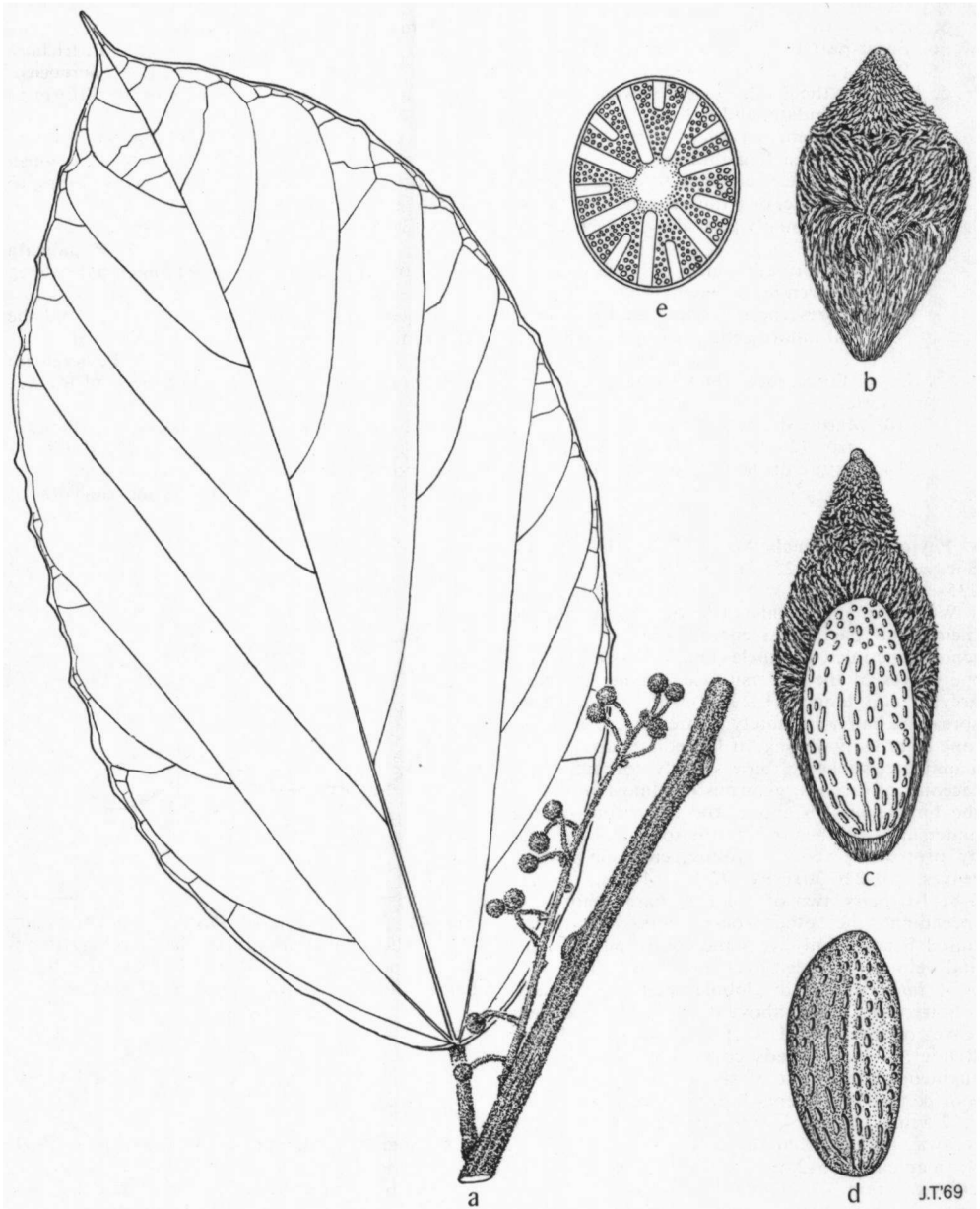


Fig. 42. *Phytocrene racemosa* SLEUM. *a.* Habit, with ♂ inflorescence, $\times \frac{1}{2}$, *b.* fruit, $\times \frac{1}{4}$, *c.* ditto, part of the exocarp removed, showing the endocarp, $\times 1$, *d.* pitted endocarp, $\times 1$, *e.* cross-section of stem, $\times 1\frac{1}{2}$ (*a, e* MURTHY & ASHTON S 22325, *b* SMYTHIES S 17155, *c-d* S 19513).

flat above, much prominent beneath as is the rather coarse reticulation of veins and veinlets, nerves 2 basal pairs, the outer pair short, the inner one rather straight-ascending to the middle of the lamina, upper *c.* 4 pairs from the midrib also rather steeply curved-ascending; petiole 1.5–3 cm

by 2–4 mm. — ♂ *Racemes* from tubercles of the stem or from slightly above foliate or defoliate axils, all over fawny, tomentose, peduncled (1 cm) heads (5–10, *c.* 5 mm ϕ), these laxly arranged along the 6–12 cm long rachis. *Calyx* segments 5, linear spatulate, long-haired, 2 mm. *Petals* 4, linear-

oblanceolate, free to almost the base, long-haired dorsally, 2.5 mm. *Stamens* 4; anther cells 0.4 mm. — ♀ *Racemes* from c. 1 cm above defoliate axils, with about 5 laxly arranged heads, fulvous-hirsute at peduncles and the c. 4 cm long rachis. Flower heads globose, c. 5 mm \emptyset , on thick peduncles 1.5–2 cm. *Calyx* segments and petals as in ♂ flowers. *Ovary* cylindrical, hirsute, c. 2 mm. Developed *ovary* or immature *drupe* (c. 1 cm long) densely covered with short and shortly hirsute emergences in the upper, and longer and longish-hirsute ones in the lower half. Mature *drupe* arranged to a globose head of c. 8 cm \emptyset , each drupe showing the same shorter and longer emergences of the exocarp as already found in the very young state, subelliptic-oblongoid, attenuate at both ends, 4–5 by 2–3 cm; endocarp oblongoid-ellipsoid, obtuse at both ends, much compressed laterally, smooth, with numerous almost linear rather deep pits, which appear on the inner side as flat warts, c. 3 by 1.5 by 1.3 cm.

Distr. *Malesia*: Borneo (Sarawak), 3 collections.

Ecol. Mixed Dipterocarp forest, from low elevation up to 250 m, apparently very scattered.

Vern. *Buah pisang munsang*, Kapit.

3. *Phytocrene interrupta* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 252; *Blumea* 17 (1969) 236.

Climber. Branchlets slender (5–7 mm \emptyset), deeply striate and brownish-hirsute, older parts laxly set with hardly pungent small emergences. *Leaves* broadly oblong, apex for 3–10 mm subabruptly acuminate, base slightly cordate, firmly chartaceous, glabrous above except nerves, covered with soft hairs all over the undersurface, and with stiffer ones on midrib and nerves, soft to the touch, entire, 7–17 by 4–8(–9) cm, midrib and nerves flat or a little impressed above, markedly prominent beneath, nerves 2 basal pairs (of which the outer pair is short, the inner one ascending to the lower $\frac{1}{3}$ of the length of the lamina), other pinnate nerves 6–8 pairs, rather straight and subparallel to each other and the inner basal pair, reticulation of veins and veinlets fine and hardly raised above, more coarse and much raised beneath; petiole 2–3.5 cm by 2–3 mm, hirsutulous. — ♂ *Inflorescences* spike-like, several in a fascicle from a tubercle of the stem (c. 1.5 cm \emptyset), pendent, the heads of flowers sessile or very shortly peduncled and (2–)3–6 of them fascicled, these fascicles spaced in the lower, less or not so in the upper half of the rachis (10–30 cm by 2 mm), the whole inflorescence covered with shorter soft and longer stiff-brownish hairs; peduncle of flower heads slender, up to 4 mm, the basal bract subulate, 2–3 mm, apparently early going. *Calyx* segments 4, ovate, fleshy, concave, hirsute, 0.8 mm. *Petals* 3 or 4, connate to the lower $\frac{1}{3}$ to $\frac{1}{2}$, ovate-oblong, subacuminate, green, \pm densely strigose dorsally, c. 1.5 mm. *Stamens* 3 or 4; anther cells ovate-elliptic, 0.4 mm. — ♀ *Inflorescences* and *drupe* unknown yet.

Distr. *Malesia*: New Guinea (Central Distr.

in ascent from Port Moresby to Mt Victoria), once found.

Ecol. Forest at c. 450 m.

4. *Phytocrene malacothrix* SLEUM. Notizbl. Berl.-Dahl. 15 (1941) 361; *Blumea* 17 (1969) 237.

"Scandent. Branchlets soft-olivaceous-tomentose in the younger parts, glabrescent below. *Leaves* ovate, apex subabruptly acuminate for 1 cm, tip obtuse, base rounded, thin-chartaceous, glabrous above, softly brownish-tomentose all over beneath especially on midrib and nerves, 16–18 by 8–10 cm, midrib raised on both faces, nerves curved-ascent, \pm distinctly impressed as are the veins above (the lamina bullate in dry specimens), much raised beneath, reticulation rather dense, slightly prominent beneath only; petiole tomentose, 3–4 cm. ♂ *Spikes* only known in a poorly developed state, brownish-tomentose, solitary from the axils of the upper leaves, the flower heads composed to glomerules, the latter spaced on a rachis c. 5 cm long."

Distr. *Malesia*: New Guinea (Morobe Distr.: Boana), at 1030 m, once found.

Note. Imperfectly known species, said to be related to *P. interrupta* SLEUM. in the original diagnosis, from which the description given above was made; type material lost.

5. *Phytocrene trichura* RIDL. Fl. Mal. Pen. 1 (1922) 433; SLEUM. *Blumea* 17 (1969) 237.

Tall woody climber. Stem of branchlets shallowly striate, patently rufous-setose distally as are the petioles, corky and with numerous roundish lenticels (no prickles) downwards, 4–6 mm \emptyset . *Leaves* ovate in circumference, whether or not 3-lobed to $\frac{1}{2}$ – $\frac{2}{3}$, lateral lobes acutish, base shallowly cordate, thin-coriaceous, subdensely short-tomentulose on both faces initially, glabrescent and a little rough above, soft to the touch beneath, 12–19 by 8–11 cm, palmately 5-nerved, midrib and inner pair of basal nerves more prominent than the other basal and the few upper lateral ones beneath, reticulation coarse, strongly raised beneath; petiole 3–6 cm by 2–3 mm. — ♂ *Panicles* from bare lower part of stem (1.5 cm \emptyset), sessile, pendulous, grey-green, squirreltail-like, 12–23 by 3.5–4 cm, formed by numerous peduncled dichasia, the ultimate pedicels (3–6 mm) bearing globular heads consisting of numerous flowers, all densely shortly greyish-pubescent; bract of each globule partly connate with pedicel, slender, almost filiform, persistent, spreading, its basal part hardly or not widened, short-pubescent, upper part plumose by spreading rufous 2–3 mm long hairs. *Calyx* segments 4 or 5, irregularly obtusate, 1 mm, free, apex fringed with long hairs. *Petals* 4, ovate-oblong, connate to the lower $\frac{1}{3}$, sparsely short-hairy or papillose outside, 1.5 mm. *Stamens* 4, slightly exserted; anther cells elliptic, 0.5 mm. — ♀ *Inflorescences* and *drupe* not yet known.

Distr. *Malesia*: Malay Peninsula (Perak, Pahang, Selangor).

Ecol. Dense forest, ascending the top of lofty trees, apparently very rare.

6. *Phytocrene borneensis* BECC. Malesia 1 (1877) 128; MERR. EN. BORN. (1921) 356; SLEUM. Blumea 17 (1969) 237. — *P. porphyrea* STAFF, Kew Bull. (1906) 72.

Big woody climber. Stem robust (seen up to 2.5 cm \emptyset), longitudinally ribbed (2–3 mm) and with distant transverse linear lenticular cracks. Branchlets \pm patently rufous-setose and striate at distal part (3–6 mm \emptyset). *Leaves* ovate in circumference, simple, or subtrilobed, or deeply obtusely 3-lobed, base cordate, edge very shortly denticulate by protruding veins, chartaceous to subcoriaceous, young ones soft-tomentulose all over both faces, mature ones finally glabrous above, \pm densely covered with appressed to suberect rather stiff hairs especially on nerves, and soft to the touch beneath, 15–25(–30) by (8–)10–18(–22) cm, nerves slightly sunken above, strongly raised beneath, basal palmate nerves 7–9 pairs, branched mainly outward, upper ones from the midrib 3–4 pairs of entire, and 4–6 ones in the central lobe of lobed leaves, all these nerves curved-ascending, connected by numerous straight and \pm transverse veins and a coarse reticulation markedly prominent underneath only; petiole subappressedly rufous to ferruginous-setulose, (3–)4–8(–12) by 2–4 mm. — δ *Inflorescences* pendent from old wood, tail-like as in *P. trichura*, sessile, compact, consisting of numerous repeatedly branched and shortly pedicelled dichasia, all over covered with greyish to brownish softer and coarse, in part hooked hairs, (12–)15–25(–50) by 3–4(–5) cm, most of the ultimate pedicels bearing a narrowly to broadly subulate-caudate, (1.2–)2–3.5 cm long and at base (1–)2–5 mm broad persistent bract, the latter covered with the same short tomentum and besides with longer, spreading, often dark red or brownish hairs which give the bracts a \pm plumose appearance; flowers in globular pedicelled heads (3–4 mm \emptyset). *Calyx* segments 4 or 5, irregularly obtusely to spatulate, distally densely hairy outside, glabrous inside, 1 mm. *Petals* 4, oblong-obovate, acutish, fleshy, slightly to densely hairy outside only especially below, 1.5 mm. *Stamens* 4; anther cells oblong-elliptic, 0.5 mm. — φ *Inflorescence* and *drupe* unknown.

Distr. *Malesia*: Borneo.

Ecol. Lowland forest, up to 1065 m.

Uses. Water from the stem is used for drinking.

Vern. *Bilis akar*, S. Kinabatangan.

7. *Phytocrene oblonga* WALL. Pl. As. Rar. 3 (1831) 12; Cat. (1832) n. 4948; WALP. Rep. 1 (1842) 98; BAILL. in DC. Prod. 17 (1873) 13; MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 592; KING, J. As. Soc. Beng. 64, ii (1895) 122; GAGNEP. Fl. Gén. I.–C. 1 (1911) 839, f. 102, 4–8; RIDL. Fl. Mal. Pen. 1 (1922) 432; CRAIB, Fl. Siam. En. 1 (1926) 275; GAGNEP. Fl. Gén. I.–C. Suppl. (1948) 757; SLEUM. Blumea 17 (1969) 237; Fl. Thail. 2 (1970) 90. — *Gynoecephalum oblongum* (WALL.) TRÉCUL, Ann. Sc. Nat. III, 8 (1847) 149. — *Miquelia cancellata* KURZ, J. As. Soc. Beng. 44, ii (1875) 201.

Climber to top of tall trees, with rather slender

stem (up to 1.5 cm \emptyset); bark brownish, rather rough, striate, not prickly. Branchlets densely set with fine retrorse prickly lenticles, tip short-pubescent. *Leaves* oblong or oblong-lanceolate, \pm abruptly and shortly acuminate, acumen rather slender and slightly curved, subacute, base cuneate to rounded, coriaceous, glabrous and shining above, rather densely stiffly short-hairy and a little rough to the touch beneath, early glabrescent, entire or undulate-subdentate, (10–)12–22 by (4–)5–9 cm, nerves 5–7 pairs, one of which basal, ascending and \pm manifestly in-arching before the edge, prominent as is the rather dense reticulation beneath; petiole rugose, 1–2.5 cm by 2–3 mm. — *Panicles* axillary, or mostly clustered on woody tubercles on the stem or larger branches, consisting of numerous pedicelled few-flowered, more laxly or densely arranged umbellules, all over patently rusty to rufous-tomentose, 2.5–5 cm by (0.5–)1–1.5 cm; pedicels slender to more stoutish, 2–5 mm, each subtended by a subulate bract as long as or shorter than the pedicel, which is generally hidden in the cluster of flowers. *Calyx* segments 4 or 5, oblong-ovate, free, 1 mm. *Petals* 4, almost free, oblong-ovate to obovate, glabrous and yellow-green inside, rufous-sericeous outside, c. 1.8 mm. *Stamens* 4; anther cells 0.3–0.5 mm. — φ *Flowers* (often diseased) in peduncled globose heads (c. 8 mm \emptyset), borne on stem and branches, peduncle stout, set with subulate bracts, c. 1 cm, all parts of the inflorescence brownish-rufous-tomentose as are the δ ones. *Calyx* segments linear, 2 mm. *Petals* subspatulate, base slightly connate, 3 mm. *Ovary* cylindrical, apex somewhat contracted into a very short thick style, tomentose; stigmas (2–)3–4, flattish, glabrous, spreading. *Drupe*s in globular orange coloured clusters 6–9(–11) cm \emptyset , each drupe ovoid to ovoid-oblongoid, obtuse, the very apex only \pm aciculate by the style, covered especially in the upper part with stout straight reddish-brown subulate prickles (5–8 mm) which after falling leave numerous circular pits (c. 1 mm \emptyset) in the endocarp, (3–)3.5(–4) by 2–2.5 cm incl. the prickles; exocarp coriaceous; endocarp crustaceous, slightly tubercled inside, c. 2.5 by 1.5 cm.

Distr. Lower Burma, Thailand (Pattani), Indo-China (Annam, Cochinchina); in *Malesia*: Malay Peninsula (Penang to Malacca and Johore).

Ecol. Lowland forests, up to 150 m.

Uses. The leaves are used by Malay natives for fever headache. The caustic seed is reported to be edible.

Vern. *Akar chumprai*, M.

8. *Phytocrene palmata* WALL. Pl. As. Rar. 3 (1831) 12; Cat. (1832) n. 4949; WALP. Rep. 1 (1842) 98; MIQ. Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 248; BAILL. in DC. Prod. 17 (1873) 11; MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 592; BECC. Malesia 1 (1877) 127; KING, J. As. Soc. Beng. 64, ii (1895) 123; RIDL. Fl. Mal. Pen. 1 (1922) 433; BURK. Dict. (1935) 1722; SLEUM. Blumea 17 (1969) 237; Fl. Thail. 2 (1970) 91. — *Gynoecephalum palmatum* (WALL.) TRÉCUL, Ann. Sc. Nat. III, 8 (1847) 149.

— *P. stylocarpa* GRIFF. Not. (1854) 320; Ic. (1854) t. 489, I.

Liana; stem generally not branched, younger parts with prickles (1 mm), striate, tips rufous-hispid. *Leaves* limited to the upper part of the branches, orbicular to reniform in outline, deeply palmately (3–)5–(rarely 7)-lobed, lobes oblong to oblong-obovate, acute or acuminate, base of lamina deeply cordate, entire or shallowly wavy, upper surface glabrous and shining, lower surface densely covered with longish coarse subappressed rufous to yellowish hairs especially on midrib and nerves, soft to the touch, 15–30 cm long, breadth about the same, main nerves 5(–7), palmate, lateral nerves per lobe 3–4 pairs, curved-ascending and looping, with more numerous coarse transverse veins in a \pm right angle from the main nerve, reticulation coarse, \pm deeply impressed above, much raised beneath as are all nerves, the lamina not rarely almost bullate in dry specimens; petiole stout, often twisted, rufous- to rusty-tomentose, 7–12.5 cm. — *Panicles* of δ flowers subcylindric, axillary or from lower part of stem, (6–)15–40 by c. 3.5 cm, all over covered with a tomentum of short soft rufous to ferruginous hairs, the ultimate branches (c. 1 cm) bearing small, 12–15-flowered, pedicelled (2–4 mm) umbellules or heads (c. 2.5 mm ϕ), part of them subtended by a \pm caducous subulate bract (2–4 mm). *Calyx* segments 3 or 4, obovate, hairy, 0.8 mm. *Petals* (3–)4, oblong-lanceolate, pale green, glabrous inside, hairy outside, c. 1.5 mm. *Stamens* 4; anther cells linear-oblong, 1 mm. — η *Flowers* in peduncled (c. 6 mm) axillary ovoid heads, c. 1 cm ϕ . *Ovary* ovoid, hirsute. *Drupes* numerous, collected in subglobular heads 7–10 cm ϕ , elongate-ellipsoid, or slightly obovoid, much tapering to the base, apiculate by the conical style, all over \pm densely covered with yellowish shining stiff hairs, (3.5)–4–5.5 by 1.6–2(–2.5) cm; exocarp thin; endocarp bony, laxly smooth outside where the hairs are gone, laxly pitted outside, low-papillate inside respectively.

Distr. Thailand (Pattani); in *Malesia*: Malay Peninsula, Sumatra (Palembang; Riouw Arch.: P. Bintan).

Ecol. Hilly lowland forest, up to 500 m.

Vern. *Akar pisang pisang bulu*, Malay Peninsula, *képanjang akar*, Palembang, M.

9. *Phytocrene bracteata* WALL. Pl. As. Rar. 3 (1831) 12; Cat. (1832) n. 4947; WALP. Rep. 1 (1842) 98; BAILL. in DC. Prod. 17 (1873) 12; MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 592; BECC. Malesia 1 (1877) 127; MERR. En. Born. (1921) 357, p.p.; RIDL. Fl. Mal. Pen. 1 (1922) 432; BAKER f. J. Bot. 62 (1924) Suppl. 21; MERR. Pl. Elm. Born. (1929) 172; DAHL. J. Arn. Arb. 33 (1952) 275 (pollen); SLEUM. Blumea 17 (1969) 238; Fl. Thail. 2 (1970) 91. — *Gynoccephalum bracteatum* (WALL.) TRÉCUL, Ann. Sc. Nat. III, 8 (1847) 149. — *P. macrocarpa* GRIFF. Not. (1854) 322; Ic. (1854) t. 487 (fl. η) & t. 488 (fr.).

High climbing liana; stem up to 2.5 cm ϕ ,

with spiny tubercles 1 mm. Branchlets \pm deeply striate, setose and minutely prickly in younger parts. *Leaves* broadly ovate, often 3-lobed and obscurely dentate then, apex acute, base cordate, coriaceous, glabrous and a little asperulous above, the nerves excepted, densely covered all over the undersurface with short brownish hairs and soft to the touch, and the nerves moreover set with bristle-like stiffer hairs beneath, 10–20(–25) by 7–15(–20) cm, 7 pairs of basal palmate nerves and 2–3 pairs of upper nerves, curved-ascending, slightly sunken above, prominent beneath, reticulation low though distinct on the undersurface; petiole hairy and bristly, \pm torted, 3–7(–9) cm by 2–3 mm. — *Panicles* of δ flowers mainly axillary, rarely from older branches, solitary or 2–3, spike-like, all over shortly greyish to brownish tomentose, 10–20 by c. 2 cm, rachis and peduncles of main branches slender, ultimate branches consisting of minute clustered, (3)–6–10-flowered pedicellate (2–5 mm) umbellules, each pedicel subtended by a filiform appressed-hispid, not properly plumed \pm persistent bract (1 cm), which is partly connate to the pedicel and exerted from the mass of flower heads. *Calyx* segments 3–5, free, obcuneate, villous outside, hardly 0.6 mm. *Petals* generally 3 (rarely 4), ovate-oblong or lanceolate, slightly hairy outside only, practically free, finally reflexed, 1–1.2 mm. *Stamens* 3(–4); anther cells oblong-elliptic, 0.6 mm. — η *Flowers* in oblong to spherical peduncled heads, either solitary or 2–3 per axil. *Calyx* segments 4, spatulate. *Petals* 4, short-strigose outside as are the calyx segments. *Ovary* strigose; style very short, 3–4-partite. *Drupes* in pendulous globose clusters up to 20 cm ϕ , each drupe ovoid-oblongoid, tapering to both ends, densely covered with appressed long soft yellowish bristles, 4.5–8 by 1.5–2.3 cm at full maturity; exocarp fleshy especially in the upper part of the drupe which bears a short beak of the former style; endocarp ligneous, ovoid-oblongoid, up to 4 by 2 by 1.5 cm, rather smooth and minutely pitted outside, faintly tubercled inside. *Seed* testa sparsely and shallowly pitted.

Distr. Thailand (Surat, Nakawn Sritamarat); in *Malesia*: Sumatra (Eastcoast, Palembang), Malay Peninsula, Lingga Arch., possibly in Borneo.

Ecol. Lowland hillside woods and hedges.

Vern. *Akar pisang pisang*, M (as *P. palmata*).

Note. All investigated Bornean specimens apparently belonging to *P. bracteata* bear immature inflorescences, or are sterile, and could possibly belong to *P. borneensis*.

10. *Phytocrene hirsuta* BL. Rumphia 4 (1849) 37; Mus. Bot. Lugd.-Bat. 1 (1849) 42; WALP. Ann. 2 (1851) 22; MIQ. Fl. Ind. Bat. 1 (1856) 797; Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 247; BAILL. in DC. Prod. 17 (1873) 12; BECC. Malesia 1 (1877) 127; KOORD. Minah. (1898) 629; HALL. f. Med. Rijksherb. 1 (1910) 14; SLEUM. Blumea 17 (1969) 238, non TEYSM. & BINN. Hort. Bog. (1866) 207. — *P. crinipes* BAILL. ex BUREAU, Mon. Bign. (1864) 146, in text, nom. nud. — *P. minahassae*

KOORD. Minah. (1898) 394, *nom. nud.* — *P. dasycarpa* (non MIQ.) DAHL, J. Arn. Arb. 33 (1952) 275 (pollen).

Climber; stem (1 cm or more \emptyset) smooth. Branchlets slender, set with longish rufous sub-setose and \pm spreading hairs, older parts also laxly with very short pale retrorse prickles. *Leaves* ovate, or ovate- or elliptic-oblong, apex acuminate, the midrib characteristically protruding up to 8 mm beyond the leaf margin as a hirsute breakable thread in young leaves, base rounded to slightly cordate, firmly chartaceous, finally glabrous above except the nerves, remaining hirsute or tomentose by shorter and longer rufous to ferruginous hairs and soft to the touch beneath, entire or shallowly sinuate-dented, or obscurely repand especially in the lower half, 12–17 by 6–9 cm, midrib and nerves very slightly immersed or flat above, prominent beneath, nerves 2 pairs palmately from the base of the lamina (outer pair short, inner one rather straight ascending to \pm half the length of the blade), other 3(–4) pairs of nerves from the upper $\frac{2}{3}$ of the midrib generally more curved, reticulation dense and finely raised above, coarser and more prominent beneath; petiole thickened at base, rufous-hirsute, 3.5–4 cm by c. 2 mm. — δ *Inflorescences* in spike-like panicles, solitary in the axils of lower leaves, up to 25 by 3 cm, composed of numerous shortly peduncled cymes, the ultimate peduncle (2–3 mm) bearing numerous flowers in a head (c. 4 mm \emptyset) and provided at base with a subulate \pm persistent bract (1–1.5 mm), the whole inflorescence covered with shorter greyish and longer rufous, bristle-like and \pm spreading hairs. *Calyx* segments 3 or 4, connate below, obtusate, hirsute, 1.3 mm. *Petals* 3 or 4, almost free, oblong, dirty yellow, with a few hairs inside, hirsute outside, c. 2 mm. *Stamens* 3 or 4; anther cells 0.5 mm. — ♀ *Flowers* in heads c. 8 mm \emptyset , on stout peduncle 2–3 cm, generally from old wood. *Calyx* segments and *petals* as in δ flowers. *Ovary* glabrous below, hirsute above; stigmas 4 or 5, short, acuminate. *Drupe*s collected in subglobular masses, each drupe ovoid-oblongoid to -ellipsoid, laterally much compressed, apex \pm broadly attenuate, densely set with retrorse setose bristle-like stiff hairs, 3–4(–4.5) by 1.5–2 by 1.5 cm, incl. the short hollow beak of the exocarp; endocarp hard, with minute scattered roundish pits, (2–)2.5–3.5 by 1.5–2 cm.

Distr. *Malesia*: Celebes (incl. Buton I.), Moluccas (Buru).

Ecol. Primary and secondary lowland forest, up to 800 m, also in rather dry places, even on limestone rocks.

Vern. *Kunét ri sasap*, Minahasa (Tl.), *pitji pitji lantjeh*, Makassar, *sapét kulo*, Minahassa (Tt.).

11. *Phytocrene macrophylla* (BL.) BL. Rumphia 4 (1849) 36; Mus. Bot. Lugd.-Bat. 1 (1849) 41, f. 7; WALP. Ann. 2 (1851) 22; ZOLL. Syst. Verz. 2 (1854) 112; MIQ. Fl. Ind. Bat. 1 (1856) 796; Suppl. 1 (1860) 137; Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 247; BAILL. in DC. Prod. 17 (1873) 10;

Hist. Pl. 5 (1874) 282 (fl.); BECC. Malesia 1 (1877) 127; C. B. ROB. Bot. Z. 47 (1889) 645 (wood anat.); ENGL. in E. & P. Nat. Pf. Fam. 3, 5 (1893) 255, f. 140; RACIB. Flora 87 (1900) 13 (foliar biology); HOCHR. Pl. Bog. Exs. (1904) 17; Bull. Inst. Bot. Btzg 19 (1904) 39; *ibid.* 22 (1905) 114; BACK. Schoolfl. Java (1911) 229 (*macrocarpa*); KOORD. Exk. Fl. Java 2 (1912) 533; KOORD.-SCHUM. Syst. Verz. 1, Fam. 162 (1912) 6; WARB. Pflanzenwelt 2 (1916) 348, f. 231 A, 1–9, f. 232 (phot.); DOCT. v. LEEUWEN, Zoocecidia (1926) 332 (galls); UITTEN, Réc. Trav. Bot. Néerl. 25 (1929) 464 (veg.); AMSH. in Back. Bekn. Fl. Java (em. ed.) 6 (1948) fam. 135, p. 8; BACK. & BAKH. f. Fl. Java 2 (1965) 62; SLEUM. Blumea 17 (1969) 239. — *Gynoecephalum macrophyllum* BL. Bijdr. (1825) 483; TRÉCUL, Ann. Sc. Nat. III, 8 (1847) 148. — *P. gigantea* WALL. Phil. Mag. N.S. 3 (1828) 223, *nom. nud.*; Pl. As. Rar. 3 (1831) 11, t. 216; Cat. (1832) n. 4946; WALP. Rep. 1 (1842) 98; BL. Rumphia 4 (1849) 36; Ann. Mus. Bot. Lugd.-Bat. 1 (1849) 41; ZOLL. Syst. Verz. 2 (1854) 112; GRIFF. Not. (1854) 329; Ic. (1854) t. 490, f. II (fl. δ & anat.); MIQ. Fl. Ind. Bat. 1 (1856) 796; SCHNIZL. Ic. 3 (1857/65) t. 172, f. 1–21; BAILL. in DC. Prod. 17 (1873) 9; MAST. in Hook. f. Fl. Br. Ind. 1 (1875) 591; KURZ, J. As. Soc. Beng. 44, ii (1875) 156; For. Fl. Burma 1 (1877) 241; BECC. Malesia 1 (1877) 127; BRANDIS, Ind. Trees (1906) 152. — *Kadsura blancoi* AZAOLA in Blanco, Fl. Filip. ed. 2 (1845) 594; ed. 3, 3 (1879) 118. — *Gynoecephalum giganteum* (WALL.) TRÉCUL, Ann. Sc. Nat. III, 8 (1847) 149. — *P. calicarpa* GRIFF. Not. (1854) 327; Ic. (1854) t. 490, f. I (fr.). — *Gynoecephalum luzoniense* LLANOS, Rev. Progr. Cienc. 15 (1865) 55. — *P. dasycarpa* MIQ. Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 248, t. 7, as to fruits only. — *P. luzoniensis* (LLANOS) BAILL. Adansonia 10 (1872) 281; in DC. Prod. 17 (1873) 10; Hist. Pl. 5 (1874) 283 (fr.); F.-VILL. & NAVES in Blanco, Fl. Filip. ed. 3, 4 (1880) 86; F.-VILL. Nov. App. (1880) 46; CERON, Cat. Pl. Herb. Manila (1892) 46. — *P. blancoi* (AZAOLA) MERR. Philip. J. Sc. 2 (1907) Bot. 432; Spec. Blanc. (1918) 237; En. Philip. 2 (1923) 492; DAHL, J. Arn. Arb. 33 (1952) 275, f. 75 (pollen). — *P. obovoidea* MERR. Philip. J. Sc. 10 (1915) Bot. 322; En. Philip. 2 (1923) 492. — *P. forbesii* BAKER f. J. Bot. 62 (1924) Suppl. 21.

See for further synonyms under the varieties.

KEY TO THE VARIETIES

1. Drupe (7–)7.5–10(–13) by 3–3.5 cm; endocarp (4–)5–6 by 2–2.5 cm. . . . 1. *var. macrophylla*
1. Drupe (5.5–)6–6.5(–7) by 1.5–2 cm.
 2. Endocarp 4–4.5 by c. 1.5 cm. 2. *var. caudigera*
 2. Endocarp c. 2.5 by 1 cm. . . . 3. *var. dasycarpa*

1. *var. macrophylla*.

High climbing, often much branched shrub or liana, up to 25 m; stem up to 10 cm \emptyset , not spiny. Branchlets striate, younger parts with appressed or somewhat spreading shorter and longer rufous or ferruginous hairs, and besides \pm densely set

with pale conical prickles (0.5 mm), older parts glabrescent and smooth, the cork with transverse lenticellar cracks. *Leaves* of young shoots often orbicular with rather deeply cordate base, and broadly and \pm obtusely 3-5-lobed, such of older parts generally ovate-oblong from a subcordate base and subacuminate, tip obtuse, firmly subcoriaceous, entire, glabrous above, the nerves excepted, the whole undersurface with a tomentum of short, weak rather pale rusty (partly almost stellate) hairs, and less numerous longer strigose rufous hairs especially on nerves and veins, soft to the touch, \pm glabrescent at full age, 14-30(-33) by 9-12(-20) cm, palmately 5-7-nerved, outer pair(s) of nerves short, inner one(s) ascending to $\frac{1}{2}$ and even $\frac{3}{4}$ of the length of the lamina, other 3-4 pairs from upper part of the midrib, all nerves almost flat above, well raised beneath, reticulation dense and very fine above, moderately raised beneath; petiole 5-15 cm by 2-3 mm. — δ *Inflorescences* spike-like panicles, from old branches or stem, generally several together, cylindrical, dense or rarely more loose, all over short-ly greyish-brownish-tomentose, up to 25 cm long and (2.5-)3(-5) cm ϕ , composed of lateral racemes or panicles up to 4 cm long which bear the flowers in heads 4-6 mm ϕ . *Calyx* segments 3-5, \pm narrowly obcuneate, apex truncate, hirsute outside, 0.7-1.2 mm. *Petals* 3 or 4, light green to yellowish, connate \pm halfway, lobes recurved, densely appressedly hairy outside, 1.5-2 mm. *Stamens* 3 or 4 (in the same inflorescence!); anther cells ovate-elliptic, c. 0.4 mm, often devoid of pollen. — ♀ *Inflorescences* collected in large, solitary or fascicled heads, each head on a thick peduncle (3-10 cm) and c. 1.5 cm ϕ , all over short-tomentose. *Calyx* segments as in δ flower. *Petals* 2.5-3.5 mm. *Ovary* columnar, tomentose with forward directed hairs, c. 4 mm, stigma 2-4-lobed. Fruit heads 20-25 cm ϕ . *Drupe* obovoid-oblongoid, (7-)7.5-10(-13) cm long incl. the hollow beak and the basal narrowed part of the exocarp, 3-3.5 cm wide, slightly variously compressed or round in ϕ , rusty-tomentose by normally forward directed hairs (sometimes reversely so in specimens from Sumatra and the Philippines), these hairs \pm appressed, stiff, shining, easily going; endocarp oblongoid, bony, laterally flattened, the crests less marked on the flattened side, with numerous roundish pits (1 mm), (4-)5-6 by 2-2.5 by (1.5-)2 cm.

Distr. Burma; in *Malesia*: Sumatra, Java, Philippines (Luzon, Polillo, Samar, Biliran, Leyte, Bohol, Mindanao, Palawan).

Ecol. Lowland thickets and forests from sea-level to c. 1200 m, also in secondary and in swamp forest, in the Philippines also in Dipterocarp forest, scattered.

Galls. DOCTERS VAN LEEUWEN mentions a

leaf-gall caused by a gall-midge.

Uses. Fruits said to be used on Palawan as 'talang', i.e. fish poison. In Java used against stomach pain and tumors.

Vern. *Akar pisang*, Sumatra Westcoast, M, *labu kumbang silai*, *olor delos*, Simalur, *areuj pitjung tjèlèng*, *hondjè bu-ut areuj*, *undjèwut*, S; Philippines: *olo-olo*, Bag.

2. *var. caudigera* (SLEUM.) Blumea 17 (1969) 240. — *P. caudigera* SLEUM. Notizbl. Berl.-Dahl. 15 (1940) 253; HEINE, Pfl. d. Samml. Clemens Kinabalu (1953) 57.

Differs from *var. macrophylla* by generally smaller leaves 7-15 by 5-8 cm, and mainly by the oblongoid, slightly 4-6-angled minor drupes, (5.5-)6-6.5(-7) by c. 2 cm; endocarp 4-4.5 by c. 1.5 cm, the pits much smaller than in *var. macrophylla*. The hairs on the drupe are strigose and retrorse.

Distr. *Malesia*: Borneo, only known from the Mt Kinabalu area, in forest around Dallas at 915-1370 m.

3. *var. dasycarpa* (MIQ.) SLEUM. Blumea 17 (1969) 240. — *P. dasycarpa* MIQ. Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 248, t. 7, the fruit excluded (which is *var. macrocarpa*); BAILL. in DC. Prod. 17 (1873) 11; BECC. Malesia 1 (1877) 127; KOORD. Minah. (1898) 394; HOCHR. Pl. Bog. Exs. (1904) n. 92; Bull. Inst. Bot. Btzg 22 (1905) 114; Ic. Bog. 2 (1906) t. 108; KOORD.-SCHUM. Syst. Verz. 3 (1914) 74; KOORD. Minah. Suppl. 2 (1922) t. 49; Suppl. 3 (1922) 25. — *P. hirsuta* (non BL. 1849) TEYSM. & BINN. Hort. Bog. (1866) 207. — *P. ovalifolia* KOORD. Minah. (1898) 394, *nom. nud.*, 629, *descr.*; KOORD.-SCHUM. Syst. Verz. 3 (1914) 74; KOORD. Minah. Suppl. 2 (1922) t. 50; Suppl. 3 (1922) 26. — *P. tinisporifolia* KOORD. Minah. (1898) 394, 629; KOORD.-SCHUM. Syst. Verz. 3 (1914) 74; KOORD. Minah. Suppl. 2 (1922) t. 51; Suppl. 3 (1922) 26.

Differs from *var. macrophylla* by its smaller drupes, (5.5-)6-6.5 by 1.5-2 cm; endocarp c. 2.5 by 1 cm.

Distr. *Malesia*: Celebes.

Ecol. Lowland forest, up to 350 m.

Vern. *Apo*, Tontembuan, *samadan*, Tonsea, *sapet kulo*, Tl., *s. putih*, Tl., *tali tali utan*, Bt.

Excluded

Phytocrene loheri MERR. Philip. J. Sc. 7 (1912) Bot. 293; En. Philip. 2 (1923) 492, *mixtum*, *nom. illeg.*

The leaves belong to a *Menispermaceae* (probably *Hypserpa*), and the loose fruits to *Phytocrene macrophylla var. macrophylla*, cf. SLEUM. Blumea 17 (1969) 241.

Excluded

Leucocorema RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 29 = *Trichadenia* THW. (*Flacourtiaceae*), cf. STEEN. Bull. Jard. Bot. Brux. 27 (1957) 114.

Pentastira RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 27 = *Dichapetalum* THOU. (*Dichapetalaceae*), cf. LEENHOUTS, Fl. Mal. I, 5 (1957) 305.