FLACOURTIACEAE (H. Sleumer, Leyden)

Trees or shrubs. *Leaves* spirally arranged or often distichous, sometimes crowded towards the top of the branchlets, simple, entire or crenate or serrate, crenations mostly glandular; petioles often thickened at the base and (or) the apex. Stipules small, rarely large and foliaceous, often early caducous, or wanting. *Inflorescences* subterminal or mostly axillary, sometimes on the old wood, in often spike-like racemes or in panicles or in short cymes, but sometimes condensed to glomerules or reduced to few-flowered fascicles or even to a solitary flower, apparently essentially cymose. *Flowers* bisexual or unisexual, in the latter case mostly dioecious, sometimes polygamous, actinomorphic, 3- to polymerous, cyclic (with sepals and petals) or rarely spiral (with perianth segments, in *trib. Oncobeae*). Pedicels often articulated near the base. *Sepals* 3–6, rarely more, mostly persistent, sometimes accrescent, imbricate or valvate, free or connate at the base into a calyx-tube, or calyx closed in bud and disrupting in different ways. *Petals* 3–8, rarely more, free, imbricate or valvate, mostly alternating with the sepals and caducous, sometimes persistent and accrescent, often inserted on the margin of a hypogynous or nearly perigynous disk, or absent. *Receptacle* often deepened in the centre, mostly with appendages such as an extrastaminal disk or disk-lobes, free glands between the stamens, or a corona of 5 phalanges, each of which is consisting of fine barbate threads, or staminode-like scales inserted on the inner side of the base of the petals, or with true, mostly barbate, staminodes. *Stamens* 5 to ∞, hypogynous, mostly free, rarely the filaments connate into a column; anthers with 2, longitudinally dehiscent cells; connective sometimes with a short appendage. *Ovary* mostly free, rarely semi-inferior, unilocular with (2–)3–5(–8) parietal placentas, sometimes incompletely 2–8-celled by the deeply protruding placentas; ovules 2 to numerous, anatropous. Styles 1–10, free or connate; stigma sessile. *Fruit* a fleshy or dry berry or a capsule, rarely a drupe, 1- to many-seeded. *Seeds* sometimes arillate, with abundant endosperm; embryo straight; cotyledons mostly broad, foliaceous.

Distr. About 84 genera with *c.* 1300 *spp.*, nearly all woody, predominantly in the tropics, rapidly decreasing in number towards the subtropics, 2 genera with a total of 9 (mostly Chilean) *spp.* in the temperate zones of S. America.

In *Malaysia* 19 genera, of which 4 are strictly endemic, *viz Eleutherandra*, *Pangium*, *Pseudosmelia*, and *Scaphocalyx*.

Eight others find their main area of distribution and generally their greatest number of species in Malaysia, but occur also in parts of SE. Asia, *viz Ahernia* (also reported from Hainan), *Bennettiodendron* (also in Assam, Indo-China, and S. China), *Hemiscolopia* (also in Annam and Cochinchina), *Hydnocarpus* (also in SE. Asia), *Itoa* (also in Indo-China and S. China), *Osmelia* (also in Ceylon), *Ryparosa* (also in Siam and the Andamans), *Trichadenia* (also in Ceylon).

Two genera, *viz Paropsia* and *Scolopia*, extend throughout the Old World tropics.

Flacourtia and *Erythrospermum* have a similar area, but extend further to the Pacific.

Xylosma is known from the American, the Australian-Pacific, and the Asiatic-Malaysian tropics, but is absent from Africa, while *Casearia* and *Homalium* are pantropical.

Flacourtiaceae of Malaysia thus show a very distinct alliance with SE. Asia. It is again remarkable that also in this family there are several genera or sets of allied species which occur both in W. Malaysia and in Ceylon, and have not yet been found in the proper continental Asiatic flora (*Hydnocarpus subsect. Pleianthera*, *Erythrospermum*, *Osmelia*, *Trichadenia*), a noteworthy phytogeographical peculiarity shared by genera of other families (*Acrotrema*, *Trichopus*, *etc.*).

Less distinct is the alliance with Australia. Australia is poor in *Flacourtiaceae*, having only representatives of the widely distributed genera *Xylosma*, *Homalium* and *Casearia*, and one endemic genus *Baileyoxylon* in Queensland, which is most closely allied to *Eleutherandra* from Sumatra and Borneo.

Ecol. Most Malaysian species occur in primary and secondary rain-forests. Their size is mostly small to moderate and the majority of the species belong to the substage of the forest. However, some

species may grow to big dimensions, *e.g. Homalium foetidum*. Among the rain-forest species none is reported to be dominant in any vegetation type, though occasionally single species may be abundant, *e.g. Hydnocarpus ilicifolia*.

As to altitude most representatives are restricted to the tropical lowland, but some species of the genera *Casearia*, *Homalium*, and *Xylosma* seem to be confined to the montane zone and are even reported from the mossy forest.

As to climate, the bulk of the *Flacourtiaceae* occurs in the everwet area. Few species occur both in the everwet and seasonal (monsoon-) forest, *e.g. Flacourtia indica*, *Scolopia spinosa*, and *Casearia grewiaefolia*. Only one species, *viz Homalium tomentosum* is confined to the monsoon-forest and adapted to the alternatingly wet and dry climate; it sheds its leaves in the dry season.

A single species is found in the very coastal forest and even takes part in the *Barringtonia*-formation on the W. coast of the Malay Peninsula (*Hydnocarpus ilicifolia*). Some others prefer coastal swamp-forest, as *Flacourtia spp.* and *Scolopia macrophylla*.

Dispersal. Little is known about the dispersal of fruits or seeds of Malaysian *Flacourtiaceae*. Dispersal by air may be granted to the winged seeds of *Itoa*. In many species of *Homalium* the sepals and petals are accrescent and form a parachute after anthesis, in others the sepals and petals are densely beset with spreading hairs. This so-called feather-cock type, also found in African, Australian and specially in the Pacific species of *Homalium*, was interpreted by ASCHERSON (Sitzungsber. Ges. Naturfreunde Berlin Oct. 1880, p. 126–133, f. 1–3) as a medium of dispersal by wind of the whole capsule, which splits tardily and not completely from the apex. Fleshy fruits or fruits with (edible ?) pulp or arils are found in *Flacourtia*, *Hydnocarpus* and *Casearia*; such species may be dispersed by animals. Dispersal by water may be assumed for the buoyant seeds of *Pangium edule* which are frequently found in the beach-drift.

Galls. No galls specific for a distinct genus or species are hitherto known from Malaysian *Flacourtiaceae* [*cf.* DOCTERS VAN LEEUWEN, The Zoocecidia of the Netherlands East Indies (1926) 392; Ned. Kruidk. Arch. 51 (1941) 195].

Floral morphology. Numerous representatives of the family are dioecious or polygamous. The solitary flowers and the inflorescences are always axillary, although sometimes seemingly terminal. They are mostly cymose, rarely racemose (*Erythrospermum*). In the structure of the flowers a great variation is found in the number and form of the various floral organs and in their aestivation. Of special importance are the form, position and structure of the disk, respectively effigurations of the receptacle. The distinction of the tribes of the *Flacourtiaceae* is mainly based on these differences.

Wood anat. DEN BERGER, Determinatietabel van Malesië, Veenman, Wageningen (1949) on several pages; DEN BERGER, Bull. Jard. Bot. Btzg III, 9 (1927) 223 (hand lens); DESCH, Man. Malayan Timb., Mal. For. Rec. 15 (1941) 202; METCALFE & CHALK, Anat. Dic. 1 (1950) 121; MOLL & JANSSONIUS, Mikr. Holzes 1 (1906) 197 (*Bixineae*), idem 3 (1918) 604 (*Samydaceae*); PEARSON & BROWN, Comm. Timb. India 1 (1932) 36; REYES, Commonwealth Philip. Dept Agric. Techn. Bull. 7 (1938) 338: *Homalium foetidum* (ROXB.) BENTH. (*H. luzoniense* F.–VILL.) & 339: *Trichadenia philippinensis* MERR.

JANSSONIUS (Blumea 6, 1950, 415 & 432) points out that the wood structure indicates close relation to *Bridelia* and other *Euphorbiaceae* (*cf.* Mikr. Holzes 5, 1934, 464; JANSSONIUS, Key to Javanese woods, Brill, Leiden, 1952, 47; DEN BERGER, Bull. Jard. Bot. Btzg *l.c.* 231).

Wood anatomy and general anatomical characters suggest a single family: MOLL & JANSSONIUS, 3 (1918) 611; JANSSONIUS, Blumea 6 (1950) 416; METCALFE & CHALK, 1 (1950) 125. *Paropsia* is treated by METCALFE & CHALK as a *Passifloracea*.—C.A.R.–G.

Uses. Among Malaysian *Flacourtiaceae* various useful plants are found. As to important timbers, only *Homalium foetidum* (Ternataans ijzerhout, Ternate ironwood) is of some commercial value. *Flacourtia* and *Pangium* are wellknown for their edible fruits or seeds although the fruits of some species in other genera (*Scolopia*, *Ryparosa*, *etc.*) may also be edible or are used locally. The seeds of *Pangium* must be specially prepared to get rid of hydrocyanic acid. Most important is or has been the use of the chaulmoogra oil contained in the seeds of various species of *Hydnocarpus*, which has acquired medicinal fame for treating leprosy.

Taxonomy. The family as a whole is characterized by a combination of several more or less constant or predominant characters, *viz* receptacle (and/or base of the petals) with appendages, ovary 1-celled and superior, placentas parietal, ovules anatropous, endosperm copious, but no single character exists wherewith to distinguish *Flacourtiaceae* from other families or to recognize them in the field.

The separate tribes are more uniform and have often been treated as families in their own right, such as *Samydaceae* or *Homaliaceae* (*Homalium*, *Osmelia*, and *Casearia*), or, as in the case of the *Paropsieae*, as part of another family (*Passifloraceae*), an arrangement still maintained by HUTCHINSON (Fam. Fl. Pl. 1926) following BENTHAM & HOOKER (Genera Plantarum 1862). Part of the family has further been assigned to the *Bixaceae* in the wider sense.

The delimitation and subdivision of the family accepted here is based on that by EICHLER (Fl. Bras. 1871), followed by WARBURG in the first (1893) and GILG in the 2nd edition of the Pflanzenfamilien (1921).

Notes. *Flacourtiaceae* are often confounded with *Euphorbiaceae*, especially in the ♂ specimens and when stipules are present; ♀ specimens are then needed for proper identification. However, *Euphorbiaceae* have mostly an entire leaf-margin, have always a distinctly celled ovary and fruit, and have often latex. *Violaceae* (*Rinorea*) have also sometimes been confused with *Flacourtiaceae* in the herbarium, by the

often striking similarity in leaf-characters; *Gestroa* BECC. (= *Erythrospermum*) was even originally assigned to *Violaceae*.

The most important precursory papers on Malaysian *Flacourtiaceae* were written by the late Dr D. F. VAN SLOOTEN in his thesis entitled 'Bijdrage tot de kennis der Combretaceeën en Flacourtiaceeën van Nederlandsch-Indië' (Utrecht, 1919), henceforth cited as '*Bijdr. Flac.*', and in a later revision (Bull. Jard. Bot. Btzg III, 7, 1925, 291–421). Both papers are strictly confined to the material from territory occupied by the former Netherlands Indies. For *Hydnocarpus* (*incl. Taraktogenos*) a precursory monograph was written by myself in 1938 (Bot. Jahrb. 69: 1–94).

I am deeply indebted to Dr VAN SLOOTEN for putting his additional manuscript notes at my disposal. Appreciation is due to Dr R. C. BAKHUIZEN VAN DEN BRINK *Jr* for help in identifying some sheets wrongly assigned to the *Flacourtiaceae*. The beautiful set of photographs of living material I owe to Mr F. HUYSMANS and collaborators of Kebun Raya Indonesia, Bogor.

In connection with what is said about the floral variation in this family, it is essential for proper naming that collectors procure flowering material of both sexes and in addition ripe fruits.

KEY TO THE GENERA
(*based on sterile material*)

1. Leaves manifestly tripli- to quintuplinerved from the base.
   2. Upper lateral nerves numerous, trabecular, at right angles with the midrib . . . **7. Scaphocalyx**
   2. Upper lateral nerves mostly few, ± curved-ascending towards the margin, at ± acute angles with the midrib.
      3. Leaves with 2 manifest, ± prominent glands at the base or at the apex of the petiole.
         4. Unarmed . . . . . **1. Ahernia**
         4. Spines usually present both on the trunk and the branchlets . . . . . **3. Scolopia** (partly)
      3. Leaves without basal or petiolar glands.
         5. Leaves manifestly distichous . . . . . **17. Osmelia** (partly)
         5. Leaves spirally arranged and crowded towards the apex of the branchlets.
            6. Leaves broadly ovate (3-lobed on saplings and suckers). Petiole 7–30(–50) cm. . . **8. Pangium**
            6. Leaves elliptic to elliptic-oblong. Petiole 3–8 cm . . . . . **9. Trichadenia**
1. Leaves penninerved or nearly so.
   7. Leaves distinctly crowded towards the top of the branchlets.
      8. Shoots without perular terminal buds. Leaves ovate to oblong-ovate, broadly truncate to subcordate at the base. Petiole not corky at the apex . . . . . **4. Itoa**
      8. Shoots with perular terminal buds. Leaves obovate-oblong or oblong-elliptic, attenuate at the base. Petiole at the swollen apex very soon covered with greyish cork . . . . **13. Bennettiodendron**
   7. Leaves ± distichous or scattered along the branchlets.
      9. Leaves with 2 distinct basal or petiolar glands . . . . . **3. Scolopia** (partly)
      9. Leaves without distinct basal glands.
         10. Leaves characteristically dull greyish-greenish beneath, finely papillose or nearly punctulate under a lens, hairs, if present, (sometimes minute!) bifurcate, normally with two unequal branches. **10. Ryparosa**
         10. Leaves not so typically dull greyish beneath, hairs, if present, simple or stellate.
            11. Leaves with pellucid dots and/or lines . . . . . **19. Casearia** (partly)
            11. Leaves not with pellucid dots or lines.
               12. Armed . . . . . **3. Scolopia** (partly)
                  14. Hemiscolopia (partly)
                  15. Xylosma (partly)
                  16. Flacourtia (partly)
               12. Unarmed.
                  13. Stipules within the leaf-axils or not visible (not present or very early caducous).
                  2. Erythrospermum
                  3. Scolopia (partly)
                  5. Paropsia (partly)
                  6. Hydnocarpus (partly)
                  11. Eleutherandra
                  12. Homalium (partly)
                  14. Hemiscolopia (partly)
                  15. Xylosma (partly)
                  16. Flacourtia (partly)
                  17. Osmelia (partly)
                  18. Pseudosmelia (partly)
                  19. Casearia (partly)
                  13. Stipules extra-axillary, subulate to foliaceous, at least present at the ultimate nodes.
                  5. Paropsia (partly)
                  6. Hydnocarpus (partly)

12. Homalium (partly)
17. Osmelia (partly)
18. Pseudosmelia (partly)
19. Casearia (partly)

ARTIFICIAL KEY TO THE GENERA
(based on leaves, flowers, and fruits)

1. Flowers bisexual or seemingly so (*Osmelia*), never polygamous.
2. Leaves with 2 distinct glands at the very base of the blade or on the apex of the petiole.
3. Sepals (4–5) and petals (10–15) distinct in size, sepals 10 by 6 mm, petals gradually decreasing in size to the centre. Capsule with crustaceous pericarp . . . . . **1. Ahernia**
3. Sepals and petals (3–)4–6, similar in size and shape, hardly or not exceeding 4 mm in length. Berry succulent . . . . . **3. Scolopia** (partly)
2. Leaves without 2 distinct basal glands.
4. Ovary or capsule free only in the upper part, connate with the calyx at least in the lower half. Capsule small, dry and few-seeded . . . . . **12. Homalium**
4. Ovary or fruit entirely free.
5. Receptacle without disk-glands, petals without basal appendage (scale-like to petaloid) inside.
6. Flowers in elongate spike-like racemes. Stamens 5. Capsule covered with numerous small tubercles, splitting tardily into 2–4 valves . . . . . **2. Erythrospermum**
6. Flowers in short few-flowered racemes or in clusters. Stamens ∞. Berry smooth. **3. Scolopia** (partly)
5. Receptacle or petals with appendages or excrescences.
7. Appendages represented by 5 phalanges, each consisting of fine densely barbate threads. Stamens 5 . . . . . **5. Paropsia**
7. Appendages otherwise. Stamens 6 or more.
8. Stamens ∞. Appendages represented by a sometimes minute disk, mostly divided into ± free, short, fleshy, glabrous glands, rarely entire.
9. Style simple . . . . . **3. Scolopia** (partly)
9. Styles 4–5, free or united in the lower part . . . . . **16. Flacourtia** (partly)
8. Stamens (6–)8–10(–12). Appendages represented by sometimes very short, flat or thick, mostly densely hairy staminodes.
10. Flowers in spike-like racemes, sometimes composed to panicles. Leaves not pellucid-punctate.
11. Staminodes rather flat. Capsule 1–3-seeded . . . . . **17. Osmelia**
11. Staminodes thick, truncate. Capsule 25–30-seeded . . . . . **18. Pseudosmelia**
10. Flowers in clusters. Leaves mostly with pellucid dots and/or lines . . . . **19. Casearia**

1. Flowers unisexual and/or polygamous. Plants usually dioecious (or functionally so: *Osmelia*), occasionally monoecious (*Hydnocarpus castanea*, *Erythrospermum candidum*).
12. Flowers numerous, in elongate spike-like racemes or panicles.
13. Panicles divaricate . . . . . **13. Bennettiodendron**
13. Racemes spike-like.
14. Receptacle without appendages . . . . . **2. Erythrospermum**
14. Receptacle with appendages.
15. Appendages represented by a petaloid or thick and mostly hairy scale attached to the inner base of each petal.
16. Filaments united into a column . . . . . **10. Ryparosa** (partly)
16. Filaments free.
17. Stamens 4 . . . . . **10. Ryparosa** (partly)
17. Stamens 5 or more.
18. Calyx considerable, covering the petals in bud.
19. Calyx-lobes imbricate . . . . . **6. Hydnocarpus**
19. Calyx closed in bud, disrupting irregularly, or calyx-lobes valvate . . **9. Trichadenia**
18. Calyx very small, covering the petals in bud only at their very base . . **11. Eleutherandra**
15. Appendages represented by thick, deeply bifid, hairy scales alternating with the stamens. Petals 0 . . . . . **17. Osmelia**
12. Flowers rather few, in short racemes or in clusters, or solitary.
20. Leaves manifestly triplinerved, main nerves ascending from the base to the apex, connected with the midrib by numerous transverse, ladder-like nerves . . . . . **7. Scaphocalyx**
20. Leaves 3- to 5-nerved at the base, but basal nerves never reaching the leaf-apex, or penninerved.
21. Appendages of the receptacle absent. Capsule lignescent, splitting tardily from the apex in (5–)6–8 valves . . . . . **4. Itoa**
21. Appendages present. Fruit with a hard shell, indehiscent, or a berry.
22. Appendages represented by petaloid or thick, mostly hairy scales attached to each petal inside at its base. Fruit a capsule.
23. Calyx-lobes imbricate . . . . . **6. Hydnocarpus**

23. Calyx closed in bud, disrupting into 2–4 unequal, reflexed segments . . . . . **8. Pangium**
22. Appendages glabrous, represented by an entire disk or short disk-lobes.
24. Style simple, sometimes very short or wanting.
25. Style rather long, stigma very shortly trilobed. Berry *c.* 2 cm long . . **14. Hemiscolopia**
25. Stigmas 2, rarely 3 or 4, rather large and reflexed, sessile or on a short columnar style. Berry relatively small . . . . . **15. Xylosma**
24. Styles 3–8, free or partly united into a column, each with 2 minute stigmas. **16. Flacourtia** (partly)

SCIENTIFIC KEY TO THE GENERA

1. Perianth segments spirally arranged, variable in number (7–20); no sharp distinction between sepals and petals, the inner ones gradually smaller. Flowers bisexual (in *Erythrospermum* sometimes polygamous). Receptacle without appendages (ONCOBEAE).
2. Stamens indefinite, inserted before the petals and inner sepals . . . . . **1. Ahernia**
2. Stamens 5 (Mal. *spp.*) . . . . . **2. Erythrospermum**
1. Sepals and petals distinct, cyclic, number of sepals in a fixed relation to the number of petals, or, if petals absent, sepals (respectively calyx segments) ± equal in size and shape, not exceeding 6.
3. Receptacle without appendages.
4. Flowers bisexual. Sepals and petals relatively small and much alike. Fruit a small, 1–6-seeded berry (SCOLOPIEAE-SCOLOPIINAE) . . . . . **3. Scolopia** (partly)
4. Flowers unisexual. Sepals relatively large. Petals 0. Fruit a large, woody capsule with ∞ flat, membranously winged seeds (FLACOURTIEAE-IDESIINAE) . . . . . **4. Itoa**
3. Receptacle with various appendages or excrescences (corona, scales, a sometimes very small disk or disk-lobes, pseudo-staminodes).
5. Receptacle with a corona, consisting of 5 phalanges, each of which consists of fine, densely barbate threads. Flowers bisexual (PAROPSIEAE) . . . . . **5. Paropsia**
5. Receptacle with appendages of another kind.
6. Petals provided inside at the base with a thin to fleshy, mostly densely haired scale. Plants unisexual or polygamo-dioecious (PANGIEAE-HYDNOCARPINAE).
7. Sepals conspicuous, entirely including the petals in bud.
8. Sepals free, imbricate. ♂ Flowers in small cymes or cyme-like inflorescences, very rarely in few-flowered fascicles or solitary . . . . . **6. Hydnocarpus**
8. Sepals closed in bud, disrupting irregularly from the apex or throwing off an irregular calyptra leaving an irregularly toothed, cup-shaped calyx-tube.
9. ♂ Flowers solitary or in few-flowered fascicles, with long, very slender pedicels. Calyx spathaceous, reflexed in anthesis . . . . . **7. Scaphocalyx**
9. ♂ Flowers in, sometimes spike-like, racemes, with rather short pedicels.
10. ♂ Flowers with numerous stamens; filaments flattened. Calyx-lobes 2–3, reflexed, deciduous. **8. Pangium**
10. ♂ Flowers with (4–)5 stamens; filaments filiform. Calyx-lobes ± persistent, reflexed in anthesis.
11. Filaments free. Leaves tufted at the twig-ends. Hairs simple or stellate . . **9. Trichadenia**
11. Filaments normally connate into a column. Leaves not tufted at the twig-ends. Hairs if present 2-armed, arms unequal . . . . . **10. Ryparosa**
7. Sepals very small, united at the base only, not including the petals in bud. Racemes spike-like. Stamens 5; filaments free, filiform . . . . . **11. Eleutherandra**
6. Petals without inner basal scale or absent.
12. Receptacle with a disk which may be entire, lobed or divided into free, sometimes rather small, glands arranged either extra-staminal or inserted between the irregularly arranged stamens, hence not forming one whorl with these, or disk absent. Petals present or absent.
13. Petals present, petals and sepals usually resembling each other. Flowers bisexual.
14. Flowers in ± elongate, spike-like racemes or panicles. Stamens single or in groups of 2–12 opposite each petal. Capsule small, few-seeded (HOMALIEAE) . . . . . **12. Homalium**
14. Flowers in short racemes, these rarely reduced to few-flowered fascicles or a solitary flower. Stamens numerous, irregularly arranged on the receptacle. Berry 1–6-seeded (SCOLOPIEAE-SCOLOPIINAE) . . . . . **3. Scolopia** (partly)
13. Petals absent. Flowers mostly unisexual, bisexual only in some *spp.* of *Flacourtia* (FLACOURTIEAE-FLACOURTIINAE).
15. Flowers in large panicles, the ♂ with rudimentary ovary. Disk-lobes between the lanate filaments. Berry dry, 1(–2–4)-seeded . . . . . **13. Bennettiodendron**
15. Flowers in short racemes or fascicles. Disk or disk-lobes outside the glabrous or slightly pilose filaments.
16. ♂ Flowers with a trigonous glabrous rudimentary ovary. ♀ Flowers with a single row of antherless staminodes between the ovary and the disk-lobes. Ovary 1-celled. Style simple, very shortly 3-lobed. Berry ovoid, *c.* 2 cm long, many-seeded . . . **14. Hemiscolopia**

16. ♂ Flowers without a rudimentary ovary. ♀ Flowers not with stamens or staminodes, *Flacourtia inermis* and *F. zippelii* excepted.
17. Ovary 1-celled. Style short or very short, with 2, rarely 3 or 4, sessile stigmas. Berry relatively small, globose to elliptic both in the fresh and dry states, mostly few-seeded.[1] **15. Xylosma**
17. Ovary (2–)4–8-celled by ± imperfect, false septa. Styles 3–8, free, inserted in the centre or distinctly in an apical ring, or ± united into a column. Fruit drupe-like, mostly considerable in size, edible, globose when fresh, but characteristically cubiform when dry, (2–)4–6(–8)-celled by hard endocarps, each normally with 2 pyrenes disposed one above the other.[1] **16. Flacourtia**

12. Receptacle with staminode-like, usually densely hairy, erect, mostly clavate appendages, strictly alternating with the stamens in one whorl (in Mal. *spp.*). Petals always absent (CASEARIEAE).
18. Flowers in axillary or subterminal spike-like racemes or panicles, unisexual or functionally so. Styles 3, shortly bilobed.
19. Staminodes rather flat. Capsule 1–3-seeded . . . . . **17. Osmelia**
19. Staminodes thick, truncate. Capsule 25–30-seeded . . . . . **18. Pseudosmelia**
18. Flowers in axillary clusters, bisexual. Style (in Mal. *spp.*) simple. Leaves mostly with pellucid dots or lines . . . . . **19. Casearia**

1. AHERNIA

MERR. Philip. J. Sc. 4 (1909) Bot. 295.

Tree. *Leaves* alternate, 5-plinerved, with 2 basal glands. Stipules 0. *Flowers* bisexual, in solitary, axillary racemes. *Outer perianth segments* 4(–5), imbricate, the outer 2 or 3 free, the inner 2 or 3 ± united at the base with the inner perianth segments. *Inner perianth segments* 10–15, very similar to the outer ones, gradually narrowing, all spirally arranged. *Stamens* ∞, inserted on the base of the inner and some outer perianth segments; filaments filiform, elongate; anthers minute. *Ovary* unilocular; placentas 5, each with many ovules. Style simple; stigma minute, obscurely 3-lobed or nearly disciform. *Fruit* capsular, indehiscent, ∞-seeded, with crustaceous pericarp.

Distr. Monotypic, Hainan and the Philippines (Luzon).

1. Ahernia glandulosa MERR. Philip. J. Sc. 4 (1909) Bot. 295; En. Philip. 3 (1923) 107; Lingn. Sc. J. 6 (1930) 283.

Tree 8–15 m, glabrous except the inflorescence and fruits; branches terete, brownish-gray, obscurely lenticellate. *Leaves* ovate or oblong-ovate, chartaceous, 9–15 by 4–8 cm, shining on both sides, entire or shallowly crenate towards the top, the apex rather abruptly acuminate, the base ± rounded and with 2 glands either on the margins at the junction with the petiole or on the petiole itself; basal nerves 5, ascending, prominent; petiole 2[1]/2–4[1]/2 cm. *Racemes* few-flowered, 2[1]/2–3[1]/2 cm, in fruit somewhat longer, densely grey-pubescent. Pedicels 5–8 mm, longer in fruit. *Outer perianth segments* ovate, acute, 10 by 6 mm, densely pubescent outside. *Inner perianth segments* on both sides densely grey-pubescent, with brown dots, the innermost only 1–1[1]/2 mm wide. Filaments 10 mm; anthers less than [1]/2 mm. *Ovary* densely grey-pubescent, slightly stipitate, ovoid. Style glabrous or slightly pubescent at the base, 2–4 mm. *Fruit* obovoid to elliptic, 1[1]/2–2[1]/4 by 1–1[3]/4 cm, apiculate, pale green when fresh, densely grey-pubescent, grooved longitudinally specially towards the apex; pericarp 1[1]/2–3 mm, green; endocarp white. *Seeds* pale green; black when dry, obovoid, drop-shaped, shining, 8 by 4 mm; testa crustaceous; albumen fleshy.

Distr. Hainan, in *Malaysia:* Philippines (Luzon).

Ecol. In primary forests up to 600 m. *Fl. fr.* Jan.–Dec.

Vern. *Butun, sanglai,* Tag..

2. ERYTHROSPERMUM

LAMK, Tabl. Encycl. 2 (1791) 407, t. 274.—*Gestroa* BECC. Malesia 1 (1877) 184.

Small trees or subscandent shrubs. *Leaves* alternate (in Mal. *spp.*). Stipules absent. *Racemes* simple or panicled, axillary and subterminal. Pedicels articulated at the base, subtended by a scale-like bract and provided with 2 minute bracteoles.

(1) There are no reliable differences between *Xylosma* and *Flacourtia* vegetatively and in the ♂ sex.

*Flowers*s, mall fragrant, bisexual, sometimes polygamous *i.e.* the lower ones ♂ only with rudimentary ovary. *Perianth segments* 7–13, imbricate, concave, glabrous, spirally arranged, the inner ones gradually decrescent and petal-like, all reflexed and caducous. *Stamens* 5 (in Mal. *spp.*); filaments glabrous; anthers broadly or lanceolate-sagittate, nearly as long as the filaments, connective broadened at the base. *Ovary* unilocular, with 3(–4), mostly many-ovulate placentas. Style thick, very short; stigma entire or 2–4-lobed. *Capsule* coriaceous, nearly globose, apiculate, rather small, rough, 3(–4)-valved or semidehiscent, splitting tardily. *Seeds* 1–6, provided with a scarlet, fleshy aril, flattened from mutual pressure; testa firm.

Distr. About 5 *spp.*, 2 from Madagascar and the Mascarenes, one of them polymorphous, 1 in Ceylon, 1 in Polynesia (Samoa & Fiji), and 1 in *Malaysia*. Fig. 1.

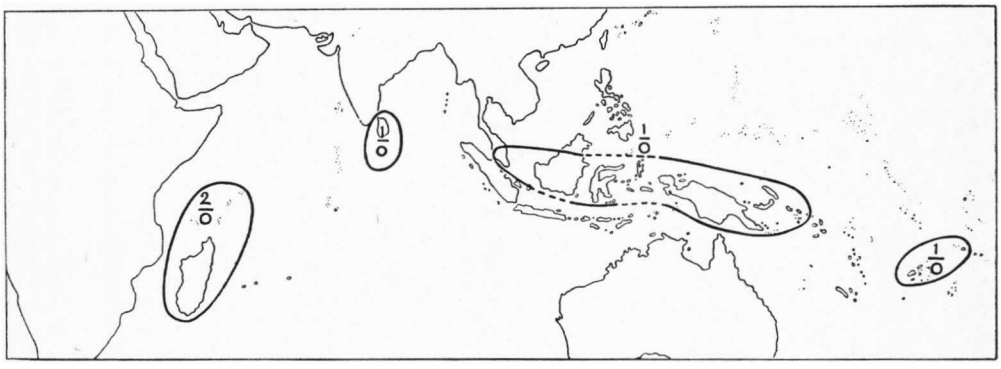

Fig. 1. Distribution of *Erythrospermum*. The figure above the hyphen indicates the number of endemic species, the figure below it the number of non-endemic species.

1. Erythrospermum candidum (BECC.) BECC. in GIBBS, Arfak (1917) 215; GILG in E. & P. Pfl. Fam. ed. 2, 21 (1925) 397, f. 168.—*Gestroa candida* BECC. Malesia 1 (1877) 184.—*E. scortechinii* KING, J. As. Soc. Beng. 59, ii (1890) 116; RIDL. Fl. Mal. Pen. 1 (1922) 157; *ibid.* 5 (1925) 290.—*E. wichmannii* VAL. Bull. Dép. Agr. Ind. Néerl. *no* 10 (1907) 34; Ic. Bog. 3 (1908) t. 264; PULLE, Nova Guinea 8 (1912) 671; GILG, Bot. Jahrb. 55 (1918) 274, f. 1; SLOOT. Bijdr. Flac. (1919) 61; Nova Guinea 14 (1924) 190; Bull. Jard. Bot. Btzg III, 7 (1925) 295; WHITE, J. Arn. Arb. 10 (1929) 243.

Shrub or (slender) tree, 4–25(–35) m; bark grey to brownish, with oblong, pustular, transverse lenticels; branchlets glabrous. *Leaves* obovate-oblong or oblong-elliptic, shortly acuminate, cuneate at the base, glabrous, shining and dark bluish-green above, chartaceous to subcoriaceous, 12–20(–26) by (3–)5–8(–11) cm, entire or slightly crenate, especially towards the apex; lateral nerves arcuate-ascending, 5–8(–10) pairs, little prominent; petiole stout, sulcate, (1–)1 1/2–2 cm. *Racemes* axillary or subterminal, interrupted, 5–8 cm. *Flowers* solitary or 2–3 in fascicles along the rhachis, white, scented like jasmin; pedicels 2–4 mm during anthesis, afterwards accrescent up to 8 mm. Outer perianth segments 5, suborbicular, ciliate, (2–)3 mm. Inner perianth lobes 5, elliptic, as long as but somewhat narrower than the sepals, fimbriate at the apex. *Stamens* 5; filaments very short, white; anthers sagittate, yellow; connective white. *Ovary* constricted at the base, yellow, attenuate into a 1 mm long style; stigmas 3, slightly divergent. *Fruit* with style-rudiment, stalked, subglobose or subangular, with a woody (± 2 mm thick), finely verrucose pericarp, glabrous, pale green or whitish when ripe, 1 1/4–1 3/4 by *c.* 1 1/2 cm, dehiscing from the top into 2–3 valves, red or violet-coloured inside. *Seeds* (1–)2–3, trigonous, roundish at the margins, dorsally convex, flat on the other 2 sides.

Distr. Solomons (San Cristobal & Florida Isl.), in *Malaysia:* Malay Peninsula (Perak, Negri Sembilan, apparently very rare), E. Borneo (N of Balikpapan), SW. Celebes (Pangkadjene), Moluccas (Misool), New Guinea.

Ecol. Apparently rather frequent but scattered in N. New Guinea, in primary forest on flat or hilly, never inundated, alluvial land with a clayey or sandy soil, 10–75 m, rarely up to 500 m (in San Cristobal up to 800 m). *Fl. fr.* Jan.–Dec.

Uses. Wood pale, sapwood not defined.

Vern. Borneo: *Mědang bĕrunai*; New Guinea: *mbren, sagobuatemeru, wobrijka, bembrok, m'béb, bokom, mana, efetra, sabao, kosy*; *auduma*, Aitape.

Note. The specimens from the Malay Peninsula

differ slightly from the others by outer perianth segments only 2 mm, fruit stalks more slender, and less coriaceous leaves in which the nerves are emitted at about right angles from the midrib.

3. SCOLOPIA

SCHREB. Gen. 1 (1789) 335, *nom. cons.*—*Aembilla* ADANS. Fam. 2 (1763) 448, *nom. rej.*—*Phoberos* LOUR. Fl. Cochinch. (1790) 317.—*Rhinanthera* BL. Bijdr. (1826) 1121.—*Dasianthera* PRESL, Rel. Haenk. 2 (1835) 90, t. 66.—*Rhamnicastrum* [LINNÉ, Fl. Zeyl. (1747) 193] O. KTZE, Rev. Gen. 1 (1891) 45.—**Fig. 2–3.**

Small trees or shrubs, often with spines on the trunk, and (or) the branches. *Leaves* alternate, entire to shallowly serrate or crenate, ± coriaceous, glabrous, pinnately nerved, sometimes with 2 distinct glands (hydathodes) at the very base of the blade or at the apex of the petiole. Stipules in the leaf-axils minute, early caducous. *Flowers* rather small, bisexual, in axillary, mostly simple racemes sometimes reduced to few-flowered fascicles or to a solitary flower. *Sepals* (3–)4–6, imbricate, expanded a long time before anthesis, ± connate at the base. Petals as many as sepals, similar in shape. *Stamens* indefinite, whether or not surrounded by a row of free, short, orange glands; these mostly 2 opposite each petal, rarely forming a continuous disk, inserted on the tomentose receptacle, downwards-incurved in bud, longer than petals; anthers elliptic-ovoid, dorsifixed, the connective produced into an apiculate appendage beyond the thecae in all Mal. *spp.*. *Ovary* sessile, unilocular, with 2–4, few-ovuled, deeply penetrating placentas. Style rather long, ± persistent; stigma entire or slightly 2-lobed. *Berry* (1–)2–3(–6), very rarely up to 20-seeded, somewhat fleshy, with the sepals, petals and the withered stamens at the base.

Distr. About 40 *spp.* from tropical and subtropical Africa, India, and SE. Asia, through *Malaysia* (7 *spp.*) to Queensland and N.S. Wales.

Ecol. In primary and secondary forests at low and medium altitudes, mostly scattered.

KEY TO THE SPECIES

1. Leaves (all or at least most of them on the same twig) with 2 distinct orange (when dry blackish), secretory glands at the very base of the blade or at the apex of the petiole. Spines on trunk and branches usually present.
2. Nerves 6–8 pairs, not or little prominent beneath. Rhachis and pedicels coarsely ferrugineous-tomentose. Sepals and petals 4(–5–6), equal to each other, only the former connate at their bases. Connective glabrous. Disk-glands 8(–12). Spines simple . . . . . **1. S. macrophylla**
2. Nerves 4–6 pairs, slightly though distinctly prominent beneath. Rhachis and pedicels ± densely finely greyish-yellowish pubescent. Sepals and petals 5–6, differing somewhat from each other in shape and size, all connate. Connectives ± hairy.
3. Disk-glands 10 or more. Leaves elliptic to orbicular- or oblong-elliptic, obtuse (nearly rounded) or slightly acuminate at apex, densely reticulate on both sides. Fruit broadly ovoid, ± rounded at the top . . . . . **2. S. chinensis**
3. Disk-glands absent. Leaves ovate to oblong- (rarely lanceolate-)ovate, ± long acuminate but obtuse at the tip, veins ± obscure. Fruit elliptic, slightly attenuate . . . . . **3. S. spinosa**
1. Leaves without distinct glands at the base of the blade or at the apex of the petiole, at most sometimes with one or two small glands on descending dentations on the leaf-margin near the insertion of the petiole. Plants usually unarmed.
4. Disk-glands absent. Racemes conspicuous, 2–4½(–8) cm long. Leaves variable in size and shape, mostly shortly acuminate but blunt at the tip, distinctly crenate-serrate . . . **4. S. luzonensis**
4. Disk-glands 6(–8), short, truncate, sometimes rather minute, but always distinct. Racemes very short, 2–5 mm long, 2–6-flowered, or reduced to a solitary flower.
5. Leaves elliptic, 1½–2¼(–2¾) by 0.9–1.4(–1.6) cm . . . . . **5. S. novo-guineensis**
5. Leaves oblong to ovate-oblong, rarely obovate-oblong, 3–5 by 1½–2½(–3) cm . . **6. S. nitida**

1. Scolopia macrophylla (W. & A.) CLOS, Ann. Sc. Nat. IV, 8 (1857) 253.—*Phoberos macrophylla* W. & A. Prod. (1834) 30.—*Ph. rhinanthera* BENN. & BR. Pl. Jav. Rar. (1840) 187, t. 39.—*Rhinanthera blumei* STEUD. Nom. ed. 2 (1840) 448.—*Ph. maritima* MIQ. Fl. Ind. Bat. Suppl. (1860) 388.

Fig. 2. *Scolopia spinosa* (ROXB.) WARB. *a.* Flowering twig, × 2/3, *b.* flower, × 6, *c.* stamens, × 7, *d.* developed ovary, subtended by the rests of the stamens and perianth, × 1 1/2, *e.* fruit, × 2/3, *f.* fruit cross-section, × 2/3 (*b* after WINCKEL 262).

—*S. rhinanthera* CLOS, Ann. Sc. Nat. IV, 8 (1857) 252; MIQ. Fl. Ind. Bat. 1 (1859) 107; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 190; KING, J. As. Soc. Beng. 59, ii (1890) 114; BRIQ. Ann. Cons. Jard. Bot. Genève 2 (1898) 46; K. & V. Bijdr. Booms. 5 (1900) 17; BACK. Fl. Bat. 1 (1907) 64; Voorl. Schoolfl. Java (1908) 15; Schoolfl. Java (1911) 70; KOORD. Exkfl. Java 2 (1912) 632; SLOOT. Bijdr. Flac. (1919) 94; MERR. En. Born. (1921) 411; RIDL. Fl. Mal. Pen. 1 (1922) 155, f. 17; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 336; BURK. Dict. (1935) 1983; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 84, p. 6; CORNER, Wayside Trees (1951) 309.—*S. rhinanthera var. siamensis* CRAIB, Kew Bull. (1922) 235.—*S. crenata* [*non* (WALL.) CLOS] KING, J. As. Soc. Beng. 59, ii (1890) 115.—*Rhamnicastrum rhinanthera* O. KTZE, Rev. Gen. 1 (1891) 45.—*S. maritima* WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 29.

Shrub or small tree 2–6(–10) m; trunk with unbranched, spirally arranged thorns 2½–7½ cm; young branches not rarely with axillary, simple spines 1–3 cm. *Leaves* ovate or ovate-elliptic to ovate-lanceolate, tapering to the acute apex, mostly rounded at the base, thinly coriaceous, hard, purplish or brownish when young, glabrous, shining above, ± crenate round the edge, 6–12 (–16) by (2½–)4–6(–8) cm; lateral nerves ascending, rather yellowish-green, reticulations distinct; petiole (0.6–)1–1.8 cm, reddish-pink with 2 black glands at the top on the upper side. *Racemes* axillary and terminal, 3–10 cm, *c.* 20-flowered. *Flowers* greenish-white, slightly fragrant. Pedicels 4–10 mm. *Sepals* (greenish) and *petals* (greenish- or yellowish-white) ovate-lanceolate, the former ferrugineous-tomentose, the latter ciliate but glabrous outside, 3–4 mm. Stamens white. *Ovary* and style commonly flushed dull crimson. *Berry* ovoid, pointed by the persistent rest of style, orange, blackish when dry, *c.* 2 by 0.8 cm, sometimes smaller, with (1–)2–6 seeds.

Distr. Cambodia, Cochinchina, S. Siam, in *Malaysia:* Sumatra (also Mentawei Isl.), Malay Peninsula, Java (Djakarta, Semarang, Madiun), Borneo.

Ecol. In humid or marshy soil at the back of mangrove forests or more inland on riversides, by swampy creeks, at margins of pools, along marsh in teak-forest, mostly on temporarily inundated soils, usually between 0–15 m, rarely up to 90–150 m, near Toba Lake (Sumatra) at 900 m. The localities are wide apart, but the species is sometimes locally comparatively common *e.g.* in the Malay Peninsula. *Fl.* Oct.–Aug.

Uses. Wood heavy (sinks in water), reddish-brown, used for house-building in Malacca.

Vern. Mal. Pen.: *Pokok rukam gajah, p.r. puteh, p.r. hutan*; *rukam* (Penang); *damak-damak tahun* (Malacca); Java: *marong*; Sumatra: *rukĕm, r. laut, r. bĕtina*; *api* (Bencoolen); Borneo: *rukam laka* (N. Born.), *bĕlangan* (SE. Born.).

2. Scolopia chinensis (LOUR.) CLOS, Ann. Sc. Nat. IV, 8 (1857) 249; BACK. Fl. Bat. 1 (1907) 65; Voorl. Schoolfl. Java (1908) 15; Schoolfl. Java (1911) 70; SLOOT. Bijdr. Flac. (1919) 99; Bull. Jard. Bot. Btzg III, 7 (1925) 340; MERR. Comm. Lour. (1935) 272; GAGNEP. Fl. Gén. I.C. Suppl. 1 (1939) 209; BACK. Bekn. Fl. Java (em. ed.) 4a (1942) fam. 84, p. 6.—*Phoberos chinensis* LOUR. Fl. Cochinch. (1790) 318.—*S. siamensis* WARB. in FEDDE, Rep. 16 (1919) 255.

Small tree 4–5 m, or mostly shrub 1–2 m; branches and branchlets usually with strong, simple spines 1–5 cm. *Leaves* widely cuneate or nearly rounded at the base, coriaceous, glabrous, shining above, dull beneath, 3–7(–10) by 2–4½ cm, entire or nearly so, rarely serrate; petiole 3–5(–8) mm. *Racemes* 2–3(–6) cm, few-flowered, often ± panicled at the tops of the branches. Pedicels 4–5(–10) mm. *Sepals* ovate, yellowish-white, ± 2 mm, dorsally somewhat tomentose. *Petals* nearly glabrous, yellowish-white, 2½–3 mm. *Berry* 8–10 mm.

Distr. Native in Indo-China, S. China, Hainan, Siam, cultivated in India, Ceylon and in *Malaysia:* Java (vicinity of Djakarta, introduced there by the Chinese long ago; once found in W. Java in cemetery-grove between Merak and Bantam), possibly elsewhere cultivated through Malaysia. *Fl.* Dec.–Jan.; *fr.* Oct.

3. Scolopia spinosa (ROXB.) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 29; MERR. En. Philip. 3 (1923) 110; Pl. Elm. Born. (1929) 209; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 338; HEYNE, Nutt. Pl. (1927) 1139; BURK. Dict. (1935) 1983; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 84, p. 6.—*Ludia spinosa* ROXB. [Hort. Beng. (1814) 38, *nomen*] Fl. Ind. ed. CAREY 2 (1832) 507.—*Phoberos roxburghii* BENN. Pl. Jav. Rar. (1840) 192; MIQ. Fl. Ind. Bat. Suppl. (1860) 388.—*S. roxburghii* CLOS, Ann. Sc. Nat. IV, 8 (1857) 250; MIQ. Fl. Ind. Bat. I, 2 (1858) 107; KING, J. As. Soc. Beng. 59, ii (1890) 115; BOERL. Cat. Hort. Bot. Bog. 1 (1899) 53, *incl. var. ovata* and *var. lamponga* BOERL.; K. & V. Bijdr. Booms. 5 (1900) 14; RIDL. J. Str. Br. R. As. Soc. 59 (1911) 72; BACK. Schoolfl. Java (1911) 70; KOORD. Exkfl. Java 2 (1912) 632; KOORD. Atlas Baumart. 2 (1914) t. 339; SLOOT. Bijdr. Flac. (1919) 97; RIDL. Fl. Mal. Pen. 1 (1922) 156; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 338.—*Rhamnicastrum spinosum* O. KTZE, Rev. Gen. 1 (1891) 45.—*S. fragrans* ELM. Leafl. Philip. Bot. 5 (1913) 1780.—**Fig. 2–3.**

Tree (6–)10–15(–27) m, rarely a shrub; old trunks grey, smooth, unarmed, but both young ones and suckers heavily armed with branched spines, young twigs not rarely with axillary, simple thorns. *Leaves* broadly cuneate, rarely subrotundate at the base, beautifully rose-coloured when young, ± coriaceous, glabrous, 8–18 by 3½–8 cm, nearly entire to remotely crenate; petiole 6–12 mm. *Racemes* 2–4½(–6–8) cm. Pedicels 7–11 mm. *Flowers* sordid-white. *Sepals* ovate, white-greyish to yellowish-tomentose outside, 2½–4 mm. *Petals* ovate-lanceolate, glabrous, ciliate, somewhat larger than the sepals. *Berry* apiculate to mamillate, 1¾–2½ cm diam., green or brown-green to greenish-purplish, black when

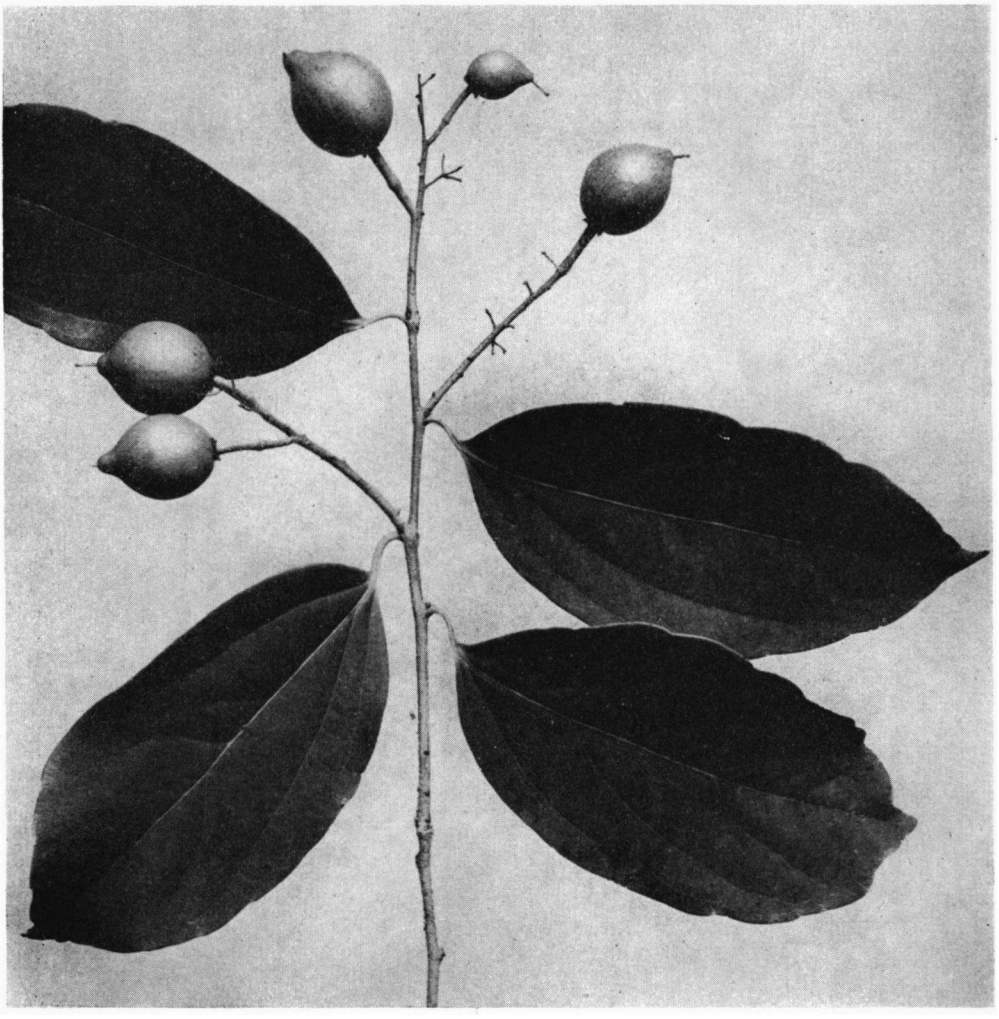

Fig. 3. *Scolopia spinosa* (ROXB.) WARB. Fruiting twig, upper surface of leaves, × 1/2 (C.H.B. IV–F–105).

dry, with 6 or more, rarely up to 20 red and bitter seeds.

Distr. Burma, Siam, Indochina, in *Malaysia:* Sumatra (also Simalur Isl.), Banka, Malay Peninsula, Java, Borneo, Palawan, Talaud Isl. (N. of Celebes).

Ecol. Both in mixed primary and secondary rain-forest and in teak- and other deciduous forest, often on calcareous soil, whether or not on riversides, up to 1100 m. *Fl.* Jan.–Dec.

Uses. Sapwood dirty-white, heart-wood orange-red, fairly hard and moderately durable; used by the Bajans (Sandakan) for fencing purposes, and for house-building in Sumatra. Fruit said to be edible.

Vern. *Rukĕm, rukam,* standard J, M, S, *rukĕm putih, sulung, s. ĕtèm, s. batu, tutun tangkulung silai,* M, *ki kĕmandèn, ki heas,* S, *bagan, kaju-tudjuh, kĕmanden, landakan, rĕmang, rilam, rukĕm karang, sintok, songowodjo,* J; Br. N. Borneo: *kaju boko, piring, rukam hutan bini, rotiom andu, rukam otan* Kedayan, *buah munyit, kapuk-kapuk,* Bajan, *toung kakang,* Dusun Putatan, *rukam* Baj. W.C.; *bunároh,* Talaud.

4. Scolopia luzonensis (PRESL) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 30; BRIQ. Ann. Cons. Jard. Bot. Genève 2 (1898) 45; MERR. Philip. J. Sc. 1 (1906) Suppl. 98; *ibid.* 10 (1915) 327; Sp. Blanc. (1918) 274; En. Philip. 3 (1923) 109.—*Dasianthera*

luzonensis PRESL, Rel. Haenk. 2 (1835) 90, t. 66, *incl.* α *ovatifolia*, β *intermedia* et γ *lancifolia* PRESL.—*Banara racemosa* BLANCO, Fl. Filip. (1837) 425.—*Banara brevifolia* BLANCO, *l.c.* 426.—*Phoberos dasyanthera* BENN. Pl. Jav. Rar. (1840) 192.—*Flacourtia corollata* BLANCO, Fl. Filip. ed. 2 (1845) 559, ed. 3 (1879) 220, t. 367.—*Flacourtia parvifolia* BLANCO, *ll.cc.* 560, 220.—*S. lanceolata* CLOS, Ann. Sc. Nat. IV, 8 (1857) 252, *quoad specim. philip.*; MIQ. Fl. Ind. Bat. I, 2 (1858) 107, *quoad specim. philip.*; VIDAL, Phan. Cuming. Philip. (1885) 94; Rev. Pl. Vasc. Filip. (1886) 49.—*S. crenata* CLOS, Ann. Sc. Nat. IV, 8 (1857) 250, *quoad specim. philip., excl. bason. Flacourtia crenata* WALL.; F.-VILL. Nov. App. (1880) 12; VIDAL, Sin. Atl. (1883) 13, t. 7, f. B; Phan. Cuming. Philip. (1895) 94; Rev. Pl. Vasc. Filip. (1886) 48; MIQ. Fl. Ind. Bat. I, 2 (1858) 107, *quoad specim. philip.*; KOORD. Minah. (1898) 478; SLOOT. Bijdr. Flac. (1919) 100; Bull. Jard. Bot. Btzg III, 7 (1925) 341.—*S. rhinanthera* [*non* (BENN.) CLOS] F.-VILL. Nov. App. (1880) 12.—*Flacourtia lanceolata* VIDAL, Rev. Pl. Vasc. Filip. (1886) 49, *nomen* (*sphalm. S. lanceolata*).—*S. saeva* (*non* HANCE) BRIQ. Ann. Jard. Bot. Genève 2 (1898) 46, *quoad specim. philip.*; MERR. J. Philip. Sc. 10 (1915) 328; En. Philip. 3 (1923) 109.—*S. dasyanthera* F.-VILL. *l.c.*; GAGNEP. in MOROT, J. Bot. 21 (1908) 167.

Shrub or small tree, 5 m, occasionally with fine axillary thorns on young twigs; bark smooth, grey. *Leaves* ovate to ovate-oblong or elliptic-lanceolate, cuneate to nearly rounded at the base, ± coriaceous, glabrous, shining above, 6–12½ by 2½–4(–5) cm; nerves little prominent, veins ± reticulate; petiole 0.6–1.2 cm. *Racemes* axillary and terminal, ± as long as the leaves, simple or panicled, 10–14-flowered; rhachis minutely pubescent or glabrous. Pedicels 4–6 mm. *Flowers* whitish, sweet-scented. *Sepals* 4, oblong, 2½ mm, ciliate. Connective ± laxly pilose. *Petals* 4, ± equal to the sepals. *Berry* ovate to nearly globose, red, *c.* 6 mm. *Seeds* 3–8, semilunar.

Distr. *Malaysia:* Br. N. Borneo, Philippines (widely distributed in Luzon, also in Mindoro, Mindanao, Masbate, Panay, Catanduanes, Guimaras Isl.), NE., SW. and SE. Celebes (*incl.* P. Kabaena).

Ecol. In dry thickets and secondary forests, up to 680 m, often common on clayey soil or along the sandy beach, also on limestone rocks. *Fl.* Sept.–March; *fr.* Apr.–June.

Uses. Wood very hard, apparently not in use.

Vern. Philippines: *Aniñguai, kandong*, Sbl., *anonot, annot*, Pang., *babaliuain, bitoñgól, malakaráyom, pilapil, suliakdagá, amayit*, Tag., *bagnayau*, C. Bis., *balingsuá, dóging hálas*, Bik., *palutan*, Ilk., *balit*, Bis. Ilongs, *ugatan-tayabas, gamut panguli, gamot uway, granada*, Mindoro.

Note. Originally I assumed the form described as *S. lanceolata* CLOS to represent a distinct variety characterized by elliptic-lanceolate leaves and a sometimes less hairy connective, but I have discarded it on account of intermediates. *S. luzonensis* comes very near *S. crenata* (WIGHT) CLOS from the Concan to the Nilgherries (India) which has entirely glabrous connectives.

5. Scolopia novo-guineensis WARB. Bot. Jahrb. 13 (1891) 384; GILG, *op. cit.* 55 (1918) 276, f. 2; SLOOT. Bijdr. Flac. (1919) 101; Nova Guinea 14 (1924) 191; Bull. Jard. Bot. Btzg III, 7 (1925) 341.

Shrub. *Leaves* rounded or emarginate at the apex, sometimes apiculate, obtuse at the base, subcoriaceous, glabrous, shining above, entire or nearly so, obscurely triplinerved from the base, lateral nerves 3–4 slightly prominent above, not raised beneath, veins very tenderly reticulate above; petiole 2(–3) mm. *Racemes* reduced to a solitary, axillary flower; pedicel (incl. peduncle) 3–4 mm, pubescent. *Sepals* 5, oblong. *Petals* 2 mm, similar to and ciliate as the sepals. Fruit unknown.

Distr. W. New Guinea (McCluer Gulf; once found near Sekar).

Ecol. On dry slope of sandstone hill, low alt., *fl.* Dec.

6. Scolopia nitida C. T. WHITE, J. Arn. Arb. 10 (1929) 243.

Much-branched treelet or shrub, up to 1½ m; young branchlets velutinous-pubescent. *Leaves* obtuse at the apex, broadly attenuate at the base, glabrous except for the puberulous upper side of the midrib, subcoriaceous, very shining above, dull beneath, remotely paucidentate or shallowly crenate to subentire; obscurely triplinerved from the base, higher lateral nerves 3–5, all somewhat prominent on both sides, veins laxly reticulate; petiole puberulous 3–4 mm. *Racemes* puberulous. Pedicels 3–5 mm. *Sepals* 4–6, ovate 1½ mm, ciliolate. *Petals* 4–6, *c.* 2 mm. *Fruit* oblong, 6 by 4 mm, few-seeded.

Distr. Melanesia (New Ireland), in *Malaysia:* SE. New Guinea (Wassi Kussa River, Port Moresby) and N. New Guinea (Humboldt Bay), from sea-level to low altitudes.

Ecol. Undergrowth of dry, bushy rain-forests along rivers.

4. ITOA

HEMSL. in HOOK. Ic. Pl. 27 (1901) t. 2688; Bot. Mag. Tokyo 15 (1901) 1.—*Mesaulosperma* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 384.

Dioecious trees. *Leaves* spirally arranged, large, long-petioled, crenate, pinnatinerved. Stipules 0, but intra-axillary buds attached to nearly all leaves. *Panicles* of ♂ flowers erect, ample, terminal, shortly peduncled. ♀ *Flowers* solitary, axillary

(or terminal ?); peduncle in fruit elongate, distinctly articulate above the middle. *Calyx* in both sexes coriaceous, lobes 3(–4), valvate, nearly free, ovate-deltoid. *Petals* 0. ♂ *Flowers:* stamens numerous, up to half the length of the calyx-lobes; filaments filiform; anthers minute, basifixed. Ovary rudimentary. ♀ *Flowers:* unknown, probably with numerous staminodes. *Fruit* capsular, large, ± attenuate-ovoid or -oblong, with short, broad style and sessile, shortly 6–8-lobed stigma, many-seeded, tardily dehiscent from the apex in (5–)6–8 valves, these coherent at the base, but the coriaceous exocarp separating both at base and apex from the hard, woody endocarp; placentas (5–)6–8, woody, filiform, persistent in the centre of the valves, but detaching at base and apex. *Seeds* very compressed, winged, vertical, the inner ones in radial groups, the outer ones arranged in tangential groups, the proper seed lenticular and small, the wing ample, membranous, very variable in size (± triangular to quadrate), with funicle running transversely through the wing.

Distr. Two closely allied *spp.*, one in S. China and Indo-China (*I. orientalis* HEMSL.), the other in E. Malaysia: Celebes, Halmaheira and N. New Guinea (Japen Isl.). Fig. 4.

1. Itoa stapfii (KOORD.) SLEUM. Notizbl. Berl.-Dahlem 11 (1934) 1026.—*Polyothyrsis stapfii* KOORD. Minah. (1898) 474.—*Polyothyrsis celebicus* KOORD. *l.c.* 476–477, *errore.*—*Mesaulosperma stapfii* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 386; HEYNE, Nutt. Pl. (1927) 1141.

Buttressed tree, 25–40 by 0.7–1 m; bark grey, peeling; branchlets glabrous; innovations subferrugineous- or greyish-tomentose. *Leaves* ovate to oblong-ovate, shortly obtusely acuminate, base truncate or mostly subcordate, subcoriaceous and glabrous when fully developed, membranous and ± densely and finely pubescent when young, intensively green above, pale beneath (brownish when dried), 10–15 by 5–8(–9) cm, ± coarsely glandulose-crenulate; nerves 10–13 pairs (the basal 2 pairs proceeding nearly from the petiole) and prominent on both sides, veins ± transversely subparallel and little reticulate; petiole 4½–6½ (–7½) cm. ♂ & ♀ *Inflorescences* unknown. *Fruit* ovoid-elliptic, attenuate at both ends, grey or dilute ferrugineous-tomentose, 7½–10 by ± 3½ cm, somewhat 6–7-sulcate longitudinally; peduncle axillary, very stout (2 mm), *c.* 4–5 cm long. *Seeds* flat, *c.* 6 mm diam., surrounded by a 3½–4 cm broad, membranous wing.

Distr. NE. & Central Celebes (Minahassa, Masamba Distr.), Moluccas (Halmaheira), N. New Guinea (Japen Isl.).

Ecol. In old, mixed primary and in secondary rain-forest, in level, sometimes inundated or hilly localities, rather rare, growing scattered, 60–1000 m. *Fl.* July, *fr.* Febr., July, Sept.

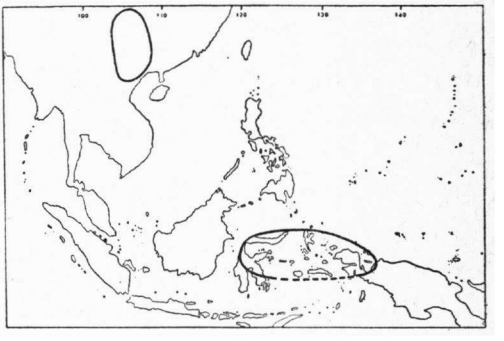

Fig. 4. Distribution of *Itoa*. In E. Malaysia *I. stapfii* (KOORD.) SLEUM., in China *I. orientalis* HEMSL.

Uses. Heart-wood yellowish, hard, used in Halmaheira for house-construction.

Vern. *Hulo aju*, Manado, *danoan*, *daägon*, Minah., *wurio*, Masamba, *usu tamau*, Halmaheira, *ramboni*, Japen.

Note. The differences between this species and *I. orientalis* HEMSL. are rather vague, the latter having terminal flowers and (12–)14–18 pairs of nerves.

5. PAROPSIA

NORONHA *ex* PETIT-THOUARS, Hist. Vég. Isl. Austr. Afr. (1805) 59, t. 19.—*Trichodia* GRIFF. Not. 4 (1854) 570.

Trees or shrubs. *Leaves* alternate, shortly petioled, with 2 distinct glands on the decurrent leaf-bases. Stipules very early caducous. *Flowers* bisexual, fascicled or glomerate in dense axillary cymes, rather small, fragrant, shortly pedicelled. *Calyx*-tube short, 5-lobed. *Petals* 5, inserted on the base of the calyx-tube as is the

corona consisting of 5 filiform, fimbriate, epipetalous phalanges. *Stamens* 5; filaments flat, linear; anthers ovate-oblong. *Ovary* subglobose, on a sometimes very short gynophore. Styles 3–5; stigmas thick, reniform-capitate. *Fruit* capsular, inflated, dehiscent from the apex into 3 valves. *Seeds* ∞, obovate-compressed, with crustaceous testa.

Distr. About 13 *spp.* in tropical Africa and Madagascar, one in W. *Malaysia* (Sumatra and Malay Peninsula).

1. Paropsia vareciformis (GRIFF.) MAST. Trans. Linn. Soc. 27 (1871) 639; in HOOK. *f.* Fl. Br. Ind. 2 (1879) 600; KING, J. As. Soc. Beng. 71, ii (1902) 49; RIDL. Fl. Mal. Pen. 1 (1922) 842; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 333; BURK. Dict. (1935) 1672.—*Trichodia vareciformis* GRIFF. Not. 4 (1854) 571.—*P. malayana* PLANCH. *ex* MAST. Trans. Linn. Soc. 27 (1871) 639; in HOOK. *f.* Fl. Br. Ind. 2 (1879) 600.—*P. bakhuisii* BOERL. & KOORD. in KOORD.-SCHUM. Syst. Verz. 2 (1914) 41; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 333, f. 8.

Shrub or small to medium-sized tree; young branches rusty pubescent. *Leaves* oblong to elliptic-oblong or lanceolate-oblong, rarely ovate to ovate-oblong, ± abruptly bluntly acuminate (1–1½ cm), broadly cuneate to subrotundate at base, chartaceous to subcoriaceous, midrib excepted glabrous above when old, but tomentose along midrib and nerves beneath, finely serrate to entire, 6½–10(–12) by 2–4(–3½–6) cm; nerves 7–8(–9) pairs; petiole 4–5(–8) mm. *Flowers* in 3–5-flowered fascicles, rusty-tomentose, with a fragrance of roses. Pedicels (2½–)4–5 mm. *Calyx* lobes oblong, somewhat inequal, subacute, 6–7 by 2–3 mm. *Petals* oblanceolate, similar to the calyx-lobes, somewhat longer, but narrower, white-tomentose. Stamens 5–6 mm; filaments glabrous. Corona consisting of a single row of flat ferrugineous woolly threads, half the length of the petals. *Ovary* ovoid, covered with a white-villous pubescence, very shortly stipitate or nearly sessile. Styles and stigmas white to greenish-white. *Fruit* ovoid to subglobose, 2–2½(–3) cm diam., 1 mm stipitate; pericarp dry, leathery, yellowish-green and nearly glabrous when ripe. *Seeds* 2–3, ovoid, flat, scrobiculate, light-brown with a white aril.

Distr. Sumatra (Palembang), Malay Peninsula (Perak, Selangor, Negri Sembilan, Malacca).

Ecol. In Sumatra in primary forest on hilly ground and sandy clay, apparently rare, 10–75 m.

Vern. *Tuba ulat, tadji*, Sum., *bĕlimbing hutan, bĕras-bĕras*, Mal. Pen.

Note. The material from the single specimen collected in Sumatra by KOORDERS in Indragiri (Padangtarab), described as *P. bakhuisii* BOERL. & KOORD., is slightly different from those collected in the Malay Peninsula by ovate-oblong leaves, broadly attenuate or rounded at both ends, 8–9 pairs of lateral nerves, 9–12 by 3½–6 cm; petiole *c.* 8 mm; pedicels 2½–4 mm. KOORDERS stated the bark of the tree to be copper-red and peeling, flowers yellowish-green, stamens 8 mm, pubescent near the base.

6. HYDNOCARPUS

GAERTN. Fruct. 1 (1788) 288, t. 60, f. 3; SLEUMER, Bot. Jahrb. 69 (1938) 1–94.—**Fig. 6–10.**

Trees, sometimes shrubs, usually dioecious, occasionally monoecious (*H. castanea. H. curtisii*). *Leaves* alternate, entire or serrate, penninerved; petioles thickened at the apex. Stipules mostly early caducous. ♂ *Flowers* in axillary (rarely supra-axillary) peduncled and ± branched cymes (these sometimes very short or reduced to ± sessile fascicles, very rarely to a solitary flower) from younger branches, or rarely in elongate raceme-like panicles from the trunk or the old branches. ♀ *Flowers* similarly arranged, but mostly solitary or in (very shortly peduncled) fascicles of 2–3 from the axils of young branches. *Bracts* small or minute, sometimes subpersistent. *Sepals* (3–)4–5, rarely 7–11, free or rarely slightly connate at the base, concave, ± equal, imbricate, ± reflexed at anthesis, caducous. *Petals* 4–5, rarely up to 14, free or rarely slightly connate at the base, mostly membranous, with a somewhat fleshy and mostly densely pilose scale at their inner base, caducous. ♂ *Flowers:* stamens 5–∞(–115); filaments free, sometimes very short; anthers oblong to ovate-cordate or didymous; cells divergent by the dilated connective. Rudimentary ovary sometimes present. ♀ *Flowers:* staminodes 5–∞, their anthers mostly reduced in size and sterile, or entirely absent. *Ovary* sessile, uni-

locular, with 3–6 placentas. Stigma sessile, with 3–5 short or elongate radial branches, these mostly dilated towards the apex and shortly bifid, rarely narrow, ± reflexed. *Fruit* indehiscent, globose or ovoid, rarely cylindrical or cucumber-like, few- to many-seeded; pericarp thick and hard to thin and fragile; exocarp brown, sometimes with distinct fibrose structure; mesocarp light-yellowish, very hard (stone-cells), *H. cauliflora* excepted; endocarp soft, mostly granular, dark-brown. *Seeds* densely packed in a pulp, angular-ovoid, with a membranous aril and very hard testa. Endosperm albuminous-oily. Embryo erect; cotyledons foliaceous.

Distr. About 40 *spp.* in Ceylon, W.–SW. Deccan Peninsula, Burma, Assam, Siam, Indo-China, S. China (Kwangsi), and Hainan, in *Malaysia:* 31 *spp.* in Sumatra, Malay Peninsula, Java, Borneo, and the Philippines. Fig. 5.

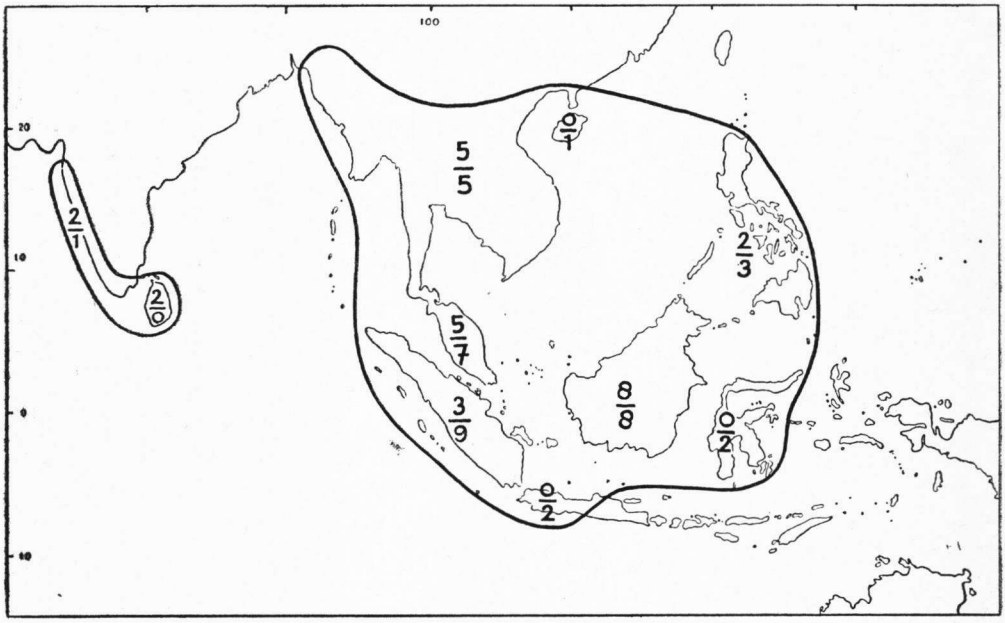

Fig. 5. Distribution of *Hydnocarpus*; the large partial area to the right corresponds with *sect. Taraktogenos*. The figure above the hyphen indicates the number of endemic species in each district, the figure below the hyphen the number of non-endemic species.

Ecol. Most species occur as substage shrubs or trees in evergreen rain-forests at low altitudes.

Uses. The oil extracted from the seeds of the greater part of the species is used for curing wounds and eczemes by the native peoples since very old times, especially in China, where the seeds are imported up to the present time. The oil of the Burmese *H. kurzii* is known as 'chaulmoogra-oil'; since 1854 is has been used as a remedy against lepra, but this has practically been abandoned today in Hawaii. It contains the glycerides of 2 fatty acids, *viz* chaulmoogric acid and hydnocarpic acid. These acids occur also abundantly in certain Malaysian representatives as *H. alcalae*, *H. cauliflora*, *H. subfalcata*, and *H. woodii* (*cf.* H. SCHLOSSBERGER, Chaulmoograöl und Verwandtes, in HEFFTER, Handb. Pharmak., Erg.-Werk vol. 5, 1937, containing a complete review on the subject). To cover the great need of chaulmoogra-oil, three species are or have been cultivated in tropical areas: *H. kurzii* (from Burma), *H. alcalae* (from the Philippines) and *H. anthelminthica* PIERRE (from Indo-China). Besides the above-mentioned fatty acids theseeds of several species contain glycosides which discharge hydrocyanic acid; they are used for fishpoisoning in the same manner as those of *Pangium edule*.

KEY TO THE SPECIES
(based on leaves and ♂ flowers)

1. Sepals 4 or 5, constant in number on the same specimen.
2. Sepals 4. Petals 4 or 8. Stamens (12–)15–30(–35). SECT. TARAKTOGENOS.
3. Petals 4, ± equal in size. Leaves serrate or shallow-crenate.
4. Petals and scales free. Sepals glabrous outside, only ciliate. Leaves 18–25 by 5½–8 cm. **1. H. humei**
4. Petals and scales coherent or slightly connate at the base. Sepals rusty-tomentose outside. Leaves (7½–)9–13(–15) by 3–5(–6) cm . . . . . **2. H. ilicifolia**
3. Petals 8, free, mostly slightly differing in size.
5. Pedicels slender to filiform, 1½–3 cm. Leaves shallow-crenate . . . . . **3. H. heterophylla**
5. Pedicels rather stout, thicker, ½–1(–1½) cm. Leaves entire.
6. Petals rather firm, densely golden-sericeous outside. Filaments 1 mm, stout, ± densely longish pilose.
7. Petioles (0.6–)0.8–1.2(–1½) cm long, ± 1 mm thick.
8. Leaves at first covered with appressed rufous hairs beneath, finally ± glabrescent, rarely glabrous . . . . . **4. H. kunstleri**
8. Leaves persistently rufous-tomentose beneath. . . . . **4a. H. kunstleri *var.* tomentosa**
7. Petioles 2½–3(–3½) cm long, ± 2 mm thick . . . . . **5. H. pinguis**
6. Petals membranous, glabrous outside, ciliate at the apex. Filaments *c.* 3–4 mm. Leaves always glabrous.
9. Filaments ± densely longish pilose . . . . . **6. H. kurzii *ssp.* australis**
9. Filaments glabrous.
10. Flowers on the trunk. Leaves with 7(–8) pairs of nerves . . . . . **7. H. calophylla**
10. Flowers axillary on foliate branches.
11. Nerves (4–)5–6 pairs ; reticulation lax. Petals *c.* 2½ mm in diam. . . **8. H. tenuipetala**
11. Nerves (7–)8–9(–10) pairs; reticulations rather dense. Petals 4 mm in diam. **9. H. wrayi**
2. Sepals 5.
12. Petals 5–7. SECT. HYDNOCARPUS.
13. Stamens 5. Petals 5. Midrib always very prominent above. *Subsect. Oliganthera.*
14. Anthers subquadrangular; cells divergent or separated from each other by the thickened connective, minute (1 mm). Flowers small; sepals and petals 2–4 mm. Leaves rather distinctly serrate, sometimes shallow-crenate to nearly entire.
15. Inflorescences distinctly axillary. Stipules early caducous.
16. Nerves 4–6 pairs.
17. Young branchlets (tips) ± densely, leaves (specially beneath on midrib and lateral nerves) ± laxly covered with minute, appressed, simple hairs. Sepals 2–3 mm diam. **10. H. subfalcata**
17. Young branchlets and leaves entirely glabrous. Sepals 4 mm diam. **11. H. merrilliana**
16. Nerves (7–)8–9 pairs.
18. Sepals ± 2 mm diam. Leaves, specially beneath, covered with ferrugineous, stellate hairs on midrib and nerves . . . . . **12. H. yatesii**
18. Sepals nearly 4 mm diam. Leaves covered with minute, simple, appressed hairs all over the undersurface . . . . . **13. H. glaucescens**
15. Inflorescence distinctly (3–5 mm) supra-axillary. Stipules mostly still persistent in anthesis on the upper part of the young branches.
19. Peduncles 3–5 mm. Sepals in anthesis very laxly pilose or glabrescent outside. **14. H. nana**
19. Inflorescences sessile or nearly so, (sub-)fascicled. Sepals in anthesis densely ferrugineous-pubescent outside . . . . . **15. H. elmeri**
14. Anthers oblong to cordate-oblong; cells parallel, connate, connective neither thickened nor dilated. Flowers larger; sepals at least 4 mm, mostly longer. Leaves strictly entire.
20. Inflorescences from the trunk or old big branches, racemose-panicled.
21. Lateral nerves 7–8 pairs. Filaments glabrous. . . . . **16. H. alcalae**
21. Lateral nerves 10–15 pairs. Filaments villous . . . . . **17. H. cauliflora**
20. Inflorescences axillary on the younger branches, cymose, rarely reduced to few-flowered fascicles or a solitary flower.
22. Sepals 3½ mm long. Lateral nerves 5–6 pairs . . . . . **18. H. cucurbitina**
22. Sepals ½–1½ mm long.
23. Leaves ovate-oblong, gradually attenuate towards the apex . . . **19. H. beccariana**
23. Leaf broadest in or above the middle, oblong to elongate-oblong, rarely obovate-oblong, mostly rather abruptly short-acuminate at the apex.
24. Lateral nerves very distinctly inarching along the leaf-margin, very prominent beneath, mostly impressed above . . . . . **20. H. borneensis**
24. Lateral nerves suberect or curved, the inferior ones excurrent along the leaf-margin, only the uppermost 1 or 2 pairs slightly anastomosing.
25. ♂ Flowers solitary or in fascicles of 2–3(–6), peduncle very short –3 mm.

26. Flowers solitary. Pedicels filiform, 2–2½ cm . . . . . **21. H. filipes**
26. Flowers in fascicles of 2–3 (very rarely up to 6). Pedicels stoutish, 2–3 cm. **22. H. castanea**
25. ♂ Peduncles 5–15 mm.
27. Inflorescences 2–3-branched, many-bracteolate. Petioles 2–4 mm. Nerves 7–8(–9) pairs. **23. H. scortechinii**
27. Inflorescences not or very shortly branched (the flowers from the upper part of the thickened peduncle one above the other). Petioles 5–15 mm. Nerves 9–12 pairs.
28. Filaments somewhat shorter than the anthers . . . . . **24. H. curtisii**
28. Filaments as long as or mostly a little longer than the anthers . **25. H. sumatrana**
13. Stamens (6–)7–16. Petals 5–7. Midrib and nerves nearly always flat or slightly impressed above, very rarely somewhat raised. *Subsect. Pleianthera.*
29. Leaves elliptic-oblong. Stamens (6–)7–8 . . . . . **26. H. woodii**
29. Leaves ovate-oblong. Stamens 14–16 . . . . . **27. H. crassifolia**
12. Petals 10. Stamens 17–24. SECT. KERRANDRIAS . . . . . **28. H. calvipetala**
1. Sepals and petals varying in number on the same specimen. SECT. ASTERIASTIGMA.
30. Sepals *c.* 5–(4–7). Petals *c.* 10–(8–12). Stamens *c.* 50–(35–70). Leaves with ferrugineous, stellate hairs beneath, specially on the nerves and midrib, characteristically dark-brown when dry. **29. H. anomala**
30. Sepals *c.* 7–(8–11). Petals *c.* 12–(8–14). Stamens 35–115. Leaves glabrous or with simple hairs.
31. Stamens *c.* 100–115. Leaves glabrous or nearly so, mostly olivaceous when dry. **30. H. gracilis**
31. Stamens *c.* 45. Leaves rufous- or ferrugineous-pubescent, specially on midrib and lateral nerves beneath, mostly red-brown when dry . . . . . **31. H. polypetala**

KEY TO THE SPECIES
(based on leaves and ± ripe fruit)[1]

1. Exocarp fibrous-cancellate, *i.e.* composed of numerous firm radial fibres (protruding from the stony mesocarp) and much thinner tangential (± parenchymal) walls, dark brown when dry.
2. Fruit globose.
3. Fruit smooth, or rough by minute warts only.
4. Leaves covered beneath with stellate, rusty hairs, specially on midrib and nerves, typically dark brown when dry. Fruit 8½–10 cm diam. Fibrous exocarp 8–15 mm, brown; stony yellowish mesocarp 1½–2 mm; endocarp soft, granular, 2 mm, brown when dry. Seeds *c.* 40. **29. H. anomala**
4. Leaves glabrous or covered densely to sparsely with simple rather stiff hairs.
5. Fruit *c.* 6½ cm diam., glabrous. Exocarp fibrous, brown, 4–5(–7) mm; mesocarp stony, yellowish, 1 mm; endocarp brown, soft, 1 mm. Seeds *c.* 15 . . . . . **4. H. kunstleri**[2]
5. Fruit *c.* 8½(–12) cm diam., brown- or blackish-velvety.
6. Fibrous exocarp 15–17 mm; stony yellowish mesocarp *c.* 1 mm; endocarp spongy. Seeds 10–15. Leaves mostly finely crenulate and a little rough by protruding tubercles . . **30. H. gracilis**
6. Fibrous exocarp 3–4(–6–8) mm; stony yellow mesocarp 1–2(–3) mm; endocarp soft, 1–2 mm. Seeds 12–18(–30). Leaves entire, glabrous, smooth to the touch. **6. H. kurzii *ssp.* australis**
3. Fruit with numerous flat-triangular appendages up to 1 cm long united at their bases and forming ± longitudinal crests, rusty-velvety, ± 9 cm diam. Fibrous exocarp (appendages excluded) 2–3 mm; stony yellowish mesocarp *c.* 1 mm; soft endocarp 1–2 mm. Seeds *c.* 20 . . **31. H. polypetala**
2. Fruit oblong, fusiform, manifestly (sometimes rather abruptly) attenuate at both ends.
7. Fruit axillary on the younger branches, 7–8 by 4–5 cm. Fibrous exocarp 3 mm; stony yellowish mesocarp ½ mm; soft endocarp 1 mm. Seeds several. Leaves with 8–9(–10) pairs of nerves, transverse veins ± distant, more or less concolorous when dry . . . . . **9. H. wrayi**
7. Fruit from the trunk or old big branches, not yet known in mature state, but probably similar to that of *H. wrayi*. Leaves with 7(–8) pairs of nerves, mostly somewhat rough to the touch, veins very densely transverse and reticulate, much darker (brown or red-brown) beneath than above when dry. **7. H. calophylla**
1. Exocarp formed from ± parenchymatic walls which include ± irregularly arranged stone-cell groups (only visible under a lens).
8. Midrib of the leaves very distinctly prominent above.
9. Fruit from the trunk or big old branches.
10. Fruit oblong, 15–31 by 12–15 cm. Exocarp 0.3–0.7 mm; stony light mesocarp 6 mm; soft (pulpy) endocarp 7 mm. Seeds 80–100(–110). Leaves up to 25 by 11 cm. Nerves 7–8 pairs. **16. H. alcalae**

(1) Not placed, as the fruit is not or imperfectly known: *11. H. merrilliana* (*cf. 13. H. glaucescens*) and *28. H. calvipetala.*

(2) See here also *5. H. pinguis* and *8. H. tenuipetala*, of which fruits are not yet known. From their leaves and the structure of their flowers it may be concluded that they probably possess fruits with fibrous exocarp similar to those of *H. kunstleri*, *7. H. calophylla*, and *9. H. wrayi*. Both have *kunstleri* leaves, but *H. tenuipetala* is quite glabrous and has petioles *c.* 1 cm long, whilst *H. pinguis*, also entirely glabrous, has bigger leaves on very stout, 2½–3½ cm long petioles.

10. Fruit globose, *c.* 8 cm diam. Exocarp very thin; mesocarp rather fragile, spongious, 6 mm; endocarp soft. Seeds several. Leaves 23–30 by 9–12 cm. Nerves 10–15 pairs. **17. H. cauliflora**
9. Fruit axillary on the younger branches.
11. Fruit very much longer than wide, cylindrical to cucumeriform or elongate-ovoid.
12. Fruit not or shortly and gradually attenuate at both ends.
13. Fruit cylindric-oblong, 9–11 by 4–5 cm, light brown when dry. Exocarp 0.3 mm; stony yellowish mesocarp 3 mm; granular endocarp 1 mm. Seeds *c.* 18. Midrib and nerves beneath and the young branches covered with stellate, rusty hairs . . . . . **12. H. yatesii**
13. Fruit cucumber-shaped, 7½–12½ by 2½ cm, dark rusty-velvety or glabrescent. Seeds few. Leaves glabrous or nearly so. Nerves 5–6 pairs . . . . . **18. H. cucurbitina**
12. Fruit ovate-oblong, 8 by 3 cm, abruptly attenuate at the apex into a marked beak, 1½–2 by 0.6 cm. Exocarp 1–1½ mm; light-yellow, stony mesocarp 0.3 mm; soft endocarp 1 mm. Seeds *c.* 10. Leaves ovate-oblong, coriaceous, glabrous. Nerves 9–10 pairs . . . **19. H. beccariana**
11. Fruit globose to depressed-globose, or broadly ovoid, sometimes contracted at the apex.
14. Fruit distinctly (3–5 mm) supra-axillary. Seeds 2–4. Nerves (5–)7–8 pairs. Stipules ± persistent, regularly present at the ultimate 2 or 3 leaf-axils at the apex of the branchlets.
15. Fruit globose, somewhat apiculate, brownish-green-velvety, 2½–3½ cm diam. Exocarp 0.2 mm; light yellow stone mesocarp 0.3 mm; soft endocarp ½ mm. Peduncle *c.* 1 cm. **14. H. nana**
15. Fruit globose, sordidly yellow-green- or rusty-tomentose, 4–5 cm diam. Exocarp 0.1–0.2 mm; light stony mesocarp 0.5–0.8 mm; soft endocarp 1–2 mm. Peduncle ½ cm. **15. H. elmeri**
14. Fruit distinctly axillary. Seeds mostly more than 4. Stipules mostly early caducous.
16. Nerves 11–14 pairs, strongly arched and characteristically anastomosing near the leaf-margin. Fruit ovoid, 6–8 by 4 cm, contracted (1–1½ cm) at the apex, fulvous-tomentose. Exocarp 0.3 mm; stony yellowish mesocarp *c.* 0.5–0.8 mm; endocarp *c.* 1 mm. Seeds 8–10. **20. H. borneensis**
16. Lateral nerves highly ascending along the leaf-margin, not or obscurely (sometimes the higher ones near the leaf-top) anastomosing.
17. Petioles thick and very short, 2–4(–5) mm. Blade elliptic-oblong, abruptly caudate, 12½–17½ by 6½–8½ cm. Nerves 7–8 pairs. Fruit ovoid, glabrescent, 3(–5) cm long, slightly 5–7-costate. Seeds 2–5 . . . . . **23. H. scortechinii**
17. Petioles manifestly longer and more slender.
18. Fruit distinctly globose or somewhat depressed-globose, rounded at the apex.
19. Leaves ± serrate (rarely shallow-crenate), 9–13(–15) by 3–5(–6) cm, mostly grey-olivaceous when dry, with 7(–10) pairs of nerves; reticulations rather distinct. Fruit blackish-brown velvety, 4–5(–8) cm diam. Exocarp 0.2 mm; light-yellow stony mesocarp 0.5–0.8 mm; soft endocarp thin. Seeds *c.* 10 . . . . . **2. H. ilicifolia**[1]
19. Leaves entire or nearly so (shallow-crenate in *3. H. heterophylla*). Stony yellow mesocarp thicker than in *H. ilicifolia*, 1–2 mm.
20. Peduncles relatively slender, *c.* 3, rarely up to 5 mm diam.
21. Leaves pale olivaceous or greenish-grey, mostly with whitish tubercles beneath when dry, ± shallow-crenate, 13–24 by 3½–8 cm. Nerves 6–7 pairs; reticulations obscure. Fruit 5½–6½(–8) cm diam., blackish-brown velvety. Exocarp 0.2 mm; light-yellow stony mesocarp *c.* 2 mm; soft endocarp 1.2–2 mm. Seeds 15–20. Peduncle 1½–2 cm.
22. Seeds 2–2½ by 1–1½ cm. . . . . **3. H. heterophylla**
22. Seeds 1.2–1.5 by 0.8–1 cm . . . . . **3a. H. heterophylla *ssp.* philippinensis**
21. Leaves olivaceous above, light-brown beneath when dry, entire, 9–14(–20) by 3–5½ (–7½) cm. Nerves 6(–7) pairs; reticulations close and very distinct on both sides. Fruit 4–6(–6½) cm, glabrous or nearly so, minutely and densely tuberculate. Exocarp 0.3 mm; stony light-yellow mesocarp 1 mm; soft endocarp ½ mm, smooth and shining inside. Seeds *c.* 12. Peduncle *c.* 3 cm . . . . . **21. H. filipes**
20. Peduncles relatively thick, (4–)6–12 mm, ½–2(–5) cm long. Leaves dark (reddish) brown when dry, entire, (13–)17–30(–35) by (5–)6½–8(–12) cm. Nerves 6–7(–8) pairs; reticulations rather distinct, specially underneath. Fruit dark brown velvety, (4–)5–6½ cm diam. Exocarp ½ mm; stony light yellow mesocarp 1–2 mm; soft endocarp 0.7–1 cm. Seeds 20–30. **22. H. castanea**
18. Fruit distinctly ovoid or globose-ovoid, apiculate or broadly contracted (mamillate) at the apex.
23. Pericarp golden-brown velvety inside and outside; fruit relatively small, ± 3½(–6) by *c.* 2½ cm, with 2–4(–7) seeds. Exocarp 0.2–0.5 mm; yellow, stony mesocarp ½–1 mm; soft endocarp 0.2–0.5 mm. Leaves olivaceous-brownish when dry, laxly beset with minute, appressed, simple hairs all over the surface beneath, entire or slightly serrate, often somewhat curved at the apex, 7½–14(–16) by 3–6(–8) cm. Nerves 4–6(–7) pairs; reticulations ± obscure . . . . . **10. H. subfalcata**

(1) See also *1. H. humei* with leaves 18–20(–25) by 6–7(–8) cm, of which ripe fruits are not yet known.

23. Pericarp glabrous inside.
24. Fruit grooved lengthwise, brown velvety, 7 by 5 cm. Exocarp 1½ mm; stony light-yellow mesocarp 3–4 mm; endocarp 4–5 mm. Leaves brownish to olivaceous, somewhat glaucescent beneath when dry, with fine, appressed, simple hairs all over the surface beneath, 12–25 by (5–)6–8 cm. Nerves 8–9 pairs; reticulations visible . . . **13. H. glaucescens**
24. Fruit not or slightly 5-sulcate at the apex. Exocarp 0.1–0.2 mm; light yellow stony mesocarp *c.* 1 mm; endocarp early dissolute. Leaves reddish-brown when dry, shining, glabrous, (13–)15–25(–33) by 5–8(–12) cm. Nerves (8–)9–13(–14) pairs; reticulations very dense and prominent on both sides.
25. Fruit yellowish-velvety, *c.* 4 by 2½ cm. Seeds few . . . . . **24. H. curtisii**
25. Fruit rufous-tomentose, 7–8(–10) by *c.* 6 cm. Seeds *c.* 20 . . . . **25. H. sumatrana**

8. Midrib of the leaves flat or slightly impressed, very rarely obscurely raised above.
26. Leaves ± oblong-elliptic. Fruit globose or obovoid-globose, ± broadly attenuate in a thick stipe (½ cm diam.), brown, rough. Exocarp 1–2(–3) mm, dark brown, with occasional radial fibres; light yellow stony mesocarp 5–9 mm; endocarp obscure. Seeds *c.* 5–8 . . . . **26. H. woodii**
26. Leaves ovate to oblong-ovate. Fruit unknown . . . . . **27. H. crassifolia**

1. Section Taraktogenos

(HASSK.) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21; SLEUM. Bot. Jahrb. 69 (1938) 14.—*Taraktogenos* HASSK. Nat. Tijd. Ned. Ind. 10 (1855) 127; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 297.

Sepals 4. Petals 4 or 8. Stamens (12–)15–30(–35).

Distr. Fig. 5.

1. Hydnocarpus humei RIDL. Kew Bull. (1926) 470; SLEUM. Bot. Jahrb. 69 (1938) 16.

Tree 3–10 m, glabrous. *Leaves* oblong-oblanceolate, rather long (3 cm) caudate-acuminate, cuneate at the base, chartaceous, shallow-crenate or mostly, specially towards the apex, ± serrate; nerves 8–9 pairs, prominent beneath, veins little but visibly reticulate-prominent on both sides; petiole 1–1½ cm. ♂ *Flowers* in condensed dichasia; peduncle thick, 6 mm long. Pedicels rather thick, 2 mm long. *Sepals* rounded, ciliate, 3 mm. *Petals* very thin, 2 mm across; scales fleshy, barbate at the apex, similar in shape to the petals. *Stamens* 15; filaments short, with longish white hairs; anthers oblong. ♀ *Flowers* unknown. *Fruit* nearly globose, blackish-brownish-velutinous, not known in the ripe state.

Distr. *Malaysia:* Mal. Peninsula (Selangor, Perak).

Note. Perhaps only a large-leafed form of *2. H. ilicifolia.*

2. Hydnocarpus ilicifolia KING, Ann. R. Bot. Gard. Calc. 5 (1896) 130, t. 151; RIDL. J. Str. Br. R. As. Soc. *no* 59 (1911) 72; Fl. Mal. Pen. 1 (1922) 161; CRAIB, Fl. Siam. En. 1 (1925) 96; BURK. Dict. (1935) 1208; SLEUM. Bot. Jahrb. 69 (1938) 17, 84; HENDERS. J. Mal. Br. R. As. Soc. 17 (1939) 36.—*H. serrata* (PIERRE) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21, *nom. nud.*; CRAIB, Fl. Siam. En. 1 (1925) 98.—*Taraktogenos serrata* PIERRE *ex* GAGNEP. Bull. Soc. Bot. Fr. 55 (1908) 525; Fl. Gén. I.C. 1 (1909) 224, t. 17 B, f. 9–16; *ibid.* Suppl. 1 (1939) 206.—*Taraktogenos microcarpa* PIERRE *ex* GAGNEP. *l.c.* 525, resp. 226, resp. 206.—*Taraktogenos subintegra* PIERRE *ex* GAGNEP. *l.c.* 526, resp. 226, resp. 206.—*H. microcarpa* GILG in E. & P. Pfl. Fam. ed. 2, 21 (1925) 408.—*H. subintegra* GILG, *l.c.*—*Taraktogenos ilicifolia* KERR, The Record, Techn. & Sc. (Bangkok) Suppl. 7 (1930) 13; GAGNEP. Fl. Gén. I.C. Suppl. 1 (1939) 205.—*Taraktogenos heterophylla* [*non* (BL.) SLOOT.] MERR. Contr. Arn. Arb. 8 (1934) 109.

Medium-sized tree, 10–30 m, sometimes bushy. Trunk with grey bark; branchlets slender, appressed rusty-pubescent or mostly glabrous. *Leaves* lanceolate-oblong or oblong, rather variable in shape, broadly cuneate to nearly rounded at the base, gradually long-attenuate towards the apex and ± shortly acuminate, (sub)coriaceous, glabrous, remotely dentate or throny-serrate, but sometimes nearly entire; nerves 7(–10) pairs, prominent on both sides, veins manifestly reticulate; petiole (0.6–)1–1½ cm. *Cymes* corymbose, few-flowered, consisting of a *c.* 1½ cm long peduncle and 2–3 branches ½–1 cm long. Pedicels 5–6 mm, appressed rusty-pilose. *Sepals* subrotundate, 4 mm. *Petals* oblong, somewhat shorter than the sepals, truncate (erose) and ciliate at the apex, nearly glabrous outside, with a subquadrangular scale inside half their length. ♂ *Flowers:* stamens 14–20, white; filaments short, pubescent; anthers ovate-oblong. ♀ *Flowers:* staminodes *c.* 15. Ovary ovoid, rusty-tomentose, with 4 radiate, truncate stigmas. *Fruit* globose, rusty to blackish-brownish velvety, 4–5(–8) cm diam.; pericarp *c.* 1½ mm. *Seeds c.* 10–15, ovoid, 1.3–1.5(–2.2) by 1–1.2(–1.5) cm.

Distr. Indo-China, Siam, in *Malaysia:* N. Sumatra (Atjeh), Malay Peninsula (Langkawi, Kedah, Perlis, Pahang).

Ecol. On quartzite and shale beach, or granite boulder slopes, mostly on rocky limestone hills, often very abundant, from sea-level (*Barringtonia*-formation) to 100 m.

Use. The oil extracted from the seeds is used for soap-making.

Vern. *Nipis kulit,* Kedah, *masi liman jantan,* Pahang.

3. Hydnocarpus heterophylla BL. Rumphia 4 (1848) 22, t. 178 B, f. 1; Mus. Bot. 1 (1849) 15; KOORD. Exk. Fl. Java 2 (1912) 631; Atlas 2 (1914) f. 349; SLEUM. Bot. Jahrb. 69 (1938) 18, 82.—*Taraktogenos blumei* HASSK. Nat. Tijd. Ned. Ind. 10 (1855) 127; MIQ. Fl. Ind. Bat. 1, 1 (1855) 110; HASSK. Flora 40 (1857) 529; Retzia ed. nov. (1858) 15; MIQ. Fl. Ind. Bat. Suppl. (1860) 159, 389; KOORD. & VAL. Bijdr. 5 (1900) 4; BACK. Schoolfl. Java (1911) 73; SLOOT. Bijdr. Flac. (1919) 71.—*Taraktogenos heterophylla* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 304; HEYNE, Nutt. Pl. (1927) 1134; BACK. Bekn. Fl. Java (em. ed.) 4a (1942) fam. 84, p. 3.

ssp. **heterophylla.** Tree up to 20(–36) m, glabrous except the inflorescence. Bark nearly black; branches pendent. *Leaves* oblong-lanceolate, long acute-acuminate, cuneate at the base, manifestly inequilateral, subcoriaceous, ± shining, entire or shallowly crenate, grey-greenish when dry and often with whitish, minute tubercles beneath, (10–)13–24 by 3½–8 cm; nerves 6–7 pairs, little prominent, veins rather obscurely reticulate; petiole (½–)1–1½ cm. Stipules rather persistent, triangular, nearly 1 mm. *Cymes* dichotomous, 4–8-flowered; peduncle *c.* 5 mm, ± as long as its 2 branches, ± densely rusty-velvety. Pedicels glabrous, thickened towards the apex, articulate at the base. *Sepals* subrotundate, concave, membranous, light-green or white, nearly glabrous, the outer 5–6 mm, the inner ones 8–10 mm. *Petals* subrotundate, thin, greenish-white, *c.* 5 mm diam., whitish-pilose outside in the upper half, fimbriate at the margin; scales half as long as the petals, ciliate, glabrous inside, densely sericeous outside. ♂ *Flowers:* stamens 20–32; filaments filiform, pubescent, 5–7 mm; anthers sagittate. ♀ *Flowers:* cymes shorter than in the ♂ inflorescence. Staminodes 15–24. *Ovary* ovoid, rusty-sericeous, slightly 3–5-sulcate at apex, crowned by the 4–5-lobed, radiate stigma. *Fruit* globose, 5½–6½(–8) cm diam., blackish-velvety; pericarp 4–5(–7) mm thick; peduncle 1½–2 cm. *Seeds* 15–20.

Distr. *Malaysia:* S. Sumatra (Palembang, Lampongs, Bencoolen), W. Java (Bantam, Bogor, Preanger), with a subspecies in SE. Borneo, N. Celebes, and the Philippines.

Ecol. In rain-forest, often on calcareous soil or on limestone rocks, scattered, 150–900 m. *Fl.* Jan.–June, *fr.* Apr.–Dec.

Uses. Wood white and very hard, but apparently not used. The seeds contain a fatty substance and are used against skin-diseases.

Vern. *Bětjampioh*, Palemb., *mědang katělapak*, Bencoolen, *kandar-lutung*, S, *lutung*, J.

ssp. **philippinensis** SLEUM. Bot. Jahrb. 69 (1938) 20.—*H. heterophylla* (*non* BL.) MERR. Philip. Bur. For. Bull. 1 (1903) 40.—*Cyclostemon iwahigensis* ELM. Leafl. Philip. Bot. 4 (1911) 1278 *pr. p. quoad fl.*—*Taraktogenos heterophylla* [*non* (BL.) SLOOT.] MERR. En. Philip. 3 (1923) 108.

Flowers and fruits smaller than in type. Sepals 3–4 mm diam. Petals 3 mm diam.

Distr. *Malaysia:* SE. Borneo (Kutei), Philippines (Luzon, Mindoro, Palawan, Negros, Leyte, Panay, Masbate, Ticao, Tablas, Busuanga Isl.), N. Celebes (Manado).

Ecol. In forests at low altitude.

Vern. Philippines: *Balik*, *busilayan*, *ouaslum*, *putian* ,P. Bis., *bato-bato*, Tagb., P. Bis., *butong-manók*, *haguphup*, Bik., *magluni*, Tagb., *matobato*, P. Bis., S.L. Bis., Celebes: *wanutèh*, Manado.

4. Hydnocarpus kunstleri (KING) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21; SLEUM. Bot. Jahrb. 69 (1938) 24.—*Taraktogenos kunstleri* KING, J. As. Soc. Beng. 59, ii (1890) 122; Ann. R. Bot. Gard. Calc. 5 (1896) 131, t. 152; SLOOT. Bijdr. Flac. (1919) 73; RIDL. Fl. Mal. Pen. 1 (1922) 162; BAK. *f.* J. Bot. 62 (1924) Suppl. 6; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 305; BAK. *f.* J. Bot. 63 (1926) Suppl. 143; HEYNE, Nutt. Pl. (1927) 1134; BURK. Dict. (1935) 1208.—*T. scortechinii* KING, J. As. Soc. Beng. 59, ii (1890) 122, *incl. var. gracilipes* KING (*nec H. scortechinii* KING, *l.c.* 120); RIDL. Fl. Mal. Pen. 1 (1922) 162.—*H. kingii* WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21; SLEUM. Bot. Jahrb. 69 (1938) 24.

var. **kunstleri.** Tree 12–20(–35) m, trunk 25–40 cm diam., often with thin, high buttresses; branchlets ± densely fulvous-pilose, finally glabrescent. *Leaves* oblong-lanceolate or mostly oblong-elliptic to elliptic, cuspidate or sometimes more obtusely acuminate, ± inequilateral at the base, the narrower side cuneate, the broader one ± rounded, ± stiff coriaceous, shining, glabrous, mostly greyish above when dry, at first short appressed-pilose beneath specially on the midrib and lateral nerves, finally ± glabrescent with some scattered persistent hairs along the midrib beneath, rarely glabrous, entire or slightly shallow-crenate, (7½–)8½–15(–20) by 3½–7½(–8½) cm; midrib flat or a little grooved above, very prominent beneath; nerves 5–6, rarely more, turning red when dry, very prominent beneath, veins reticulate on both sides, specially beneath; petiole mostly stout and pilose. *Cymes* few-branched, (4–)6–8-flowered. Pedicels 5–8 mm, ± rusty-puberulous. *Sepals* green-white, suborbicular to elliptic, laxly pilose or nearly glabrous outside, glabrous inside, 6–7 by 4 mm. *Petals* ovate or broadly-oblong, 4–5 by 3 mm; scales nearly glabrous, erose, ciliate at the apex, 2½ mm. ♂ *Flowers:* stamens (20–)24–32(–35). ♀ *Flowers:* staminodes *c.* 17. *Ovary* ovoid, glabrous, sulcate; stigmas 4, oblong, reflexed. *Fruit* globose, smooth, *c.* 6½ cm diam., green (dark when dry), with thick pericarp.

Distr. *Malaysia:* Sumatra, Riouw, Malay Peninsula (rare: Perak, Selangor, Pahang), Borneo.

Ecol. Growing scattered on hilly, never inundated soil on sandy or clayey ground, mostly at low altitudes, in S. Sumatra up to 700 m.

Uses. Wood dull brown, rather hard, but not heavy, attacked by various insects, therefore used only where it is not in contact with the soil.

Vern. *Sětumpol*, Pahang, *kaju tanah*, Palemb., *gambir-gambir*, Karo, *banio-djirak*, *tulang bĕliung*,

tiga urat, babi kurus, tan liese, kĕrambil tupai, daru-daru, situmpol, sanumpol, pangin djaong, M.

var. **tomentosa** (KING) SLEUM. 'Bot. Jahrb. 69 (1938) 25.—*Taraktogenos tomentosa* KING, J. As. Soc. Beng. 59, ii (1890) 123.—*Taraktogenos kunstleri* KING *var. tomentosa* (KING) RIDL. Fl. Mal. Pen. 1 (1922) 163.

Leaves more densely and persistently rufous-tomentose, specially underneath.

Distr. *Malaysia:* Malay Peninsula (Perak, Selangor, Kemaman, Pahang, Johore).

Vern. *Sĕtumpol*, Selangor, *mĕdang pĕrdam*, Pahang.

5. Hydnocarpus pinguis SLEUM. Blumea 7 (1954) 493.

High tree, glabrous; branchlets nigrescent. *Leaves* (oblong-)elliptic, ± abruptly obtusely acuminate (rarely subrotundate) at the apex, ± rounded at the base, inequilateral, thick-coriaceous, shining, entire, (11–)13–18 by (5–)7–10(–12) cm; midrib and lateral nerves reddish when dry, midrib ± flat above, very prominent beneath, lateral nerves 6–7 pairs, subcurvate, prominent specially beneath, veins laxly transverse and reticulate, raised on both sides; petiole very stout, 2–3 mm diam., thickened at apex and base, grooved by numerous transverse linear lenticels. *Cymes* short, on a thick, 5 mm long peduncle, nearly glabrous, not yet known in full developed state. ♂ *Flowers:* very similar to those of *H. kunstleri*.—♀ *Flowers* and *fruit* unknown.

Distr. *Malaysia:* Borneo (Sarawak, near Kuching), once found.

6. Hydnocarpus kurzii (KING) WARB. *ssp.* **australis** SLEUM. Bot. Jahrb. 69 (1938) 23.—*H. castanea* (*non* HOOK. *f.* & TH.) J. F. ROCK, U. S. Dep. Agr. Bull. *no* 1057 (1922) 12, pl. 3; GILG, in E. & P. Pfl. Fam. ed. 2, 21 (1925) 408, f. 177.—*Taraktogenos kurzii* (*non* KING) CRAIB, Fl. Siam. En. 1 (1925) 97; FISCHER, Kew Bull. (1927) 97, *p.p.*

Tree 12–20(–30) m; bark smooth; young branchlets fulvous-pubescent, rather soon glabrescent. *Leaves* lanceolate-oblong, shortly subacutely acuminate, cuneate at the base, equilateral, subcoriaceous, somewhat shining, olivaceous when dry, entire, glabrous, 15–22 by 4–6½ cm; midrib little prominent above, distinctly so beneath, nerves 7–8(–9) pairs, suberect, other interjacent ones ± distinct, veins transverse, reticulation prominent beneath; petiole 1.2–1.6 cm, thickened at the apex, glabrous. Stipules not seen, probably early caducous. *Cymes* abbreviated, 5–7(–9)-flowered, rather densely fulvous-substrigose-pubescent in all parts; peduncle 0.4–1(–1½) cm. Pedicels somewhat thickened, ½–1 cm. ♂ *Flowers: sepals* ovate-rotundate, fulvous-pubescent outside, 5 by 4 mm. *Petals* broadly ovate, obtuse, ciliate; scales fleshy, densely ciliate, *c.* 2 mm. Stamens (15–)18–25(–30); anthers elongate-cordate. ♀ *Flowers* in few-flowered cymes. Pedicels 1½ cm. Sepals and petals a little larger than in the ♂ flowers. Staminodes 10–16. *Ovary* elliptic, 6–7-sulcate, fulvous-tomentose. *Fruit* globose, rugose, (5–)8–10 cm diam.; peduncle thick, *c.* 0.6 cm. *Seeds* angular-ovoid, *c.* 3 by 1½ cm.

Distr. N. Siam and Lower Burma (southwards to Tavoy), in *Malaysia:* Malay Peninsula (Pahang: base Kota Gelanggi, HENDERSON SF 22417, with ripe fruit; near the Gap, SYMINGTON For. Dep. F.M.S. 45009, Herb. SING.).

Note. It would be of interest to get flowering material to confirm the determination, *H. kurzii* being the true chaulmoogra-tree.

'*H. castanea* with fruits 3 in. long' mentioned by RIDLEY (Trans. Linn. Soc. II, 3, 1893, 276) from the banks of Tahan River, may belong here.

7. Hydnocarpus calophylla (RIDL.) SLEUM. Bot. Jahrb. 69 (1938) 26.—*Taraktogenos calophylla* RIDL. in HOOK. Ic. Pl. V, 2 (1932) t. 3167.

Shrub or mostly small tree up to 6 m; branchlets angular, puberulous, soon covered with a greyish bark. *Leaves* elliptic-oblong to oblong-cuspidate (1½–2½ cm), cuneate at the base, nearly equilateral, coriaceous, glabrous, a little rough to the touch when younger, ± shining, olivaceous above, brown beneath when dry, (18–)30–40 by (7–)9–13 cm; midrib and nerves rather flat above, manifestly prominent beneath. Stipules elongate-triangular, 6–10 mm, subpersistent. *Cymes* few-flowered, with a thick peduncle up to 1 cm, densely covered with persistent, ovate, densely fulvous-pilose bracts. Pedicels stout, 1–1½ cm, fulvous-puberulous. *Sepals* ovate, chartaceous, ± fulvous-pilose outside, 8 by 5 mm. *Petals* oblong, 4 by 3 mm; scales nearly orbicular, thick, whitish-hirsute. ♂ *Flowers:* stamens *c.* 20; anthers subcordate-oblong, 3–4 mm. ♀ *Flowers:* sepals and petals as in the ♂ flowers but slightly larger (10–11 by 6–7, respectively 6 by 2½ mm). Staminodes *c.* 17, anthers half as long as in the ♂ flowers. *Ovary* ellipsoid, angular at the base, ribbed, fulvous-tomentose, with 4 radiate stigmas. *Fruit* green, not yet known in ripe state, fusiform, at least 4 by 2 cm, on a stout peduncle 1½ cm long.

Distr. *Malaysia:* Borneo (Sarawak).

Ecol. In old jungle on slopes above streams.

8. Hydnocarpus tenuipetala SLEUM. Blumea 7 (1954) 494.

Small tree; young branchlets rather soon covered with a light-brown, older ones with a grey bark. *Leaves* elliptic-oblong or subovate-oblong, abruptly and shortly (1 cm) subacutely acuminate, rounded at the base, equilateral, thickly coriaceous, brown when dry, paler beneath, glabrous (only young ones sparsely pilose on midrib and lateral nerves beneath), entire, (8–)11–14 by 4½–6½ cm; midrib and nerves little prominent above, distinctly so beneath, the latter arcuate-ascending along the margin, dark when dry, veins distantly transverse, forming with the venules a rather lax net prominent on both sides; petiole 2 mm diam., rugose, 6–8 mm. *Cymes* few-flowered; peduncle thick, rufous-puberulous, 3–5 mm. Bracts several, ovate. Pedicels nearly glabrous, 3 mm. *Sepals* ovate-rotundate, concave, firmly membranous, *c.*

4 mm diam. *Petals* thin, broadly ovate, glabrous, fimbriate at the apex, with a thick, fleshy, hirsute scale nearly as big as the petals. ♂ *Flowers:* stamens *c.* 14; filaments slender, dilated at the base, 2½–3 mm. ♀ *Flowers* and *fruits* not yet known.

Distr. *Malaysia:* Borneo (Sarawak), once found.

9. Hydnocarpus wrayi KING, J. As. Soc. Beng. 59, ii (1890) 121; Ann. R. Bot. Gard. Calc. 5 (1896) 130, t. 150; RIDL. Fl. Mal. Pen. 1 (1922) 161; SLEUM. Bot. Jahrb. 69 (1938) 27.

Small tree *c.* 8 (rarely up to 15) m; young branchlets puberulous, soon glabrescent. *Leaves* elliptic-oblong to oblong, 1–1½ cm cuspidate at the apex, nearly rounded or broadly cuneate at the base, ± inequilateral, subcoriaceous to coriaceous, entire, glabrous and somewhat shining above, pubescent on midrib and primary nerves beneath, (15–)20–25 by (6½–)8½–12½ cm; nerves suberect, very prominent beneath, veins manifestly transverse, reticulations prominent on both sides; petiole stout, 1¼ cm. ♂ *Flowers* in few-flowered, small, short-peduncled cymes. Pedicels *c.* 4 mm. Sepals subrotundate, pubescent outside, *c.* 6 mm diam. Petals broadly oblong, glabrous; scales erose, hirsute. Stamens 15–17. ♀ *Flowers:* solitary or in twos; peduncle thick, glabrous, *c.* 7 mm. Sepals as in the ♂ flowers. Petals suborbicular, 2½ mm diam.; scale subquadrate, 1½ mm. Staminodes *c.* 17. *Ovary* depressed-ovoid, densely fulvous-pilose, with a 5-lobed stigma. *Fruit* green, ± narrow-ovoid-elliptical, tapering to both ends, 7–8(–10) by 4–5½ cm, minutely fulvous-velvety, slightly longitudinally costate at the apex, crowned by 5 thick, large, separate, lignescent stigmas, many-seeded; peduncle 1½–2(–2½) cm long, 6–7 mm diam. *Seeds* elongate, plano-convex, *c.* 2 cm.

Distr. *Malaysia:* Malay Peninsula (Perak; possibly also in Pahang), Borneo (Sarawak).

Ecol. In lowland forests, apparently rare.

2. Section Hydnocarpus

Sect. Euhydnocarpus WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21; SLEUM. Bot. Jahrb. 69 (1938) 30.

Sepals 5. Petals 5.

1. Subsection Oliganthera

WARB. *l.c.*; SLEUM. *l.c.*

Stamens 5.

10. Hydnocarpus subfalcata MERR. Philip. J. Sc. 4 (1909) 297; En. Philip. 3 (1923) 107; PERK. & CRUZ, Philip. J. Sc. 23 (1923) 549, t. 1, f. 1 (fr.); SLEUM. Bot. Jahrb. 69 (1938) 57.—*H. ovoidea* ELM. Leafl. Philip. Bot. 4 (1912) 1514.—*H. quadrasii* ELM. *l.c.* 1515; MERR. En. Philip. 3 (1923) 107.—*H. setumpul* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 308, f. 3; SLEUM. Bot. Jahrb. 69 (1938) 47.—**Fig. 6.**

Tree 5–15(–20–30) m; young branchlets ± densely rusty-pubescent. *Leaves* ovate-oblong or oblong, rarely ovate or lanceolate-oblong, sometimes subfalcate, ± abruptly subcaudate-acuminate, ± inequilateral at the base, one side cuneate, the other subrotundate, subcoriaceous, glabrous and shining above, pubescent at the midrib, dull and laxly covered with minute, appressed, simple hairs (well visible only with a lens) all over the undersurface, more distinctly pubescent on the midrib and primary nerves, 7½–14(–16) by 3–6 (–8) cm, obscurely and distantly serrate or mostly ± entire; midrib and nerves little raised above, very prominent beneath, veins ± transverse, reticulations ± obscure; petiole ± pubescent, 5–7(–10) mm. ♂ *Cymes* obscurely branched, *c.* 5 mm peduncled, all over finely rusty-pubescent, few-flowered. Pedicels rather slender, 3–5(–8) mm. *Sepals* ovate, 2–3 by 2 mm, the inner 2 slightly smaller. *Petals* ovate-orbicular, membranous, ciliate, elsewhere glabrous, 2–2½ mm diam.; scales orbicular, pilose on both sides, 1½ mm diam. Filaments subulate, thick, glabrous, 1½ mm. ♀ *Flowers* 2–4, very shortly peduncled. Pedicels 6–8 mm. Sepals and petals similar to those of the ♂ flowers, but slightly larger 4–5, resp. 3–3½ mm long. Staminodes subulate-triangular, 2 mm; anthers 0. *Ovary* ovoid, rufous-tomentose; stigmas 3–5, rather narrow, radiate. *Fruit* ovoid, rarely subglobose, always ± attenuate at apex and base, obtuse, *c.* 3½(–6) by *c.* 2½ cm, inside and outside rusty-tomentose, with 2–4(–7) seeds. *Seeds* ovoid, variously compressed, *c.* 1½ by 1 cm; pericarp rather thin, fragile.

Distr. *Malaysia:* S. Sumatra (Palembang), Borneo (Sarawak), Philippines (Luzon, Sibuyan, Samar, Mindanao).

Ecol. In thickets and forests on level, never inundated clayey ground, 15–25 m. *Fl.* March–May, *fr.* Oct.–Dec.

Vern. *Sětumpul*, M; Philippines: *amitan*, Ibn., *apanang*, C. Bis., *dalinias*, *putian*, Sbl., *damol*, S. L. Bis., *lagtang*, P. Bis., *ñgeret*, Tag., *pai*, Pang.

11. H. merrilliana SLEUM. Bot. Jahrb. 69 (1938) 50, *nec* LI, J. Arn. Arb. 24 (1943) 446 (Kwangsi).

Large glabrous tree; branchlets slender. *Leaves* oblong to lanceolate-oblong, slightly curved and shortly acuminate at the apex, broadly attenuate at the base, somewhat inequilateral, subcoriaceous entire, 12–15 by 4½ cm; midrib prominent on both sides, nerves 5–6 pairs, curved-ascending, little but distinctly raised on both sides, veins rather densely reticulate; petiole 8–10 mm. Stipules not seen. ♂ *Flowers:* few-flowered cymes; peduncle 8 mm, ferrugineous-tomentose as are the pedicels,

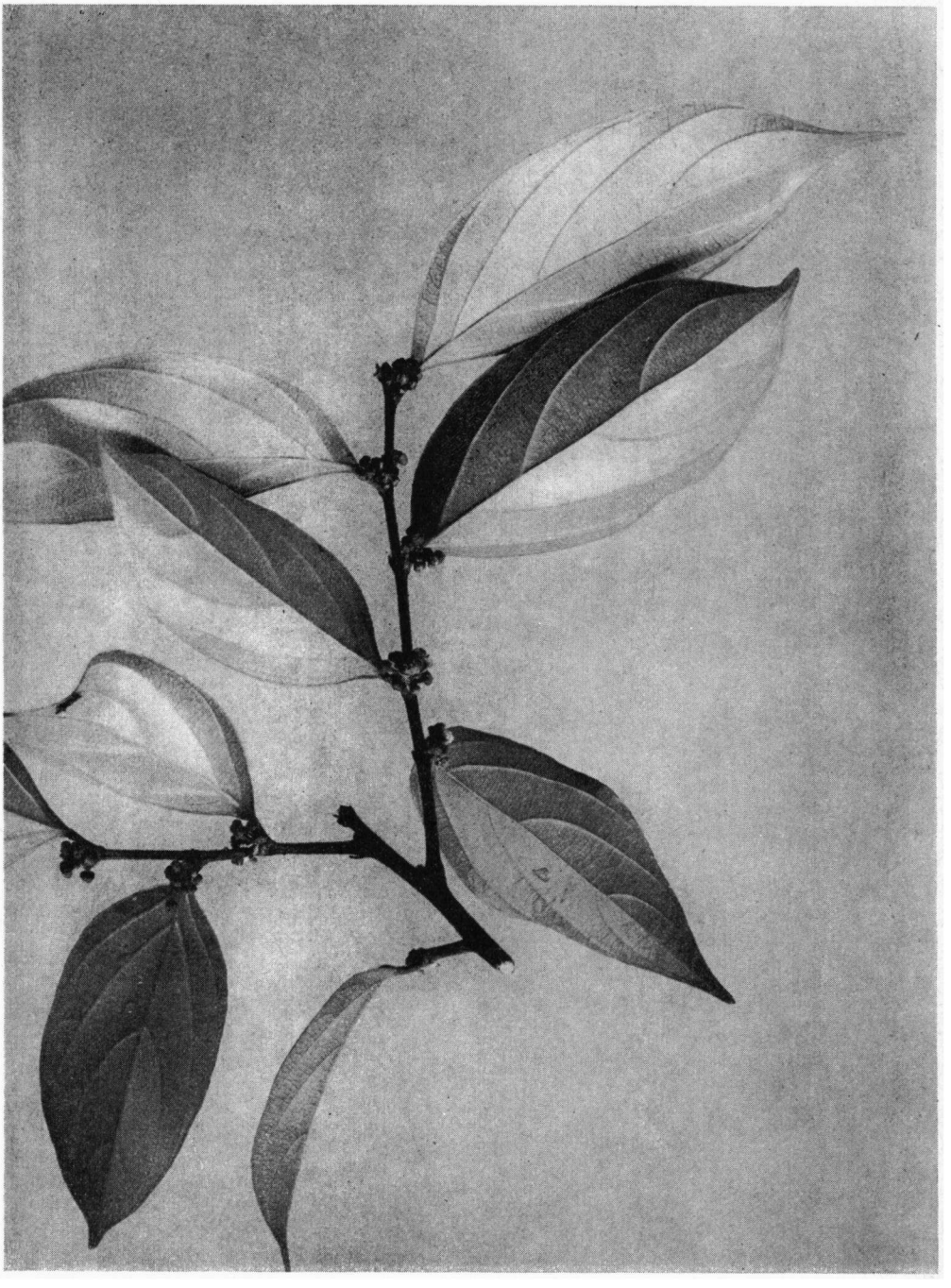

Fig. 6. *Hydnocarpus subfalcata* MERR. Flowering twig, showing underside of leaves, × 3/4 (C.H.B. IV–F–49).

the latter 7–8(–12) mm. *Sepals* orbicular-ovate, densely ferrugineous-pilose outside, 4 by 3½ mm. *Petals* broadly oblong, membranous, glabrous, 4 mm; scales oblong, 3½ by 1½ mm, fleshy, ciliate, elsewhere glabrous. Filaments and anthers each 1½ mm long. ♀ *Flowers* and *fruit* unknown.

Distr. *Malaysia:* Sumatra (East Coast), once found. Possibly also further south in the Kuantan Districts, judging from sterile material.

Vern. *Situmpul*, M.

Note. Very near to *H. glaucescens* and possibly only a glabrous form of it.

12. H. yatesii MERR. Philip. J. Sc. 29 (1926) 402; Pap. Mich. Acad. Sc. 19 (1934) 174; SLEUM. Bot. Jahrb. 69 (1938) 49.

Tree *c.* 8 m; branchlets first covered with a dense, rusty-stellate tomentum, glabrescent. *Leaves* oblong, ± abruptly acuminate, attenuate at base, distinctly inequilateral, chartaceous to subcoriaceous, glabrous and shining above, dull and minutely stellate-pubescent on the midrib and nerves beneath, entire, (7–)12–17 by (3–)5–7 cm; midrib and lateral nerves little prominent above, distinctly so beneath, veins ± transverse, reticulations little distinct on both sides; petiole pubescent, 8–10(–14) mm. Stipules lanceolate, acuminate, densely rusty-stellate-pubescent, 8–10 by 2 mm, rather early caducous. ♂ *Cymes* depauperate, all over rusty-stellate-pubescent; peduncle 5–8 mm, 2–4(–6)-branched at the apex, branches curved, up to 7 mm, each bearing 4–6 biseriate flowers. Pedicels 3–4 mm. *Sepals* orbicular-ovate, outer ones 1½–2 mm, inner ones slightly larger. *Petals* suborbicular, membranous, 2½ mm diam., ciliate, rusty-pubescent on the back; scales broad-obovate, thick, densely pubescent on both sides, 1–1½ mm. Filaments thickened at the base, glabrous, 1½ mm; anthers reniform, 0.6 by 1 mm. ♀ *Flowers* not yet known. *Fruit* oblong-cylindric, obtuse and obscurely 5-angled at the apex, covered with minute, irregular tubercles and a very short rusty-velvety tomentum, 9–11 by 4–5 cm. *Seeds c.* 18, 2–2½ cm long.

Distr. *Malaysia:* Sumatra (East Coast, E. Tapanuli).

Ecol. Lowland rain-forests, along creeks, rare and scattered, up to 450 m.

Vern. *Kaju si deppoh, k. golom lisak*, Tapanuli, *djilo k*, Sum. E.C.

13. Hydnocarpus glaucescens BL. Rumphia 4 (1848) 22; Mus. Bot. 1 (1849) 15; MIQ. Fl. Ind. Bat. 1 (1859) 110; *ibid.* Suppl. 1 (1860) 159; SLOOT. Bijdr. Flac. (1919) 63; Bull. Jard. Bot. Btzg III, 7 (1925) 308, SLEUM. Bot. Jahrb. 69 (1938) 48.—*H. setumpul* (*non* SLOOT.) BAK. *f.* J. Bot. 64 (1926) Suppl. 142.

Tree 10–25 m; young branchlets laxly appressed-rusty-pilose, older ones glabrous, angular. *Leaves* oblong, shortly acuminate at the apex, very inequilateral at base (cuneate at the narrower side, rounded at the wider one), coriaceous or nearly so, glabrous and shining above, opaque and glaucescent beneath, ± distinctly serrate, 12–25 by (5–)6–8 cm, lateral nerves nearly plane above, little but visibly raised beneath, veins transverse, numerous, slightly reticulate; petiole ± laxly covered with appressed hairs, 1½–2 cm long. Stipules not seen, probably very early deciduous. ♂ *Cymes* 0.6–1 cm peduncled, very shortly branched, 6–8-flowered, rather densely covered with appressed, nearly strigose ferrugineous hairs; pedicels 2–4 mm. *Sepals* ovate-rotundate, obtuse, pubescent outside, glabrous inside, green. *Petals* elliptic, minutely erose and ciliate at the apex, elsewhere laxly pubescent, 2½ mm across; scales ovate, thick, densely rufous-pilose on both sides, specially inside, 2 mm, slightly divided at the apex. Anthers reniform, 1¼ mm wide; filaments subulate, very thickened at the base, glabrous, 1 mm. ♀ *Flowers* not yet known. *Fruit* subglobose-ovoid, markedly contracted at the apex, *c.* 1½ cm, 'umbonate' with 5 vertical grooves, *c.* 7 by 5 cm, dark-brown- or rusty-velvety with many light dots; peduncle woody, 0.8–1.5 by 0.9 cm.

Distr. Sumatra (Atjeh to Padang Highlands, Lampongs).

Ecol. In primary forest on never inundated hilly ground and clayey soil, rather rare and scattered, up to 600 m.

Vern. *Langsat*, Atjeh.

14. Hydnocarpus nana KING, J. As. Soc. Beng. 59, ii (1890) 118, incl. *var. pubescens* KING, *l.c.* 119; Ann. R. Bot. Gard. Calc. 5 (1896) 128, t. 147; RIDL. Fl. Mal. Pen. 1 (1922) 159; BURK. & HENDERS. Gard. Bull. Str. Str. 3 (1925) 346; *ibid.* 4 (1928) 223; SLEUM. Bot. Jahrb. 69 (1938) 37.

Shrub or small tree, up to 6 m, stem 5–7 cm across; branchlets rusty-pilose. *Leaves* subovate-oblong to lanceolate-oblong, ± elongate-acuminate and slightly curved at the apex, ± rounded at the base, inequilateral, chartaceous to subcoriaceous, glabrous above except the midrib and nerves, rusty-pilose beneath specially on the midrib and nerves, but sometimes nearly entirely glabrescent, 6½–12½ by 2–4(–6) cm, mostly distinctly (1 mm) serrulate; midrib and nerves slightly raised or a little impressed above; nerves 5–8 pairs, curved-ascending, mostly manifestly prominent beneath as is the midrib, veins ± transverse, not or only obscurely reticulate; petiole pubescent, 3–5(–8) mm. Stipules subovate-lanceolate, acute, 5–7 mm, pubescent, finally caducous. ♂ *Flowers* in few-flowered, 2-branched cymes; peduncle ½ cm, flowering branches each with 3–4 biseriate, white flowers. Pedicels slender, *c.* 3 mm. *Sepals* rounded, 2 mm diam.. *Petals* oblong, 1½ mm long, somewhat fleshy, sericeous outside by rather longish white hairs; scales oblong, half as long as the petals. Filaments thick, 1 mm, laxly pilose. ♀ *Flowers* solitary, supra-axillary; pedicels *c.* 1 cm. Sepals and petals as in the ♂ flowers. *Ovary* ovoid, yellowish-tomentose. *Fruit* globose, somewhat apiculate, minutely rugose, brownish-greenish-velvety 2½–3½ cm diam.; peduncle *c.* 1 cm; pericarp thin, fragile. *Seeds* (2–)3–4, plano-convex, 1¼ cm long.

Distr. *Malaysia:* Malay Peninsula (Penang, Perak, Selangor, Pahang, Kemaman, Johore, Kedah, Wellesley).

Ecol. Forests on hilly ground, 100–650 m.

Vern. *Alai*, M.

15. Hydnocarpus elmeri MERR. Pl. Elm. Born. (1929) 207; SLEUM. Bot. Jahrb. 69 (1938) 53.

Small tree up to 18 m; young branches angular, initially slightly ferrugineous-pubescent, glabrescent. *Leaves* oblong or ovate-oblong, shortly obtusely acuminate or cuspidate, cuneate to rotundate at the base, mostly distinctly inequilateral, chartaceous to subcoriaceous, brown when dry, shining above, dull beneath, glabrous or slightly pubescent on the midrib and nerves, 7–20 by 3 1/2–8 cm; nerves 7–8 pairs, little prominent above, markedly so beneath, veins ± transverse and little prominent on both sides, reticulations rather lax; petiole 8–15 mm. Stipules ovate-lanceolate, pubescent, 7–8 by 2 mm, rather soon caducous. ♂ *Flowers* in dense, sessile, supra-axillary clusters, densely rusty-pubescent all over. Pedicels 1–3 mm. *Sepals* ovate-elliptic, obtuse, 2 by 1 1/2 mm. *Petals* obovate, white, *c.* 1 mm long, densely rufous-papillose on both sides; scales minute, densely white-pilose, reddish when dry. Filaments fleshy, densely ferrugineous-papillose, hardly 1 mm. ♀ *Flowers* unknown. Young fruit subglobose, ferrugineous-tomentose, with 3 bifid, reflexed stigmas. *Fruit* globose, 4–5 cm diam., sordidly yellow-green, rufo-tomentose-punctate, with thin fragile pericarp; peduncle thick, 5 mm. *Seeds* 1–3, oblong-trigonous, 2 1/2–3 by 1 1/2 cm; testa striate-maculate.

Distr. *Malaysia:* Br. N. & SE. Borneo.

Ecol. Primary forest on hilly ground, 130–200 m.

Vern. *Malantidang*, M.

16. Hydnocarpus alcalae C. DC. Philip. J. Sc. 11 (1916) Bot. 37; MERR. En. Philip. 3 (1923) 107; SANTOS & WEST, Philip. J. Sc. 40 (1929) 485; TOLENTINO-VALLARTA, Nat. & Appl. Sc. Bull. Univ. Philip. 5 (1936) 27; SLEUM. Bot. Jahrb. 69 (1938) 55, 78; BROWN, Useful Pl. Philip. 2 (1950) 507, f. 237; QUIS. Med. Pl. Philip. (1951) 628.

Tree, 4–7 m, or shrub; branchlets glabrous. *Leaves* ovate-oblong, acuminate at the apex, very inequilateral at base, subcoriaceous, firm, shining, olivaceous when dry, glabrous, entire or shallow-crenate, 15–25 by 7–11 cm; midrib little prominent above, markedly raised beneath, lateral nerves prominent beneath, veins transversal, reticulations distinct but little raised; petiole stout, glabrous, *c.* 1 cm. Stipules not seen. *Flowers* in pseudo-racemose, glabrous panicles, ♂ in fascicles of 3 or 4, ♀ solitary from the trunk or big branches, each panicle 15–30(–60) cm long, with very distantly arranged, reduced cymes; cymes subsessile to 1–2 mm long, peduncled, bearing 2–4 fascicled flowers on top. Pedicels 1 1/4–2 cm. ♂ *Flowers: sepals* ovate, greenish, 1 1/4 by 3/4 cm. *Petals* elliptic, greenish-white or cream, villose at margin, *c.* 0.8 by 0.6 cm; scales ovate, densely white-pilose specially at the apex, glabrous near the base, fleshy, 5 by 3 1/2 mm. Filaments *c.* 10 mm, thickened at the base, glabrous; anthers cordate-oblong, 5 by 3 mm. ♀ *Flowers:* similar to the ♂ ones, but slightly larger. Pedicels 1 1/4–4 cm. *Sepals* 1 1/4–2 by 1–1 1/2 cm. *Petals* 1.1–1.2 by 0.8–1 cm. Filaments 7–8 mm; anthers sterile, 2–3 mm. *Ovary* elliptic, yellowish stellate-velvety; stigmas 5–7, slightly stellate-pubescent. *Fruit* very large, obovoid, pendent, 15–31 by 8–15(–20) cm, dark-brown with purple and greenish spots, somewhat rugose, reticulate by numerous fissures when dry. *Seeds* 80–110, subglobular-ellipsoid, 3–5 by 2 1/2–3 cm, polyedric, with a light-yellow aril, embedded in a fragrant, adstringent pulp.

Distr. *Malaysia:* Philippines: S. Luzon (Albay Prov.), now planted and naturalized on Mt Maquiling (Laguna Prov.) and elsewhere.

Ecol. Damp ravines at low altitudes.

Uses. This species possesses the largest fruits known in the genus. The oil extracted from the seeds yields chaulmoogric and hydnocarpic acid and is used by the Filipinos as a good cure for wounds.

Vern. *Dúdu* or *dudóa*, Bik.

17. Hydnocarpus cauliflora MERR. Philip. J. Sc. 9 (1914) 323; En. Philip. 3 (1923) 107; SLEUM. Bot. Jahrb. 69 (1938) 56.

Small tree, glabrous, the inflorescences excepted. *Leaves* broadly oblong to ovate-oblong, shortly acuminate at the apex, attenuate to cordate-rounded at the base, chartaceous or subcoriaceous, shining on both sides, entire, 23–30 by 9–12 cm; nerves prominent and conjunct along the margin, veins ± transverse, reticulations little prominent. *Racemelike panicles* from the trunk fulvous-tomentose all over, 5–15 cm. ♂ *Flowers:* pedicels stout, 3 mm, subtended by an attenuate-oblong bract, 2 mm long. *Sepals* rounded, villose, 5 mm. *Petals* elliptic, rounded at the apex, thinner than the sepals, 3 mm, laxly appressed pilose outside; scales 1 mm, slightly lobed. Filaments 1 1/2 mm; anthers ovate, 1–1.2 mm. ♀ *Flowers* unknown. *Fruit* globose, *c.* 8 cm across, with several compressed, ovoid seeds, 2 by 1 1/2 cm; pericarp rather fragile.

Distr. *Malaysia:* Philippines: Mindanao (Cotabato Prov.).

Ecol. In primary *Dipterocarp*-forest at low altitude.

18. Hydnocarpus cucurbitina KING, J. As. Soc. Beng. 59, ii (1890) 120; Ann. R. Bot. Gard. Calc. 5 (1896) 129, t. 149; RIDL. Fl. Mal. Pen. 1 (1922) 161; SLEUM. Bot. Jahrb. 69 (1938) 34.

Tree 20–25 m; branches spreading, hanging, innovations ferrugineous-pubescent. *Leaves* oblong or elliptic-oblong, ± abruptly and obtusely subfalcate-acuminate, cuneate at the base, subcoriaceous, entire, rather shining, 8 1/2–12 1/2 by 3 1/2–5 1/2 cm; nerves arcuate, as the veins slightly but distinctly prominent. ♂ *Inflorescence* subcymose, ferrugineous-tomentose, 1–1 1/2 cm peduncled, 3–6-branched. Pedicels 8 mm. *Sepals*

ovate, ferrugineous-pubescent outside, *c.* 3½ by 1½–2 mm. *Petals* ovate-rounded, pale green, glabrous, membranous; scales fleshy, ciliate, nearly as large as the petals. Filaments short, nearly conical, 1½ mm; anthers ovate-cordate, 2 mm. ♀ *Flowers* solitary or in twos. Pedicels shorter, but sepals and petals similar as in the ♂ flowers. *Ovary* subcylindrical, glossy ferrugineous-tomentose. *Fruit* narrow-obovoid or cylindrical, mamillate at the apex, contracted at the base, pale green when fresh, dark brown when dry, glabrescent, 7½–1½ by 2½ cm; peduncle thick, *c.* 2½ cm. *Seeds* few, *c.* 2½ cm long.

Distr. *Malaysia:* Malay Peninsula (Perak: Goping).

Ecol. Open jungle, 150–350 m.

19. Hydnocarpus beccariana SLEUM. Bot. Jahrb. 69 (1938) 50.

Tree, young branches rather terete, slender, glabrous. *Leaves* oblong-ovate, gradually acuminate, cuspidate and acute at the very tip, rounded at the base, somewhat inequilateral, coriaceous, glabrous, entire, brown and shining when dry, (9–)12–18 by 3½–5½ cm; midrib prominent on both sides, nerves 9–10 pairs, curved-ascending towards the margin, little prominent above, more so beneath, veins densely reticulate and prominent on both sides, specially beneath; petiole 6–8 mm, very thickened at the apex, rugose. Stipules not seen. ♂ *Flowers* in 2–3-flowered dichasia; peduncle 0.6–1.3 cm. Pedicels rather thick (1–)1½–2½ cm, as the sepals ferrugineous-velvety by stellate hairs. *Sepals* broadly-oblong, 1.2–1.5 by ½–0.6(–0.8) cm, inside rubescent and greyish-sericeous. *Petals* oblong, purpurascent when dry, glabrous, fleshy, 1–1.3 by 0.4–0.5 cm, each including a fleshy, oblong, densely pilose scale nearly as long as the petals, but much narrower. Filaments slender, somewhat broadened at the base, glabrous, 5 mm; anthers oblong, 5–6 by *c.* 2 mm. ♀ *Flowers* not known. *Fruit* solitary, oblong to subovoid-oblong, slightly narrowed at the base, very attenuate at the apex, 1.5–2 by 0.6 cm, densely minutely tuberculate, rusty-velvety, 8 by 3 cm; peduncle 0.8 by 0.7 cm; pericarp rather thin. *Seeds c.* 10, variously angular, 1.2 by 1 cm.

Distr. *Malaysia:* Borneo (Sarawak: Kuching), once found.

20. Hydnocarpus borneensis SLEUM. Bot. Jahrb. 69 (1938) 52; AIRY SHAW, Kew Bull. (1949) 158.— *H. hutchinsonii* (*non* MERR. 1920) MERR. Pl. Elm. Born. (1929) 207.

Tree, (4–)10–18(–30) m; young branchlets initially covered with rusty, fascicled and simple hairs, soon glabrescent. *Leaves* oblong to broadly-oblong, ± abruptly acuminate, mostly inequilateral at the base, subcoriaceous, first laxly fasciculate-pilose on midrib and nerves, specially beneath, later glabrous, shining and olivaceous or brown above when dry, dull red-brown beneath, 15–30 by 6–9 cm; midrib little prominent above, manifestly so beneath, nerves mostly a little impressed above, very prominent beneath, reticulations distinct only beneath; petiole 1–1½ cm. Stipules ovate-lanceolate, 7 by 2 mm, pubescent, rather early caducous. *Cymes* rusty-tomentose all over, reduced to (2–)3 or 4 'white and yellow' or greenish-white, fragrant flowers; peduncle 3–6 mm only, stout. Pedicels of the ♂ flowers rather slender 1½–2 cm, those of the ♀ ones shorter and stouter, *c.* 5 by 2 mm. *Sepals* ovate, 10–12 by 6 mm, finely and densely ferrugineous-tomentose outside, greyish-pubescent inside. *Petals* white to yellowish, oblong, rather dark-purple when dry, glabrous, involute, 12–15 by 4 mm; scales lanceolate, 10 by 2 mm, pilose towards the apex. ♂ *Flowers:* filaments thick, elongate-triangular, 5 mm; anthers oblong-subsagittate, 5 mm. Rudiment of ovary hirsute. ♀ *Flowers:* filaments deltoid, 1½ mm, fleshy; anthers 0. *Ovary* elongate-ovoid, yellowish-tomentose, cylindrically contracted towards the apex; stigma nearly peltate, lobes very short. *Fruit* depressed-ovoid or bottle-shaped, contracted at the apex or apiculate, fulvous-tomentose, 6–8 by *c.* 4 cm when fully developed, upper attenuate part 1–1½ cm long; pericarp thin. *Seeds* 8–10, *c.* 2 cm across.

Distr. *Malaysia:* Borneo (Br. N. Borneo; Sarawak: Mt Dulit).

Ecol. In primary *Dipterocarp*-forest at low altitudes in hilly or steep localities.

Uses. Wood hard.

Vern. *Andara, madansat,* Kwijau, *pasir-pasir, nangka-nangka,* M, *ĕmpupuak,* Dusun.

21. Hydnocarpus filipes SYMINGTON & SLEUM. Bot. Jahrb. 69 (1938) 40.

Tree; young branchlets slender, angular, glabrous or nearly so, brownish. *Leaves* oblong, subcaudate-acuminate (1–2 cm), cuneate at the base, slightly inequilateral, chartaceous to subcoriaceous, glabrous, olivaceous above and brown beneath when dry, entire, 9–14(–20) by 3–5½(–7½) cm; midrib raised above, very prominent beneath, nerves 6(–7) pairs curved-ascending, veins rather densely reticulate and prominent on both sides; petiole slender, thickened at the apex, 1–1.6 cm, dark when dry. Stipules not seen. Flowers always solitary. Pedicels 2–2½(–3) cm, filiform, laxly fulvous-tomentose. ♂ *Flowers: sepals* oblong, ferrugineous-velvety on both sides, 8–10 by 4 mm. *Petals* elongate-oblong, purpurascent when dry, glabrous, 11–13 by 3 mm; scales narrow-oblong, pilose at the apex, 6–7 by 1½ mm; anthers oblong, 3½ mm; filaments subulate, glabrous, 2½–3 mm. ♀ *Flowers:* sepals and petals similar to those of ♂ flowers, but larger *viz* 5, respectively 5–6 mm wide. Filaments elongate-triangular, 2–2½ mm. *Ovary* ovoid, contracted at the apex, fulvous-tomentose. *Fruit* globose to subglobose, 4–6(–6½) cm diam., fulvous-velvety and provided with minute warts; peduncle 3 cm long, 3–4 mm thick. *Seeds c.* 12.

Distr. *Malaysia:* Malay Peninsula (Selangor, Pahang, Trengganu).

Vern. *Sĕtumpol,* M.

22. Hydnocarpus castanea HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 197; KING, J. As. Soc. Beng. 59, ii

(1890) 118; KURZ, For. Fl. Burma 1 (1877) 77; RIDL. J. Str. Br. R. As. Soc. *no* 59 (1911) 72; Fl. Mal. Pen. 1 (1922) 159; CRAIB, Fl. Siam. En. 1 (1925) 96; HENDERS. Gard. Bull. Str. Settl. 4 (1926) 93; SLEUM. Bot. Jahrb. 69 (1938) 38; HENDERS. J. Mal. Br. R. As. Soc. 17 (1939) 36.

Glabrous tree, 15–20(–30) m, up to 60 cm diam.; bark pale whitish grey or brownish, smooth; branches stout, angular, smooth, glabrous. *Leaves* elliptic-oblong or oblong, gradually attenuate and rather abruptly acuminate, ± rounded at the base, slightly inequilateral, coriaceous, entire, ± shining, red-brown when dry, (13–)17–30(–35) by (5–)6½–8(–12) cm; nerves 6–7(–8) pairs, curved-ascending, prominent specially beneath, veins ± densely reticulate, little raised above, more distinct so beneath; petiole stout, thickened at both ends, 1½–2 cm. Stipules linear-oblong, rusty-tomentose, 4 mm, very early caducous, leaving pale scars. *Flowers* white, sweet-scented. ♂ *Flowers:* cymes few-flowered, 2–3 mm peduncled or the flowers essentially in fascicles, rusty-pubescent all over. *Sepals* obovate, 6–7 by 4–5 mm, greyish-tomentulose inside. *Petals* narrow-oblong, 8–11 by 3 mm, glabrous; scales linear, 7 by 1½ mm, pilose at the apex. Filaments subulate, glabrous, 2½ mm; anthers oblong-cordate, 2½ mm. Rudiment of the ovary rufous-tomentose. ♀ *Flowers:* pedicels 1½–2½ cm. Sepals and petals similar to those of ♂ flowers, but 8–11 by 5, resp. 12–15 by 3–4 mm; scale 11 mm. Filaments subulate, thick, 2 mm, without anthers. *Ovary* ovoid, contracted into a conical beak, yellowish-tomentose. *Fruit* globose or depressed-globose, (4–)5–6½ cm diam., minutely rugose, rather scurfy, first fulvous-velvety, glabrescent. *Seeds c.* 20–30, densely packed and variously angled, 2.5–3.3 by 1.8–2.5 cm.

Distr. Tenasserim, S. Siam, in *Malaysia:* Sumatra (Asahan), Malay Peninsula (Perak, Kedah, Langkawi, Pahang, Selangor, Dindings, Penang, Malacca).

Ecol. Dense forests, swampy ground, often along small streams, 100–150 m, also on limestone cliff bases. Reported by HENDERSON (1926) from Frazer Hill (Selangor), at 1100–1200 m (material not seen).

Uses. Wood whitish.

Vern. *Kula*, Pattani, *alai batu*, M, *těngkurak lang*, *těmbikar periyok*, Kedah, *gěnggulak*, Perak.

23. Hydnocarpus scortechinii KING, J. As. Soc. Beng. 59, ii (1890) 120; RIDL. Fl. Mal. Pen. 1 (1922) 161; SLEUM. Bot. Jahrb. 69 (1938) 35.

Glabrous tree. *Leaves* subovate-elliptic-oblong or elliptic, abruptly narrowly caudate-acuminate, rounded at the base, slightly inequilateral, subcoriaceous, shining, entire, 12½–17 by 6½–8½ cm; nerves curved-ascending and little prominent on both sides, veins distinctly and densely reticulate. ♂ *Flowers:* peduncle rusty-tomentose, 1–1½ cm; pedicels *c.* 1.8 cm. *Sepals* oblong-elliptic, obtuse, rusty-velvety outside, greyish-puberulous inside, 8–9 by 4 mm. *Petals* glabrous, purpurascent when dry, 8–9 by 3 mm; scales linear, 5 by 1 mm, ciliate. Filaments conical, 2 mm; anthers oblong, 4 mm. ♀ *Flowers:* solitary, rarely 2. *Sepals* and *petals* similar to those of the ♂ flowers, but slightly larger. Pedicel stout, 2–3 mm. *Ovary* ovoid, subcylindrically attenuate in the upper part, yellowish or greyish-tomentose, slightly 5-ribbed. *Fruit* ovoid, rather glabrous, with 5 longitudinal ribs, 3(–5) by 2½ cm. *Seeds* 2–5, 1½ by 1¼ cm.

Distr. *Malaysia:* Malay Peninsula (Dindings: P. Pangkor).

Note. This species comes nearest to *H. curtisii.*

24. Hydnocarpus curtisii KING, J. As. Soc. Beng. 59, ii (1890) 119; Ann. R. Bot. Gard. Calc. 5 (1896) 129, t. 148; RIDL. Fl. Mal. Pen. 1 (1922) 160, f. 18; ROCK, U.S. Dep. Agr. Bull. *no* 1057 (1922) 14; CRAIB, Fl. Siam. En. 1 (1925) 96; SLEUM. Bot. Jahrb. 69 (1938) 36.

Tree 5–8 m, rarely shrub, branchlets glabrous. *Leaves* lanceolate-oblong, rarely ovate-oblong, somewhat inequilateral and ± rounded at the base, rather abruptly acuminate at the apex, subcoriaceous, entire, glabrous, shining on both surfaces, (15–) *c.* 20(–30) by 5½–7½ cm; midrib prominent specially below, nerves arcuate, sometimes slightly impressed above, prominent beneath, reticulations rather dense and raised on both sides; petiole 5–10 mm. ♂ *Flowers* in small, few-flowered cymes; peduncle ½–1 cm. Pedicels rusty-puberulous, *c.* 1.9 cm. *Sepals* elliptic-ovate, minutely rusty-pubescent outside, 8 by 4 mm. *Petals* narrow-oblong, nearly glabrous, 1.2 by 0.3–0.4 cm; scales linear, 6 by 1½ mm, nearly glabrous. Filaments 2½ mm; anthers 3½ mm. ♀ *Flowers* subsolitary. Pedicels 6–15 mm. Sepals and petals slightly larger than in the ♂ flowers. *Ovary* elongate-ovoid, fulvous-tomentose, obscurely 5-costate near the apex. *Fruit* subglobose-ovoid, protracted at the apex, slightly 5-sulcate, yellowish-velutinous when dry, 3.7–4 by 2½ cm. *Seeds* 5–6, *c.* 1 cm long.

Distr. S. Siam (Surat), in *Malaysia:* Malay Peninsula (Langkawi, Penang, Pahang, Johore, Negri Sembilan).

Vern. *Kikir buntal*, M.

Note. Differs from *H. sumatrana* only by the smaller fruit; both species have very similar leaves.

25. Hydnocarpus sumatrana (MIQ.) KOORD. Exk. Fl. Java 2 (1912) 631; SLOOT. Bijdr. Flac. (1919) 65; Bull. Jard. Bot. Btzg III, 7 (1925) 312; SLEUM. Bot. Jahrb. 69 (1938) 51.—*Bergsmia sumatrana* MIQ. Fl. Ind. Bat. Suppl. (1860) 159, 389; KOORD. & VAL. Bijdr. Booms. Java 5 (1900) 33; KOORD. Atlas Baumarten 2 (1914) f. 348.—*Ryparosa sumatrana* WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21. —*H. hutchinsonii* MERR. Philip. J. Sc. 17 (1920) 291; En. Philip. 3 (1923) 107; PERK. & CRUZ, Philip. J. Sc. 23 (1923) 548; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 313; SLEUM. Bot. Jahrb. 69 (1938) 54; BROWN, Useful Pl. Philip. 2 (1950) f. 238.

var. **sumatrana.** Tree (7–)15–25 m; tips of branches ferrugineous-sericeous. *Leaves* oblong or subovate-oblong, rarely lanceolate-oblong, ± abrupt-acumi-

nate, distinctly inequilateral at base, coriaceous to subcoriaceous, entire, shining, reddish-brown when dry, glabrous (sometimes very laxly pilose on midrib and nerves beneath), (13–)15–25(–33) by 5–9(–12) cm; midrib prominent on both sides, nerves little prominent or slightly impressed above, distinct beneath, veins densely reticulate and rather prominent on both sides; petiole 1–1½(–2) cm. Stipules not seen, apparently very early caducous. ♂ *Flowers* in 2–4-flowered cymes; peduncles 0.8–1.4 cm, rusty-pubescent. Pedicels rather slender, 1½–2 cm, somewhat thickened at the apex, rusty-velvety. *Sepals* greenish-white, ovate-oblong, ferrugineous-tomentose on both sides, 8–11 by 4–6 mm. *Petals* oblong, glabrous, 11–13 by 4–5 mm, involute, probably white *in vivo*, but intensively red-coloured when dry; scales linear-oblong, fleshy, ciliate, 7–10 by 1–1½ mm. Filaments subulate, glabrous, 3–5 mm; anthers oblong, 4 mm. Rudiment of ovary pilose. ♀ *Flowers* 1–2, *c.* 1½–2½ cm peduncled. *Sepals* slightly larger than in the ♂ flowers, up to 16 by 6 mm, but *petals* similar to those in the ♂ flowers. Filaments elongate-deltoid, obtuse, 2 mm, appressed to the ovary. *Ovary* ovoid, contracted at the apex, densely fulvous-pilose, distinctly sulcate lengthwise. *Fruit* subglobose to ovoid-globose, slightly attenuate and sulcate at the apex or apiculate, densely fulvous-tomentulose and provided with fine tubercles, 4–6(–8) cm across; pericarp thin, fragile. *Seeds* (10–)20–30(–45), irregularly compressed, 2 by 1½ cm.

Distr. *Malaysia:* Sumatra, S. Central Java (Banjumas), Br. N. & SE. Borneo, Celebes (S. & SE. Celebes, Manado), Philippines (Mindanao, Basilan, Tawi-Tawi).

Ecol. In rain-forests on never inundated, sandy or clayey soil and hilly or steep ground, scattered, 30–200 m. *Fl.* Aug.–Dec., *fr.* Sept.–June.

Vern. *Buntut kaju*, Palembang, *limus buntu*, J, *lěmonuh, ingleoh, madansat, nangka-nangka, andara*, Borneo, *wulosu*, S. Cel.. Philippines: *bagarbas*, Lan., *kamupang*, Sul., *mangasaluká*, *mansaloka*, *mangabo*, *mangasalokág*, Yak., *tioto*, *sugalingayau*, Sub.

var. **pentagyna** (SLOOT.) SLEUM. Bot. Jahrb. 69 (1938) 52.—*H. pentagyna* SLOOT. Bijdr. Flac. (1919) 64; Bull. Jard. Bot. Btzg III, 7 (1925) 311.—*H. curtisii* KING *var. sumatrana* BAK. *f.* J. Bot. 62 (1924) Suppl. 6.

Leaves more coriaceous, shining, smaller, 9–15 by 4½–5½ cm, with very dense and prominent reticulations.

Distr. *Malaysia:* S. Sumatra (E. Palembang Rawas River), once found, *c.* 200 m.

Note. Very similar but not quite identical specimens have been found in Borneo: Sarawak (BECCARI 2038, ♂) and N. Borneo: Mt Kinabalu (CLEMENS 32639, sterile), 1700 m, and in the Philippines: Palawan: Puerto Princesa (EDAÑO PNH 192, fr.), recently described as *H. palawanensis* MERR & QUIS., Philip. J. Sc. 82, 1953, 330, t. 3, low alt.

2. *Subsection Pleianthera*

WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21; SLEUM. Bot. Jahrb. 69 (1938) 58. Stamens (6–)7–16.

Distr. Fig. 7.

26. Hydnocarpus woodii MERR. Pl. Elm. Born. (1929) 208; SLEUM. Bot. Jahrb. 69 (1938) 60.—*H. punctifera* SLOOT. *ex* DEN BERGER, Bull. Jard. Bot. Btzg III, 9 (1928) 233, *nom. nud.*—*H. stigmatophora* SLOOT. *ex* DEN BERGER, *l.c.* 234, *nom nud.* —**Fig. 8a–e.**

Tree (18–)25–30(–37) m, glabrous the inflorescences excepted; branchlets rather thick, soon covered with grey bark. *Leaves* mostly oblong-elliptic rarely subovate-elliptic, gradually narrowed towards the apex, mostly rather abruptly contracted at the apex (1–1½ cm) and subacute, cuneate or rarely subrotundate at the base, ± equilateral, manifestly coriaceous when fully developed, stiff, olivaceous-grey-green and mostly very shining and smooth above when dry, dull and mostly brownish beneath, entire, the apical ones mostly much smaller than the lower ones, (6–)10–18 by (3½–)4–6(–7) cm; nerves mostly obscure and veins little visible above, all conspicuously prominent underneath, veins ± transverse, reticulations fine, scattered black points not rarely present; petiole 1–2(–2.7) cm. Stipules not seen, probably very early caducous. *Cymes* axillary on

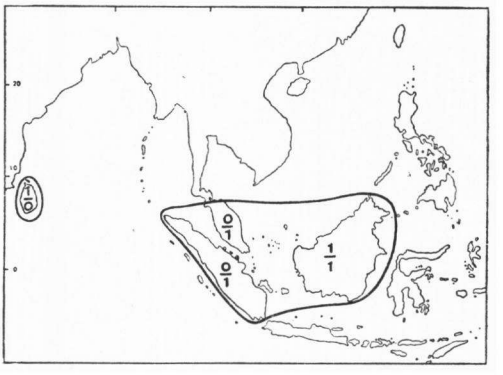

Fig. 7. Distribution of *Hydnocarpus sect. Hydnocarpus subsect. Pleianthera*. The figure above the hyphen indicates the number of endemic species in the district, the figure below the hyphen the number of non-endemic species.

leafless branchlets (possibly cauline also), few-flowered, finely rusty-pubescent; peduncles stout, up to 1 cm, with many scars. Pedicels *c.* 1 cm.

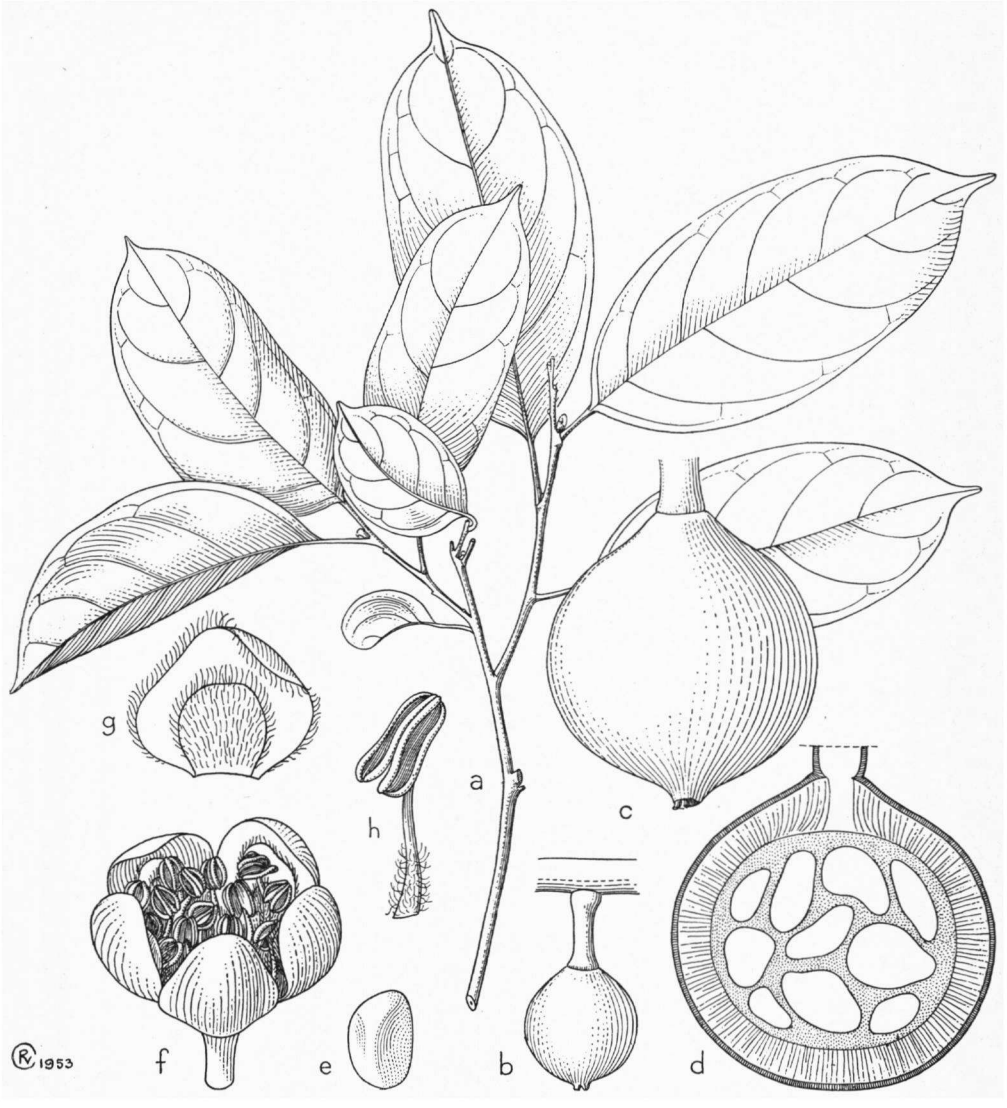

Fig. 8. *Hydnocarpus woodii* MERR. *a*. Sterile twig, × 1/2, *b*. young fruit, × 1/2, *c*. ripe fruit, × 1/2, *d*. fruit, longitudinal section, × 1/2, *e*. seed, × 1/2.—*Hydnocarpus crassifolia* SLEUM. *f*. ♂ flower, × 2, *g*. petal with scale, × 5, *h*. stamen, × 5 (*a* after Br. N. Born. For. Dep. A 830, *b* after HALLIER 3293, *c* after SING. F.N. 16396, *d* after SING. F.N. 32364, *e* after ELMER 20303, *f–h* after the type BECCARI 3972).

♂ *Flowers: sepals* elliptic-ovate or nearly orbicular, densely ferrugineous-stellate-pubescent outside, glabrous inside, 5–6 by 4 mm, the inner ones slightly larger. *Petals* membranous, white, suborbiculate, glabrous, somewhat purplish when dry, densely ciliate, 4–5 mm diam.; scales thick, oblong-elliptic, densely whitish-yellowish-villous on both sides, 2–3 mm long. Filaments subulate, ± densely whitish-pilose in their inferior half, (3–)4 mm; anthers oblong-subcordate, *c*. 2 mm.

♀ *Flowers* similar to the ♂, but with 5–7 staminodia and ovoid, ferrugineous-tomentose ovary; stigmas 4, radiate, thick, each 4 mm long. *Fruits* mostly solitary, rarely in fascicles on old branchlets, globose or mostly globose-obovoid, attenuate at the very base into a short broad stipe, (5–)7–8 cm diam., brown, somewhat rugose and mostly with many fine irregular fissures when dry, glabrous, with very thick (*c*. 1–1 1/2 cm) pericarp, exocarp dark-brown, perforated with stout, lighter-colour

ed fibres, radiating or protruding from the stony mesocarp (but not fibrous-cancellate in a distinct sense). *Seeds c.* 5–8, irregularly ovoid, (2½–) 3–3½ cm.

Distr. *Malaysia:* Sumatra (also Mentawei Isl. and Riouw), Malay Peninsula (Pahang, Negri Sembilan, Perak, Selangor, E. Johore, Malacca), Borneo.

Ecol. In rain-forests on flat or hilly, never inundated sandy, clayey or stony soil, rather common but scattered, up to 200 m.

Uses. Wood pale brown, close textured, not used.

Vern. Sumatra: *Madang miang*, W. Coast, *kaju tanah*, Palemb., *kĕrambil tupai*, Riau, *niur mentji*, *kĕlapa tikus*, Atjeh, *partangisani motji*, Tapanuli, *bo-ahlo*, *bogolo*, Mentawei. Borneo: *kĕlapa djankai*, *pinanak*, *kuhui*, *kohoi*, *londing*, *gĕmpadi*, *apa*, *pevor*, *empilis*; *karpos*, Mal.. Mal. Pen.: *sĕtumpol*, *kulau*, Selangor, Perak, *mĕndol*, Pahang.

Note. Distinct from *H. octandra* THWAIT. from Ceylon only by minor characters.

27. Hydnocarpus crassifolia SLEUM. Bot. Jahrb. 69 (1938) 61.—**Fig. 8f–h.**

Tree; branchlets stout, terete, greyish-corticate, innovations finely brown-tomentose. *Leaves* ovate to oblong-ovate, gradually acuminate, rather abruptly (1–1½ cm) contracted and acute at the apex, rounded at the base, thick-coriaceous, stiff, glabrous except the ± densely and minutely stellate-pubescent midrib beneath, rather shining above, paler beneath, brownish when dry, entire, 10–14 by 5–7 cm; midrib very prominent beneath, nerves curved, lower ones excurrent along margin, upper ones ± enarching, all nearly obscure above, little raised beneath, veins laxly reticulate and little prominent on both sides; petiole stout, 1½–2 cm. ♂ *Dichasia* axillary. Pedicels ferrugineous-puberulous, 1–1½ cm. *Sepals* 5, orbicular-elliptic, densely ferrugineous-pubescent outside, glabrous inside, greenish when fresh, *c.* 6–7 by 4 mm. *Petals* 5–6, mostly 7, suborbicular, membranous, greenish, glabrous, ciliate, *c.* 4 mm across; scales ovate, golden-villous inside, 2 mm. Filaments subulate towards the apex, flattened and whitish pilose near the base, 4 mm; anthers broad-ovate, 2 mm. ♀ *Flowers* and *fruit* unknown.

Distr. *Malaysia:* Borneo (Sarawak), once found.

Note. The inflorescences seen by me were very inadequate. The flowers described were not attached to the plant; they were said to have an unpleasant odour.

3. Section Kerrandrias

SLEUM. Bot. Jahrb. 69 (1938) 14, 61.
Petals 10. Stamens 17–24. Sepals 5.

28. Hydnocarpus calvipetala CRAIB, Kew Bull. (1928) 234; SLEUM. Bot. Jahrb. 69 (1938) 61.—*Taraktogenos calvipetala* KERR, The Record, Techn. & Sc. (Bangkok) Suppl. 7 (1930) 13.

Tree 8–10 m; young branchlets sparsely covered with appressed, fulvous hairs, soon glabrescent, with greyish bark. *Leaves* oblong, long-acuminate or caudate at the apex, ± inequilateral, cuneate or subrotundate at the base, rigidly chartaceous, glabrous, entire, 17–24 by 5–7 cm; midrib rather flat above, prominent beneath, nerves (6–)7 pairs, prominent beneath, veins transverse, numerous, subparallel and prominent. ♂ *Inflorescence* cymose, subumbelliform; peduncle stout, 1–1½ cm, secondary peduncles *c.* ½ cm long. Pedicels glabrous, thin, up to 1½ cm. ♂ *Flowers* white. *Sepals* subrotundate-elliptic, 6–8 by 4–6 mm, glabrous on both sides, ciliolate. *Petals* ± elliptic, rounded at the apex, somewhat unguiculate at the base, glabrous, ciliate towards the apex, 4(–5½) mm diam.; scales thick-carnose, broad-oblong, subtruncate at the apex, *c.* 2½ mm across, densely pilose at the apex. Filaments glabrous 2–3(–6) mm; anthers subsagittate, 3 mm, with broad connective. ♀ *Flowers* and *fruit* unknown.

Distr. S. Siam (Surat: Langsuan), 100 m, to be expected to occur in the N. part of the Malay Peninsula.

Vern. *Kabao.*

4. Section Asteriastigma

(BEDD.) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 21.—*Asteriastigma* BEDD. For. Man. Bot. (1873) t. 266 anal. pl. 27; Ic. Pl. Ind. Or. 1 (1874) 59, t. 242.—*Hydnocarpus sect. Vanslootenia* SLEUM. Bot. Jahrb. 69 (1938) 14, 62.
Sepals 4–10. Petals 8–14. Stamens 35–115.
Distr. Fig. 9.

29. Hydnocarpus anomala (MERR.) SLEUM. Bot. Jahrb. 69 (1938) 65.—*Taraktogenos anomala* MERR. Philip. J. Sc. 29 (1926) 401.—*H. lasionema* AIRY SHAW, Kew Bull. (1949) 157.

Buttressed tree (10–)20–25(–50) m; bark smooth, scaling-off in small irregular pieces; branchlets densely rusty-stellate-pubescent. *Leaves* oblong or elliptic-oblong (rarely oblanceolate), shortly (1–1½ cm) cuspidate, ± rounded to cuneate, rarely subcordate at the base, mostly slightly inequilateral, entire, chartaceous to subcoriaceous, ± shining and dark-brown when dry, glabrous above,

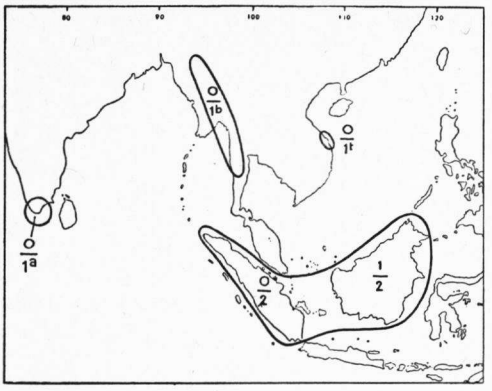

Fig. 9. Distribution of *Hydnocarpus sect. Asteriastigma*. The figure above the hyphen indicates the number of endemic species in the island or area, the figure below the hyphen the number of non-endemic species, eventually followed by *a* and *b* for different subspecies.

± densely to sparsely covered with fine, fascicled or mostly stellate, ferrugineous hairs beneath, specially on midrib and lateral nerves, (10–)15–22 (–25) by 5–9 cm; midrib and nerves flat above, very prominent beneath, nerves 5–7(–8) suberect, excurrent at the leaf-margin, veins ± transverse, slightly prominent above, more so beneath, rather laxly reticulate with venules; petiole ± densely rusty-stellate-pubescent, 2–3 cm. ♂ *Cymes* mostly few-flowered, minutely rusty-stellate-puberulous; rhachis stoutish, 1–4 cm long. Pedicels rather slender, 1–2½(–3) cm long, articulated at the base with the very short peduncle. *Sepals* (4–)5–6(–7), broad-ovate, chartaceous, light-green, outer 2–3 concave, *c.* 1–1½ cm diam., glabrous inside, inner ones membranous, smaller, glabrous on both sides but the innermost 1–2 sometimes with a pubescent longitudinal stripe on their back and subpetaloid, always without scales. *Petals* white, outer ones obovate, 1–1½ by 0.8 cm, inner ones gradually smaller, 10 by 3–2 mm, all densely covered with appressed, golden sericeous hairs outside, glabrous inside and with a basal, ± obovate, thick, golden-haired scale 3–5 mm. Stamens 35–50; filaments 6–9 mm, subulate, incrassate at the base and with longish, golden hairs in the lower part, glabrescent towards the apex; anthers oblong-elliptic, 3–4 mm. ♀ *Flowers* not yet known. *Fruit* globose, green, glabrous, 8½–10 cm diam.; peduncle 2½ cm long, 1 cm thick; pericarp fibrose.

Distr. *Malaysia:* Borneo (also Banguey Isl.).

Ecol. In primary forests on hilly, sloping to steep, never inundated sandy or clayey soil, 90–400 m.

Uses. Heart-wood light brown, used in native house-building.

Vern. *Jaui*, Kayan, *djangan*, *pajang balaan*, *tetek*, Dayak, *kaju ulan*, Kaju, *oparan bukit*, S. Kinabatangan.

30. Hydnocarpus gracilis (SLOOT.) SLEUM. Bot. Jahrb. 69 (1938) 64.—*Taraktogenos gracilis* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 301, f. 2.

Tree 25–35 m; branchlets slender, glabrous, the laxly rusty-pilose tips excepted. *Leaves* oblong-lanceolate, subcuspidate-acuminate and acute at the apex, cuneate at the base, ± inequilateral, chartaceous to subcoriaceous, olivaceous and ± dull when dry, mostly a little rough on both sides by numerous minute tubercles, practically glabrous or very scarcely appressed-pilose specially on midrib and nerves beneath, finely crenulate or mostly subentire, 10–15(–18) by 3½–5½(–6½) cm; midrib and nerves somewhat prominent on both sides, nerves 6–7 pairs, arcuate, excurrent along the margin, veins ± transverse, rather densely and prominently reticulate on both sides; petiole 1–1½ cm. Stipules minute, densely rusty-pilose, early deciduous. ♂ *Flowers* in few-flowered cymes; peduncle thick, striate, fulvous-puberulous, ½–1 cm. Pedicels stoutish, thickened towards the apex, glabrous, 1–1¼ cm. *Sepals* 8–10(–11), ± orbicular, unequal, *c.* 5–8 mm diam., glabrous on both faces, ciliate. *Petals* 12(–14), variable in size, outer ones spathulate, inner ones oblong to lanceolate, membranous, erose at the apex, long-fimbriate, 6–7 by 5–2½ mm; scales subquadrate, 2 mm, manifestly shortly lobed at the apex, fleshy, glabrous. Filaments slender, densely set with patent, whitish hairs, 4–5 mm. Rudiment of the ovary minute, pilose. ♀ *Flowers* similar to the ♂, but mostly solitary, with numerous staminodes. *Ovary* ovoid, rusty-velvety, with 5 radiate, large, ± bilobed stigmas. *Fruit* globose, somewhat depressed, densely nigrescent-velvety, 6–8½(–11) cm diam.; exocarp fibrous; peduncle 3–4 by 1½–2½ cm, very thickened upwards.

Distr. *Malaysia:* Sumatra (Atjeh, East Coast, Palembang, Bencoolen), SE. Borneo.

Ecol. In never or periodically (during the west-monsoon) inundated forest on level or hilly ground and clayey or sandy soil, rather common but scattered, 10–100 m.

Vern. *Kaju sĕbija*, *manau*, *simarbanban*, *kudin*, *lontar kuning*, Sumatra, *mata ulat*, *kĕrsik*, Atjeh, *karup*, *gisak*, *babot*, *enta buruk*, *bĕlangian*, *rasak lagar*, *umpasdungan*, *talan*, Borneo.

31. Hydnocarpus polypetala (SLOOT.) SLEUM. Bot. Jahrb. 69 (1938) 62.—*Taraktogenos polypetala* SLOOT. Bijdr. Flac. (1919) 74; Bull. Jard. Bot. Btzg III, 7 (1925) 297, f. 1; HEYNE, Nutt. Pl. (1927) 1135.—*Taraktogenos grandiflora* MERR. J. Str. Br. R. As. Soc. *no* 86 (1922) 332.—**Fig. 10.**

Tree 7–20 m; bark pale brown, cracked; young branches, inflorescences and leaves beneath on midrib and nerves ± densely ferrugineous-pubescent, otherwise glabrous or nearly so. *Leaves* oblong to elliptic-oblong, rarely lanceolate-oblong, abruptly (1–2 cm) acuminate at the apex, subrounded at the base, slightly inequilateral, subcoriaceous, entire, red-brown and mostly dull when dry, 16–35 by 6½–11 cm; midrib and nerves little distinct above, very prominent beneath, nerves in 9–12 pairs, curved-anastomosing, veins

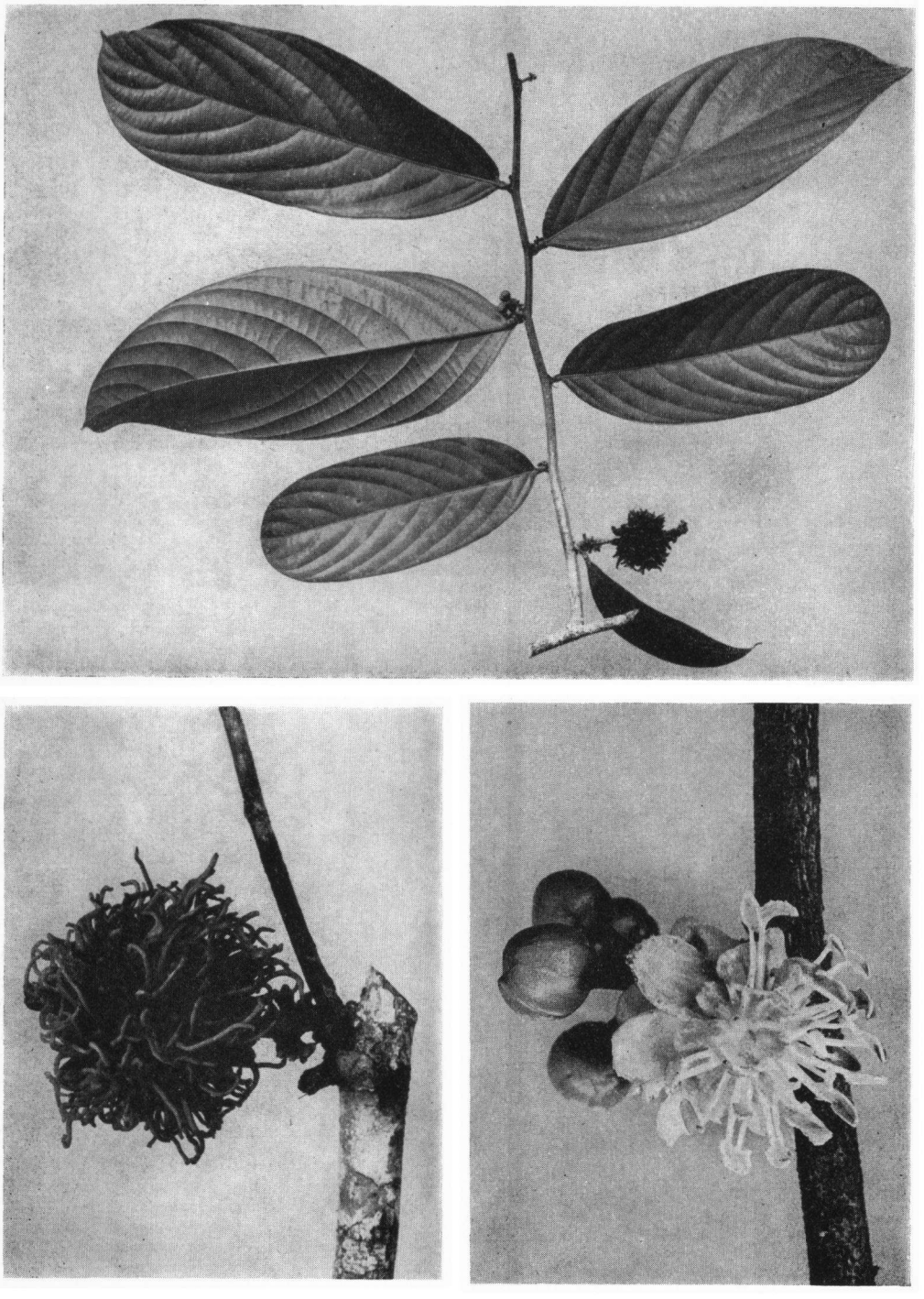

Fig. 10. *Hydnocarpus polypetala* (SLOOT.) SLEUM. Above, fruiting twig, × 1/5, below, immature fruit ± nat. size and flower nat. size (C.H.B. IV–F–25).

subparallel, reticulations prominent; petiole 5–8 mm. Stipules oblong-lanceolate, subpersistent, 6–11 by 3 mm. *Cymes* compact, sometimes 3–4 fasciculate, few-flowered, ± densely ferrugineous-pubescent; peduncle stout, 1 cm. Pedicels 1¼–1½(–2½) cm. ♂ *Flowers: Sepals* 8–10, yellow-green, orbicular, very unequal, the 2 outer ones 1½ cm diam., 2 subsequent ones 2 cm diam., inner ones gradually smaller, all glabrous. *Petals* white or greenish, 8–12, ± obovate, unequal, outer ones ± oblong, *c.* 1 by 0.8 cm, inner ones orbicular to ovate, nearly glabrous, gradually decreasing in size, 9–7 by 8–5 mm, all fimbriate; scales thick, sulcate, ± densely brownish-pubescent, 3–4 by 1½–3 mm. Filaments slender, glabrous, 1 cm; anthers elliptic, 3–4 mm. Rudiment of ovary pilose, 2 mm. ♀ *Flowers* as the ♂ ones, but staminodes numerous; anthers sterile and slightly smaller in size. *Ovary* ovoid, ferrugineous-velvety; stigmas 5, radiate, flat, dilated and irregularly bilobed at the apex, blackish. *Fruit* globose, *c.* 9 cm diam., densely covered with numerous, irregular appendages, these flat, elongate-triangular and obtuse, softly ferrugineous-tomentose, *c.* 5–10 mm long, coherent at their bases and forming ± longitudinal crests. *Seeds c.* 20, *c.* 2 by 1 cm.

Distr. *Malaysia:* Sumatra (Palembang), Borneo. A specimen cultivated in Hort. Bog. is stated to have come from Banka.

Ecol. In primary forest on level, never inundated localities, on sandy or clayey soil, along riverbanks, mostly scattered, seldom gregarious, 10–600 m.

Uses. Wood light-brown. Oil is extracted from the seeds.

Vern. *Pětjah periuk*, Palembang, *kělapa bout*, W. Central Borneo, *namih*, *baliutod*, *pěgalasong*, Br. N. Borneo.

Excluded

Hydnocarpus moluccana (ROXB.) SPR. Syst. 4 *cur. post.* (1827) 93.—*Vareca moluccana* ROXB. Hort. Beng. (1814) 18, *nomen nudum;* Fl. Ind. ed. CAREY 1 (1832) 647; BENN. & BR. Pl. Jav. Rar. 3 (1844) 209. Ins. Molucc. *cf.* WIGHT & ARN. Prod. 1 (1834) 30 = possibly *Rinorea* (*Violaceae*).

Hydnocarpus laevis MIQ. Fl. Ind. Bat. Suppl. (1860) 159, 388; BOERL. Cat. Hort. Bog. 1 (1899) 54 = *Cyclostemon laevis* (MIQ.) J. J. S. Ic. Bog. 4 (1910) t. 307, 308 = *Drypetes laevis* (MIQ.) PAX & HOFFM. Pfl. R. Heft 81 (1922) 240.

Hydnocarpus tamiana PULLE, Nova Guinea 8 (1912) 671 = *Aphania cuspidata* (BL.) RADLK. (*Sapindaceae*) and not as VAN SLOOTEN assumed belonging to *Durandea*, *cf.* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 314; Nova Guinea 14 (1927) 194.

Hydnocarpus unonifolia ELMER, Leafl. Philip. Bot. 5 (1913) 1779; MERR. En. Philip. 3 (1923) 108; SLEUM. Bot. Jahrb. 69 (1938) 57 = *Annonacea* (*cf. Orophea* or *Mitrephora*)!

Hydnocarpus sp.? HASSK. Neuer Schlüssel zu RUMPHIUS Herb. Amb., in Abh. Naturf. Gesellsch. 9, 2 (1866) 333.—*Malum aruanum* RUMPH. Herb. Amb. 7 (1755) 55, t. 24, f. 1.

After RUMPHIUS known from the Aru Islands as *caim gulur*. This is apparently no *Flacourtiacea*, *cf.* MERR. Interpr. Rumph. Herb. Amb. (1917) 510; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 307.

7. SCAPHOCALYX

RIDLEY, J. Bot. 58 (1920) 148; Fl. Mal. Pen. 1 (1922) 163.—**Fig. 11.**

Dioecious trees. *Leaves* alternate, triplinerved from the base, with many nerves at ± right angles from the midrib and ladder-like parallel to each other. Stipules not present. ♂ *Flowers* in axillary or slightly supra-axillary, few-flowered fascicles inserted on top of agglomerate, very short tubercles (*i.e.* reduced peduncles of an originally cymose inflorescence), both on young shoots and old wood. Pedicels elongate, very slender, articulated at the base. Bracts 0. *Calyx* membranous, closed in bud, spathaceous, reflexed in anthesis. *Petals* 5(–6), imbricate, narrow-oblong, slightly connate at the base, membranous, each provided with a narrow-triangular scale up to 1/3 of the length of the petal at the base inside. *Stamens* 5–6(–7); filaments subulate, covered with long, papillose, white hairs in their lower part, glabrous towards the filiform tip; anthers versatile, linear-oblong, shortly cordate at the base, dorsifix near the base. Rudiment of ovary 0. ♀ *Flowers* not yet known. *Capsule* rather large, indehiscent, globose, crowned by (4–)6–7(–8) minute stigmas, with several seeds embedded in a pulp; pericarp thin-leathery, fragile. *Seeds* ovoid-oblong, irregularly compressed, with membranous aril; testa smooth, rather hard; endosperm albuminous-oily; embryo straight; cotyledons vertical, reniform, foliaceous; radicula very thick, short, transverse as is the embryo.

Distr. Two *spp.* in the Malay Peninsula.

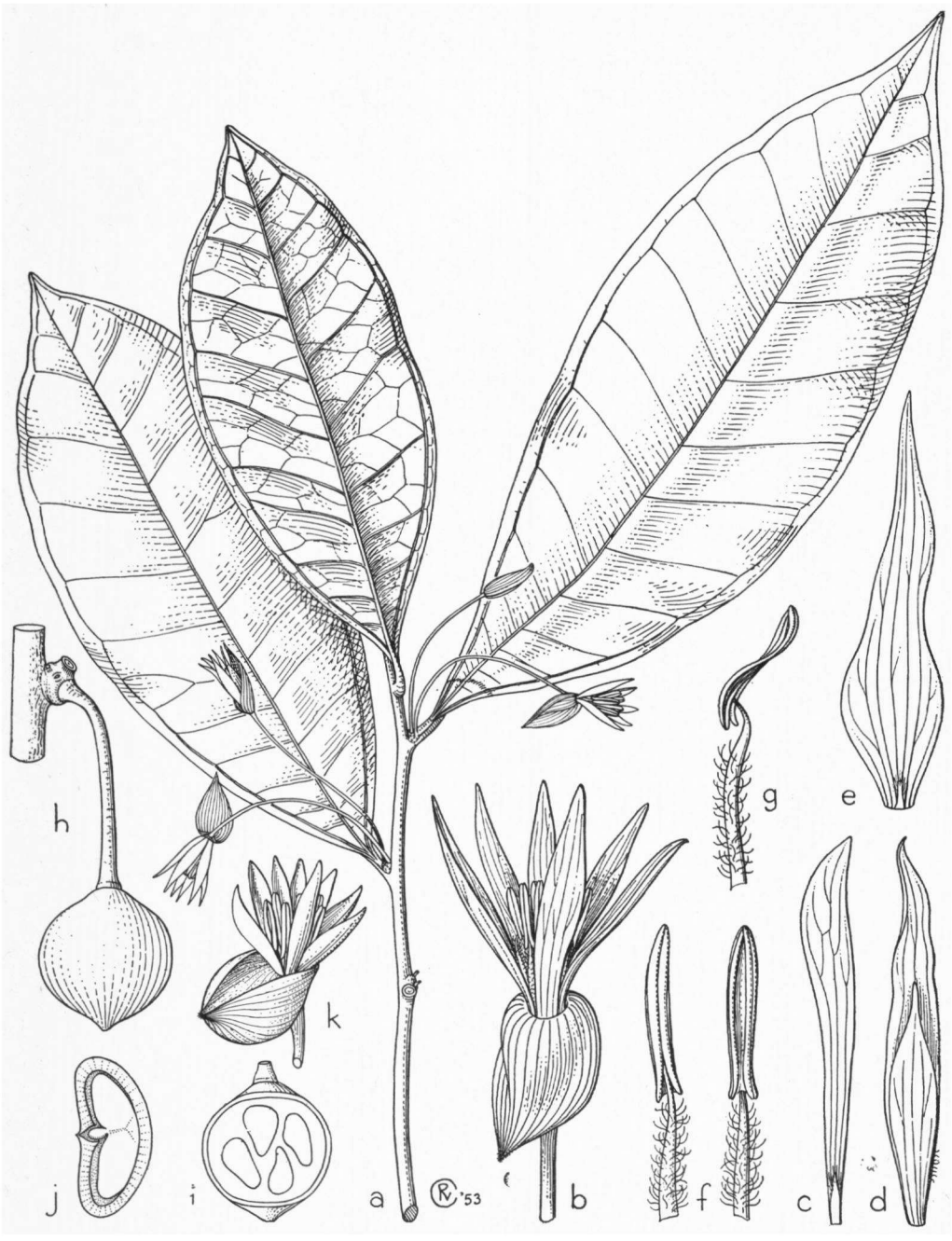

Fig. 11. *Scaphocalyx spathacea* RIDL. *a.* Twig with ♂ flowers, × 2/3, *b.* ♂ flower, × 2 1/4, *c.* petal with normal scale, × 3 1/3, *d–e.* petal with abnormal scale, × 3 1/3, *f–g.* stamens, × 5 1/2, *h.* young fruit, × 2/3, *i. ditto*, in section, × 2/3, *j.* seed, longitudinal section, × 1 1/2.—*Scaphocalyx parviflora* RIDL. *k.* ♂ flower, × 3 2/3 (*a–g* after SING. F.N. 24020, *h–i.* after SING. F.N. 10898, *j.* after SING. F.N. 29626, *k.* after the type RIDLEY 14736).

KEY TO THE SPECIES

1. Flowers 1½–2 cm. Pedicel 3–4 cm. Leaves with *c.* 12–18 pairs of nerves running from the midrib to the basal nerves. Petiole 0.6–1 cm . . . . . **1. S. spathacea**
1. Flowers 5 mm only. Pedicel 5–6 mm. Leaves with *c.* 13 pairs of nerves running from the midrib to the basal nerves. Petiole 1½–2 cm . . . . . **2. S. parviflora**

1. Scaphocalyx spathacea RIDL. J. Bot. 58 (1920) 149; Fl. Mal. Pen. 1 (1922) 164; HENDERS. Gard. Bull. S.S. 4 (1928) 223.—**Fig. 11a–j.**

Slender tree 3–8(–15) m; branchlets terete, red-brown or violaceous-pruinose when dry, with many longitudinal fissures and elliptic, pallid lenticels. *Leaves* elliptic to elliptic-oblong, shortly rather abruptly acuminate at the apex, cuneate at the base, triplinerved from the base, subcoriaceous, glabrous, entire or slightly undulate, 15–20 (–25) by 5–7½(–8½) cm; midrib and both side-nerves little raised above, very prominent beneath, basal side-nerves ascending along the margin to the leaf-top, anastomosing with numerous secondary nerves from the midrib (these rather prominent beneath) and other subparallel, intercalar, less distinct nerves, veins little but visibly prominent and laxly reticulate on both sides; petiole rugose, thickened. ♂ *Fascicles* 2–3(–5)-flowered from pubescent tubercles. Pedicels laxly pilose. *Calyx* ovoid-oblong, beaked, laxly pilose or nearly glabrous, parallel-nerved from base to top, ± 1¼ by ½ cm. *Petals* oblong-linear, acuminate, slightly fleshy, glabrous, said to be bright yellow, purplish when dry, *c.* 1.5 by 0.2–0.3 cm; scales pilose towards the apex, 3–4 by 1 mm. Filaments 6–7 mm; anthers 4–5 by ½ mm. *Fruit* shortly apiculate, greenish or somewhat rusty-pilose, soon glabrescent, set with numerous small tubercles, red-brown when dry and rough to the touch, (2½–)3½–4½ cm diam.; pericarp 0.6 mm thick. *Seeds* 6–7(–10), densely packed in a juicy pulp, each with a greenish aril which exudes a milky juice, 1–1½ by 0.6–0.8 cm; peduncle 3–4½(–7) by 0.3 cm, thickened at the apex, rugose.

Distr. *Malaysia:* Malay Peninsula (Kelantan, Trengganu, Selangor, Pahang, Johore, Negri Sembilan, Malacca), not common. *Fl.* Nov–Apr., *fr.* Dec.–July.

Ecol. In dense forest or deep shade, up to 550 m.

Uses. Wood not durable, but used in house-building.

Vern. *Kĕlat-bĕludu*, Pahang, *teje*, Selangor, *poko manilo*, Malacca.

2. Scaphocalyx parviflora RIDL. J. Bot. 58 (1920) 149; Fl. Mal. Pen. 1 (1922) 164.—**Fig. 11k.**

Leaves broader, elliptic-acuminate, up to 22 by 7–11 cm. ♂ *Flowers* only known in bud. *Calyx* 5 by 3 mm. *Petals* (sometimes 8) *c.* 4–5 by 2 mm, yellowish-white; scales minute, 1 mm. Filaments pilose 1 mm; anthers 3 mm. ♀ *Flowers* and *fruit* not yet known.

Distr. *Malaysia:* Malay Peninsula (Perak-Temengoh), once found.

Notes. RIDLEY states, that in *S. parviflora* the calyx 'splits into 4 acute points tipped with hairs', but this could not be recognized when examining the type. *S. parviflora* is possibly only a very young stage of *S. spathacea*; the twigs of the type-specimen have the appearance of suckers as they are filled with a big pith.

8. PANGIUM

[RUMPH. Herb. Amb. 2 (1743) 182, t. 59]; REINW. [*ex* BL. Cat. (1823) 112, *nom. nud.*] Syll. Ratisb. 2 (1825) 12.—**Fig. 12–15.**

Dioecious, more rarely andromonoecious tree. *Leaves* spirally arranged and crowded at the ends of the branches, long-petioled, in young trees 3-lobed, in old ones broadly ovate, with cordate to truncate base, acute-acuminate, palmately-nerved. Stipules 0. *Flowers* usually unisexual, but the terminal flowers of the ♂ inflorescence sometimes hermaphrodite; ♂ flowers in few-flowered pseudoracemes, ♀ flowers mostly solitary in the axils of the upper leaves. Pedicels elongate, articulated above the middle, with one (fl. ♂) or several (fl. ♀) linear, caducous, basal bracts. *Calyx* closed before anthesis, nearly globose, disrupted afterwards irregularly in 2–3(–4) caducous segments. Petals (4–)5–8(–9), imbricate, each with a large, vaulted, thick, hairy scale inside at the base. ♂ *Flowers: stamens* 20–25(–31), free; filaments thick, flat, with a linear stripe of hairs ventrally; anthers minute, ovate, dorsifixed. Rudiment of pistillode 0. ♀ *Flowers: staminodes* as many as petals, rarely more, alternating with them. *Ovary* thick-walled, with 2–4 many-ovuled placentas; stigma sessile, discoid, rounded or nearly trigonous, with (2–) 3–5 short, impressed rays, slightly lobed at the margin. *Fruit* large, indehiscent;

pericarp coriaceous. *Seeds* many, large, transversal- or triangular-ovoid, in an oily and fleshy, sweet, aromatic, edible pulp. Testa hard, reticulate-ribbed, with a linear hilum. Endosperm large, oily.

Distr. Monotypic, throughout *Malaysia*, extending to Melanesia and Micronesia.

Note. The fossil *Pangium treubii* RACIB. Bull. Ac. Sc. Krakau (1909) 283, f. 1–3 (fr.) has been described from the Miocene of West Java.

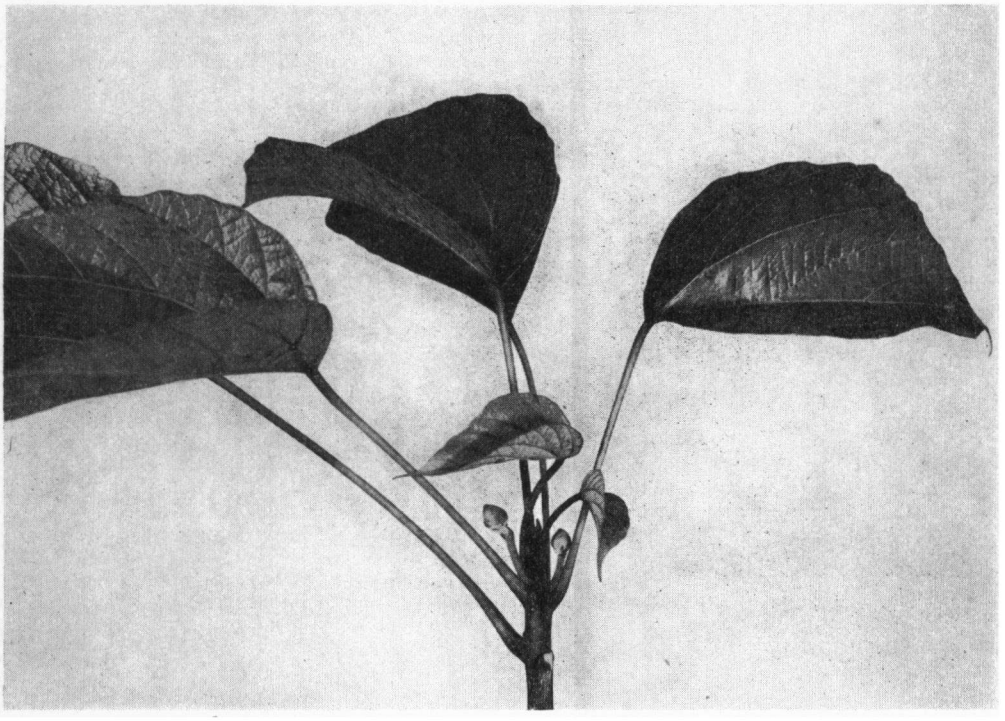

Fig. 12. *Pangium edule* REINW. ♀ Buds (C.H.B. XIX).

1. Pangium edule REINW. [*ex* BL. Cat. (1823) 112, *nom. nud.*] Syll. Ratisb. 2 (1825) 13; BENN. & BR. Pl. Jav. Rar. 3 (1844) 205, t. 43; BL. Rumphia 4 (1849) 20, t. 178; Mus. Bot. 1 (1849) 14; MIQ. Fl. Ind. Bat. 1, 2 (1858) 109; Suppl. (1860) 89, 159; F.-VILL. Nov. App. (1880) 13; VIDAL, Sin. Atl. (1883) 13, t. 7, f. D; KING, J. As. Soc. Beng. 59, ii (1890) 124; WARB. Bot. Jahrb. 13 (1891) 384; GRESHOFF, Nutt. Ind. Pl. (1894) t. 4; TREUB, Ann. Jard. Bot. Btzg 13 (1896) 1–86; KOORD. Minah. (1898) 474; VORDERMAN, Teysm. 10 (1899) 77–84; ENGEL, Teysm. 11 (1900) 223; K. & V. Bijdr. Booms. 5 (1900) 6; VOLKENS, Bot. Jahrb. 31 (1901) 469; BECC. Nelle For. Born. (1902) 598; COST. & J. J. S. Ann. Jard. Bot. Btzg 19 (1904) 150, t. 21, f. 41; BACK. Fl. Bat. 1 (1907) 68; Voorl. Schoolfl. Java (1908) 16; Schoolfl. Java (1911) 72; KOORD. Exk. Fl. Java 2 (1912) 631; BACK. Trop. Natuur 1 (1912) 125, pl.; KOORD. Atlas Baumart. (1914) f. 347; MERR. Interpr. Rumph. (1917) 376; Sp. Blanc. (1918) 274; SLOOT. Bijdr. Flac. (1919) 79; BROWN, Bull. Philip. Isl. Dep. Agr. Bur. For. *no* 21 (1920) 129; Philip. Agr. Rev. 13 (1920) 360, t. 23; Minor Prod. Philip. For. 2 (1921) 161, 348, f. 70; MERR. En. Philip. 3 (1923) 108; Philip. J. Sc. 24 (1924) 115; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 314; GILG, in E. & P. ed. 2, 21 (1925) 411, f. 181, 182; MERR. Philip. J. Sc. 29 (1926) 400; HEYNE, Nutt. Pl. (1927) 1135; WHITE & FRANCIS, Proc. R. Soc. Queensl. 39 (1928) 66; WHITE, J. Arn. Arb. 10 (1929) 243; BURKILL & HANIFF, Gard. Bull. S.S. 6 (1930) 173; OCHSE, Ind. Groenten (1931) 294, f. 188; KANEHIRA, Tokyo Bot. Mag. 45 (1931) 331; Fl. Micron. (1933) 246, f. 115; BURK. Dict. (1935) 1652; GUILLAUMIN, J. Linn. Soc. Bot. 51 (1938) 549; CORNER, Wayside Trees (1940) 308; BACK. Bekn. Fl. Java (em. ed.) 4 (1942) fam. 84, p. 4; BROWN, Useful Pl. Philip. 2 (1950) 507, f. 329; QUIS. Med. Pl. Philip. (1951) 629.—*Pangium* RUMPH. Herb. Amb. 2 (1743) 182, t. 59.—*P. rumphii* VOIGT, Hort. Suburb. Calc. (1845) 85.—*Hydnocarpus polyandra* BLANCO, Fl. Filip. ed. 2 (1845) 445; ed. 3 (1879) 200, t. 391; MERR. Sp. Blanc. (1918) 274.—*P. ceramense* TEYSM. & BINN. *ex* BOERL. Cat. Pl.

Hort. Bot. Bog. 1 (1899) 53.—*P. naumannii* WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 23; GILG, *op. cit.* ed. 2, 21 (1925) 411.—**Fig. 12–15.**

A polygamous-dioecious, medium-sized to lofty, buttressed tree, up to 40 m, with a dense crown and ± drooping branches; trunk up to 1 m diam.; young branches ± densely rufescent-tomentose, old branches glabrous, with large leaf-scars. Bark

Fig. 13. *Pangium edule* REINW. Twig with ♂ flower (C.H.B. XI–B–VI).

reddish-brown or brownish-grey to dark brown, smooth or somewhat roughened by flaky decortication and horizontal fissures. *Leaves* large, ovate-cordate, entire, dark-green, glabrous, shining above, but dull and rusty-scurfy beneath especially on the veins, (10–)12–30(–40–60) by 8–20(–25–40) cm, 5–7-nerved from the base; petiole 7–30(–50) cm, much swollen at the base. ♂ *Racemes* 4–9-flowered, sometimes the bigger terminal flower (or rarely the 2 highest flowers) hermaphrodite, the others smaller and with stamens only, 6–24 cm long including the stout, 5–12 cm, long rusty-tomentose peduncle. Pedicels 2½–4 cm, brown-pubescent, sustained by a subulate bract 1–3 cm. Calyx rusty-scurfy in bud, lobes reflexed in anthesis, glabrescent, ¾–1¼(–2) cm long. *Petals* ovate-oblong, somewhat fleshy, ciliate, patent, later on reflexed, bright pale green, 1½–2½ cm, each provided with an ovate or subrounded, densely appressed-hairy scale. *Stamens* inserted on a flat, villous disk, half as long as the petals. ♀ *Flower* mostly solitary, 6–9(–12) cm pedicelled, and with 5–8 anantherous staminodes occasionally in few-flowered racemes (then the flowers seemingly ☿ but really ♀ as the 20–25 staminodes carry empty anthers). *Calyx* and *petals* as in ♂, but petals somewhat larger. Disk annular, small, fleshy, pubescent, surrounding the ovary at its base. *Ovary* ovoid, sessile, sericeous. *Fruit* somewhat asymmetrical, mostly oblong-ovoid ('pear-shaped'), 15–25(–30) by 7½–12(–15) cm, variable in size, brownish, rather scurfy and rough by small lenticels, bluntly tipped at each end, pendent from a thick, brown, curved stalk, 8–15 cm long, 7–12 mm diam., containing about 20 irregularly shaped seeds which are closely packed; pericarp 6–10 mm thick, becoming soft and mushy in the ripe fruit. *Seeds* (3–)4–6 by 2–3(–4) cm, enclosed by a white, fleshy aril, greyish-white when fresh, blackish when weather-beaten, leathery.

Distr. Melanesia (New Ireland, New Britain, New Hebrides), Micronesia (Yap), and throughout *Malaysia*.

Ecol. Primary and secondary rain-forests, in many regions chiefly in deforested localities, always in isolated specimens though locally common, wild or semi-cultivated, also along river-banks, in teak-forests, on both dryland and temporarily inundated places, on stony or clayey soil, chiefly below 300 m, but up to 1000. *Fl.* Jan.–Dec., *fr.* mostly at the beginning of the rainy season.

The seeds are well fitted to dispersal by water and have excellent floating capacity; they are frequently found in the beach drift. Occasionally

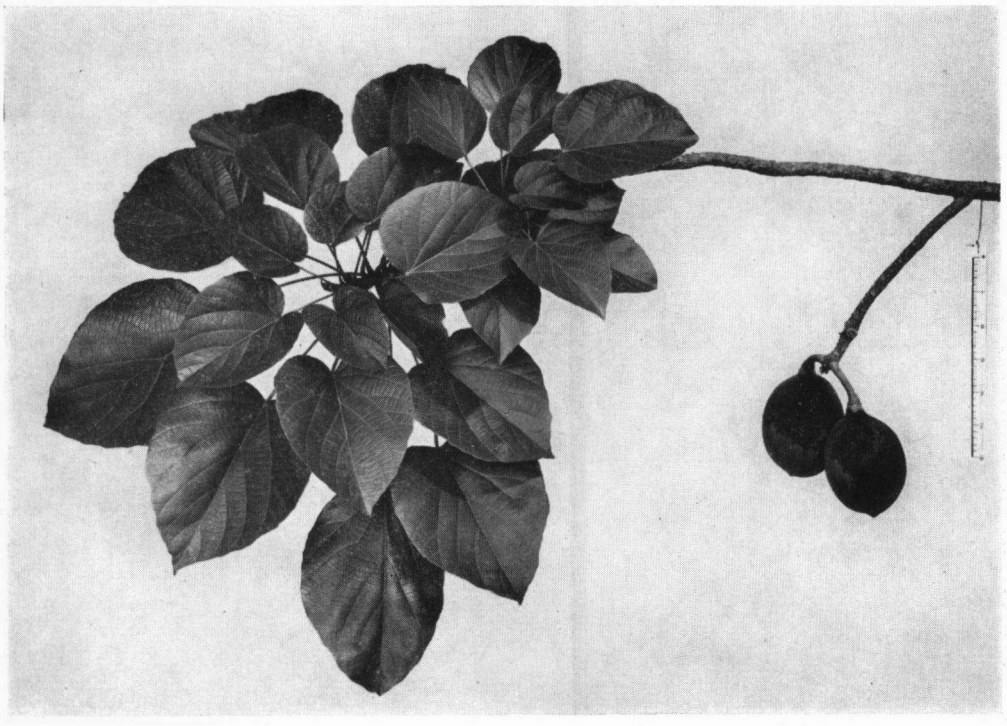

Fig. 14. *Pangium edule* REINW. Fruiting twig, × 1/11 (C.H.B.).

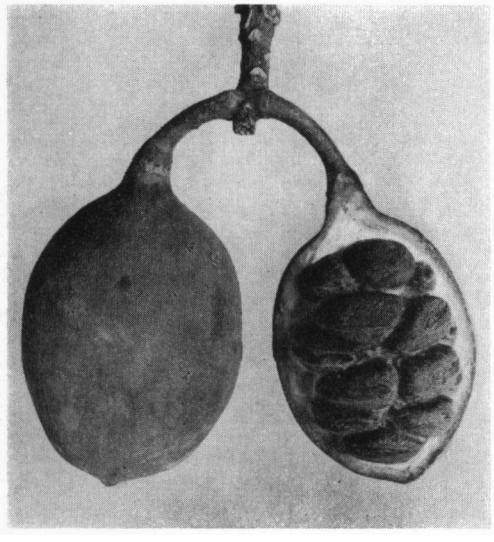

Fig. 15. *Pangium edule* REINW. Fruits; the shell and pulp of one have been removed halfway, × 1/5 (C.H.B.).

trees are found in the beach forest, but *Pangium* is certainly not a beach tree as has been sometimes wrongly assumed.

Trees which produce mostly male flowers also may bear fruit as the terminal flower in many inflorescences is often bisexual.

Uses. *Pangi* is used for many purposes throughout its area of distribution. The tree starts fruiting when *c.* 15 years old. Leaves, seeds and most other parts of the tree contain a high percentage of gynocardin, a glucoside which readily yields prussic acid, which is fugitive and is eliminated from the seeds before using them in various ways (washing, soaking, roasting, subterranean storage), so that they can be eaten when boiled or roasted. There are various methods to prepare them, *cf.* HEYNE (1927) and BURKILL (1935); the product is known in Indonesia as *kluwak*, *kělěwik*, *trasi putjung*, *bětong*, *dagé*, *katjap pangi* or *jaruk*. Fresh leaves or seeds or their oil are used as an antiseptic, desinfectant or antiparasitic, to preserve meat, to prepare dart poison or to kill fish; the bark is also used as piscicide. Raw seeds are especially poisonous to poultry. The oil extracted from the seeds is a substitute for coconut oil in cooking; it can also be used as an illuminant or for making soap. The sapwood and heart-wood is (light-)yellow, with a disagreeable odour, rather hard, but little durable, used for construction of houses by the people

of the Div. East Coast of Sumatra. The shells are used as rattles on dancing masks in New Guinea (Wide Bay).

Vern. *Kĕpajang, pangi*, standard M; *pakĕm*, Bali, J, Md, *patjung, pitjung*, S, *putjung*, J, S; *payang*, Mal. Pen.; *gĕmpangi, hapèsong*, Toba, *kaju tuba buwah*, Lampong, *binuang*, Simalur, *jĕho*, Enggano, *kapèntjuĕng, kapètjong, simaung*, Minangk.; *kuam, pakĕm*, Borneo; *(ma)pangi*, Minah.; *pangi*, Ambon; *pañgi*, S. L. Bis., P. Bis., Bik., *salingkumut*, Mand.; *kalowa*, Sumbawa, Makass.; *ngafu*, Tenimber; *booija*, Sula, *lakufussa*, Mangoli, *calloi, lioja*, Ceram, *kapait*, Buru, *il*, Aru; *awaran*, W. New Guin. *igu(w)ié*, Manokwari, *kakara*, Mimika, *orlan*, Maclay coast, *amigi*, Sulka, *seika*, Upper Waria, *atombo*, Rabaul.

9. TRICHADENIA

THWAITES in HOOK. J. Bot. & Kew Gard. Misc. 7 (1855) 196, t. 8.

Dioecious trees. *Leaves* spirally arranged, large, rather shortly petioled. Stipules foliaceous, caducous. *Flowers* unisexual, in simple and panicled, axillary racemes. *Calyx* calyptriform, disrupting irregularly from the apex or laterally. *Petals* 5, imbricate, each with a lanceolate, fleshy, hirsute scale adnate to the inner side of the base. ♂ *Flowers:* stamens 5, alternating with the petals; filaments stout, terete; anthers oblong, dorsifix. Rudiment of ovary sometimes present. ♀ *Flowers:* staminodes 0. *Ovary* sessile, with 3 placentas, each with 1 (rarely 2) ovules. Styles 3, short, divergent; stigmas dilatate, reniform, crenate. *Fruit* spherical, berry-like, indehiscent, 1–3-seeded; pericarp crustaceous when dry. *Seeds* with oily endosperm, testa bony.

Distr. Two *spp.*, one endemic in Ceylon, the other in *E. Malaysia*, the Philippines, and Melanesia (New Georgia, New Britain). Fig. 16.

1. Trichadenia philippinensis MERR. Philip. J. Sc. 4 (1909) Bot. 298; En. Philip. 3 (1923) 108.—*Vitex curvifrutescens* ELM. Leafl. Philip. Bot. 8 (1915) 2873.

Tree 15–20(–40) m high; buttresses plank-like, up to 2 m high; bark whitish-grey to yellowish-brown, rough; branches stout, glabrous, with very large leaf-scars; branchlets densely ferrugineous-pubescent. *Leaves* borne in pseudo-whorls at end of branchlets, elliptic-oblong or oblong, dark green brown when dry, shining, subcoriaceous, glabrous above, ferrugineous-pubescent on the midrib and rather laxly pilose beneath especially along the nerves, rather sharply and abruptly acuminate at the apex, broadly cuneate to ± rounded at the base, entire or obscurely repand in the upper portion, 14–30 by 6–15(–20) cm; nerves (8–)10–12 pairs, prominent, reticulations distinct, rather lax; petiole 3–8 cm. Stipules linear-lanceolate, pubes-

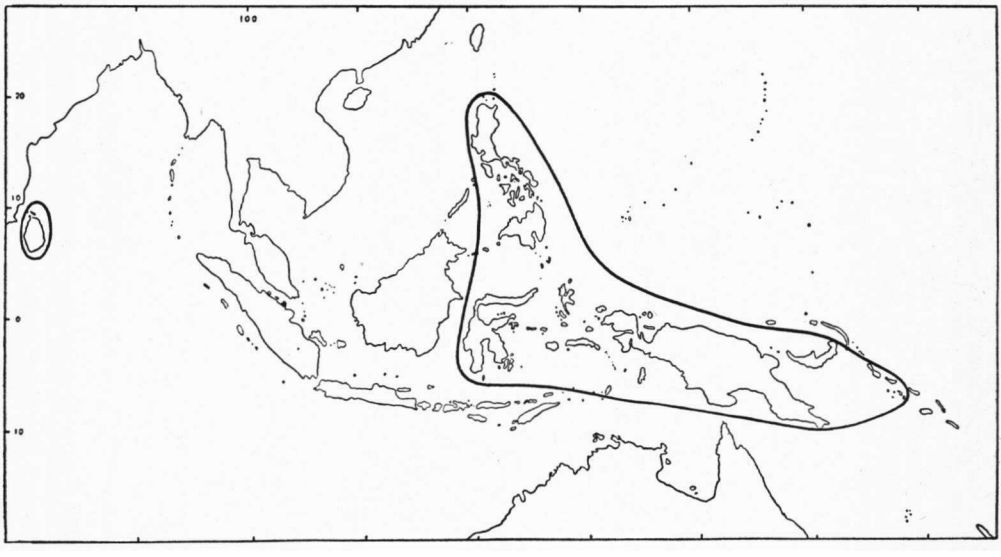

Fig. 16. Distribution of *Trichadenia*. Two closely allied species: *T. zeylanica* THWAITES and *T. philippinensis* MERR.

cent, 6 mm. *Racemes* ferrugineous-puberulent, up to 10 cm. *Flowers* solitary or in groups of 2–3, green-yellow. *Calyx* glabrous, lobes *c.* 3–4 by 2–3 mm. *Petals* elliptic-ovate, obtuse, *c.* 4 by 2½–3 mm; scale 3 mm. ♂ *Flowers:* filaments 2½ mm; anthers 2 mm. ♀ *Flowers:* ovary ovoid, pubescent. *Fruit* subglobose, glabrous, green, *c.* 2 cm diam., 3-seeded; pericarp coriaceous.

Distr. Melanesia (Solomons: New Georgia & New Britain), in *Malaysia:* Philippines (Luzon, Sibuyan, Panay, Negros, Mindanao), S. Celebes, Moluccas (Morotai, Buru, Batjan, Tenimber Isl., Key Isl.), New Guinea, Schouten Isl.. Fig. 16.

Ecol. Primary or old secundary forest in level or hilly, never inundated localities, 5–100(–500 m in the Philippines), apparently rather common occasionally, but mostly growing scattered or being fairly rare. *Fl. fr.* Jan.–Dec.

Uses. Wood pale orange, hard, close grained; sapwood not defined.

Vern. Philippines: *Tadong, tandong,* Tag., *malapĩggan,* Tag., Bik., *bagolipag, banau,* Bik., *banaog, linab, malapáñgi,* P. Bis., *ibal,* Pang., *magalinabut, magamabut,* Bag.; *kabini,* Buru, *popotan,* Batjan, *titiée,* Tenimber; New Guinea: *impaiwen, ankieéu, n'kieéu, aiga,* Manokwari, *ogeoga,* Inanwatan, *mamperiwen,* Schouten Isl., *waratj, kanuk, bavorie, abujet,* Hollandia, *garapo,* Upper Waria, Milne Bay.

Note. *Trichadenia zeylanica* THWAIT. differs by its coarsely sinuate-dentate leaves, *c.* 6 lateral nerves and the petals 7 mm long.

10. RYPAROSA

BL. Bijdr. (1825) 600; KING, J. As. Soc. Beng. 59, ii (1890) 124; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 317.—*Ryparia* BL. [Fl. Jav. praef. VIII (1828), *nom. nud.*] *ex* ENDL. Gen. (1840) 1118; HASSK. Cat. Hort. Bog. (1844) 239 (*Rhyparia*); MIQ. Fl. Ind. Bat. I, 2 (1859) 361.—*Bergsmia* BL. Rumphia 4 (1849) 23, t. 178 c, 1 & 2; Mus. Bot. 1 (1849) 16.—*Aspidandra* HASSK. Versl. & Med. Kon. Acad. Wet. Afd. Natuurk. 4 (1856) 141; Flora 40 (1857) 532.—*Gertrudia* K. SCH. in K. SCH. & LAUT. Fl. Deut. Schutzgeb. (1900) 454, t. 15; GILG, Bot. Jahrb. 55 (1918) 292.—**Fig. 18–20.**

Trees or rarely shrubs, dioecious. *Leaves* spirally to seemingly distichously or subopposite arranged, entire, mostly greyish-green or pallid beneath when dry, with a darker shining subtriangular spot at the upper side of the very base, tapering into the petiole, penninerved, finely papillose, glabrous or often ± densely beset with appressed, bicrural or (through reduction) simple hairs underneath, these sometimes minute (lens!); petiole longish, thickened at both ends, often curved at the apex. Stipules 0. *Racemes* elongated, spiciform, interrupted, solitary or 2–3 together in the axils of whether or not fallen leaves, or from thick tubercles on the stem. *Flowers* small. Pedicels slender. Bracts minute, subulate, subpersistent. *Calyx* globose, closed in bud, 3–4-lobed in anthesis, later recurved, *Petals* 4–5, imbricate, later recurved, densely sericeous-tomentose outside, nearly glabrous inside, at the base inside with a hairy, ovate scale half as long as the petals. ♂ *Flowers:* stamens 5(–4), central, episepalous, their filaments usually connate into a column, or rarely practically free and divergent; anthers ovate, extrorse. Rudiment of ovary 0. ♀ *Flowers:* staminodes 5(–4, or absent), alternating with the petals, free or shortly connate at the base, small, whether or not with rudimentary anthers. *Ovary* sessile, densely hairy, with 2–3(–4) placentas each with 1 or few ovules. Stigmas 2–5, obovate or subreniform, impressed or flat, ± bilobed, radiating, sessile and then mostly very close together (very rarely spaced), or shortly stalked and spaced, their apex flattened and ± reniform. *Berry* capsular, with ± coriaceous, rather thin pericarp, 1–6-seeded, mostly globose or angular corresponding to the number of seeds. *Seeds* globose to semiglobose or variously compressed, embedded in a little, readily drying up pulp; testa coriaceous.

Distr. About 18 *spp.*, 1 restricted to S. Siam, 1 through *Malaysia* extending to both S. Siam and the Andamans & Nicobars, 16 only in Malaysia. Fig. 17.

Ecol. In rain-forest, from the lowland to the montane zone.

Note. The characters used for specific distinctions in this genus appear to be difficult and can be recognized satisfactorily only with the use of a lens. It is not certain, that the antithesis 'infl. cauline–infl. axillary' will hold. Furthermore the hairiness is caducous with age. Several species are known only in the ♂ or ♀ state, and the improvement of the key will depend on future complete material of these species. Four apparently new species could not be described on account of inadequacy of the specimens.

KEY TO THE SPECIES[1]

1. ♂ and/or ♀ inflorescences cauline, *i.e.* from distinct tubercles of the stem or old big branches, or both cauline and axillary.
2. Column of filaments ± densely covered with whitish rather long hairs, at least in the upper part. **11. R. javanica**
2. Column of filaments or free filaments glabrous.
3. Leaves glabrous or practically so (some scarce hairs on the midrib or nerves, but not on the intervenium beneath).
4. Stigmas 2. Lenticels orbicular to elliptic, not numerous. Fruit transverse-oblong, somewhat depressed in the middle, 1–2-seeded.
5. Stigmas sessile, reflexed, very close together on ovary and fruit. Nerves (6–)7–9 pairs. **1. R. cauliflora**
5. Stigmas spaced on the ovary, flat-discoid, slightly stalked.
6. Nerves 5–7 pairs. Fruit smooth, brown-velvety. . . . . **2. R. scortechinii**
6. Nerves 8–10(–12) pairs. Fruit glabrescent, minutely verrucose . . . . . **3. R. inconstans**
4. Stigmas 3(–5). Lenticels ± linear.
7. Stigmas slightly stalked, rather spaced on ovary and fruit, flat-discoid. Leaves ± narrow-oblong, (20–)23–45 cm long.
8. Fruit shortly and broadly pear-shaped, 4–6-seeded, with rather thick pericarp. Nerves excurrent along leaf-margin. Lenticels numerous. . . . . **4. R. fasciculata**
8. Fruit subglobose, 1–3-seeded, with rather thin pericarp. Lateral nerves (at least the superior ones) curved-anastomosing along leaf-margin. Lenticels sparse . . . . . **5. R. glauca**
7. Stigmas on the ovary sessile, radiate from the centre, reflexed, very near together in fruit. Leaves elliptic or ovate-elliptic, 11–20(–22) cm long . . . . . **6. R. baccaureoides**
3. Leaves densely or sparsely pilose all over the undersurface.
9. Stigmas 2, subsessile. Hairs golden to ferrugineous, spreading, densely covering the branchlets, the midrib and nerves, not so densely on the intervenium . . . . . **7. R. hirsuta**
9. Stigmas 3(–5), sessile. Hairs very pallid, appressed, scattered on midrib, nerves and veins (only visible with a lens), branchlets soon glabrescent. . . . . **6. R. baccaureoides**

1. ♂ and/or ♀ inflorescences axillary, *i.e.* from the leaf-axils of young foliate or defoliate branches.
10. Leaves ± densely, rarely laxly covered with mostly ferrugineous spreading hairs underneath.
11. Petioles relatively slender, 1–1½ mm diam. Nerves 4–5(–6) pairs, suberect. Hairs pale, very laxly arranged on the surface, more densely on midrib and nerves beneath. Stigmas 2, sessile, spaced on the ovary . . . . . **8. R. wallichii**
11. Petioles relatively thick, 2–2½ mm diam. Nerves (5–)6–8(–10) pairs, curved-ascending.
12. Stamens 4. Filaments free, divergent. Stigmas 2, subsessile, very distant from each other on the ovary and fruit . . . . . **7. R. hirsuta**
12. Stamens 5. Filaments connate into a column. Stigmas 2, sessile, very close together on the ovary. **9. R. calotricha**
10. Leaves covered underneath with fine, very short, or longer strigose, pallid, appressed hairs, or subglabrous, or entirely glabrous.
13. Nerves 10–12 pairs. Petioles 5–10 mm long . . . . . **10. R. multinervosa**
13. Nerves 2–9 pairs. Petioles mostly longer.
14. Column of filaments ± densely covered with whitish rather long hairs, at least in the upper part. Inflorescences mostly on lower, defoliate parts of the branchlets . . . . **11. R. javanica**
14. Column of filaments (or rarely free filaments) glabrous. Inflorescences mostly in the upper leaf-axils.
15. Nerves 2(–3) pairs, very elongate-erect. Young fruit nearly sessile . . . **12. R. kostermansii**
15. Nerves 4–9 pairs. Fruit 2–5 mm peduncled.
16. Leaves ± densely pilose all over the surface beneath.
17. Young shoots and branchlets very densely and ± persistently, dark rusty-hirsute. Underside of the leaves equally and subdensely, midrib and nerves densely covered with substrigose yellow-brown hairs. Stigmas 2, sessile, very close together on the ovary . **13. R. micromera**
17. Young shoots with a short, rusty-silky, subhirsute tomentum, rather soon glabrescent. Midrib and nerves less densely hairy.
18. Stigmas 2, slightly stalked and divergent on the ovary. Leaves chartaceous, mostly densely covered with substrigose, rather long, appressed pale hairs beneath. Fruit transverse-oblong, (1–)2-seeded . . . . . **14. R. caesia**

(1) Imperfectly known and not placed: *R. minor* RIDL.

18. Stigmas 3(–4), sessile, radiate, reflexed and very close together on the ovary. Leaves laxly covered beneath with fine, appressed, brown or pale hairs, but mostly entirely glabrous.
19. Leaves coriaceous; reticulations strong and very prominent on both surfaces. **15. R. kunstleri**
19. Leaves subcoriaceous; reticulations little prominent on both surfaces. **6. R. baccaureoides**
16. Leaves entirely glabrous (or sometimes with solitary hairs on the midrib beneath).
20. Stigmas 2, flat, subsessile, near together. Rhachis golden-brown-tomentose. Fruit 1–2-seeded, glabrous . . . . . **16. R. acuminata**
20. Stigmas 3(–4).
21. Nerves 3–4 pairs. Leaves rather thin, finely reticulate. Fruit subglobose when 2-seeded, fusiform-oblong when 4–6-seeded . . . . . **17. R. hullettii**
21. Nerves 5–7 pairs.
22. Leaves coriaceous; reticulations distinctly prominent on both sides. Fruit globose, dark velvety-brown, little glabrescent, *c.* 3 cm diam., 4–6-seeded . . . . **15. R. kunstleri**
22. Leaves subcoriaceous; reticulations little prominent on both sides. Fruit depressed-globose (when 2-seeded) or rounded-trigonous (when 3-seeded), 1½–2 by 2–2½ cm, brownish-hirsute (up till now known only from cauline inflorescences) . . **6. R. baccaureoides**

1. Ryparosa cauliflora MERR. Philip. J. Sc. 9 (1914) Bot. 325; En. Philip. 3 (1923) 109.

Tree 10 m; branchlets terete, ± densely covered with appressed, rusty hairs, soon glabrescent. *Leaves* broad-oblong to obovate-oblong, subcoriaceous, ± rounded, but 1–1½ cm cuspidate at the very apex, broadly cuneate at the base, dilutely olivaceous and shining above, pale greyish beneath, practically glabrous, but with very few, solitary, bristle-like hairs on the under surface specially on the nerves and midrib, rather densely hirsute towards the base, (16–)20–35 by (6½–)9–14(–17) cm; midrib nearly flat above, very prominent beneath, nerves rather straight and subparallel, slightly curved and anastomosing near the leaf-margin, very little raised above, distinctly so beneath, veins irregularly transverse, rather coarsely reticulate, little prominent above, more so beneath; petiole stout, 2–3 mm diam., rather densely ferrugineous-hirsute, (2½–)3–4(–9) cm. *Inflorescences* solitary, rather densely ferrugineous-pubescent, up to 35 cm long. ♂ *Flowers:* only seen in buds on *c.* 10 cm long spike-like racemes. Pedicels 2 mm. *Calyx* densely ferrugineous-pilose. *Petals* 4, thin; scale ovate, densely ferrugineous-villose. Stamens 5; column glabrous. ♀ *Inflorescence* not seen. *Fruit* transverse-oblong, 2-seeded, 1½ by 2½ cm, covered with a short rusty-brown tomentum, tubercles not very prominent; stigmas reniform, impressed lengthwise. *Seeds* globular-ovoid, *c.* 1 cm diam.

Distr. *Malaysia:* Philippines (Mindanao, Tinago Isl., Surigao).

Ecol. Forests at low altitude.

Vern. *Buñganon*, P. Bis.

2. Ryparosa scortechinii KING, J. As. Soc. Beng. 59, ii (1890) 126; Ann. R. Bot. Gard. Calc. 5 (1896) 134, t. 156; RIDL. Fl. Mal. Pen. 1 (1922) 166.— *Ryparia scortechinii* RIDL. Trans. Linn. Soc. II, 3 (1893) 276.

Rather small, slender, spreading tree, 5–12 m, trunk 15–20 cm diam.; branchlets appressed rusty-hirsute, glabrescent, red-brown when dry. *Leaves* oblong-lanceolate to oblanceolate, gradually attenuate at the apex, sometimes ± abruptly cuspidate (1–2 cm), ± broadly cuneate to subrotundate at the base, coriaceous or firmly charta-

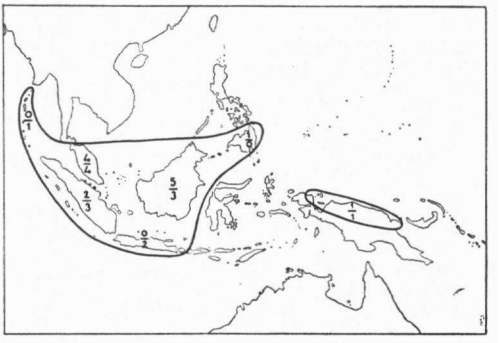

Fig. 17. Distribution of *Ryparosa*. The figure above the hyphen indicates the number of endemic species in the island, the figure below the hyphen the number of non-endemic species.

ceous, dark-green above, bluish-green beneath when alive, olivaceous-brownish above when dry, much paler (glaucous) beneath, glabrous, sometimes laxly beset with short, bristle-like, appressed hairs on the midrib beneath, (15–)20–25(–37) by (6–)8–10(–15) cm; midrib flat or little grooved above, very prominent beneath, nerves elongate curved-ascending, obscurely anastomosing near the leaf-margin, little prominent above, strongly so beneath, veins rather densely reticulate and prominent on both sides; petiole thick, stout, ± densely ferrugineous-hirsute, glabrescent, 2½–6 (–7) cm. *Racemes* solitary, shortly ferrugineous-hirsute, pendulous, the ♂ slender, 10–25 cm, the ♀ mostly shorter. *Calyx* rusty-pilose outside; lobes 3, ovate, 2 mm. *Petals* 4–5, oblong, subacute, 2 by 1 mm; scales ovate, densely fulvous-silky, 1 mm. ♂ *Flowers:* stamens 5; column glabrous. ♀ *Flowers:* calyx and petals slightly larger than in the ♂. Staminodes 5, glabrous, very short; anthers minute, early caducous. *Ovary* ovoid, later somewhat 4-angled, densely rusty-tomentose. *Fruit* angular, with green or white dots, mostly transverse-oblong, *c.* 2 by 3 cm, retuse at the apex when 2-seeded, or rarely subglobose, *c.* 2 cm diam., when 1-seeded; pericarp thin, fragile, velvety-black; peduncle 1–2 mm. *Seeds* plano-convex to subglobular.

Distr. *Malaysia:* Malay Peninsula (Perak, Penang, Selangor, Pahang, Kelantan, Trengganu).

Ecol. Dense forests, up to 300 m.

Vern. *Tukol, talon,* M.

3. Ryparosa inconstans CRAIB, Kew Bull. (1926) 154.

Tree 8 m; branchlets appressed-ferrugineous-pubescent when young, soon glabrescent. *Leaves* oblong-oblanceolate or oblong-elliptic, acuminate, nearly mucronate at the very apex, cuneate or rounded at the base, subcoriaceous, glabrous, pallid beneath, 37–70 by 13½–17 cm; nerves little prominent above, more so beneath, conspicuously anastomosing at the leaf-margin, veins reticulate-prominent on both sides; petiole thick, up to 7½ cm. ♂ *Flowers* not yet known. ♀ *Racemes* up to 40 cm, rhachis appressed-ferrugineous-pubescent. Pedicels 3–4 mm. *Calyx*-lobes deltoid, obtuse, ferrugineous-puberulous outside, 3½ by 3 mm. *Petals* oblong, 3½ by 2 mm; scale densely hirsute, 2 mm. *Ovary* subglobose, attenuate at the base, densely ferrugineous-hirsute. *Fruit* transverse-oblong, retuse at the apex, 2 by 3 cm.

Distr. S. Siam (Pattani: near Bachaw), once found.

Ecol. Evergreen forest, 500 m.

4. Ryparosa fasciculata KING, J. As. Soc. Beng. 59, ii (1890) 127; Ann. R. Bot. Gard. Calc. 5 (1896) 135, t. 158; RIDL. Fl. Mal. Pen. 1 (1922) 166; BURK. Dict. (1935) 1923.—*Ryparia fasciculata* RIDL. Trans. Linn. Soc. II, 3 (1893) 276.

Tree (10–)15–20(–35) m; branchlets red-brown, the younger parts very soon glabrescent, longitudinally striate; lenticels linear-oblong, 1–2 mm. *Leaves* narrow-oblong, coriaceous or nearly so, gradually attenuate and mostly slightly curved at the apex, cuneate at the base, rarely rounded, shining and bluish- to greyish-olivaceous above when dry, much paler beneath, 23–40 by (6–)7–10 (–12) cm, midrib mostly somewhat raised above, very prominent beneath, nerves suberect, (5–)6–7 (–9) pairs, little prominent above, strongly so beneath, veins ± manifestly transverse, reticulations dense and prominent on both sides; petiole thick, (1½–)2–3½(–5) cm. *Racemes* mostly numerous, in fascicles of 3–10 from each tubercle, slender, 15–25(–30) cm, rusty-hirsute. Pedicels 2–3 (–5) mm. *Flowers* light yellowish-brown, exactly as in *R. scortechinii*, but ovary more attenuate at the base and with 3 stigmas. *Fruit* yellowish-green, rusty-tomentose, triquetrous, the base substipitate-attenuate, apex very shortly mamillate, 3–4(–4½) by 2½–3 cm; peduncle thick, 1–2 mm. *Seeds* 3, enclosed in a white pulp of excellent flavour.

Distr. *Malaysia:* Malay Peninsula (Perak, Selangor, Kuantan, Malacca).

Ecol. In dense forests up to 300 m, apparently not common.

Uses. Wood dark dirty or light in colour, hard and durable, used for house-building and beams. The fruit is said to possess decidedly purgative qualities.

Vern. *Talón, tukol,* Selangor, *rambai ayam, pokok lemos, tajam b'lat, mesekang, putih,* Malacca, *putat gajah, sĕrungkup, talan.*

Note. In the sterile state to be distinguished from the very similar *R. scortechinii* by the numerous, elongate-linear lenticels on the branchlets, which are in *R. scortechinii* very few in number and short orbicular-elliptic in shape.

5. Ryparosa glauca RIDL. J. Bot. 74 (1936) 225.

Tree *c.* 5–6 m; branchlets brown-red when dry, glabrous, with sparse oblong-linear lenticels. *Leaves* narrow-oblong to oblong, ± shortly subacute-acuminate, broadly cuneate at the base, coriaceous, glabrous, pallid green or olivaceous when dry, shining above, dull and lighter-coloured beneath, (20–)25–45 by (6–)7–12(–13) cm; midrib impressed above specially towards the base, very prominent beneath, nerves 8–9 pairs, raised on both sides, reticulations rather dense and prominent; petiole stout, 2–3 mm thick, glabrous, (2½–)3–7 cm. *Racemes* spiciform, mostly solitary, slender, rather densely cinereous-subferrugineous-pubescent, 15–30 cm. Pedicels 1 mm. *Calyx*-lobes ovate, thin, 1½ mm. *Petals* 5, ovate-oblong, thick, 2–2½ mm; scale oblong, densely whitish-villose, 1½ mm. ♂ *Flowers:* staminal column slender, glabrous, 2½ mm. ♀ *Flowers* not seen. *Fruit* glabrescent, a little rough by many brown, corky lenticels; peduncle 5–6 mm long and 3 mm diam.

Distr. *Malaysia:* Borneo (Sarawak), at low altitude.

6. Ryparosa baccaureoides SLEUM. Blumea 7 (1954) 495.

Small tree; branchlets red-brown when dry, appressed-ferrugineous-pubescent, rather soon glabrescent, subterete; lenticels elliptic or mostly elongate-elliptic. *Leaves* acute-acuminate, broadly cuneate to rounded at the base, subcoriaceous, brownish-olivaceous, somewhat shining and glabrous when dry, greyish-greenish, pale and dull beneath, nerves and veins as well as undersurface mostly laxly covered with very small appressed pallid hairs, or glabrous, (11–)13–20(–22) by (5–)6–9(–12) cm; midrib slightly grooved above, very prominent into the apex beneath, nerves 5–6 pairs, curved-ascending and manifestly anastomosing near the margin, nearly flat above, very prominent beneath, veins rather densely reticulate, prominent specially beneath; petiole 2½–4(–9) cm, brown when dry, dark ferrugineous-pubescent, soon glabrescent, longitudinally striate. ♂ *Racemes* axillary or cauline, 8–12 cm, slender, spiciform; rhachis ± densely ferrugineous-pilose. Pedicels 3 mm. *Calyx* lobes ovate, ferrugineous-pilose outside, nearly glabrous inside, *c.* 3 mm diam. *Petals* oblong, acuminate, dark red when dry, *c.* 3 by 2 mm; scale ovate, golden-villous, 2 mm. Column of filaments glabrous, 4 mm. ♀ *Racemes* solitary or in fascicles of 2–3, cauliflorous; rhachis rather stout, 2 mm thick, pendent in anthesis, angular, 20–30 cm, rather densely ferrugineous-pilose. Pedicels 1½ mm. *Calyx* lobes and *petals* a little larger than in the ♂ flowers. Staminodes 5, reduced to short filaments. *Ovary* ovoid-subglo-

bose, densely ferrugineous-hirsute. *Fruit* 1½–2 by 2–2½ cm, brown-hirsute and rugose; pedicel thick, 2 mm.

Distr. *Malaysia:* N. Borneo (Kinabalu).

Ecol. Mountain-forest, 1000–1600 m.

7. Ryparosa hirsuta J. J. SMITH, Ic. Bog. 4 (1910) 57, t. 317; SLOOT. Bijdr. Flac. (1919) 90; MERR. En. Born. (1921) 411; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 318.

Tree 20–25 m; ultimate branchlets covered with a dense golden-brown or rusty tomentum; branches terete, with greyish bark and few elliptic lenticels. *Leaves* oblong or slightly obovate-oblong, acute-acuminate, rarely obtuse, cuneate to rounded at the base, subcoriaceous, brownish-olivaceous above, paler and more ferrugineous beneath when dry, shining and glabrous above, dull beneath, (15–)18–30 by (7–)8–12(–14) cm; midrib flat or slightly immersed above, very prominent beneath, nerves (5–)6–8(–9) pairs, suberect, little anastomosing at the margin, little or not prominent above (but often markedly dark-coloured), manifestly so beneath, veins transverse and prominent beneath, reticulations rather dense, little but visibly raised on both sides; petiole rather thick, ferrugineous-tomentose, 2½–5(–8½) cm. *Racemes* said to be 'cauline', but as far as seen from dried material, apparently axillary on defoliate twigs, mostly solitary, sometimes fascicled, ♂ ones very slender and (15–)20–55 cm, ♀ ones stouter, 8–15 cm, less densely set with flowers, always densely golden-brown, nearly hirsute-tomentose. ♂ *Flowers:* pedicels 1 mm. *Calyx* lobes 4, *c.* 1 mm, densely ferrugineous-pilose outside, glabrous inside. *Petals* 4, cream, oblong, subacute, 1.8 by 1 mm; scales ovate, 0.7 mm. *Stamens* 4, free, divergent, filaments 1 mm. ♀ *Flowers:* pedicels 3–5 mm. *Calyx* lobes 2½ mm. *Petals* 3 by 2 mm; scales very thick, 1½ mm. Staminodes 4, reduced to short glabrous filaments. *Ovary* subglobose, densely ferrugineous-hirsute. *Fruit* slightly depressed-globose (when 1-seeded, *c.* 2½ cm diam.) or mostly a little transverse-oblong (when 2-seeded, 2½ by 3–3½ cm), dark brown, initially tomentose, but soon glabrescent and somewhat rough. *Seeds* oval-semiglobose, *c.* 2–2½ by 1½ cm.

Distr. *Malaysia:* Borneo.

Ecol. Mountain-forest, 1000–1150 m.

Vern. *Poh-poh*, S. Kinabatangan.

8. Ryparosa wallichii RIDL. J. Str. Br. R. As. Soc. *no* 73 (1916) 139; Fl. Mal. Pen. 1 (1922) 165.

Tree; young branches with dense, dark-ferrugineous tomentum, ± concealing the sparse pallid elongate-elliptic lenticels. *Leaves* lanceolate-oblong, shortly (1 cm) acute-acuminate, cuneate at the base, subcoriaceous, olivaceous, glabrous and shining above, pallid and dull beneath, 12–20 by 3–5 cm; midrib slightly impressed above, very prominent beneath, lateral nerves suberect-ascending, in 5 pairs, nearly flat above, prominent beneath, veins laxly reticulate and little raised; petiole at first brownish-ferrugineous-hirsute, later glabrescent at least at one side, rather thick, 1½ mm diam., 2–3 cm. ♂ *Flowers:* buds in 5–8 cm long spike-like dark-ferrugineous-tomentose racemes. ♀ *Inflorescence* not seen. Immature *fruit* ovoid-subglobose, ± ferrugineous-tomentose, apparently 2-seeded.

Distr. *Malaysia:* Malay Peninsula (Penang, Selangor).

Note. Very near *R. acuminata* in general appearance, but with scattered, spreading, rather pale hairs on the underside of the leaves. The description above is based upon WALLICH's specimens from Penang (7847B, *lectotype*, K; 7847A, *leg.* FINLAYSON, K, apparently also from Penang) and a specimen with young fruits collected by HOSHIM (SF 2937, K) at Federal Hills, Kuala Lumpur, which is doubtless conspecific with WALLICH's plants. RIDLEY included his *no* 14163 (Singapore: Garden jungle, SING) in his description of *R. wallichii*, but this specimen I refer to *R. scortechinii*.

9. Ryparosa calotricha MILDBR. Notizbl. Bot. Gart. Mus. Berl.-Dahlem 10 (1928) 339.

Tree 8–20 m; young branchlets fulvous-hirsute or -tomentose, the old ones entirely glabrous, terete, covered with a thin, greyish peeling bark; lenticels sparse, orbicular-elliptic; bark grey or brownish-grey. *Leaves* elliptic-oblong, shortly obtusely or subacutely acuminate, cuneate at the base, rigidly chartaceous, upper surface olivaceous when dry, glabrous, rather dull, lower surface densely covered with a rufous, soft tomentum of ± spreading hairs specially on midrib, nerves, and veins, 13–20(–25) by (5–)6–9(–10) cm; midrib flat or somewhat immersed and tomentose in the lower half above, very prominent beneath, nerves (6–)7–9(–10) pairs, curved-ascending and excurrent along the margin, little or not prominent above, manifestly prominent beneath, veins ± transverse and prominent beneath, reticulations slightly prominent on both sides; petiole rufous-tomentose, 1½–3(–4) cm, rather stout, 1½–2 mm diam. ♂ *Racemes* many-flowered, up to 11 cm, fulvous-hirsute; pedicels 3–4 mm; ♀ *racemes* similar, but mostly shorter, their rhachis stouter and the flowers less densely arranged; pedicels 4–5 mm. ♂ *Flowers* only known in bud; staminal column glabrous. ♀ *Inflorescences* not yet known. Very young *fruits* broadly obovoid, fulvous-tomentose, with short filiform staminodes (without anthers).

Distr. *Malaysia:* New Guinea (Manokwari, Sepik).

Ecol. In primary forests, at very low altitude.

Vern. *Bijsje bijka*, Manokwari.

10. Ryparosa multinervosa SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 318, f. 4; HEYNE, Nutt. Pl. (1927) 1138.

Tree 10–23 m, sometimes buttressed; bark smooth; innovations rusty-tomentose, branchlets soon glabrescent; lenticels oblong, pallid. *Leaves* oblong or mostly ovate-oblong, gradually attenuate to the apex, sometimes rather abruptly (½–1½ cm) acuminate, subacute, broadly cuneate to

rounded at the base, glabrous, shining and olivaceous-brownish above when dry, dull, pallid and dilutely yellowish-brownish beneath, undersurface laxly covered with fine, appressed, pallid hairs, more densely so to nearly hirsute on the midrib and nerves, 20–32 by 9–14 cm; midrib little raised above, very prominent beneath, nerves curved-ascending, rather distinctly anastomosing near the margin, rather flat above, prominent beneath, veins transverse-parallel, manifestly prominent beneath, reticulations dense and little prominent on both sides; petiole ferrugineous-tomentose,

11. Ryparosa javanica (BL.) KURZ *ex* KOORD. & VAL. Bijdr. Booms. 5 (1900) 11; *l.c.* 6 (1900) 185; BACK. Schoolfl. Java (1911) 72; KOORD. Exk. Fl. Java 2 (1912) 631; Atlas 2 (1914) f. 350; SLOOT. Bijdr. Flac. (1919) 85; Bull. Jard. Bot. Btzg III, 7 (1925) 324.—*Bergsmia javanica* BL. Rumphia 4 (1849) 23, t. 178 c, f. 2; MIQ. Fl. Ind. Bat. I, 2 (1859) 111.—*Ryparia javanica* KURZ, J. Bot. 11 (1873) 234.—*Ryparosa caesia* (*non* BL.) KURZ, J. As. Soc. Beng. 45, ii (1876) 117; For. Fl. Br. Burma 1 (1877) 78; SLOOT. Nova Guinea 14 (1924) 190.—*R. wrayi* KING, J. As. Soc. Beng. 59, ii (1890) 126;

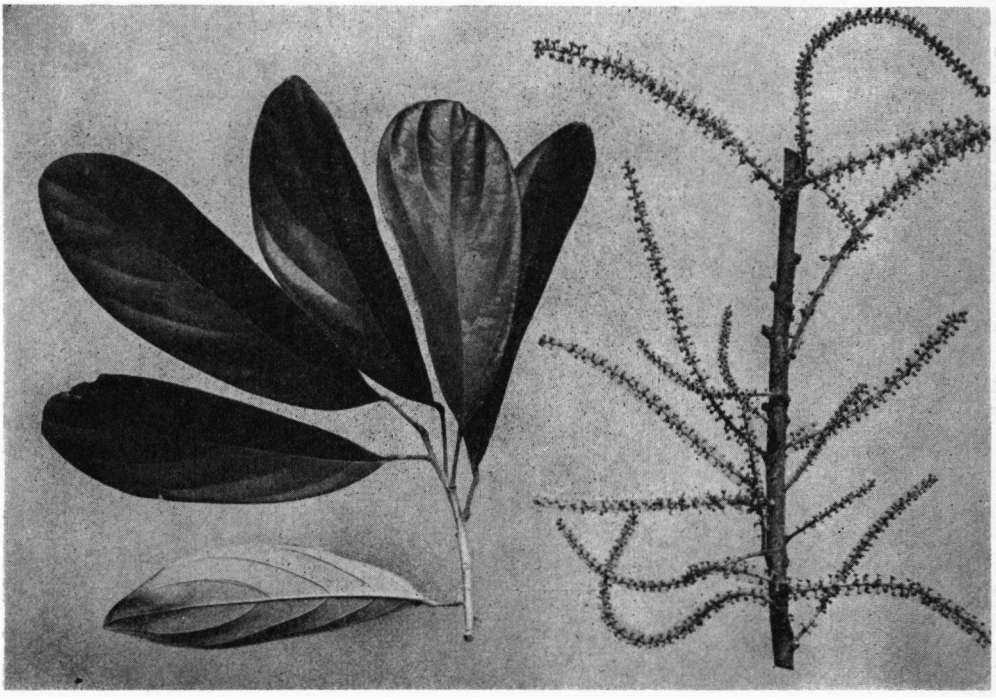

Fig. 18. *Ryparosa javanica* (BL.) KURZ, ♀, × 1/5 (C.H.B. III–F–15).

soon glabrescent. ♂ *Racemes* 20–30 cm, densely, finely rusty-tomentose, flowers only known in very young buds. ♀ *Flowers* (seen only below developed ovary): sepals and petals 3 mm; staminodes 4–5, manifestly pilose, 1 mm. *Ovary* appressed-ferrugineous-tomentose, the 2 sessile, ± rounded-reniform stigmas very close together. Peduncle *c.* 2 mm. Nearly mature *fruit* depressed-globose, ferrugineous-tomentose to glabrescent, minutely verrucose, (1–)2-seeded, *c.* 2½ by 1½ cm; pericarp thin, fragile; stigmas 2, *c.* 2–3 mm spaced.

Distr. *Malaysia:* N. Sumatra (Simalur Isl.).

Ecol. Scattered but rather common in lowland forests.

Uses. Heart-wood hard and durable. Fruits sour but edible.

Vern. *Mauseu uru, sikasa ilir, taramajang silai, djamboij, elul sawali,* Simalur.

Ann. R. Bot. Gard. Calc. 5 (1896) 133, t. 155; SLOOT. Bijdr. Flac. (1919) 89; RIDL. Fl. Mal. Pen. 1 (1922) 165; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 323.—*R. kurzii* KING, J. As. Soc. Beng. 59, ii (1890) 125; Ann. R. Bot. Gard. Calc. 5 (1896) 133, t. 154.—*R. longipedunculata* BOERL. Cat. Hort. Bog. (1899) 55; KOORD. & VAL. Bijdr. Booms. 5 (1900) 12.—*Gertrudia amplifolia* K. SCH. in K. SCH. & LAUT. Fl. Deut. Schutzgeb. (1901) 455, t. 15; GILG, Bot. Jahrb. 55 (1918) 292.—*R. amplifolia* MILDBR. Notizbl. Berl.-Dahlem 10 (1928) 339.—**Fig. 18–19.**

Tree 15–20(–30) m; bark grey to pale brown, rather smooth; branchlets appressed-rusty-tomentose apically, lower parts soon glabrescent, striate, light red-brown, later with a grey bark; lenticels sparse, oblong-elliptic. *Leaves* oblong or obovate-oblong, usually shortly (1–1½ cm) acuminate,

acute or obtuse at the base, olivaceous when dry, shining and glabrous above, yellowish on the lower surface when dry, young ones minutely pubescent beneath, mostly glabrous beneath when adult, ± subcoriaceous, variable in size, 12–35 (–45) by 4½–12(–14) cm; midrib mostly slightly impressed above, very prominent beneath, nerves 5–6 (in New Guinea sometimes up to 9) pairs, mostly curved-ascending rarely suberect, rather distant, nearly flat above, manifestly prominent beneath, veins ± distinctly transverse, reticulations fine, little but visibly prominent on both sides; petiole (1–)1½–6 cm, pubescent or glabrescent, 1½–2(–3) mm diam. *Racemes* all or for the greater part on defoliate twigs (very rarely also on old branches), 6–40(–70) cm, solitary or occasionally in fascicles of 2 or 3, densely subsericeous-rusty-tomentose; rhachis slender. Pedicels 2–3(–5) mm. *Calyx* lobes 3–4, ovate, acuminate, 2–2½ mm. *Petals* 4–5, ovate-oblong, nearly 3 by 2 mm; scale nearly half as long as the petals, villous. ♂ *Flowers:* staminal column 3–4 mm. ♀ *Flowers:* staminodes pilose, without anthers, up to 1 mm. *Ovary* ovoid, somewhat contracted at apex and base, densely rusty-sericeous-tomentose, soon glabrescent, with 2(–3), thick, reflexed, sessile, broadly obovate or reniform stigmas. *Fruit* globose to depressed-globose, (1½–)2½–3 cm across, glabrous, dilute-brown and with slightly elevated lighter spots when dry, rather smooth (tubercles not or little prominent), crowned by 2 ± spaced stigmas or their rests; pericarp *c.* 1 mm thick, fragile; peduncle 5–8 mm. *Seeds* mostly 2, ± oblong, slightly curved, 1½–2 cm long; aril fleshy, light-yellow.

Distr. Andamans, Nicobars, and S. Siam, in *Malaysia:* Malay Peninsula (Perak, Selangor, Pahang), Sumatra, Java, Bali, Borneo, New Guinea.

Ecol. Rain-forests, scattered, on not or only periodically inundated ground, 50–300, rarely up to 1100 m; *fl.* June–Jan., *fr.* May–Oct.

Uses. Wood yellowish brown.

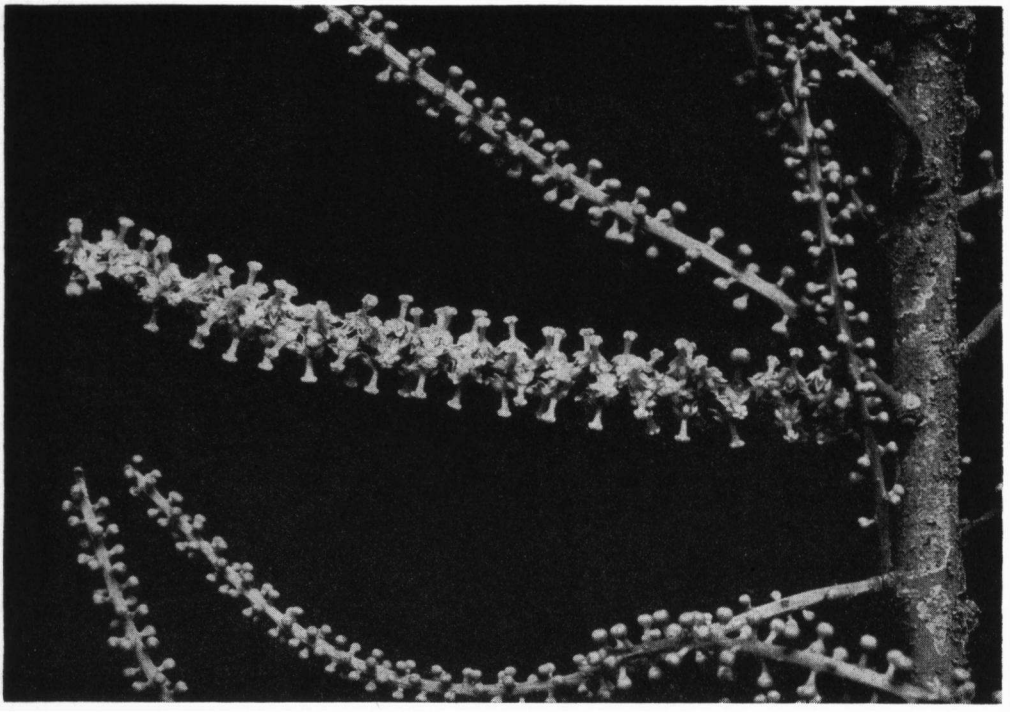

Fig. 19. *Ryparosa javanica* (BL.) KURZ, ♀ inflorescences, × 4/5 (C.H.B. III–F–15).

Vern. *Bungin*, Indragiri, *badja*, *tjingkuang*, Sum. E.C., *mědang ajou*, Benkulen, *ki sijung*, *huru gading*, *h. tangkalak*, *ki měngati*, *ki manjěti*, S, *adem ati*, *langit*, *wera*, Banjumas, *buru merak*, *hendog*, *sapi*, *kadju*, Besuki.

Note. Most of the New Guinean material has 7–8 (very rarely up to 9) pairs of nerves, and the fruits are more markedly tubercled, but the column is pilose within or at least in the upper part, which indicates the conspecificy or very close relationship with *R. javanica sens. stricto*. The New Guinean material at hand is too incomplete to allow a clear segregation of *R. amplifolia* as a distinct taxon.

12. Ryparosa kostermansii SLEUM. Blumea 7 (1954) 496.

Tree 14–20 m, bole 12 m, diam. 12–20 cm,

somewhat fluted; buttresses 1 m high; bark grey or pale brown to dark brown-red, smooth, pitted; branchlets angular, densely covered with minute, olivaceous, appressed hairs; lenticels oblong to elongate-oblong. *Leaves* oblong, gradually attenuate at the apex into a rather fine, acute acumen (1–1½ cm), cuneate at the base, firmly chartaceous, olivaceous, glabrous and dull above, cream-pallid or greyish-greenish and opaque beneath when dry, rather densely covered over the whole surface beneath with minute, fine, but rather stiff, pale, appressed hairs (well visible only by a lens), (10–)12–20 by (3–)4–7 cm; midrib slightly immersed above, very prominent and sometimes set with short strigose hairs beneath, lateral nerves erect in 2 (rarely 3, then the outermost ones faint) pairs, little prominent above, manifestly so beneath, veins ± obscurely transverse, reticulation distinct on both sides, but little prominent; petioles rather thin (1–1½ mm), (1–)1.2–1.8 cm, densely set with olivaceous, appressed, sericeous hairs. ♂ and ♀ *flowers* not yet known; developed ovaries and very young fruits several on 5–9 cm long racemes; rhachis slender, 1½ mm diam., densely covered with olivaceous, appressed hairs. Pedicels 1 mm long, 1½ mm diam. Immature *fruit* subglobose, covered with a dark-olivaceous or grey-green, short tomentum and with numerous tubercles; stigmas 2, broad-reniform, sessile, very close together on the developed ovary, 1–2 mm spaced on the submature fruit (*c.* 1½ cm diam.). *Seeds* 1–2.

Distr. *Malaysia:* SE. and W. Borneo (? Sarawak).

Ecol. Forests, on sandy or sandy-loamy soil, 30–700 m.

Vern. *Kakapasan*, Bandjar, *lĕmbuan*, *bĕtikĕl*, *daju*, Dyak.

Note. Fruiting material from Sarawak possibly belongs to this species: ripe fruit depressed-globose, finely tubercled, with lighter spots, 2½–3 by 3–3½ cm, with short peduncle (G. Silang, vern. *tampol batu*).

13. Ryparosa micromera SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 325, f. 5.

Tree up to 30 m; bark grey-brown; innovations and young branchlets rather dark rusty-tomentose or nearly hirsute, somewhat striate; lenticels elliptic. *Leaves* mostly oblong, sometimes obovate-oblong, rarely lanceolate-oblong, acutely or obtusely acuminate, cuneate to rounded at the base, subcoriaceous, densely rusty-hirsute on both sides when very young, but glabrous when adult, rather dull and greenish-olivaceous or -glaucous above when dry, yellowish-olivaceous and much paler beneath, 6½–12 by 2¾–4½ cm; midrib and 5–6 pairs of suberect nerves rather obscure above, very prominent beneath, veins ± indistinctly transverse, reticulations little prominent above, more so beneath; petiole initially rusty-tomentose, soon glabrescent, 1½–2½ cm, 1 mm diam. *Inflorescences* mostly in the axils of the upper leaves, sometimes also from lower defoliate parts; ♂ ferrugineous-tomentose, 3½–6 cm long, rhachis slender; ♀ ones seen only in fruiting state, somewhat stouter, *c.* 4–5 cm long. *Calyx* lobes ovate, *c.* 1½ mm. Petals 4, ovate-oblong, 2 by 1 mm; scales ovate, *c.* ½ mm.—♂ *Flowers:* column glabrous, 1½–2 mm. ♀ *Flowers* not yet known. Immature fruit subglobose, fulvous-tomentose, (1–)2-seeded, with 2 sessile, subreniform stigmas; peduncle 1½ mm.

Distr. *Malaysia:* Sumatra (Palembang), possibly elsewhere (sterile specimens).

Ecol. Primary forest, on hilly never inundated sandy soil at low altitude.

Vern. *Tindjar blukar abang*, *t.b. mèrah*, *kĕpayang*, M.

14. Ryparosa caesia BL. Bijdr. (1825) 601; KURZ, J. Bot. 11 (1873) 234; KING, J. As. Soc. Beng. 59, ii (1890) 128; Ann. R. Bot. Gard. Calc. 5 (1896) 133, t. 153; KOORD. & VAL. Bijdr. Booms. 5 (1900) 9; KOORD. Exk. Fl. Java 2 (1912) 631; Atlas Baumarten 2 (1914) f. 351; SLOOT. Bijdr. Flac. (1919) 82; BAK. *f.* J. Bot. 62 (1924) Suppl. 6, *incl. var. sumatrana* BAK. *f.*, SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 320; RIDL. Kew Bull. (1925) 77; HEYNE, Nutt. Pl. (1927) 1138.—*Ryparia caesia* BL. *ex* HASSK. Cat. Hort. Bog. (1844) 239; Pl. Jav. Rar. (1848) 267; MIQ. Fl. Ind. Bat. I, 2 (1859) 361; Suppl. (1860) 443.—*Aspidandra fragrans* HASSK. Versl. en Med. Kon. Akad. Wet. Afd. Natuurk. 4 (1856) 141; Flora 40 (1857) 532; Retzia *ed. nov.* (1858) 47; MIQ. Fl. Ind. Bat. I, 2 (1859) 411.

Small tree 5–15 m; bark grey; branchlets terete, striate, with small orbicular or elliptic lenticels, younger parts appressed-rusty-substrigose or -silky, soon glabrescent. *Leaves* elliptic-oblong or oblong, ± long-acuminate and acute at the apex (rarely obtusely acuminate), attenuate at the base, ± firmly chartaceous, dark green, glabrous and shining above, pale, greyish-green and densely appressed-subsericeous or substrigose beneath with ± longish, pale or yellowish hairs specially on midrib and nerves, (10–)15–25 by 4½–7½ (–10) cm; midrib and nerves little prominent above, manifestly so beneath, nerves curved-ascending 5–6 pairs, rather distant, inferior 2–3 excurrent along the margin, upper ones slightly enarching, veins ± transverse, reticulations rather dense and little prominent on both sides; petiole appressed-ferrugineous-hirsute (1–)1½–5 cm, relatively thin, 1–1½ mm diam. *Racemes* slightly supra-axillary, solitary, 5–30 cm, sericeous-rusty-tomentose; rhachis rather slender. Pedicels 2–3 mm. Buds ovate-apiculate. *Calyx* lobes 3(–4), oblong-ovate, acuminate, 3 mm. *Petals* 4–5, elliptic, *c.* 4 mm, greenish-white; scale suborbicular, *c.* 1½ mm. ♂ *Flowers: stamens* mostly connate, but sometimes free, the column respectively filaments glabrous. ♀ *Flowers: staminodes* 5, minute, whether or not with rudimentary anthers. *Ovary* ferrugineous-hirsute; stigmas reniform, slightly emarginate. *Fruit* first rusty-tomentose, later more greyish-tomentose and punctate, when ripe 2–2½(–3) cm across; peduncle 2–3 mm.

Distr. *Malaysia:* Sumatra, Java (W. half).

Ecol. In mixed forests, 400–1600(–2000) m,

scattered and not common. *Fl.* July–Nov., March–April, *fr.* July–Oct.

Vern. *Gĕgĕr tako, djĕdjĕr tĕko*, S, *wuru*, J, *kalumpang asoh*, M.

Uses. Fruits said to be edible.

Note. Not known with certainty from Bali, Celebes or New Guinea, as stated in literature.

15. Ryparosa kunstleri KING, J. Soc. Beng. 59, ii (1890) 127; Ann. R. Bot. Gard. Calc. 5 (1896) 134, t. 157; HALL. *f.* Med. Rijksherb. Leiden 1 (1910) 3; SLOOT. Bijdr. Flac. (1919) 87; RIDL. Fl. Mal. Pen. 1 (1922) 165; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 325; HEYNE, Nutt. Pl. (1927) 1138; BURK. Dict. (1935) 1923; SYMINGTON, Kew Bull. (1937) 318.—*Xanthophyllum hebecarpum* CHOD. Bull. Herb. Boiss. 4 (1896) 263; RIDL. Fl. Mal. Pen. 1 (1922) 149.

Tree 10–25 m, branchlets red-brown when dry, apically appressed-subferrugineous-pubescent, elsewhere glabrous, striate; lenticels oblong, 1–1½ mm; bark grey-brown, mottled with transversely oblong lenticels 3–4 mm. *Leaves* ovate-oblong or obovate-oblong to oblong, shortly and abruptly (1–1½ cm) acuminate, narrowed or rarely rounded at the base, coriaceous, upper surface olivaceous-green when dry, lower surface dull, pale, glabrous or mostly laxly covered with minute, pale-ferrugineous, appressed hairs with some longer bristle-like hairs or numerous shorter, appressed, ferrugineous hairs in the lower part of the midrib beneath, 12–20(–30) by 6–8½(–12) cm; midrib flat or slightly impressed above, very prominent beneath, nerves 5–6(–7) pairs, subarcuate-ascending and slightly raised above, prominent beneath, veins ± transverse, reticulations dense and rather prominent on both sides; petiole 2–3 mm diam., first dark ferrugineous-pubescent, glabrescent, 2–3(–4½) cm. *Racemes* solitary, rarely 2–3 fasciculate, ♂ 15–20 cm, ♀ half as long; rhachis stoutish, 1½ mm diam., subdensely covered with brown, appressed hairs. Pedicels 2½–3½ mm. ♂ *Flowers: calyx* thin, rusty pubescent outside, with 3 ovate lobes 2½ mm. *Petals* 5, oblong-lanceolate, 3 by 2½ mm. Staminal column glabrous. ♀ *Flowers: staminodes* apparently 0. *Ovary* obovoid, attenuate and angular at the base, contracted at the apex, ferrugineous-hirsute. *Fruit* globular, yellowish or dark greenish-brown, first dark velvety-brown, somewhat glabrescent, densely minutely tubercled, *c.* 3 cm diam.; pericarp rather thin, 1 mm diam.; peduncle *c.* 0.8 cm long, 2½ mm thick, glabrous. *Seeds* 5–6, oblong, compressed, striate, 1.8 cm long.

Distr. *Malaysia:* Sumatra, Malay Peninsula (Perak, Pahang, Selangor, Dindings, Kedah).

Ecol. Primary forests, 20–300 m, rarely ascending to 1000 m.

Uses. Wood hard and durable.

Vern. Sumatra: *Kĕpayang rimbu, kalĕt akar mambu, kubang-kubang*. Pahang: *tĕmbasah, kĕlat*.

16. Ryparosa acuminata MERR. Philip. J. Sc. 11 (1916) Bot. 100; En. Born. (1921) 411; Pl. Elm. Born. (1929) 209.

Small tree 8–12 m, rarely a shrub 3 m, innovations dark rusty-brown-appressed-hirsute, lenticels whitish, elongate-elliptic, mostly glabrous, clearly visible; branchlets terete, soon glabrous and covered with a thin whitish cork. *Leaves* oblong, gradually acute-acuminate (1–2 cm), acute at the base, subcoriaceous, upper surface olivaceous, glabrous, shining, lower surface dull, pale, often greyish or yellowish-pruinose when dry, midrib and nerves ± densely to laxly subappressed-hirsute, intervenium itself glabrous, 12–22 by (3½–)4–7 cm; midrib slightly raised above, very prominent beneath, nerves suberect, 4–5(–6) on each side, somewhat prominent above, very distinct so beneath, reticulations rather dense and prominent on both sides; petiole first ferrugineous-hirsute, soon glabrescent, 1½–3(–4) cm. ♂ *Racemes* slender 10–25(–30) cm, the ♀ ones shorter and stouter, all covered with a dark ferrugineous-hirsute tomentum. Pedicels *c.* 2 mm. ♂ *Flowers: calyx* light-green or cream, the 3 lobes ovate-elliptic, *c.* 2½ mm, appressed ferrugineous hirsute outside. Petals 5, rather membranous, oblong-subacuminate, 2½ by 1¼ mm; scale ovate, *c.* 1.2 mm, yellowish-villous. *Stamens* 5, column glabrous, ♀ *Flowers* not yet known. Nearly ripe *fruit* globose, first with a rusty tomentum, which soon peels off, leaving the fruit minutely rugose, glabrous, with white dots; peduncle 2 mm.

Distr. *Malaysia:* Malay Peninsula (Penang, Selangor), Borneo.

Ecol. Dense forests at low altitudes, on Mt Poi (Sarawak) at 1000 m. *Fl.* Sept.–Dec.

Uses. Bark said to have the odour of wintergreen-oil.

Vern. Borneo: *Tampasak burong*, Dusun Kinabat., *giewei*, Sungei.

17. Ryparosa hullettii KING, J. As. Soc. Beng. 59, ii (1890) 126; RIDL. Fl. Mal. Pen. 1 (1922) 165; BURK. Dict. (1935) 1923; AIRY SHAW, Kew Bull. (1949) 158.—*R. oligophlebia* MERR. Philip. J. Sc. 13 (1918) Bot. 97; En. Born. (1921) 411; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 322; MERR. Philip. J. Sc. 29 (1926) 400.—*R. borneensis* SLOOT. Bijdr. Flac. (1919) 88, t. 2; in FEDDE, Rep. 29 (1931) 101.—**Fig. 20.**

Slender tree or shrub (2–)5–10(–20) m; bark greyish-brown or brown, smooth, rather flaky; branchlets reddish-brownish when dry, the apical part minutely pubescent, elsewhere quite glabrous, terete, striate, laxly covered with pallid, suborbicular to oblong lenticels. *Leaves* elliptic or obovate-elliptic, sometimes oblong or oblanceolate, firmly membranous, rather abruptly (1–2½ cm) subacute-acuminate, tapering to the petiole, shining and grey-olivaceous on the upper surface, dull, greyish-greenish and pale beneath when dry, glabrous on both sides except the minutely pubescent midrib and occasional short hairs on the nerves beneath, (10–)12–18(–23) by (4–)5–8(–10) cm; midrib and lateral nerves slightly raised above, very prominent beneath, nerves curved-ascending to suberect, upper ones only slightly anastomosing, veins distinctly transverse and somewhat raised

on both sides, reticulations rather fine and dense, well visible on both sides; petiole rather slender, minutely pubescent, very soon glabrescent, (1½–)2½–5 cm long, 1½ mm diam. *Racemes* mostly solitary, slender, the ♂ (10–)30–40(–50) cm, the ♀ 4–8 cm; rhachis rather densely greyish- or yellowish-pubescent. Pedicels very slender, 2–3 mm. *Calyx* membranous, with 3, broad, ovate lobes, laxly appressed-pilose outside, 2 mm. *Petals* 5, ovate-oblong, pale-green, usually dark red when dry, 2½ mm; scale ovate, 1.2 mm. ♂ *Flowers: stamens* 5; column glabrous or sometimes

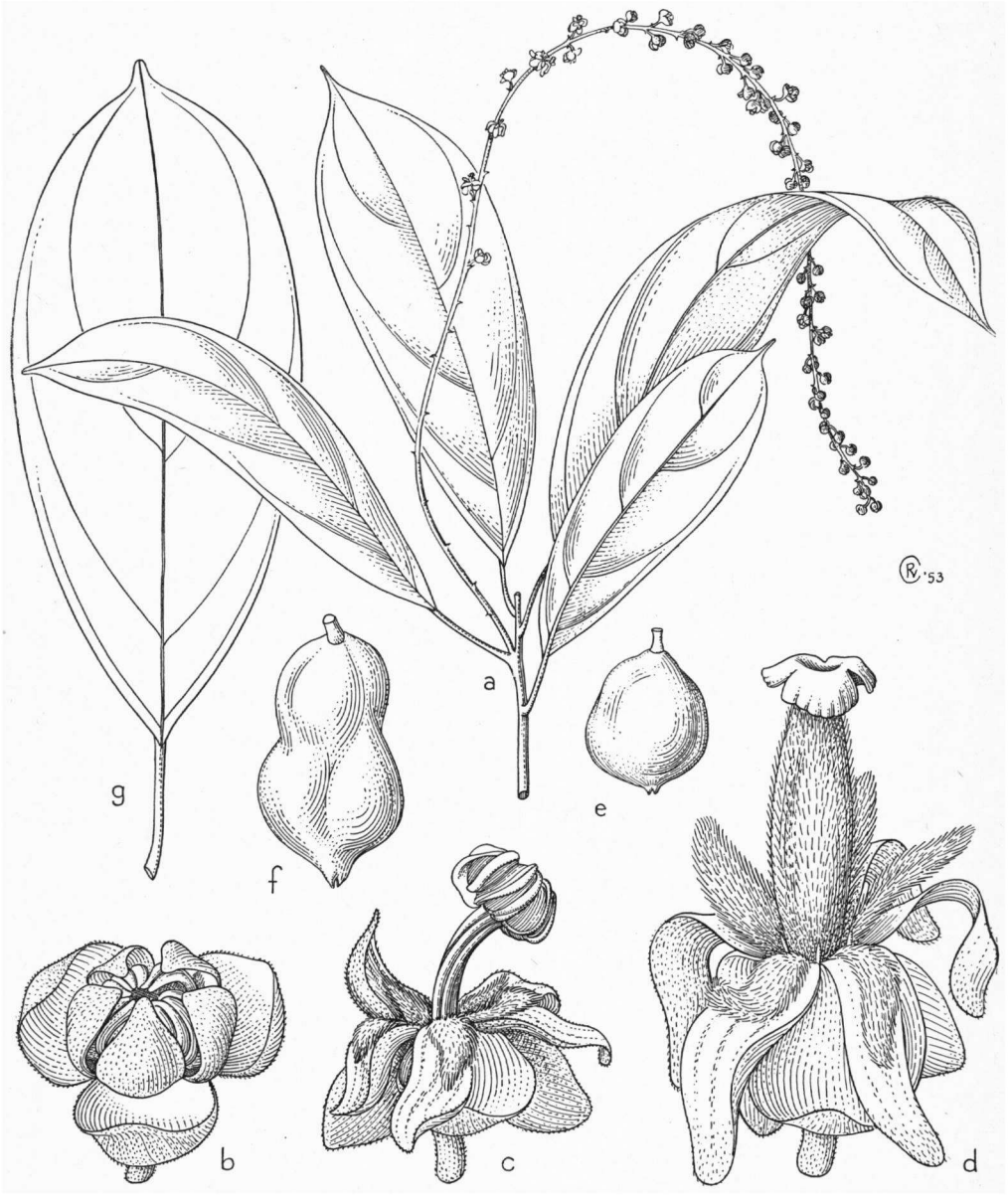

Fig. 20. *Ryparosa hullettii* KING. *a.* Twig with ♂ flowers, × 2/3, *b.* young ♂ flower, × 8, *c.* ♂ flower in full anthesis, × 8, *d.* ♀ flower, × 8, *e.* 2-seeded fruit × 2/3, *f.* 4-seeded fruit, × 2/3, *g.* leaf, × 2/3 (*a–c* after Br. N. Born. For. Dep. A 2297, *d* after KORTHALS, *ex* Borneo, *e* after VILLAMIL 263, *f* after SING. F.N. 29345, *g* after SING. F.N. 35947).

very little pilose immediately below the anthers, 3 mm. ♀ *Flowers: calyx* lobes and petals slightly larger than in the ♂. Staminodes 5, short, glabrous, without anthers. *Ovary* cylindrical, 3–4 mm, somewhat angular, dilutely rusty-hirsute; stigmas large, flat, reflexed, broadly obovate, sessile. *Fruit* fusiform when young, densely covered with minute tubercles, when ripe elliptic-fusiform and narrowed in the middle, when 4–6-seeded (3½–)4–4½(–6) by 2–2½ cm, rarely smaller, obovoid or subglobose, subacuminate, when 2–3-seeded 2½ by 2–2½ cm; pericarp thin, coriaceous, reticulate-pustular, greyish outside, at last nearly glabrous; peduncle 5–8 mm. *Seeds* irregularly compressed, mostly semiglobose, *c.* 1½ by 1 cm.

Distr. *Malaysia:* Malay Peninsula (Singapore, Johore, Trengganu), Borneo.

Ecol. On swampy ground or riversides in primary or secondary rain-forest (Dipterocarpaceous-forest), up to 200 (on Mt Kinabalu up to 550) m. *Fl.* Oct.–May, *fr.* Dec.–July.

Uses. Wood yellowish-white, pale brown or slightly pinkish, said to be soft; bark smelling of wintergreen-oil. Fruit yellow or yellowish-white, said to be edible.

Vern. Borneo: *Pitoling, bubuak, tampasak busong, sireh-sireh* (Sandakan); *piramoh* (Dusun); *impupuak, kayu tahi gagi* (Dusun Kinabat.); *kĕpayang bangai* (P. Laut); *chandar(a)i* (Brunei); *sumpit-sumpit* (SE. Borneo).

Note. A form with more rufous-pubescent leaves rounded at the base but otherwise very similar, was found at the base of Mt Dulit (Sarawak).

Imperfectly known

18. Ryparosa minor RIDL. J. Bot. 74 (1936) 225.

Small tree; branchlets glabrous, soon covered with grey cork. *Leaves* oblong, shortly (1 cm) acute-acuminate, cuneate at the base, coriaceous, glabrous, brownish and shining above, pallid and dull beneath when dry, (8–)9–14 by 4½–6 cm; midrib slightly impressed above, very prominent beneath, nerves ± 5 pairs, curved-ascending, excurrent at the margin or the upper ones very slightly anastomosing, little prominent on both surfaces, veins rather densely reticulate and raised specially beneath; petiole rugose, 1.3–1.8 cm. ♂ *Flowers: racemes* axillary, spike-like, 6–7 cm, grey-puberulous. Pedicels 1 mm. *Calyx* lobes 3, ovate, 1.2 mm. *Petals* 5, oblong-ovate, 2 mm; scales ovate, barbate, 1 mm. Column of filaments glabrous. ♀ *Flowers* and *fruit* not yet known.

Distr. *Malaysia:* Borneo (Sarawak; Kuching), only once found in swampy jungle.

Excluded species

Bergsmia acuminata MIQ. Fl. Ind. Bat. Suppl. (1860) 159, 389 belongs to the *Annonaceae, cf.* KURZ, J. Bot. 11 (1873) 233; HALLIER, Beih. Bot. Centralbl. 39, ii (1923) 160; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 328.

11. ELEUTHERANDRA

SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 328, f. 6–7.

Tree. *Leaves* alternate. Stipules 0. *Racemes* axillary, many-flowered, spike-like, simple or sometimes a little branched at the base. *Flowers* unisexual, 5-merous, the ♂ with rudiment of ovary. *Calyx* lobes valvate, minute, persistent. *Petals* imbricate, fugaceous, with basal scale inside. Disk 0. ♂ *Flowers: stamens* 5, episepalous; connective large. ♀ *Flowers: staminodes* 5, episepalous, subulate. *Ovary* unilocular; placentas 2(–3), each with one ovule. Styles 2 (very rarely 3), very short; stigmas conspicuous, erect, ovate-oblong and flattened, rather thick, together shaped like a deer's footprint. *Fruit* indehiscent, crowned by the style rests, 1–2(–rarely 3)-seeded; pericarp subcoriaceous, rather thin. *Seeds* arillate; testa hard.

Distr. Monotypic, *Malaysia:* S. Sumatra and SE.–NE. Borneo.

1. Eleutherandra pes-cervi SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 329, f. 6–7; HEYNE, Nutt. Pl. (1927) 1138.

Erect, slender tree, 10–35 m, buttressed up to 1 m; bark whitish, peeling; branches ferrugineous-tomentose, glabrescent when old. *Leaves* oblong to elliptic, entire, abruptly (0.5–1.7 cm) constricted at the apex, cuneate at the base, subcoriaceous, glabrous above, laxly pilose beneath, 11–17 by 4–8 cm; nerves 5–7 pairs; petiole stout, 3–6 cm, thickened at the apex. *Racemes* solitary, in the upper leaf-axils of the branchlets (these defoliate or beset with young, brownish-tomentose leaflets), 3–18 cm long. *Flowers* in spaced fascicles. Bracts and pedicels densely rusty-tomentose. *Calyx*-lobes ½ mm, triangular-subulate. *Petals* naviculate, glabrous, caducous, 4 by 1½–2 mm, pale-green, with a linear, inside densely pilose scale 2½ by 1 mm. ♂ *Flowers:* filaments pilose at apex and base only, 3 mm; anthers subcordate. Rudiment of ovary subulate. ♀ *Flowers:* staminodes glabrous, anthers reduced in size. *Ovary* oblong-ovoid, densely rusty-tomentose (white or greenish-white when fresh). Styles 2(–3), very short, tomentose, each with a blackish, *c.* 1 mm long stigma. *Fruit* irregularly globular-trigonous when containing 3 seeds, somewhat flattened when containing 2 seeds, asymmetrically applanate with 1 seed only, rusty-pilose. *Seeds* nearly reniform, 1.2 by 0.8–0.9 cm; testa striate; aril fleshy, 2–3 mm.

Distr. *Malaysia:* S. Sumatra (Palembang), SE. Borneo (Pleihari, Tanahbumbu), NE. Borneo (Berau).

Ecol. Primary dryland forest, probably scattered and rather rare, on sandy soil, 25–150 m. *Fl.* May–Nov., *fr.* July–March.

Vern. *Kĕtjintang, gistang, pĕlupi bara,* Palembang, *manuk-manuk, asahanlandak,* Borneo.

Uses. Sapwood red, heart-wood whitish, hard, occasionally used.

Note. Closely allied to the monotypic genus *Baileyoxylon* C. T. WHITE (J. Arn. Arb. 22, 1941, 143, pl. 1) from NE. Queensland, which differs from *Eleutherandra* only by 3 peltate, irregularly emarginate, foliaceous and shortly stalked stigmas. The fruits of *Baileyoxylon* are not yet known and may offer additional generic differences.

12. HOMALIUM

JACQ. Enum. Pl. Carib. (1760) 5.—**Fig. 21–25.**

Trees or shrubs. *Leaves* alternate (in Mal. *spp.*), penninerved, either with minute, caducous stipules (Mal. *spp.*) or exstipulate, entire or crenate-serrate (teeth obtuse, glandular beneath). *Flowers* bisexual, in axillary racemes (these often spike-like and solitary) or panicles, many-flowered. *Flowers* solitary or fascicled along the rhachis, sessile or pedicelled, subtended by a small, caducous or ± persistent bract. *Calyx*-tube obconical, connate with the ovary; calyx-lobes (sepals) (4–)5–8 (–12), flat, linear or obovate-spathulate, sometimes accrescent, wing-like. *Petals* inserted in the throat of the calyx, similar to the sepals and alternating with them, isomerous, whether or not accrescent, persistent. *Stamens* epipetalous, solitary or in fascicles of 2–8(–12), between the disk-lobes or rarely partly inserted on the base of the petals, very rarely irregularly inserted in the confluent disk-lobes; filaments filiform; anthers small, extrorse, dorsifixed. Disk represented by a (mostly tomentose) gland opposite each sepal. *Ovary* connate with the calyx in the inferior half, unilocular, with 2–6(–8) placentas, each with (1–)3–7 ovules near the apex. Styles 2–5(–7), free or shortly connate at the base; stigmas small or punctate. *Capsule* almost inferior, ± coriaceous, 2–8-valved from the apex, or indehiscent. *Seeds* 1 or few, minute.

Distr. About 180 *spp.* through all tropical countries, in *Malaysia* 23 *spp.*

Ecol. Most species belong to the lowland rain-forest.

Uses. Of several tall species the wood is used.

Note. Among the Malaysian species *23. H. moultonii* shows a remarkable structure of the androecium which does not fit into any of the known sections. To establish its infrageneric status a revision of the genus is necessary; this falls outside the scope of the present work. The species has been arranged here at the end of the genus as anomalous.

KEY TO THE SPECIES

1. Stamens solitary or in twos or in fascicles, strictly before the petals.
 2. Stamens solitary before each petal. SECT. PYTHAGOREA.
  3. Leaves softly tomentose or villous on the entire undersurface, or at least so on midrib and nerves.
   4. Racemes simple or rarely 1–2-partite near the base, elongate, spike-like. Flowers sessile or nearly so. Leaves nearly sessile . . . . . **1. H. tomentosum**
   4. Racemes panicled, divaricate. Pedicels 1½–2 mm. Leaves 5–7 mm petioled . **2. H. barandae**
  3. Leaves glabrous or practically so, sometimes laxly appressed-pilose or puberulous beneath on midrib and nerves only.
   5. Flowers (sub)sessile, very small, 3–4 mm diam. . . . . **3. H. acutissimum**
   5. Pedicels at least 1 mm.
    6. Racemes elongate, spike-like, simple, solitary . . . . . **4. H. longifolium**
    6. Panicles divaricate, or several spike-like racemes forming a few-branched panicle (single racemes sometimes still with leaflets at their base).
     7. Leaves entire or obscurely shallow-crenate, (4–)5–10(–12) by 3–5 cm . . **5. H. panayanum**
     7. Leaves manifestly serrate-crenate to crenate.
      8. Leaves 6–8 by 3–4½ cm. Nerves 6 pairs. Pedicels very slender . . . **6. H. multiflorum**
      8. Leaves (9–)12–17 by 5–8 cm. Nerves 8–10 pairs. Pedicels thicker . . . . **7. H. loheri**
 2. Stamens 2 or more before each petal.

9. Stamens inserted only between the disk-glands respectively at the very base of each petal but free from them. Sepals not or slightly accrescent after anthesis. SECT. EUMYRIANTHEIA.
10. Stamens constantly 2 before each petal, one behind the other.
11. Petals conspicuously patently pilose or tomentose, specially at the apex. **8. H. dasyanthum**
11. Petals shortly ± appressedly pilose or tomentose.
12. Leaves rigidly coriaceous, glaucescent-pruinose specially underneath. Bracts ovate or obovate, longer persistent . . . . . **9. H. kunstleri**
12. Leaves chartaceous to subcoriaceous. Bracts minute, narrow-lanceolate, early caducous. **10. H. foetidum**
10. Stamens at least partly in fascicles of 3–4(–5–7, very rarely more) in the same specimen.
13. Pedicels up to 1/3 mm.
14. Racemes spike-like, mostly solitary.
15. Sepals and petals triangular-ovate, shorter than the calyx-tube. **11. H. caryophyllaceum**
15. Sepals and petals narrow-linear, as long as the calyx-tube . . . . **12. H. spathulatum**
14. Panicles divaricate . . . . . **13. H. oblongifolium**
13. Pedicels at least 1 mm.
16. Racemes spike-like, solitary, simple or rarely 2–3-partite near the base.
17. Calyx-tube narrow-turbinate, about twice as long as the sepals or petals. **11. H. caryophyllaceum**
17. Calyx-tube as long or shorter than the sepals or petals.
18. Sepals and petals with longish, patent hairs.
19. Sepals and petals linear, 0.5–0.6 mm wide, subacute . . . . . **14. H. samarense**
19. Sepals and petals oblong-spathulate, rounded-obtuse, 1 mm wide. **15. H. villarianum**
18. Sepals and petals ± densely short-pilose or tomentulose.
20. Petals ± as long as or slightly shorter than sepals . . . . . **16. H. ramosii**
20. Petals about twice as long as the sepals . . . . . **17. H. undulatum**
16. Panicles very much branched, divaricate.
21. Petals and sepals with patent, longish hairs.
22. Petals and sepals oblong-spathulate, rounded-obtuse, 1 mm wide . . **15. H. villarianum**
22. Petals and sepals linear, subacute, *c.* 1/2 mm wide, (3 1/2–)4(–5) mm long. **14. H. samarense**
21. Petals and sepals ± densely or laxly shortly pilose or tomentose.
23. Bracts persistent, ovate, 1–1 1/2 mm long . . . . . **18. H. bracteatum**
23. Bracts early caducous . . . . . **19. H. celebicum**
9. Stamens partly inserted on the lower part of the petals. Sepals manifestly accrescent after anthesis. SECT. PIERREA.
24. Flowers subsessile to sessile during anthesis; fruit on a 1 mm long pedicel. Inflorescence condensed, densely greyish-yellowish-villous . . . . . **20. H. gitingense**
24. Pedicels at least 1 mm during anthesis, in fruit 2–4 mm.
25. Leaves ± broadly elliptic to oblong-elliptic or oblong, rather abruptly acuminate at the apex. **21. H. grandiflorum**
25. Leaves lanceolate- or oblong-ovate, gradually narrowed to the apex, greatest width below the middle . . . . . **22. H. minahassae**
1. Stamens *c.* 20, inserted irregularly in the disk formed by the ± fused, tomentose glands. Anomalous species . . . . . **23. H. moultonii**

Subgenus Pythagorea

(LOUR.) SLEUM. *stat. nov.*—*Blackwellia* LAMK, Encycl. (1785) 428 (*Blakwellia*); COMM. *ex* JUSS. Gen. (1789) 343, *nec* SCOP. (1777); BL. Mus. Bot. 2 (1852) 25; MIQ. Fl. Ind. Bat. 1, 1 (1855) 714; WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 36, *pro subgen.*—*Pythagorea* LOUR. Fl. Cochinch. (1790) 243.

Stamens solitary before the petals.

Section Pythagorea

(LOUR.) O. KTZE in POST & KUNTZE, Lex. Gen. Phan. (1904) 285.—Sect. *Blackwellia* BENTH. J. Linn. Soc. Bot. 4 (1860) Suppl. 33, *pro parte*.

Sepals and petals ± similar to each other.

1. Homalium tomentosum (VENT.) BENTH. J. Linn. Soc. Bot 4 (1860) 34; KURZ, For. Fl. Br. Burma 1 (1877) 531; J. As. Soc. Beng. 46, ii (1877) 93; CLARKE in HOOK. *f.* Fl. Br. Ind. 2 (1879) 596; KOORD. & VAL. Bijdr. Booms. 1 (1894) 182; KOORD. Exk. Fl. Java 2 (1912) 632; Atlas Baumarten 2 (1914) f. 340; SLOOT. Bijdr. Flac. (1919) 105; Bull. Jard. Bot. Btzg III, 7 (1925) 348; HEYNE,

Nutt. Pl. (1927) 1140; CRAIB, Fl. Siam. En. 1 (1931) 742; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 85, p. 2.—*Blackwellia tomentosa* VENT. Choix (1803) 57, t. 57; BL. Bijdr. 16 (1826) 1115; Mus. Bot. 2 (1856) 26, t. 2; MIQ. Pl. Jungh. (1855) 419; Fl. Ind. Bat. 1 (1857) 714.—*Blackwellia spiralis* WALL. Pl. As. Rar. 13 (1820) 400, tab.— **Fig. 21–22.**

Deciduous tree, (5–)20–30(–40) m, with well-shaped bole; branches horizontal; innovations ± tomentose; bark thin, smooth, green under the thin, whitish or light-grey peeling epidermis; trunk columnar, up to 90 cm diam., buttresses 1 m high, 20 cm broad at the base. *Leaves* broadly obovate to obovate-oblong, subsessile, rounded-obtuse or apiculate, cuneate towards the base, but rounded at the very base, subcoriaceous, shallowly and distantly ± glandular, crenate, ± glabrescent above, (7½–)10–15(–25) by 4–7(–13) cm; nerves strongly parallel, *c.* 12 pairs; petiole stout, 1–3(–5) cm. *Flowers* small, greenish, with a disagreeable smell, 5–6-merous, in 2–3(–5)-flowered glomerules spirally arranged along the stout, yellowish-tomentose, pendulous rhachis 10–35 cm long. *Calyx*-tube conical, tomentose. *Sepals* and *petals* linear-oblong, woolly, *c.* 1½ mm. Filaments 2 mm. Styles 2–3, glabrous. *Fruit c.* 3 mm, indehiscent, 1-seeded.

Distr. N. Circars, E. Bengal, Burma, Siam (southwards to 13°), Indo-China, in *Malaysia:* W. Coast of Sumatra (once found), Java (the W. part excepted rather common), Madura, Kangean Arch., Lesser Sunda Islands (Bali, Sumbawa, Flores, Timor). Not in the Malay Peninsula. Fig. 23.

Ecol. In mixed forests as well as in teak-forests (Java), not seldom on calcareous soil and often on periodically dry ground, mostly in localities where the dry monsoon is well-pronounced; sometimes the tree stands leafless for a few months. Not gregarious as a rule, though sometimes locally numerous, mostly at low altitude, from sea-level to 200 (rarely up to 700) m; *fl.* Jan.–Oct.

Uses. After MEIJER DREES (Commun. For. Res. Inst. Btzg *no* 33, 1951, 106) fairly fire-resistant, easily sprouting from stumps, recommended for afforestation and local timber production in not too dry regions; it stands short periods of high groundwater.

Wood brown, hard, heavy, but not durable, used for matches.

Vern. *Ki bodas*, S, *dělisĕm, dělissĕm, d(ĕ)lingsem, g(ĕ)lingsĕm, gĕrinsĕng kĕlingsĕm, estri*, J, *habu*, Md, *kaladdo, kĕleddo*, Flores, *lanung*, Sumbawa, *nèku*, Timor.

2. Homalium barandae VID. *ex* F.-VILL. Nov. App. (1880) 94; Cat. Pl. Prov. Manila (1880) 32; Sin. Atl. (1883) 27, t. 35, f. A; Rev. Pl. Vasc. Filip. (1886) 141; MERR. Philip. J. Sc. 3 (1908) Bot. 245; Sp. Blanc. (1918) 20; En. Philip. 3 (1923) 110.

Tree; young branchlets brownish, ± tomentose, the older ones quickly glabrescent. *Leaves* oblong or elliptic-oblong, abruptly (1 cm) obtuse-acuminate, attenuate into the petiole to ± rounded at the base, somewhat inequilateral, thinly chartaceous, coarsely subserrate-crenate, (6–)7–13(–15)

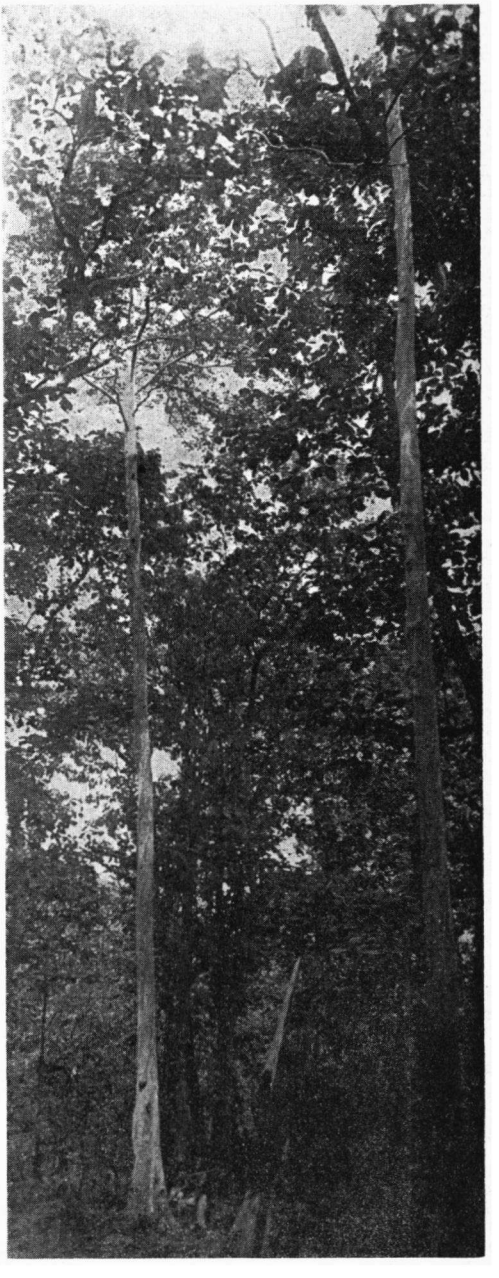

Fig. 21. Two trees of *Homalium tomentosum* (VENT.) BTH., conspicuous by their ivory-white greenish tinged bark, in teak-forest Ngandong (S. Randublatung), E. Java, Dec. 1917 (KALSHOVEN).

Fig. 22. *Homalium tomentosum* (VENT.) BTH. Flowering twig, above left showing underside of part of a leaf, × 3/5 (C.H.B. IV–F–59).

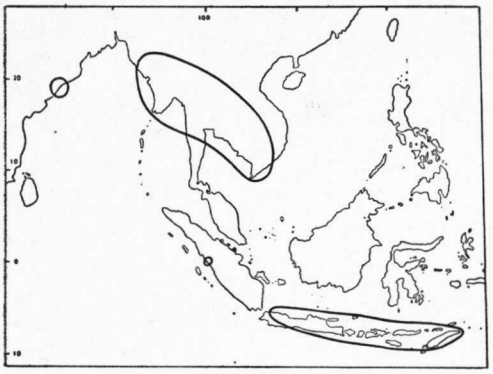

Fig. 23. Distribution of *Homalium tomentosum* (VENT.) BTH. The locality in Sumatra is represented by one collection.

by (4–)5–6½ cm; nerves 6–8 pairs, joined at the margin, veins rather densely reticulate and prominent on both sides; petiole tomentose. *Panicles* ± densely shortly cinereous-pilose, branched from near the base, 15–20 cm long, lower branches up to 10 cm. *Flowers* 7-merous, in fascicles of 4–6(–8) interruptedly disposed on the rhachis. Bracts subulate, ½ mm. Pedicels slender, ± connate at their bases. *Calyx*-tube conical-oblong, 1.8 mm. *Sepals* narrow-spathulate, 1½ by 0.3 mm. *Petals* similar to the sepals, 1½ by ½ mm, slightly accrescent. Styles 7, very short.

Distr. *Malaysia:* Philippines (Luzon: Benguet, Rizal, Batangas).

Ecol. In forests at low and medium altitudes.

Vern. *Laing*, Tag.

Note. Possibly only a tomentose form of *H. loheri.*

3. Homalium acutissimum GILG, Bot. Jahrb. 55 (1918) 278.

Shrub or tree, glabrous the inflorescences excepted. *Leaves* oblong or oblong-lanceolate, acutely and long-attenuate to caudate at the apex, cuneate or subrotundate at the base, entire or obscurely distantly crenate, firmly chartaceous, shining, 6–11 by 2–4¼ cm; nerves *c.* 10 pairs, prominent on both sides, veins very numerous densely reticulate; petiole 3–4 mm. *Racemes* spike-like, densely pilose, 10–20 cm; pedicels, if any, very short (up to ½ mm). *Flowers* 6-merous; bracts scariose, 1½ mm. *Calyx*-tube obconical, short. *Sepals* and *petals* linear, *c.* 1½ and 2 mm, densely set with rather patent longish hairs.

Distr. *Malaysia:* N. New Guinea (Waria River: Gomadjidji), once found.

Ecol. Rain-forests, 450 m.

4. Homalium longifolium BENTH. J. Linn. Soc. Bot. 4 (1860) 35; CLARKE in HOOK. *f.* Fl. Br. Ind. 2 (1879) 596; KING, J. As. Soc. Beng. 67, ii (1898) 20; RIDL. Fl. Mal. Pen. 1 (1922) 834; CRAIB, Fl. Siam. En. 1 (1931) 741; BURK. Dict. (1935) 1184.—*Blackwellia macrostachya* TURCZ. Bull. Soc. Nat. Moscou 36 (1863) 610; (Kew Ind.: *sphalm. monostachya*); SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 355 (*sphalm. macrocarpa*).

Tree 6–10 m, glabrous the inflorescences excepted. *Leaves* lanceolate or oblong-lanceolate, acute or shortly and bluntly acuminate, narrowed at the base, rather coriaceous, shining, entire, sometimes shallow-crenulate, 7–11 by 3½–5 cm; nerves 7–9(–10) pairs, spreading, curved, faint, veins obscure above, somewhat reticulate-prominent beneath; petiole 0.5–0.8(–1) cm. *Racemes* almost slender, solitary, rarely branched near the base, 10–15(–22) cm, covered with a minute, white or pale-yellowish tomentum. *Flowers* 5–6-merous, pale-yellow or greenish, in fascicles of 3–4(–5), rather interruptedly disposed along the rhachis. Pedicels 1–1½ mm, confluent at their bases. *Calyx*-tube turbinate, short. Sepals oblong, 1½–2 mm. *Petals* similar to the sepals, but a little narrower. Disk-glands tomentose, whitish or yellow. Styles 4–5.

Distr. S. Siam (Pattani), in *Malaysia:* Malay Peninsula (Perak, Selangor, Trengganu, Negri Sembilan, Pahang, Penang, Johore, Malacca).

Ecol. In forests, 60–650 m.

Uses. Wood said to be very hard, used in house-construction.

Vern. Siam: *Chen kiang, kamap, panasan, pauh kijang jantan, rukam babi, tias mula*; Selangor: *sangah, pětaling gajah, kěmap, sělěmbar, sělěmbu*; Pahang: *sělum(b)ar*; Negri Sembilan: *masikang*; Johore: *slěmbar.*

5. Homalium panayanum F.-VILL. Nov. App. (1880) 94; VID. Rev. Pl. Vasc. Filip. (1886) 141, *descr. corr.*; MERR. Philip. J. Sc. 3 (1908) Bot. 246; Sp. Blanc. (1918) 20; En. Philip. 3 (1923) 111.—*H. grandiflorum* (*non* BENTH.) NAVES in BLANCO, Fl. Filip. ed. 3 (1877–83) t. 443.—*H. myrianthum* BAKER, Kew Bull. (1896) 23; MERR. En. Born. (1921) 412.—*H. subscandens* ELM. Leafl. Philip. Bot. 4 (1912) 1518.—*H. obovatum* MERR. Philip. J. Sc. 27 (1925) 37; En. Philip. 4 (1926) 253.

Small tree or shrub, glabrous the inflorescences excepted. *Leaves* elliptic-obovate or oblong-obovate, broadly obtusely acuminate or subrotundate, attenuate into the petiole at the base, subcoriaceous, shining above, dull beneath, dark greyish-brownish when dry; nerves 6–7 pairs, distinctly prominent beneath, veins reticulate-prominent beneath only; petiole 3–6(–8) mm. *Panicles* branched from near the base, (4–)5–10(–12) cm long, lower branches 3–4 cm; rhachis and branches rather slender, greyish-ciliate-pubescent. *Flowers* white, 6–7-merous, solitary. Pedicels slender, *c.* 2½ mm. Bract subulate, 1 mm. *Calyx*-tube short, rather narrow, 1.8 mm, ciliate. *Sepals* linear, 1½–1¾ by ½ mm, subacute, densely covered with spreading hairs. *Petals* similar to the sepals but 1 mm wide, both accrescent up to 3 mm. Styles 4, hirsute nearly to their apex.

Distr. *Malaysia:* Br. N. Borneo, Philippines (Luzon, Palawan, Guimaras Isl., Sibuyan).

Ecol. On ridges in forests at low and medium altitudes, ascending to 1400 m.

Vern. Borneo: *Malaban*, Dusun, *kaninium*, D. Tambuwan, *panawan*, Bajan. Philippines: *ampupuyót*, Bis., *kandong*, Ilk. *puyót*, P. Bis.

6. Homalium multiflorum MERR. Philip. J. Sc. 13 (1918) 35; En. Philip. 3 (1923) 111.

Tree, glabrous the inflorescences excepted. *Leaves* elliptic, attenuate at apex and base, subcoriaceous to coriaceous, shining; nerves prominent beneath, veins distinctly reticulate on both sides; petiole 5–7 mm. *Panicles* elongate, composed of several simple racemes from the uppermost axils, sometimes sustained by very reduced leaves, up to 12 cm long, ± densely hirsute-ciliate. *Flowers* 5-merous, white, fasciculate. Pedicels 2½ mm. Bracts oblong-ovate, acute, 2 mm. *Calyx*-tube funnel-shaped, 2 mm. Sepals narrow-oblong, ciliate, 2 by ½ mm. *Petals* subspathulate, ciliate, 3 mm. Filaments pilose. Styles 4–5.

Distr. *Malaysia:* Philippines (Luzon: Ilocos Norte, Bontoc, Benguet, Rizal, Bataan).

Ecol. In forests up to 1500 m altitude.

Vern. *Tamúyan*, Ibn.

7. Homalium loheri MERR. Philip. J. Sc. 3 (1908) Bot. 245; En. Philip. 3 (1923) 110.

Medium-sized tree, glabrous the inflorescences excepted; branchlets greyish. *Leaves* oblong-elliptic, shortly obtuse-acuminate at the apex, acute at the base, subcoriaceous, shining; nerves prominent, veins distinctly reticulate; petiole *c.* 5 mm. *Panicles* 12–20 cm, with few, elongate branches, densely patent-pilose. *Flowers* fasciculate, 5–6-merous. Pedicels 3–4 mm. Bracts narrow-ovate, minute, caducous. *Calyx*-tube narrow-funnel-shaped, 2 mm. *Sepals* oblong, spreading pilose, 2 mm. *Petals* subspathulate, spreading pilose, 2½ mm. *Ovary* villous. Styles 4–5.

Distr. *Malaysia:* Philippines (Luzon: Rizal).

Ecol. In forests at medium altitude.

Vern. *Laing*, *parañgyat*, Tag.

Subgenus Homalium

Homalium subgen. Myriantheia (THOU.) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 36.—*Myriantheia* THOU. Gen. Nov. Madag. (1806) 21.

Stamens in fascicles of 2 or more.

Section Eumyriantheia

WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 36.—*Cordylanthus* BL. Mus. Bot. 2 (1852) 27, t. 3.

Stamens inserted strictly before the petals.

8. Homalium dasyanthum (TURCZ.) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 36; CRAIB, Fl. Siam. En. 1 (1931) 739; HENDERS. J. Mal. Br. R. As. Soc. 17 (1939) 46.—*Blackwellia dasyantha* TURCZ. Bull. Soc. Nat. Moscou 36 (1863) 610.—*H. foetidum* (*non Ludia foetida* ROXB.) BENTH. J. Linn. Soc. Bot. 4 (1860) 37, *quoad pl.* GRIFFITH; CLARKE in HOOK. *f.* Fl. Br. Ind 2 (1879) 597.—*H. griffithianum* KURZ, J. As. Soc. Beng. 40, ii (1871) 57 (*cf.* GRIFF. Not. 4, 1854, 584, t. 585 A, f. 10); *l.c.* 46, ii (1877) 93; For. Fl. Br. Burma 1 (1877) 531; CLARKE in HOOK. *f.* Fl. Br. Ind. 2 (1879) 597; KING, J. As. Soc. Beng. 67, ii (1898) 21; RIDL. J. Str. Br. R. As. Soc. *no* 59 (1911) 106; *l.c. no* 61 (1912) 53; J. Fed. Mal. St. Mus. 5 (1915) 161; GAGNEP. Fl. Gén. I.C. 2 (1921) 1009, *incl. var. glabrum* GAGNEP. & *var. cambodianum* GAGNEP. *l.c.* 1011; RIDL. Fl. Mal. Pen. 1 (1922) 835, f. 68; MERR. Lingn. Sc. J. 14 (1935) 40.—**Fig. 25d–e.**

Small tree 4–12 m, trunk 10–20 cm diam., young parts softly tawny-pubescent; outer bark thin, stripping off in bands. *Leaves* ovate- or obovate-oblong, shortly and bluntly acuminate, slightly narrowed to the rounded or subcordate base, sometimes inequilateral, thinly chartaceous, nearly entire to coarsely crenate, younger ones sparsely pubescent on both sides, sometimes more densely pubescent to tomentose specially on midrib and nerves beneath, at maturity ± glabrescent but subpersistently pubescent on midrib and nerves, rarely entirely glabrous, 5–12 by 3–5½ cm; nerves 5–7 pairs, spreading, slightly curved, little prominent beneath, veins rather obscure; petiole tawny-tomentose, 4–5 mm. *Racemes* spiciform, solitary, slender, (6–)8–12 cm long, softly tawny-tomentose at rhachis, pedicels and calyx. *Flowers* (9–)10–12-merous, greenish-yellow or white, in spaced ± whorled 2–4-flowered fascicles along the rhachis. Pedicels 2–3 mm. *Calyx*-tube obconical, nearly 3 mm. Sepals triangular-linear, 2 mm, scarcely 2 mm at the base, subacute. *Petals* oblong-obovate, 2½–3 by 1¼ mm, densely hirsute or covered with tawny spreading hairs. *Ovary* hirsute. Styles *c.* 5.

Distr. Indo-China, Lower Burma, Siam, in *Malaysia:* Malay Peninsula (Perlis, Langkawi, Kedah, Pahang, Johore).

Ecol. Rocky places on limestone, but also in swampy forest (CORNER).

Vern. *Tĕlor buaya, ayĕr anjiing, lĕnggundi laut, mĕsĕrah puteh, pĕtaling jantan*, M.

9. Homalium kunstleri KING, J. As. Soc. Beng. 67, ii (1898) 20; RIDL. Fl. Mal. Pen. 1 (1922) 835; HENDERS. J. Mal. Br. R. As. Soc. 17 (1939) 46.

Tree 6–14 m; young branches glabrous, rather slender, smooth, glaucous. *Leaves* subovate-elliptic-oblong, attenuate towards the apex, shortly obtusely acuminate, narrowed or mostly rounded

at the base, slightly inequilateral, stiffly coriaceous, glabrous, glossy light-green alive, shining above, dark-brown when dry, dull and glaucous beneath, remotely crenate, 11–18 by 6–8 cm; midrib nearly flat above, very prominent beneath, nerves 8–9 pairs, faint, curving upwards, veins obscure or prominent-reticulate above only; petiole stout, 4–6 mm. *Racemes* solitary, spiciform, rather robust, ± as long as the leaves; rhachis olivaceous-tomentose. *Flowers* pale greenish-yellow, 6-merous, in interrupted, 3–4-flowered fascicles. Pedicels 2 mm. Bracts nearly rounded to ovate, firm, ± persistent, 3 mm diam.. *Calyx*-tube widely funnel-shaped, 2 mm, densely cinereous-tomentose outside as are the sepals and petals. Sepals oblanceolate, obtuse, 2 mm. *Petals* broadly lanceolate, subacute, villous inside, 2 mm. *Ovary* tomentose. Styles 5.

Distr. *Malaysia:* Malay Peninsula (Perak), apparently very rare.

Ecol. Limestone rocks, 150–300 m.

10. Homalium foetidum (ROXB.) BENTH. J. Linn. Soc. Bot. 4 (1860) 37, *pro parte, quoad pl.* ROXB.; KOORD. Minah. (1898) 473; VAL. Bull. Dép. Agric. Ind. Néerl. *no* 10 (1907) 35; MERR. Interpr. Herb. Amb. (1917) 378; SLOOT. Bijdr. Flac. (1919) 107; Nova Guinea 14 (1924) 191; Bull. Jard. Bot. Btzg III, 7 (1925) 350; MERR. Philip. J. Sc. 29 (1926) 401; HEYNE, Nutt. Pl. (1927) 1139; MERR. Pl. Elm. Born. (1929) 209.—*Metrosideros Molucca Samar mas* RUMPH. Herb. Amb. 3 (1750) 25, t. 11.—*Ludia foetida* ROXB. [Hort. Beng. (1814) 38, *nom. nud.*] Fl. Ind. ed. CAREY 2 (1832) 508.—*Blackwellia foetida* WALL. [Cat. (1831) 4899, *nom. nud.*] *ex* DELESSERT, Ic. 3 (1837) 32, t. 53; BL. Mus. Bot. 2 (1856) 27; MIQ. Fl. Ind. Bat. 1 (1857) 714.—*Blackwellia propinqua* WALL. Cat. (1831) 4898, *nom. nud.*—*Blackwellia spiralis* WALL. *l.c.* 4897 *pr.p., nom. nud.*—*Blackwellia moluccana* BL. Mus. Bot. 2 (1856) 27.—*Scolopia foetida* CLOS, Ann. Sc. Nat. IV, 8 (1857) 253.—*Astranthus foetida* WALL. *ex* CLARKE in HOOK. *f.* Fl. Br. Ind. 2 (1879) 598.—*H. propinquum* CLARKE *l.c.* 597; KING, J. As. Soc. Beng. 67, ii (1898) 21; RIDL. Fl. Mal. Pen. 1 (1922) 835; HEYNE, Nutt. Pl. (1927) 1140; BURK. Dict. (1935) 1184.—*H. luzoniense* F.-VILL. Nov. App. (1880) 94; VID. Sin. Atl. (1883) 27, t. 53, f. B; Rev. Pl. Vasc. Filip. (1886) 141; MERR. Philip. J. Sc. 1 (1906) Suppl. 99; *ibid.* 3 (1908) Bot. 247; Interpr. Herb. Amb. (1917) 48 (*sphalm. luzonicum*); Sp. Blanc. (1918) 20; En. Philip. 3 (1923) 111.—*H. aranga* VID. *ex* F.-VILL. Nov. App. (1880) 94, *in syn.*—*H. platyphyllum* MERR. Philip. J. Sc. 13 (1918) 36; En. Philip. 3 (1923) 111.—*H. pachyphyllum* GILG, Bot. Jahrb. 55 (1918) 276, f. 3; WHITE & FRANCIS, Proc. R. Soc. Queensl. 38 (1927) 248; C. T. WHITE, J. Arn. Arb. 10 (1929) 243.—*H. amplifolium* GILG, Bot. Jahrb. 55 (1918) 276.—*H. novoguineense* SLOOT. Bijdr. Flac. (1919) 109; Nova Guinea 14 (1924) 191; Bull. Jard. Bot. Btzg III, 7 (1925) 353.—**Fig. 24.**

Tree (6–)20–30(–50) m; trunk straight, buttressed to 1.20 m; bark mottled grey to brown-yellow, smooth with transverse fissures; branchlets primarily pilose, soon glabrescent, brownish. *Leaves* oblong or ovate-oblong, rarely ovate or elliptic, mostly rather abruptly acuminate, cuneate or rounded at the base, coriaceous to subcoriaceous, shining above, dull beneath, glabrous (but those of suckers often rather densely tomentose beneath), (juveniles red, mature ones yellowish-green alive), dark red-brownish when dry, mostly coarsely crenate, rarely shallow-crenate only or nearly entire, (10–)12–20(–28) by 5–8(–11) cm; nerves 8–12(–15) pairs, distinctly parallel, very prominent beneath, veins sometimes manifestly, but mostly little reticulate and prominent; petiole stout, rough, (0.7–)1–1.5 cm. *Panicles* ample, composed of several to many spike-like racemes, (7–)10–15(–22) cm long, peduncle 2–3 cm, lower branches (or racemes) 10–15 cm; rhachis as well as pedicels and flowers densely covered with a very short, grey indument. Pedicels 1–2 mm. Bracts linear-subulate, minute, early caducous. *Flowers* 7–8-merous, pale-green or light-yellow, with a repulsive odour, in spaced, whorled fascicles. Calyx-tube obconical, 1 mm. *Sepals* lanceolate, subacute, *c.* 1½ mm. *Petals* oblong-spathulate, 2½–3 mm long, in fruit accrescent up to 4 mm, densely pilose (with hairs a little spreading) at the apex. *Ovary* tomentose. Styles 4.

Distr. Melanesia (New Ireland, New Britain), in *Malaysia:* Sumatra (Tapanuli), Malay Peninsula (Penang, Perak, Kelantan, Pahang, Malacca), Borneo, Philippines (Luzon, Leyte, Cebu, Mindanao), Celebes, Moluccas, New Guinea.

Ecol. In thickets (Philippines) or rain-forest, often along river-banks, on clayey or sandy, often stony, whether or not periodically inundated soil, 20–200(–350) m. Apparently rather common in the eastern part of Malaysia, but specimens scattered. *Fl.* Jan.–Dec.

Uses. Wood yellowish-brown or light reddish-yellow on exposure, blackish in seawater. A hard, dense timber used for house- and bridge-constructions and making combs.

Vern. *Ternataans ijzerhout*, D, *Ayĕr anjing, menserah puteh, pantat ulat puteh*, Mal. Pen.. Sumatra: *sarumar, kalĕt batu, pantat u'lat putih*. Borneo: *takĕlim*, M, *dijung barak, manuk manuk, hatan sauw, turug pau, katal katal, batu bagalang*; *bo-o*, Suluk, *punit-punit*, Bajan, *kalamis*, Dajak, *takilin*, Sungei, *tĕlutu*, Dusun, *takabu*, S. Labuk. Philippines: *arâñgan*, Tag., *kamagáhai, kamagáhi'*, Bik., *yagau*, C. Bis.. Celebes: *aliwowos* (t.s.), *kaju bĕsi, kaju watu* (t.l.), *tohasik*, (ponos.), *watu, momola*; *molaba*, Kolaka, *karondang rante, hija*; *gia*, Buton. Moluccas: *atébe, hatebesi*, Morotai, *mustigawe, bohomangit*, Buru, *samal, s. mérah*, Ceram, *samar, samale, samal batu*, Ambon, *hote besi putih*, Batjan, *hati bĕsi fina, fatu*, Sulu, *ngersaun, merkai*, Aru, *hate bĕsi* (*merah*), *horo ma bĕka*, Halmah.. New Guinea: *manggusaaipi, ropi*, Japen, *ropir, ropil, kopral, petian, bengeran*, W. Nw G., *ied*, N. Nw G., *tiakaote*, SW. Nw G., *tala*, SE. Nw G., *malasa*, Nakanai, *kavea*, Vailala, *emapu*, Kikoro, Pt Moresby, *manai*, Orokaiva, Mumuni, *lowup*, Rabaul, *malas*, pidgin.

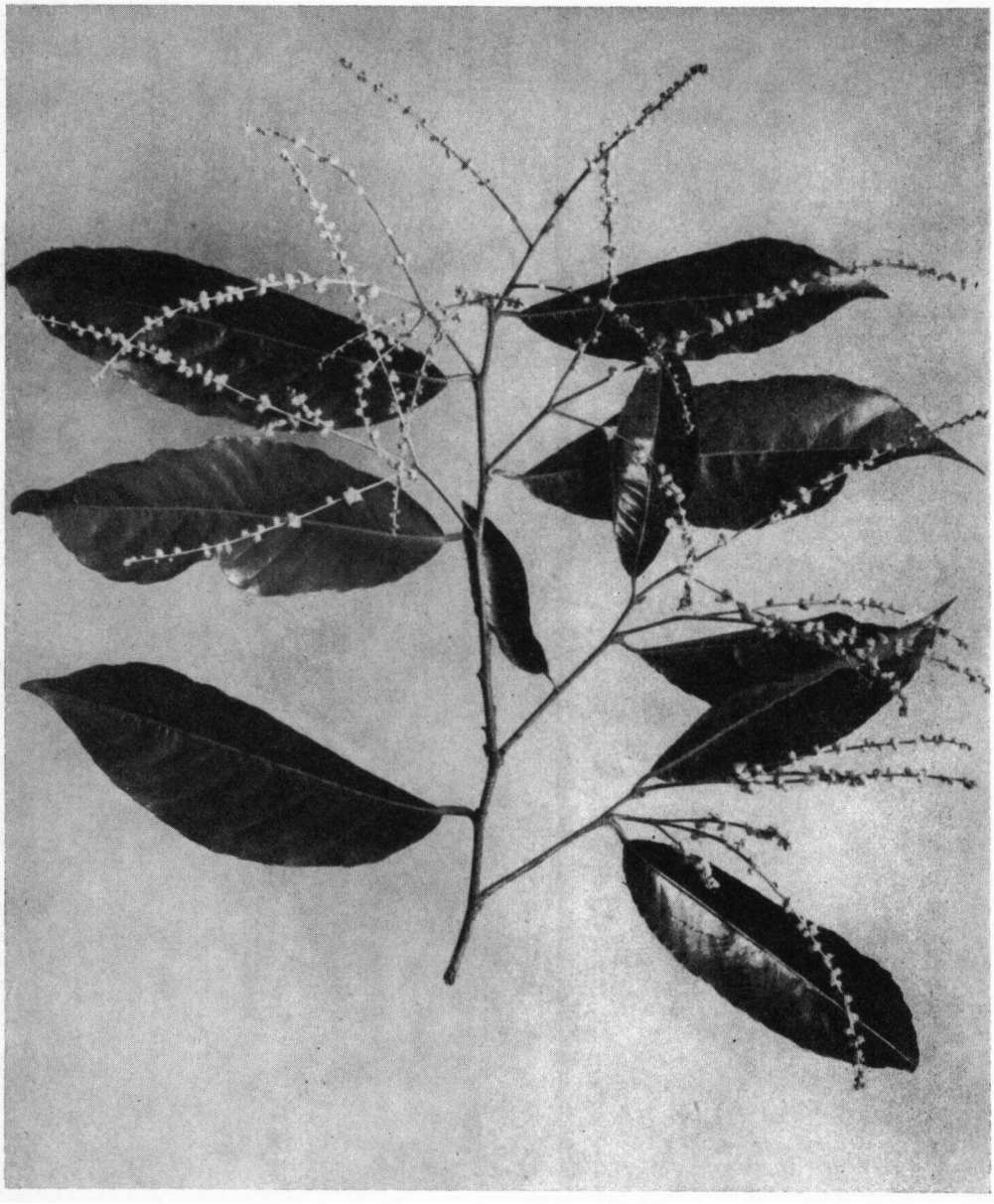

Fig. 24. *Homalium foetidum* (ROXB.) BTH., × 2/7 (C.H.B. IV-F-7).

11. Homalium caryophyllaceum (Z. & M.) BENTH. J. Linn. Soc. 4 (1860) 38; MIQ. Fl. Ind. Bat. Suppl. (1860) 132, 335; SLOOT. Bijdr. Flac. (1919) 110; GAGNEP. Fl. Gén. I.C. 2 (1921) 1012; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 335; HEYNE, Nutt. Pl. (1927) 1139; MERR. Pl. Elm. Born. (1929) 209; CRAIB, Fl. Siam. En. 1 (1931) 738; FISCHER, Kew Bull. (1932) 180; BURK. Dict. (1935) 1183; RIDL. Kew Bull. (1938) 111; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 85, p. 2.—*Blackwellia caryophyllacea* Z. & M. in MOR. Syst. Verz. (1846) 33; ZOLL. Nat. & Geneesk. Arch. 4 (1847) 31; MIQ. Pl. Junghuhn. (1855) 400; Fl. Ind. Bat. 1 (1857) 715.—*Blackwellia longiflora* MIQ. *l.c.*—*Cordylanthus frutescens* BL. Mus. Bot. 2 (1856) 28, t. 3.—*H. cordylanthus* BENTH. J. Linn. Soc. Bot. 4

(1860) 38.—*H. sumatranum* MIQ. Fl. Ind. Bat. Suppl. (1860) 132, 334; SLOOT. Bijdr. Flac. (1919) 112; Bull. Jard. Bot. Btzg III, 7 (1925) 356.—*H. obovale* MIQ. Fl. Ind. Bat. Suppl. (1860) 132, 334. —*H. frutescens* WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 36; KING, J. As. Soc. Beng. 67, ii (1898) 22; RIDL. Fl. Mal. Pen. 1 (1922) 836.—*H. longiflorum* BENTH. *ex* KOORD. Exk. Fl. Java 2 (1912) 633.—*H. hosei* MERR. Philip. J. Sc. 11 (1916) Bot. 98; En. Born. (1921) 411.—**Fig. 25a–c.**

Small tree 4–10(–15) m, or shrub; young branchlets slender, glabrous, angular, striate, pallid; bark smooth. *Leaves* elliptic-oblong to elliptic, rarely ovate-oblong, shortly obtusely acuminate, broadly cuneate at the base to nearly rounded, coriaceous, shining, brownish when dry, entire or slightly to coarsely crenate-serrate, glabrous or sparsely pubescent beneath (very rare more densely pilose underneath), 7–16(–19) by (3–)4–7(–10) cm; nerves 7–8 pairs, prominent beneath, curved, ascending, anastomosing, reticulations distinct, specially beneath; petiole 2–3(–5) mm. *Racemes* rather stiff, simple or rarely 2–3-branched above the base, ± sparsely pubescent, 7–8(–10) (very rarely up to 15) cm. *Flowers* 5–6-merous, subsessile, white, solitary or in pairs, not rarely in fascicles of 3–5 and then 1 mm peduncled. Bracts ovate, subacute, 1 mm, subpersistent. *Calyx*-tube elongate, (4–) 5–6 mm, ± densely pilose to glabrescent, red-brown when dry, manifestly sulcate. *Sepals* coriaceous, oblong-ovate, subacute, *c.* 2½ mm, erect. *Petals* white, similar to the sepals, but slightly longer and more densely greyish-appressed-tomentose on both sides, somewhat stellate-patent. Glands yellow. Stamens in fascicles of 3–4, exceeding the petals a little in length; filaments glabrous. *Ovary* elongate-conical, tomentose. Styles 4–5(–7), cylindric, erect, exserted.

Distr. Indo-China, S. Siam, in *Malaysia:* Malay Peninsula (Johore, Pahang, Selangor, Perak), Sumatra (East Coast and S. Sumatra), Banka, W. Java, Borneo, and Central to S. Celebes.

Ecol. Humid forest or in brushwood vegetation on level or hilly land, usually along river-sides or in humid soil periodically inundated during the wet monsoon, also on sandy loam, up to 150 m, *fl.* Jan.–Dec.

Uses. Wood light-brown, rather hard and heavy, possibly useful for house-construction. Used in Java as a hedge plant.

Vern. *Kaju bĕras*, M, *k. palis*, *k. polis*, *k. tulang*, Lampongs, *anjing ayĕr*, *pĕtaling ayĕr*, *dada ruan*, Mal. Pen., *mĕdang*, Pahang; Banka: *mĕntulang kĕrak*, *kaju rĕtjah piengan*, *rukĕm paja;* Borneo: *tangan mungit*, *malinein*, *kamuning*, Mal., *kamandjar*, Sampit, *kaju laras*, S. Borneo, *pintik*, Lower Dyak, *tulang ular*, *tambalinoh*, Kuala-Kapuas, *kaju keras*, W. Borneo, *bulalang*, *basing*, *malinoin*, Sungei, *kulahit hitam*, *kutang*, Dusun Kinab.; S. Celebes: *tenau*, *warra*.

Note. *H. sumatranum* MIQ. (*H. obovale* MIQ.) is merely a local, hairy variety, once found in S. Sumatra (Lampongs).

12. Homalium spathulatum RIDL. J. As. Soc. Str. Br. *no* 75 (1917) 35; Fl. Mal. Pen. 1 (1922) 835.

Glabrous tree. *Leaves* elliptic, obtusely acuminate, narrowed at the base, thinly coriaceous, shining, entire or undulate, 9–11 by 3–4 cm; nerves *c.* 7 pairs, very fine and rather obscure as are the reticulations; petiole 4–5 mm. *Racemes* slender, tomentose, *c.* 7–8 cm. *Flowers* 10-merous, subsessile. Pedicel up to 0.3 mm. *Calyx*-tube tomentose, 2½ mm. *Sepals* narrow-linear, rather densely patent-hairy, *c.* 2½ mm. *Petals* linear-spathulate, *c.* 3 by ½ mm, with spreading hairs as the sepals. Stamens mostly 3 (rarely also 2 in the same flower), opposite each petal. Disk-glands rounded, rather flat, densely pubescent. Styles 3, glabrous.

Distr. *Malaysia:* Malay Peninsula (Dindings: Pangkor), once found.

13. Homalium oblongifolium MERR. Philip. J. Sc. 10 (1915) Bot. 326; En. Philip. 3 (1923) 111.

Tree *c.* 35 m, glabrous the inflorescences excepted. *Leaves* oblong, shortly acuminate, acute at the base, entire, coriaceous, shining on both sides, more pallid beneath when dry, entire or obscurely undulate, 20–30 by 7–11 cm; nerves 15 pairs, distinct, veins manifestly reticulate-elevated on both sides; petiole thick (2½ mm diam.), *c.* 1½–2 cm. *Panicles* branched from the base, 20–30 cm, rather densely shortly yellowish-greyish-hirsute, lower branches up to 25 cm. *Flowers* sessile, 7-merous. Bracts narrow-subulate, 1½ mm, very early caducous. *Calyx*-tube funnel-shaped, 3–4 mm. *Sepals* oblong-lanceolate, 4–5 by 1.8 mm, subacute. *Petals* oblong, 4 mm. Stamens in fascicles of 3; filaments sparsely pilose. Ovary hirsute.

Distr. *Malaysia:* Philippines (Mindanao: Zamboanga), once found.

Ecol. Primary forest at low altitude.

14. Homalium samarense MERR. Philip. J. Sc. 11 (1916) 199; En. Philip. 3 (1923) 111.—*H. villosum* MERR. Philip. J. Sc. 13 (1918) 37; En. Philip. 3 (1923) 112.—*H. polillense* MERR. Philip. J. Sc. 27 (1925) 38; En. Philip. 4 (1926) 253.

Tree about 10–15 m; branchlets grey-villous when young, rather soon glabrescent. *Leaves* elliptic or oblong-elliptic, obtusely acuminate, rounded to acute at the base, subcoriaceous, rather shining and brownish-olivaceous when dry, distantly and ± distinctly crenate-serrate, glabrous above but ± pilose at midrib, sparsely to densely pilose beneath when young, but ± glabrescent when adult the midrib and nerves excepted, 7–9(–10) by (2½–)3½–5 cm; nerves 6 pairs, prominent beneath, anastomosing, veins manifestly reticulate but little elevated on both sides; petiole 4–8 mm, ± villous. *Racemes* solitary or mostly several arranged in sometimes much-branched panicles up to 15 cm long, mostly provided with reduced, subpersistent leaflets, with soft long, spreading, pale hairs. *Flowers* 6–7-merous, white, scattered along the rhachis. Pedicels 2–3 mm. Bracts ovate to lanceolate,

Fig. 25. *Homalium caryophyllaceum* (Z. & M.) BTH. *a*. Flowering twig, × 2/3, *b*. bud, × 10, *c*. flower, × 10.—*Homalium dasyanthum* (TURCZ.) WARB. *d*. part of flower, × 7, *e*. longitudinal section, × 7 (*a–c* after KORTHALS from Borneo, *d–e* after KUNSTLER 1393).

membranous, 2½–4 mm. *Calyx*-tube funnel-shaped, *c.* 2–3 mm. *Sepals* linear to oblanceolate, subacute, densely set with patent hairs. *Petals* narrow-spathulate, similar to the sepals and equally long. Stamens 3 opposite each petal; filaments 5 mm, in the lower half with spreading hairs. *Ovary* ± villous. Styles 5–6, patent-hairy in the lower half, 2–3 mm.

Distr. *Malaysia:* Philippines (Luzon, Samar, Polillo, Mindanao).

Ecol. Primary forests at low altitude.

Vern. *Bato-bato*, S.L.Bis.

Note. *H. polillense* and *H. villosum* represent the juvenile state of *H. samarense* with not yet fully developed flowers.

15. Homalium villarianum VID. Rev. Pl. Vasc. Filip. (1886) 142; MERR. Philip. Bur. For. Bull. 1 (1903) 41; Philip. J. Sc. 3 (1908) Bot. 247; En. Philip. 3 (1923) 111.—*H. sorsogonense* ELM. Leafl. Philip. Bot. 1 (1908) 325.

Tree up to 8 m. *Leaves* elliptic, broadly attenuate or nearly rounded at the apex but rather abruptly extended into a short (1 cm) blunt acumen, cuneate to nearly rounded at the base, subcoriaceous, usually glabrous, distantly serrate-crenate, (6–)7–12(–18) by 4–7 cm; nerves 5–6 pairs, specially prominent beneath, veins rather densely reticulate-elevated on both sides; petiole 3–6 mm. *Panicles* rather slender, (10–)12–20 cm, in all parts rather densely greyish patent-pilose. *Flowers* 5–6-merous, whitish, in spaced 2–3-flowered fascicles. Pedicels 2–3 mm. Bracts narrow-oblong, subacute, 2 by 1 mm, subpersistent. *Calyx*-tube turbinate, sulcate, shortly but distinctly stipitate at the base. *Sepals* spathulate, nerved, 4 by 1 mm, rather densely set with spreading hairs. *Petals* very similar to the sepals, sometimes a little smaller. Stamens normally in fascicles of 3, sometimes of 2 and 3 in the same flower or specimen; filaments pilose at the base only, 2 mm. *Ovary* villous. Styles 4–5.

Distr. *Malaysia:* Philippines (Luzon, Leyte, Mindanao); said to occur also in Panay and Samar.

Ecol. Forests, up to 400 m.

Vern. *Adáñga*, Bik., *aráñgan, kamagahai*, Tag., *matobato*, S.L.Bis.

Note. This species is in habit similar to *H. bracteatum.*

16. Homalium ramosii MERR. Philip. J. Sc. 14 (1919) 423; En. Philip. 3 (1923) 111.

Small tree, glabrous the inflorescences excepted. *Leaves* oblong to oblong-elliptic, gradually attenuate at the apex and the base, subcoriaceous, entire or obscurely crenate, shining, 6–8(–10) by 3–4½ cm; nerves 6–7 pairs, anastomosing, curved, prominent beneath, veins rather densely reticulate-elevated on both sides; petiole 5–8 mm. *Racemes* solitary or mostly several from the axils of the uppermost decrescent and rather soon caducous leaves forming a lax, depauperate, ± densely grey-pubescent panicle, up to 10 cm. *Flowers* 5-merous, white, 6–7 mm in diam., in fascicles of 2–3 along the rhachis. Pedicels slender, 3–4 mm. Bracts narrowly oblong-obovate or oblong, more distinctly pubescent inside, *c.* 2½ mm. Stamens in fascicles of 3; filaments glabrous, 2 mm. *Ovary* very densely pubescent. Styles 4–5, glabrous towards the apex.

Distr. *Malaysia:* Philippines (Luzon: Ilocos Norte), once found.

Ecol. Forested slope, *c.* 450 m.

17. Homalium undulatum KING, J. As. Soc. Beng. 67, ii (1898) 23; RIDL. Fl. Mal. Pen. 1 (1922) 837; HENDERS. J. Mal. Br. R. As. Soc. 17 (1939) 46.—*H. verruculosum* CRAIB, Kew Bull. (1928) 239; Fl. Siam. En. 1 (1931) 742.

Tree 10–20 m, glabrous the inflorescences excepted; young branches slender, pale brown. *Leaves* elliptic to oblong-elliptic, rarely oblanceolate, shortly and bluntly acuminate, narrowed and sometimes unequal at the base, subcoriaceous, yellowish-green, grey-green when dry, shining above, dull beneath, shallowly crenate, (6–)7–10½ by (2½–)4½–5 cm; nerves 8–10 pairs, little prominent, veins minutely reticulated when dry; petiole (3–)4–5(–7) mm. *Panicle* 7–10 cm, composed of several racemes, the lower ones from the uppermost leaf-axils; rhachis slender, sparsely tomentose. *Flowers* 5–6-merous, greenish-yellow with a silvery tinge, tomentose, laxly arranged along the rhachis. Pedicels slender, 4–5(–8) mm. Bracts ovate-acuminate, minute, very early caducous. *Calyx*-tube infundibuliform, *c.* 2 mm, minutely grey-tomentose. *Sepals* lanceolate, obtuse, 4 by 1½ mm, grey-tomentulose on both sides. *Petals* obovate, clawed at the base, 5 by 3 mm, reticulate, tomentose, somewhat accrescent after anthesis. Stamens 4–5 at the base of each petal. Filaments glabrous, 2 mm. *Ovary* tomentose. Styles 3, glabrous upwards.

Distr. S. Siam, in *Malaysia:* Malay Peninsula (Perak, Langkawi).

Ecol. Evergreen forest, on rocky limestone hills up to 300 m.

18. Homalium bracteatum BENTH. J. Linn. Soc. Bot. 4 (1860) 37; ROLFE, J. Bot. 23 (1885) 213; VID. Phan. Cuming. Philip. (1885) 115; Rev. Pl. Vasc. Filip. (1886) 142; MERR. Philip. J. Sc. 3 (1908) Bot. 246; En. Philip. 3 (1923) 110.—*H. curranii* MERR. Philip. J. Sc. 4 (1909) Bot. 297; En. Philip. 3 (1923) 110.

Tree, glabrous the inflorescences excepted. *Leaves* ovate or mostly elliptic-oblong, gradually attenuate to the apex, obtuse, cuneate to nearly rounded at the base, coriaceous, shining on both sides when dry, manifestly and rather coarsely crenate, 15–20 by 5–8 cm; midrib very prominent beneath, nerves 5–6 pairs, elongate-curved and ascending, veins rather densely reticulate-elevated on both sides; petiole stoutish, rugose, 7–10 mm. *Panicles* thyrsoid, 10–14(–18) cm, grey- or yellowish-tomentose, lower branches 4–7 cm. *Flowers* 5-merous, single or rarely in pairs along the rhachis. Pedicels 1 mm. *Calyx*-tube turbinate, 3 mm, a little stipitate. *Sepals* narrow-oblong, obtuse, 3 by 1 mm. *Petals* oblong-spathulate, nerved, 4 by 1½ mm, somewhat accrescent, like the sepals and calyx grey-hirsutulous. Stamens in fascicles of 3.

Filaments pilose above the base, 2½ mm. *Ovary* hirsute. Styles 4–5, *c.* 2 mm.

Distr. *Malaysia:* Philippines (Luzon).

Ecol. In primary forests at low altitude.

Vern. *Arâñga(n)*, Tag., Bik., *arangan-babai*, Bik., *boñguas*, *pañginahauan*, S.L.Bis., *ubiön*, *matambokal*, Ilk., *malakamâñga*, Tag.

19. Homalium celebicum KOORD. Minah. (1898) 473, 623; SLOOT. Bijdr. Flac. (1919) 116; Bull. Jard. Bot. Btzg III, 7 (1925) 353.

Tree 20–?50 m; bark reddish, scaling; branchlets glabrous. *Leaves* elliptic to ovate-elliptic, sometimes nearly ovate, obtusely acuminate, attenuate at the base, subcoriaceous to coriaceous, glabrous, shining on both sides, distantly subserrate-crenate, 7–12(–17) by (4–)5–7(–10) cm; nerves 7–8(–9) pairs, little prominent on both sides, reticulations dense and conspicuously raised specially beneath; petiole 4–5 mm. *Panicles* divaricate, up to 20 cm, lower branches up to 12 cm; rhachis finely greyish-pubescent. *Flowers* 5-merous, in fascicles of 2–3, rarely solitary. Pedicels 1½–3 mm. *Calyx*-tube 2½ mm, greyish-tomentulose as are the sepals and petals. *Sepals* oblong, 3½ by 1 mm, whitish. *Petals* spathulate, rounded at the apex, 3 by 1½ mm, later accrescent up to 6 mm. Stamens in fascicles of 3; filaments 3 mm, pilose at the base only. Disk-glands red. *Ovary* outside laxly, inside densely pilose. Styles 4–5, pilose at the base.

Distr. *Malaysia:* Celebes (Minahasa and S. Celebes), Buton Isl.

Ecol. Primary mixed forests on hills, on stony clay or limestone rock, 30–550 m.

Uses. Wood excellent for house-building.

Vern. *Karingis*, *karikis*, *k. rintek*, *k. meha*, *k. makaânak*, *togo ulu*, Manado, *kombolili*, Buton.

Section Pierrea

(HANCE) WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 36.—*Pierrea* HANCE, J. Bot. 15 (1877) 339.

Stamens inserted both before and on the petals.

20. Homalium gitingense ELM. Leafl. Philip. Bot. 4 (1912) 1513.

Small to large spreading tree; branchlets grey to brown, glabrous. *Leaves* ovate-elliptic to broadly subovate-oblong, shortly and abruptly obtusely acuminate, ± rounded at the base, subcoriaceous to coriaceous, glabrous, entire, shining on both sides, (7–)10–15 by (4–)5–7(–8) cm; nerves 8–9 pairs, elevated on both sides, veins rather densely reticulate and prominent on both faces; petiole stout, 1–1½ cm. *Panicles* suberect, 5–8 cm, usually 3-branched from the base, the central and longest spike occasionally short-rebranched; rhachis stout, sulphur- or creamy-woolly. *Flowers* 6-merous, light-green, crowded. Bracts broadly ovate, rounded at the apex, 2½–3 mm diam., caducous. *Calyx*-tube turbinate, 3–4 mm, villous. *Sepals* lanceolate, subacute, accrescent, finally 7–8 by 2 mm, rather densely pilose. *Petals* similar to the sepals, but only half their length. Stamens 5–6 before each petal, *viz* 1 between the disk-glands, 4–5 inserted on the basal part of the petals; filaments filiform, glabrous, 2–3 mm. Disk-glands villous, nearly round. *Ovary* tomentose. Styles 5.

Distr. *Malaysia:* Philippines (Sibuyan: Capiz; Mindanao: Surigao; Luzon: Albay), apparently rare.

Ecol. Forests along streams, on reddish soil with a gravelly subsoil, 150 m.

Vern. *Camagalial*, Luzon.

21. Homalium grandiflorum BENTH. J. Linn. Soc. Bot. 4 (1860) 36; MIQ. Fl. Ind. Bat. Suppl. 1 (1860) 132; CLARKE, in HOOK. *f.* Fl. Br. Ind. 2 (1879) 598; KING, J. As. Soc. Beng. 67, ii (1898) 23; SLOOT. Bijdr. Flac. (1919) 113; GAGNEP. Fl. Gén. I.C. 2 (1921) 1012; RIDL. Fl. Mal. Pen. 1 (1922) 837; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 360, *excl. pl. javan.*; HEYNE, Nutt. Pl. (1927) 1139; MERR. Pl. Elm. Born. (1929) 210; CRAIB, Fl. Siam. En. 1 (1931) 741; BURK. Dict. (1935) 1184; HOLTTUM, Gard. Bull. Str. Settl. 11 (1940) 145.—*H. grandiflorum var. heptagynum* MIQ. Fl. Ind. Bat. Suppl. (1860) 334.—*H. parvifolium* HOOK. *f. ex* BENTH. J. Linn. Soc. Bot. 4 (1860) 37; MERR. En. Born. (1921) 412.—*H. damrongianum* CRAIB, Kew Bull. (1915) 429; Fl. Siam. En. 1 (1931) 739.—*H. fallax* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 356, f. 10.—*H. crassipes* SLOOT. *ibid.* 362, f. 11.—*H. calciphilum* RIDL. Kew Bull. (1928) 112.

var. **grandiflorum.**

Buttressed tree, 10–30 m, glabrous the inflorescences excepted. *Leaves* ovate-elliptic to elliptic-oblong, shortly rather abruptly obtusely acuminate at the apex, broadly narrowed into the petiole or rounded at the base, (light-green when alive, red when young), greyish-olivaceous when dry, ± coriaceous, shining, entire or nearly so, (7–)10–15(–26, very rarely up to 37) by (3–)4–7(–10, sometimes up to 15) cm; nerves (7–)9–12(–14) pairs, veins distinctly reticulated on both sides; petiole stout, grooved, 4–6 (–15) mm. *Racemes* simple or sometimes short-branched, 5–10(–15, very rarely up to 22) cm, with scattered flowers along the rather thin rhachis 1 mm diam.. *Flowers* all or for the greater part solitary, (5–)6–8(–9)-merous. Bracts lanceolate-oblong, 4–5 mm, glabrescent, caducous. *Calyx*-tube short, 3 mm, turbinate, tomentose, accrescent in fruit to 6 mm. *Sepals* oblong, subacute, in anthesis 5–6 mm long and reflexed, later on stellate and accrescent up to 10–16 by 4 mm, nerved and glabrescent. *Petals* triangular-oblong, 3–4 mm, otherwise similar to the sepals, accrescent up to 8 mm, ± curved over the ovary. Stamens (4–)6–12

before each petal, *viz* 1–3 between the disk-glands, the rest in pairs (one above the other) inserted on the basal part of the petals; filaments pilose. Disk-glands slightly lobed, tomentose. *Ovary* 5–8-ridged, tomentose. Styles 5–8, rather short. *Fruit* spindle-shaped, 5–8-valved.

Distr. Cochin-China, Siam, Lower Burma (Tenasserim), in *Malaysia:* Sumatra, Malay Peninsula (Pahang, Selangor, Kedah, Negri Sembilan, Malacca, Singapore), Borneo.

Ecol. Lowland forests (rarely up to 600 m), on never inundated, hilly ground and sandy soil. According to RIDLEY and HOLTTUM this tree flowers very rarely, probably once in 25 years, with the new leaves. *Fl.* Nov.–Jan.

Uses. Wood hard, difficult to work, used for house-construction.

Vern. *Kaju batu, k. b. kuning, k. b. arèng, kaju manau, manu, bias, kĕrbok, pau rusah, petjah pinggan, tutur batu,* Sumatra; *bajud,* Borneo.

Note. *H. parvifolium* HOOK. *f. ex* BENTH. is a small-leafed form.

var. **javanicum** (K. & V.) SLEUM. *stat. nov.*—*H. javanicum* KOORD. & VAL. Bull. Inst. Bot. Btzg *no* 2 (1899) 11; Ic. Bog. 1 (1901) 69, t. 100; KOORD. Exk. Fl. 2 (1912) 633; Atlas Baumarten 2 (1914) t. 341; SLOOT. Bijdr. Flac. (1919) 144.—*H. grandiflorum* (*non* BENTH.) SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 360, *pro pl. javan.*; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 85, p. 2.

Differing from the type-variety by its nearly woolly, longer (18–26 cm), more laxly flowered inflorescence.

Distr. *Malaysia:* Java (Banjumas & Pekalongan).

Ecol. Mixed rain-forest up to 200 m.

Vern. *Uru watu, langit, l. lawé,* J.

22. Homalium minahassae KOORD. Minah. (1898) 474, 624; SLOOT. Bijdr. Flac. (1919) 116; KOORD. Fl. N.O. Celeb. Suppl. pt 2 (1922) t. 92; *ibid.* pt 3 (1922) 45; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 359; HEYNE, Nutt. Pl. (1927) 1139.

Tree up to 35 m; branches glabrous. *Leaves* oblong- or ovate-lanceolate, gradually narrowed to the subacute apex, attenuate into the petiole to nearly rounded, sometimes a little inequilateral, coriaceous, glabrous, shining, entire, (10–)15–20 by 4–5(–6, rarely up to 8) cm; nerves 9–11(–12) pairs, veins distinctly reticulate and prominent on both sides; petiole stout, 1.2–1.5 cm. *Racemes* slender, in the upper axils on the young shoots, simple or branched, lax, grey-tomentose, 10–15 (–30) cm. *Flowers* whitish-greenish, fragrant, 6–7-merous. Pedicels 2–3 mm, in fruit up to 8 mm. Bracts ovate-oblong, subacute, 3–5 mm, glabrescent, caducous. *Calyx*-tube narrow-obconic, grey-tomentose, 3 mm. *Sepals* oblong, subacuminate, *c.* 4 by 1½ mm, stellate-patent, nerved, glabrescent. *Petals* similar to the sepals, but remaining shorter in fruit and inflexed above the ovary. Stamens in fascicles of 6–7(–8) before each petal, one stamen between the disk-glands, the others inserted on the base of the petal. *Ovary* tomentose. Styles 6–7.

Distr. *Malaysia:* Celebes (Manado), Moluccas (Key and Tenimber Isl.).

Ecol. In primary forest on level, never inundated ground on sandy clay, up to 100 m.

Uses. Timber used for house-construction.

Vern. Moluccas: *Lagumuté, kationgar;* Minahasa: *karikis sèla* (t.l.).

Anomalous species

23. Homalium moultonii MERR. Philip. J. Sc. 11 (1916) Bot. 97; En. Born. (1921) 411.

Small tree, glabrous inflorescences excepted; young branchlets soon covered with reddish-brown, rough, splitting bark. *Leaves* ovate- or elliptic-oblong, gradually attenuate and subacute, cuneate into the petiole to nearly rounded at the base, coriaceous, olivaceous when dry, shining, entire or obscurely and distantly denticulate, (7–)8–12 by (3–)4–5½ cm; midrib prominent beneath, nerves 7–8 pairs, curved, prominent on both sides as are the densely reticulate veins; petiole rugose, 5–7 mm. *Racemes* solitary, slender, curved, 10–18 cm, yellowish- or grey-appressed-pilose. *Flowers* solitary, 10-merous, laxly arranged. Pedicel ½ mm. Bract very small, persistent. *Calyx*-tube narrow-funnel-shaped, grey-pubescent, nearly 5 mm. *Sepals* linear, acute, pubescent in anthesis *c.* 2 by 0.3 mm. *Petals* very similar to the sepals, slightly wider below, some of them up to 3 mm. Disk-glands fused, nearly covering the apex of the ovary. Filaments *c.* 1 mm, glabrous. Ovary conical, short, tomentose. Styles 3–4, short, glabrous.

Distr. *Malaysia:* Borneo (Sarawak), apparently rare.

Excluded species

Homalium gilgianum LAUT. Nachtr. Fl. Deut. Schutzgeb. Südsee (1905) 320 = *Lophopyxis maingayi* HOOK. *f.* (*Euphorbiaceae*). *Cf.* HALLIER *f.* Med. Rijksherb. *no* 1 (1910) 9; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 364.

13. BENNETTIODENDRON

MERRILL, J. Arn. Arb. 8 (1927) 10.—*Bennettia* MIQ. Fl. Ind. Bat. 1, 2 (1859) 105, *non* S. F. GRAY (1821), *nec* R. BROWN (1852).

Dioecious tree or shrub. Young shoots terminating with a perular bud; perular bracts persistent. *Leaves* spirally arranged, the uppermost ones crowded, sometimes subopposite, penninerved, ± coarsely glandular-serrate; petiole mostly elongate, very variable in length, in the upper leaves generally much shorter, mostly with a

distinct axillary bud. Stipules 0. *Panicles* axillary or terminal, often much-branched. *Flowers* small, mostly umbellate at the apex of the stalks of the inflorescence. Bracts minute, lanceolate, caducous. *Sepals* 3(–4, rarely 5), small, imbricate, ciliate, caducous. *Petals* 0. ♂ *Flowers:* stamens indefinite, with numerous, short, fleshy, glabrous disk-glands between them; filaments filiform, woolly to their middle; anthers very small, dorsifixed. Rudiment of ovary minute, with 3 short styles. ♀ *Flowers:* staminodes indefinite like the stamens, but sterile; filaments less than half as long as in the ♂ flowers, densely pilose at the base; disk-glands numerous, truncate. *Ovary* incompletely 3-locular, each placenta with 2 (or 3) ovules. Styles 3, divergent, caducous; stigmas shortly 2-lobed. *Berry* small, rather dry, globose, usually 1–(rarely 2–4)-seeded; pericarp thin, fragile. *Seeds* blackish, shining; testa minutely reticulate.

Distr. Two or 3 *spp.* in Assam, Burma, Tonkin, and S. China, one of them in *W. Malaysia* (Sumatra and Java).

1. Bennettiodendron leprosipes (CLOS) MERR. J. Arn. Arb. 8 (1927) 11; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 84, p. 8.—*Xylosma leprosipes* CLOS, Ann. Sc. Nat. IV, 8 (1857) 230; MIQ. Fl. Ind. Bat. 1, 2 (1859) 106.—*Bennettia horsfieldii* MIQ. Fl. Ind. Bat. 1, 2 (1859) 105; KOORD. & VAL. Bijdr. Booms. 5 (1900) 29; Ic. Bog. 2 (1904) 133, t. 126.—*Bennettia longipes* OLIV. in HOOK. Ic. Pl. 16 (1887) t. 1596.—*Myroxylon leprosipes* O. KTZE, Rev. Gen. Pl. 1 (1891) 44.—*Bennettia leprosipes* KOORD. Med. Kon. Akad. Wet. 18 (1909) 49; BACK. Schoolfl. Java (1911) 71; KOORD. Exk. Fl. Java 2 (1912) 635; Atlas Baumarten 2 (1914) t. 337–338; SLOOT. Bijdr. Flac. (1919) 135; RIDL. J. Mal. Br. R. As. Soc. *no* 87 (1923) 53; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 382.—*B. longipes* MERR. J. Arn. Arb. 8 (1927) 11.—*B. brevipes* MERR. *ibid.* 10.

Shrub or small tree, 3–6(–15) m, glabrescent; bark, grey, fetid. *Leaves* arranged in distant groups, obovate-oblong or oblong-elliptic, obtusely acuminate, ± attenuate at the base, subcoriaceous, shining above, coarsely and ± irregularly glandular-serrate, (8½–)10–18 (rarely up to 35) by (3½–)4–7½(–14) cm; tripli- to nearly quinquenerved from the base, with *c.* 5 pairs of additional lateral nerves, veins finely reticulated on both sides; petioles (0.4–)1.5–4(–6, rarely up to 8) cm, glabrescent, whether or not with 2 glands at the apex. *Panicles* ± densely puberulent, finally glabrous, (5–)10–20 cm. *Flowers* dirty white or greenish-yellow, scented. Pedicels 3–4(–5) mm, thickened under the fruit, as the rhachis, petioles and young twigs ± densely set with thick, scale-like, nearly triangular or oblong, tubercled lenticels. ♂ *Flowers:* sepals rotundate-ovate, 3–4 mm. Stamens light-yellow, somewhat exserted. Disk-lobes purple. ♀ *Flowers:* sepals and staminodes nearly half as long as in the ♂ flowers. *Ovary* trigonous, glabrous, yellowish-green to orange. Styles dirty white as are the stigmas. *Berry* red to yellowish-red when ripe, shining, 6–9 mm diam. *Seeds* globose (or semiglobose, when 2 seeds are developed), 3–4 mm diam.

Distr. Assam, Burma, and S. China (Yunnan, Kwangtung, Hunan, Hainan), in *Malaysia:* Sumatra and Java. Fig. 26.

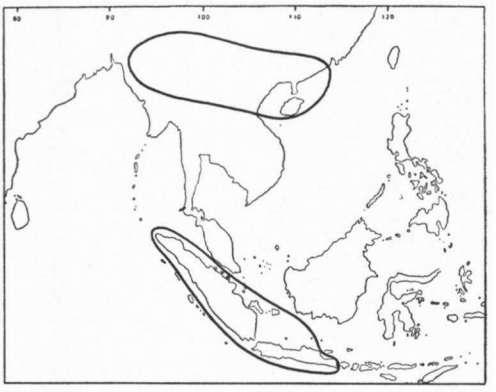

Fig. 26. Distribution of *Bennettiodendron leprosipes* (CLOS) MERR.

Ecol. Mixed forests or brush-woods, locally apparently rare, (15–)200–1450 m, in Java mostly above 1000 m, in the Padang Uplands once collected at 2400 m. Specimens with ♂ flowers seem to be rather rare. *Fl. fr.* Jan.–Dec.

Vern. *Ki hiur, andĕm ati,* S, *lumut, golèk laban, kulik (labang), lortĕloran, tutup labang, katjĕngal, tangkil, bĕrassan, rasbĕrasan,* J.

Note. The leaves and berries have an intensely bitter taste.

Doubtful or excluded species

Bennettia trinervia (LAUT. & K. SCH.) GILG *ex* DIELS, Bot. Jahrb. 57 (1922) 430; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 381.—*Terminalia trinervia* LAUT. & K. SCH. Fl. Deut. Schutzgeb. (1901) 466.

DIELS transferred this to *Bennettia* apparently on authority of GILG, in 1922. In 1925 VAN SLOOTEN noted that, according to DIELS (*in sched.*), the type (LAUTERBACH 1123, from Astrolabe Bay, Gogol River) was absent from Berlin. The descrip-

tion generally agrees to *Bennettiodendron*, but I hesitate to refer it definitely to this genus, as there are some discrepancies in the inadequate diagnosis; *e.g.* the leaf-margin was apparently entire, a character unknown in the genus.

Bennettiodendron papuanum (GILG) MERR. J. Arn. Arb. 8 (1927) 10.—*Bennettia papuana* GILG, Bot. Jahrb. 55 (1918) 283, f. 6; in E. & P. ed. 2, 21 (1925) 443, f. 205 = *Pimeleodendron papuanum* WARB. (*Euphorbiaceae*).

14. HEMISCOLOPIA

SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 342, f. 9.

Dioecious tree. *Leaves* alternate, large, oblong, penninerved; petiole short. Stipules 0. *Inflorescence* short, cluster-like, axillary, on leafy or defoliate branchlets. *Perianth* segments little distinct between each other, in 2 whorls of 3, persistent. ♂ *Flowers:* stamens numerous, inserted inside the lobes of a rather narrow disk; anthers with a thick, apiculate connective. Rudiment of the ovary present. ♀ *Flowers:* antherless staminodes 1-seriate between the ovary and disk-lobes. *Ovary* unilocular, with 3–4, prominent, few-ovuled placentas. Style simple, shortish, thick; stigma large, somewhat oblique and recurved at the margin, obscurely 3-lobed. *Berry* rather large, many-seeded, crowned by the persistent style and stigma; pericarp coriaceous. *Seeds* exarillate, with thick albumen.

Distr. Monotypic, in Indo-China and *Malaysia* (Sumatra, Banka, and Java).
Ecol. In mixed rain-forests, mostly at low altitudes.

1. Hemiscolopia trimera (BOERL.) SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 343, f. 9.—*Scolopia trimera* BOERL. Cat. Hort. Bot. Bog. 1 (1899) 53; KOORD. Exk. Fl. Java 2 (1912) 632; SLOOT. Bijdr. Flac. (1919) 102.—*? Flacourtia kelampagine* VAN EEDEN, Houtsoort. Ned. Oost-Ind. ed. 3 (1905) 12, *nom. nud.*—*Xylosma macrocarpum* PIERRE *ex* GAGNEP. Bull. Soc. Bot. Fr. 55 (1908) 527; Fl. Gén. I.C. 1 (1909) 232, f. 22, 7–13; *ibid.* Suppl. 1 (1939) 210.

Glabrous tree, 2–5(–12) m, normally unarmed but occasionally with simple spines 2½–3½ cm, buttressed when old. *Leaves* oblong, large, shortly attenuate at the apex, rounded or subtruncate at the base, coriaceous, shining on both sides (young ones purplish alive), (10–)16–32 by (5–)6–12 cm, distantly glandular-subserrate-crenate (1 mm deep) with 2 or 4 basal glands near the apex of the petiole; nerves curved-ascending, (7–)8–10(–12, rarely 14) pairs, prominent beneath, veins numerous, ± transversal and little prominent; petiole stout, rugose, ½–1 cm. *Flowers* (3–)4–8 in compact, axillary, fascicle-like racemes, sordid-white, inside red; peduncle very short, woody, with minute bracts at the base. Pedicels 2–5 mm. ♂ *Flowers:* perianth segments (4–)6, ovate to nearly orbicular, ciliate, further glabrous, concave, many-nerved, the outer ones firm, the inner ones somewhat smaller and thinner, (3–)4–5 by 3½–5 mm. Disk fleshy, consisting of many short, red lobes coherent at the base. Filaments filiform, glabrous; appendage-like connective glabrous. Rudiment of ovary minute, glabrous. ♀ *Flowers:* perianth segments and disk similar to those in the ♂ flowers, the first a little smaller. Staminodes glabrous.

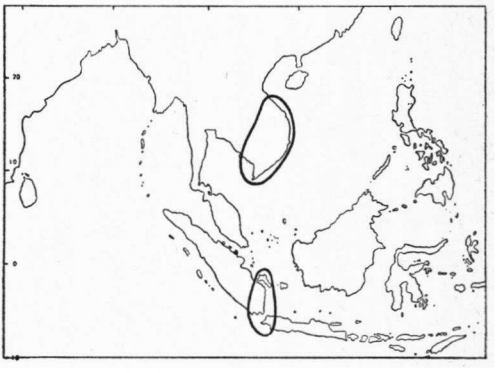

Fig. 27. Distribution of *Hemiscolopia trimera* (BOERL.) SLOOT.

Ovary ovoid, glabrous, attenuate at the apex into a 3–4 mm long style. *Berry* green, ovoid or obpyriform, rather abruptly attenuate at the apex, somewhat 3–5-sulcate, crowned by the persistent style and stigma, glabrous, 2–2½ by 1½ cm. *Seeds* 10–15(–20), oblong, irregularly angular, shining, 6–8 mm.

Distr. Indo-China (Cochin-China, Annam), in *Malaysia:* S. Sumatra (Ranau Lake), Banka, and W. Java (Banten, Preanger, Djakarta). Fig. 27.

Ecol. In rain-forest, both on limestone rock or sandy soil, 20–300, in S. Sumatra up to 700 m, everywhere rare.

Uses. Fruit said to be edible; wood not used.

Vern. *Rukĕm gunung, ki kĕmandĕn*, S, *kĕlampa laut, k. gine*, M (Banka).

15. XYLOSMA

G. FORST. Prod. (1786) 72, *nom. conserv.*—*Myroxylon* J. R. & G. FORST. Char. Gen. (1776) 125, t. 63, *nec* L. *f.* (1781).—*Hisingera* HELLEN. Vet. Akad. Handl. Stockh. (1792) 32, t. 2.—**Fig. 28–29.**

Dioecious trees or shrubs, often with axillary, simple spines on branches and branchlets, sometimes with (simple or compound) thorns on trunk. *Leaves* spirally arranged, ± coriaceous, mostly subglandular-serrate or -crenate, more rarely entire, penninerved, mostly with a short petiole. Stipules 0. *Flowers* small, in short, axillary, few-flowered, mostly solitary racemes. Bracts small, subpersistent. Pedicels articulated immediately above their insertion or a little higher up. *Perianth* segments (sepals) 4–6(rarely up to 8), slightly connate at the base, imbricate. Petals 0. Disk fleshy, mostly ± regularly 4–8-lobed, more rarely entire, extrastaminal. ♂ *Flowers:* stamens very numerous, mostly exserted; filaments filiform; anthers subglobose, basifixed, ± gibbous. Rudiment of ovary 0. ♀ *Flowers:* ovary sessile, with 2(–3, rarely up to 6), few-ovuled placentas; stigmas 2 (or 3), somewhat bilobed, sessile or on a (sometimes very) short, cylindrical style. *Berry* rather dry; pericarp mostly thinly leathery. *Seeds* mostly few, ± obovoid by mutual pressure, with a thin aril.

Distr. About 104 *spp.* throughout the tropics Africa excepted, the bulk (*c.* 68 *spp.*) in Central and South America, *c.* 7 in Polynesia, *c.* 15 in New Caledonia, 3 in Australia, 1 in the New Hebrides, 1 in Micronesia (Guam), 4 in *Malaysia* and 5 in SE. Asia.

Ecol. In *Malaysia* in rain-forests, sometimes in the montane zone.

Note. The specific delimitation in this rather large genus is very difficult as neither the flowers nor the fruits yield good or distinctive characters. However, the differences, though small, or even minute, seem to hold.

KEY TO THE SPECIES

1. Leaves entire or nearly so.
 2. Leaves ± coriaceous, rather laxly reticulate. Nerves (4–)5–7 pairs, distant and prominent on both sides . . . . . **1. X. papuanum**
 2. Leaves ± subcoriaceous, finely and densely reticulate. Nerves 8–10 pairs, rather close and little prominent on both sides . . . . . **2. X. suluense**
1. Leaves at least in the upper half manifestly serrate or crenate.
 3. Leaves rather coarsely and irregularly crenate, densely reticulate . . . . . **3. X. luzonense**
 3. Leaves ± sharply and regularly crenate-serrate, little and ± laxly reticulate. **4. X. sumatranum**

1. Xylosma papuanum GILG, Bot. Jahrb. 55 (1918) 280, f. 4; SLEUM. Notizbl. Berl.-Dahlem 14 (1938) 296.—*Flacourtia papuana* PULLE, Nova Guinea 8 (1912) 672; SLOOT. Bijdr. Flac. (1919) 131.—*X. pullei* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 379; Nova Guinea 14 (1924) 192.

Small or medium-sized tree up to 6 m. *Leaves* ovate to ovate-oblong, acutely acuminate, subrotundate at the base, shining above, 7–15 by 3[1]/2–5[1]/2(–7) cm; nerves rising strongly from or somewhat above the base, veins prominent; petiole thickened (0.6–)1–1[1]/2 cm. *Racemes* mostly solitary, 10–12-flowered, (1[1]/2–)2[1]/2–4 cm long; rhachis densely pilose. Sepals 4–6, 1–1[1]/2 mm, ovate, ciliate further glabrous. Disk thick, irregularly 5-lobed or crenulate. ♂ *Flowers:* stamens *c.* 15; filaments glabrous, 2–3 mm. ♀ *Flowers:* ovary ovoid, glabrous. Style very short; stigmas 2, applanate. *Berry* globose, red, *c.* 6 mm.

Distr. Solomon Isl. (Guadalcanal), in *Malaysia:* Moluccas (Ternate), New Guinea.

Ecol. Scattered in forest, 400–1600 m.

Uses. Wood very tough, used in the Solomon Isl. by the natives for making tool-handles.

2. Xylosma suluense MERR. Philip. J. Sc. 9 (1914) Bot. 324; En. Philip. 3 (1923) 112; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 379; SLEUM. Notizbl. Berl.-Dahlem 14 (1938) 296.—**Fig. 28.**

Shrub or little tree 3–5 m, glabrous; branches and branchlets slender, very pale, with scattered lenticels. *Leaves* oblong-ovate, flexile, shining, glabrous, brownish when dry, gradually acuminate from the middle to the apex, attenuate at the base, not rarely with one or 2 little glands at the very base respectively the apex of the petiole, (7–)9–18 by (3–)3[1]/2–5(–6) cm; petiole 0.6–0.8(–1) cm. *Racemes* minutely pubescent, *c.* 1[1]/2 cm long, few-flowered. Pedicels glabrous, 3–5 mm, with two minute pubescent bracteoles at the base. Perianth segments 4–6, minute, ovate-acuminate, 0.8 mm, nearly glabrous; disk-lobes *c.* 8, truncate or clavate, as long as the sepals. ♂ *Flowers:* stamens *c.* 20–25; filaments 2 mm, glabrous. ♀ *Flowers:* ovary

Fig. 28. *Xylosma suluense* MERR. *a.* Twig with ♂ flowers, × 3/4, *b.* ♂ flower, × 12, *c.* exterior stamen, × 18, *d.* fruit, × 3 (*a–c* after MERRILL 7174, *d* after MERRILL 11623).

oblong, with 2 nearly sessile, subreniform stigmas. *Berry* globose, 6–8 mm diam., green. *Seeds* 3–4, blackish, 3–4 mm.

Distr. *Malaysia:* Br. N. Borneo (Balabac Isl.), Philippines (Guimaras Isl.; Mindanao: Cotabato, Zamboanga; Basilan; Sulu Arch.: Bongao, Ubian, Cavilli, Tawi-Tawi); Moluccas (Sula: Taliabu).

Ecol. Thickets back of the beach (MERRILL) and low limestone region on rocks, from sea-level up to 200 m (Guimaras Isl.).

3. Xylosma luzonense (PRESL) CLOS, Ann. Sc. Nat. IV, 8 (1857) 229, *in clavi*, 273; MERR. Philip. J. Sc. 9 (1914) Bot. 323; En. Philip. 3 (1923) 112.— *Prockia luzonensis* PRESL, Rel. Haenk. 2 (1835) 94.— *Flacourtia amara* SPAN. Linnaea 15 (1841) 166.— *X. fragrans* FORST. *ex* DECAISNE, Voy. Vénus, Atlas (1846) t. 25, Bot. 5 (1864) 31; CLOS, Ann. Sc. Nat. IV, 8 (1857) 232; MIQ. Fl. Ind. Bat. I, 2 (1858) 106.—*X. cumingii* CLOS, Ann. Sc. Nat. IV, 8 (1857) 231; MIQ. Fl. Ind. Bat. I, 2 (1858) 106; F.-VILL. Nov. App. (1880) 13; VID. Phan. Cuming. Philip. (1885) 94; Rev. Pl. Vasc. Filip. (1886) 49.— *Myroxylon cumingii* O. KTZE, Rev. Gen. Pl. 1 (1891) 44.—*Myroxylon fragrans* O. KTZE *l.c.*— *Myroxylon amarum* WARB. in E. & P. Pfl. Fam. 3, 6a (1893) 41.—*X. amarum* KOORD. Versl. Kon. Akad. Wet. A'dam 18 (1909) 51; Exk. Fl. Java 2 (1912) 633; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 377.—*Flacourtia lanceolata* MERR. Philip. J. Sc. 9 (1914) Bot. 455; En. Philip. 3 (1923) 113; MEIJER DREES, Comm. For. Res. Inst. 33 (1951) 59.—*X. fragrans* DECNE & CLOS *ex* SLOOT. Bijdr. Flac. (1919) 132.

Large shrub or tree up to 10 m, glabrous, occasionally with spines on the trunk; branchlets unarmed or with simple, axillary, slender spines, 1/2–1 cm. *Leaves* rather variable in shape and size, ovate-oblong to oblong-lanceolate, rarely ovate or elliptic, ± acuminate, but obtuse at the extreme apex, attenuate at the base, 6–10(–14) by (1 1/2–) 2–3(–4–5, rarely up to 6) cm, mostly subentire towards the base, ± distinctly obtusely serrate, at least above the middle, ± chartaceous to subcoriaceous, mostly shining above, dull beneath; petiole almost rather slender, 1/2–1 cm. *Racemes* usually solitary, puberulous, the ♂ 1–2 1/2(–4) cm long and 8–10(–15)-flowered, the ♀ 1/2–1 1/2 cm long and 3–5-flowered. *Flowers* small, yellowish green or whitish. Pedicels minutely puberulous, 2–3 mm. Perianth segments 4–6, oyate, ciliate, otherwise glabrous, 0.5–0.8 mm. Disk shortly 6–8-lobed, as long as the sepals. ♂ *Flowers:* stamens *c.* 40, exserted; filaments unequal, glabrous, 2 mm. ♀ *Flowers:* ovary ovoid, attenuate at the apex, glabrous; stigmas 2, nearly sessile. *Berry* globose, (4–)5–6 mm diam., glabrous, blackish when dry, apiculate by the very short, persistent style. *Seeds* 1–2(–4), lenticular-compressed, 2–3 mm.

Distr. *Malaysia:* Philippines (Babuyan Isl., Luzon), S. Celebes and Buton Isl., Lesser Sunda Islands (Timor: P. Lamaan; Wetar, Flores), Moluccas (Key Isl.).

Ecol. Mostly rare and scattered in primary and secondary forest on never inundated hilly or level, clayey or stony ground, from the sea-shore up to 1200 m.

Vern. Philippines: *Amaet*, Bis., *babaliuayin, mambuk*, Sbl., *digek, palútan*, Ilk., *kuliága, mangkil, mamangkil, suliak-dagá*, Tag.; *kaju ulĕr, hauw sisi, sisi moné hau, lianfui*, Timor, *kĕsuja, laihéha*, Wetar.

4. Xylosma sumatranum SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 379, f. 12; MERR. Contr. Arn. Arb. 8 1934) 109; SLEUM. Notizbl. Berl.-Dahlem 14 (1938) 295.—**Fig. 29.**

Shrub or tree, 3–15 (rarely up to 25) m; bark greenish-brown or light-greyish; branches mostly unarmed, but sometimes with simple or branched spines up to 2 cm; branchlets glabrous. *Leaves* shortly acuminate, cuneate at the base, chartaceous, glabrous, (pale green, but reddish when young), brown when dry, oblong-lanceolate to oblong-elliptic, 5–9(–11–13) by 2 1/2–4(–5–6) cm; nerves (4–)5–7 pairs, distant and ± prominent specially beneath; petiole rather stout, red when fresh, (3–)5–10(–12) mm. *Racemes* 1–2 (rarely up to 4) cm, 4–8-flowered, puberulous on the rhachis and pedicels. Bracts small, narrow-ovate, acute, ciliate. Pedicels 2–3 mm (in the ♂ flowers somewhat longer and more slender), thickened and corky in fruit. Perianth segments 6–8, unequal (4 mostly bigger in size), white or greenish, ovate or nearly rounded, ciliate, glabrous outside, pilose inside, 1–1 1/2 mm. Disk-lobes 6–8, truncate, very short. ♂ *Flowers:* stamens *c.* 30; filaments glabrous; anthers creamy. ♀ *Flowers:* ovary elongate-ovoid, bottle-like thickened at the apex, little exserted; stigmas 2, minute. *Berry* subglobose, blackish and shining when dry, 4 mm diam.; pericarp rather dry, red. Style subcylindric, 1/2 mm, subpersistent. *Seeds* 2–3, subrotundate-trigonous, *c.* 3 mm.

Distr. *Malaysia:* Sumatra (Atjeh, East Coast), E. Java (Besuki: Idjen Plateau), Borneo (Br. N. Borneo and Sarawak), Lesser Sunda Islands (Bali, Lombok), New Guinea.

Ecol. Rain-forest, apparently scattered, 1070–2200 m.

Uses. Wood whitish, not used.

Vern. *Tata-tata*, Sum. E.C., *taeni, talini*, Gajo. Br. N. Borneo: *rukam*, Kedayan. New Guinea: *mikeia*, Anona.

Note. *Rottlera zollingeriana* MIQ. Fl. Ind. Bat. 1, 2 (1859) 394; M.A. in DC. Prod. 15, 2 (1866) 983; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 381, *nota*.

Java: ZOLLINGER 3174, probably on the Idjen plateau in extreme E. Java.

Only known by a single collection with ♂ flowers which do not allow to decide, if the species belongs either to *Flacourtia* or *Xylosma*. Not identical with any so far known species of these genera, but rather similar in leaf-characters to *X. sumatranum*, differing by its quite glabrous inflorescence.

Fig. 29. *Xylosma sumatranum* SLOOT. After a ♀ living twig from Mt Idjen, E. Java (VAN STEENIS 12059).

16. FLACOURTIA

L'HÉRITIER, Stirp. Nov. 3 (1785) 59, t. 30, 31; JUSS. Gen. (1789) 291 (*Flacurtia*).—*Satania* NOR. Verh. Bat. Gen. 5 (1790) ed. 1, Art. IV, 3, *nom. nud.*—*Stigmarota* LOUR. Fl. Cochinch. (1790) 633; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 193 (*sphalm. Stigmarosa*).—*Rhamnopsis* RCHB. Consp. (1828) 188.—**Fig. 30–33.**

Trees or erect shrubs; trunk thorny or not; branches often with axillary spines when young, unarmed when old. *Leaves* spirally arranged, shortly petioled, ± 3–5-nerved at the base, otherwise penninerved, mostly crenate. Stipules 0. *Flowers* unisexual, rarely hermaphrodite, small, in short, axillary racemes. Perianth segments (sepals)

4–6(–7), slightly connate at the base, imbricate, green, subpersistent. Disk extrastaminal, entire or crenulate (mostly so in ♀ flowers), or broken up into free glands inserted mostly in twos more or less before each sepal (mostly so in ♂ flowers). ♂ *Flowers:* stamens 15-∞, free, with ellipsoid, extrorse, dorsifixed, ± versatile, ± gibbous anthers; rudiment of ovary 0. ♀ *Flowers:* ovary incompletely (2–)4–6(–10)-celled by false septa. Ovules 2 per cell. Styles as many as cells, free or ± connate; stigmas notched or shortly 2-lobed. *Fruit* a berry-like, fleshy, indehiscent drupe; pyrenes twice the number of styles, (1–)2-seeded, in the latter case the seeds superposed. *Seeds* obovoid; testa thinly crustaceous; cotyledons orbicular.

Distr. About 15 *spp.* in the warmer parts of Africa and Asia to Polynesia, in *Malaysia* 7 *spp.*, one of them introduced.

KEY TO THE SPECIES

1. Flowers always bisexual. Stamens ± persistent at the base of the fruit.
 2. Leaves, branchlets, and petioles wholly glabrous. Blade subacute. Styles central, somewhat connate at the base . . . . . **1. F. zippelii**
 2. Leaves, branchlets, and petioles ± densely pubescent beneath along the midrib and nerves. Blade mostly obtuse at the apex. Styles central, entirely free, sometimes very short . . **2. F. inermis**
1. Flowers unisexual (dioecious trees or shrubs, exceptionally in *F. rukam* a few ± ☿ flowers on otherwise ♂ specimens).
 3. Leaves softly-tomentose throughout the undersurface, cordate at the base. Nerves (8–)10–12 pairs. **3. F. tomentella**
 3. Leaves glabrous or pubescent beneath along midrib and nerves, not cordate at the base.
  4. Styles entirely connate into a distinct column, both on the ovary and fruit; stigmas very short and spreading, ± applanate. Leaves ovate-oblong to ovate-lanceolate, mostly membranous, glabrous, shining, the petiole slender . . . . . **4. F. jangomas**
  4. Styles entirely free or practically so.
   5. Styles 6–7(–8), elongate-filiform free from each other, erect, inserted in a circle on the flat top of the fruit, distinctly spaced. Leaves ± elliptic-oblong, mostly coarsely but regularly crenate, firmly chartaceous, lateral nerves subparallel and not rarely impressed above when dry. **5. F. rukam**
   5. Styles 4–6(–7), central or nearly so, spreading and ± reflexed both in ovary and fruit, sometimes somewhat united at the base (apex of the fruit tapering into a connate portion).
    6. Leaves oblong- or lanceolate-ovate, manifestly and narrowly reticulated at both sides, with 6–8(–9) pairs of lateral nerves, (10–)14–17 by (4–)5–6 cm . . . . . **6. F. kinabaluensis**
    6. Leaves smaller, occasionally up to 9 by 4 cm, very variable in shape, with 3–6 pairs of lateral nerves . . . . . **7. F. indica**

1. Flacourtia zippelii SLOOT. Bijdr. Flac. (1919) 128; Bull. Jard. Bot. Btzg III, 7 (1925) 372; Nova Guinea 14 (1924) 192.—*F. cerasifera* ZIPP. Bijdr. Nat. Wet. 5 (1830) 179, *nomen.*—*F. inermis var. glabra* BOERL. Cat. Hort. Bog. (1899) 51.—*F. inermis* (*non* ROXB.) MERR. Philip. J. Sc. 1 (1906) Suppl. 99.

Unarmed, slender tree, 5–10(–25) m high, rarely a shrub, tall specimens sometimes buttressed; branches mottled-brown and green, the young ones including the tips entirely glabrous and often shining (vernicose), striate, brownish; lenticels rather sparse, pallid, oblong-elliptic; bark thin, brown. *Leaves* ovate-oblong, rarely ovate-elliptic or lanceolate-ovate, gradually acuminate, broadly attenuate to nearly rotundate at the base, shining specially above, coriaceous to subcoriaceous, coarsely crenate to subentire, entirely glabrous, (7–)12–20 by (3–)5–7(–9) cm; midrib little prominent above, distinctly so beneath, 2 pairs of lateral nerves rising from or near the base, 3–4 pairs ascending from the midrib, all distinctly prominent beneath, veins numerous, transverse and slightly prominent as are the rather dense reticulations; petiole rather stout, 1½–2 mm, rugose, 0.6–1 cm. *Racemes* abbreviate, few-flowered, shortly, laxly, yellowish-pubescent. Pedicels 4–6 mm. *Sepals* 4–5, ovate, subacute, outside laxly, inside densely pilose. Disk shortly 4–5-lobed. Stamens *c.* 15 (the anthers sometimes not well developed); filaments normally *c.* 2½ mm, glabrous. *Ovary* ovoid; styles 4–5, radiate, 1 mm long and connate at the base, forming a very short column. *Fruit* depressed-globose, *c.* 1½–2 cm diam., first pale green, dark red when ripe or dry, mostly surrounded at the base by the ± persistent sepals and stamens or their rests, crowned by 4–5 short, radiate styles and not rarely a little apiculate giving the impression of the presence of a short style-column.

Distr. Melanesia (Solomon Isl. and New Britain) and *Malaysia:* Philippines (Luzon, Mindanao, Mindoro, Dinagat, Polillo), Celebes, Moluccas (Key, Banda, Morotai), New Guinea.

Ecol. Primary or secondary rain-forest on level or hilly moist ground and clayey soil, scattered, at low altitude, up to 1200 m.

Uses. Wood very tough, used by the people of the Solomon Islands for making handles of tools.

Vern. *Rukam manis, maraijo, mokoronda,* Malili, *karondang pangala,* Palopo; *lati,* Guadalcanal.

2. Flacourtia inermis ROXB. Pl. Corom. 3 (1811) 16, t. 222; Hort. Beng. (1814) 73; JACK, Mal. Misc. 1 (1820) 25; ROXB. Fl. Ind. ed. 2 (1832) 833; JACK, Calc. J. Nat. Hist. 4 (1843) 230; CLOS, Ann. Sc. Nat. IV, 8 (1857) 216; MIQ. Fl. Ind. Bat. I, 2 (1859) 103; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 192; KURZ, For. Fl. Br. Burma 1 (1877) 74; KOORD. Minah. (1898) 472; KOORD. & VAL. Bijdr. Booms. 5 (1900) 25; K. SCHUM. & LAUT. Fl. Deut. Schutzgeb. Südsee (1901) 454; BACK. Fl. Bat. 1 (1907) 68; Voorl. Schoolfl. Java (1908) 15; Schoolfl. Java (1911) 70; KOORD. Exk. Fl. Java 2 (1912) 634; Atlas Baumarten 2 (1914) t. 335; MERR. Philip. J. Sc. 11 (1916) Bot. 293; GILG, Bot. Jahrb. 55 (1918) 282; SLOOT. Bijdr. Flac. (1919) 127; Nova Guinea 14 (1924) 192; Bull. Jard. Bot. Btzg III, 7 (1925) 373; HEYNE, Nutt. Pl. (1927) 1140; OCHSE & BAKH. v. D. BR. Vruchten en Vruchtenteelt N.I. (1931) 47, pl. 18; BURK. Dict. (1935) 1022; KANEH. & HATUS. Bot. Mag. Tokyo 52 (1938) 416; CORNER, Ways. Trees (1940) 307; BACK. Bekn. Fl. Java (em. ed.) 4 A (1942) fam. 84, p. 7; MERR. J. Arn. Arb. 33 (1952) 225.— *F. sapida* (*non* ROXB.) TEYSM. & BINN. Cat. Bog. (1866) 185, *nom. nud.*—**Fig. 30e–g.**

KEY TO THE VARIETIES

1. Leaves ovate or ovate-oblong, 10–20 by (4–) 5–8(–12) cm *var.* **inermis**
1. Leaves oblong to oblong-lanceolate, 3–5 cm wide.
2. Leaves 12–18 cm long, attenuate-cuneate at the base *var.* **rindjanica**
2. Leaves 5–8(–11) cm long, broadly cuneate at the base, the base itself rounded or truncate. *var.* **moluccana**

var. **inermis.**

Unarmed tree, (3–)5–15 m; trunk usually crooked, gnarled and furrowed, up to 35 cm; bark brown or grey, rather smooth; young branchlets pubescent to nearly tomentose, brownish, laxly beset with pallid subrotundate lenticels. *Leaves* ovate-oblong to ovate-elliptic, attenuate-acuminate, broadly cuneate or rarely rounded at the base, firmly chartaceous, glabrous but always puberulous at the midrib on both surfaces, olivaceous to brown when dry, coarsely to slightly crenate, 8–14(–20) by (4–)5–8(–12) cm; midrib little prominent above, distinctly so beneath, nerves 5–6(–7) pairs, curved-ascending, but not interarching, little prominent above, distinctly so beneath, veins transverse and distinct, reticulations rather dense, well visible but little prominent; petiole stoutish, 8–10(–12) mm, manifestly pubescent. *Racemes* short, sometimes nearly reduced to fascicles, 1–1½ cm, puberulous, with several small bracts at the base. Pedicels slender, 4–10 mm, finely pubescent. *Sepals* (3–)4–5, ovate, obtuse, nearly glabrous or little pubescent outside, densely pilose inside, *c.* 2½ mm. Stamens 15–25, sometimes not fully developed; filaments glabrous, 2½ mm. Disk ± manifestly 6–8-lobed. *Ovary* ovoid, contracted apically; styles 4–5, slightly reflexed and enlarged into disciform or cuneate, bilobed stigmas. *Fruit* globose, pink to red, *c.* 2–2½ cm diam., adstringent, crowned by the compact styles or their rests, usually with remains of stamens or filaments at the base; pyrenes 8–10.

Distr. Only known in a cultivated or semi-cultivated state in the tropics in the vicinity of human habitations, widely spread from India (Silhet) over *Malaysia:* Sumatra, Malay Peninsula, Java, Borneo, Celebes, Moluccas and New Guinea to New Britain.

Ecol. Cultivated as a fruit tree up to 1300 m; grows also near the sea on sandy soil. *Fl.* Jan.–Febr.; *fr.* May–July.

Uses. The bright, cherry-red ripe fruit, the varieties with sweet fruits excepted, is too acid and adstringent to be eaten when fresh, but very good for making jams, syrup and preserves.

Vern. *Lobi-lobi, l.l. asĕm, rukĕm, rukam,* M, J, S, *saradan kaju,* S; *rukĕm bĕlanda,* Lingga; *tomi-tomi* Manado; *tomè-tomè,* Ternate; *tomo-tomo,* S. Ceram, *tombi-tombi,* S. Halmah., *kamondju, mĕngkorondo,* Barèe dial., *kĕnilango,* Buol; *lubi-lubi,* Minangk., Bugin.; *kegboi,* Manokwari.

Note. ROXBURGH founded this species on a specimen introduced from the Moluccas into the Botanic Garden at Calcutta. In many botanical works *F. inermis* has been cited as a native of the Moluccas, where it is nowadays widely distributed, but apparently it was not present there in the days of RUMPHIUS († 1702), who does not mention this very popular fruit tree. *Cf. var. moluccana.*

var. **rindjanica** (SLOOT.) SLEUM. *stat. nov.*—*F. rindjanica* SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 372; MALM in FEDDE, Rep. 34 (1934) 281. —*F. lanceolata* SLOOT. Bijdr. Flac. (1919) 129, *nec* MERR. 1914.

Differs from *var. inermis* by the lanceolate, attenuate leaves, 12–18 by 3–5 cm, attenuate-cuneate at the base.

Distr. *Malaysia:* Lesser Sunda Islands (Lombok, Sumba).

Ecol. Monsoon forests, on clayey soil, 750–950 m.

Vern. *Lobah,* Sumba.

var. **moluccana** SLEUM. Blumea 7 (1954) 493.—*F. cataphracta* (*non* ROXB.) SCHEFF. Ann. Jard. Bot. Btzg 1 (1876) 6.

Differs from *var. inermis* by smaller leaves, 5–8 (–11) cm long, with a characteristically truncate, nearly rounded, base. Fruit said to be green or red.

Distr. *Malaysia:* Moluccas (Halmaheira, Morotai), New Guinea (McCluer Gulf, Wissel Lake Region, Andai).

Ecol. In primary forests on coralline limestone (Halmaheira), up to 150 m (Morotai); *fr.* Jan.–April.

Uses. Used for timber in Halmaheira.

Vern. *Halimaditoko,* Tobelo, Halmaheira.

Note. The material of this variety has apparently been collected from indigenous specimens, and *var. moluccana* may represent the ancestral form from which the cultigens of *var. inermis* originated.

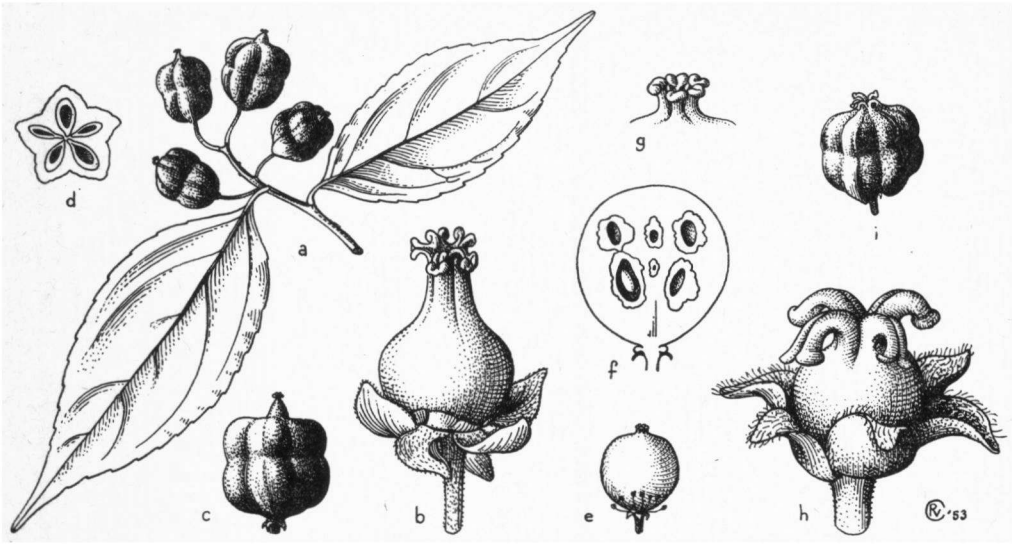

Fig. 30. *Flacourtia jangomas* (LOUR.) RAEUSCH. *a.* Twig with fruits, × 2/3, *b.* ♀ flower, × 9, *c.* fruit, × 2/3, *d.* fruit, cross-section, × 2/3.—*Flacourtia inermis* ROXB. *e.* fruit, × 2/3, *f.* fruit, cross-section, × 1 1/3, *g.* stigma, × 7.—*Flacourtia indica* (BURM. *f.*) MERR., *h.* ♀ flower, × 9, *i.* fruit, × 1 1/3 (*h–i* after COERT 1558).

3. Flacourtia tomentella MIQ. Fl. Ind. Bat. Suppl. (1860) 387; SLOOT. Bijdr. Flac. (1919) 125; Bull. Jard. Bot. Btzg III, 7 (1925) 372; RIDL. J. Bot. 74 (1936) 222.—*F. sumatrana* PLANCH. *msc. ex* HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 192 *excl. pl.* HELFER; GAGNEP. in MOROT, J. de Bot. 21 (1908) 172; SLOOT. Bijdr. Flac. (1919) 130; Bull. Jard. Bot. Btzg III, 7 (1925) 365.

Unarmed tree; branchlets dilute-ferrugineous-pubescent apically, soon covered with whitish or greyish cork. *Leaves* oblong-elliptic, obtuse-acuminate, inequilateral and distinctly cordate at the base, firmly chartaceous, coarsely crenate, shining and glabrous on the upper surface except the pubescent midrib and the nerves, dull beneath and laxly covered with short, subferrugineous hairs, more densely so on midrib and nerves, 9–25 (–30) by 4–10 cm; midrib slightly prominent, sometimes somewhat impressed above, very prominent beneath, nerves (8–)10–12 pairs, the inferior 3–4 rising from the leaf-base, the others suberect from the midrib, all slightly prominent above, distinctly so beneath, veins transverse, numerous, only little prominent on both sides as are the rather dense reticulations; petiole thick, densely pubescent 5–7(–10) mm. *Racemes* axillary, few-flowered, 1–1 1/2 cm, rather densely rufous-pubescent. Pedicels rather slender, 4 mm. Bracts ovate-rotundate, 1 mm. *Sepals* 4, ovate, densely hairy on both sides, *c.* 1 1/2 mm. Disk undulate. ♂ *Flowers:* stamens *c.* 15; filaments pubescent, 2 mm. ♀ *Flowers:* not seen. *Fruit* subglobose, *c.* 1 1/2 cm diam., crowned by 4–5(–7), ± reflexed, shortly bilobed, *c.* 1 mm long styles radiating from the very apex of the fruit.

Distr. *Malaysia:* W. Sumatra (Padang Lowlands); only 2 gatherings are known, both collected a century ago.

4. Flacourtia jangomas (LOUR.) RAEUSCH. Nomencl. Bot. ed. 3 (1797) 290; GMEL. *ex* STEUD. Nomencl. (1821) 343; MIQ. Fl. Ind. Bat. 1, 2 (1859) 105; MERR. En. Born. (1921) 412; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 375; HEYNE, Nutt. Pl. (1927) 1140; BURK. Dict. (1935) 1023; MERR. Comm. Lour. (1935) 274: RIDL. J. Bot. 74 (1936) 224; HENDERS. J. Mal. Br. R. As. Soc. 17 (1939) 36; CORNER, Wayside Trees 1 (1940) 307, p. 64, f. 99; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 84, p. 8.—*Stigmarota jangomas* LOUR. Fl. Cochinch. 2 (1790) 634; ed. WILLD. (1793) 779.—*F. cataphracta* ROXB. *ex* WILLD. Sp. Pl. 4 (1806) 830; ROXB. Pl. Corom. 3 (1811) t. 222; BL. Bijdr. 1 (1825) 55; ROXB. Fl. Ind. ed. CAREY 3 (1832) 834; KURZ, Nat. Tijd. Ned. Ind. 27 (1864) 177; TUL. Ann. Sc. Nat. V, 9 (1868) 340; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 193; SCHEFF. Ann. Jard. Bot. Btzg 1 (1876) 6; KURZ, For. Fl. Burma 1 (1877) 74; KING, J. As. Soc. Beng. 59, ii (1890) 117; KOORD. & VAL. Bijdr. Booms. 5 (1900) 26; GAGNEP. in MOROT, J. de Bot. 21 (1908) 172; Fl. Gén. I.C. 1 (1909) 233; BACK. Schoolfl. Java (1911) 71; KOORD. Atlas Baumarten 2 (1914) f. 334; RIDL. Fl. Mal. Pen. 1 (1922) 158; CRAIB, Fl. Siam. En. 1 (1925) 94.—*Roumea jangomas* SPR. Syst. Veg. 2 (1825) 632.—*Xylosma borneense* RIDL. J. Bot. 74 (1936) 224.—**Fig. 30a–d.**

Small, deciduous tree, 6–10(–14) m; trunk and branches commonly thornless in old trees, ± densely beset with simple or branched, woody

thorns when younger; bark light-brown to copper-red or pinkish-buff, flaky into thin lamels; young branches white-dotted by numerous suborbicular lenticels, puberulous or mostly glabrous. *Leaves* ± narrow-ovate to ovate-oblong, rarely ovate-lanceolate, long-obtuse-acuminate, broadly cuneate to rounded at the base, membranous to thinly chartaceous (pinkish or light cinnamon-brown when young in a fresh state), glabrous, shining above, mostly dull beneath, subserrate-crenate, (5–)7–10(–11) ny (2–)3–4(–5½) cm; petiole puberulous or glabrescent, 6–8 mm. *Racemes* axillary, subcorymbose, glabrous, few-flowered, the ♂ 1½–3, the ♀ 1–1½ cm long. *Flowers* fragrant of honey, before or with the young foliage. Pedicels very slender, ½–1(–1½) cm. *Sepals* 4(–5), ovate, obtuse, greenish, ± pubescent on both sides, 2 mm. Disk fleshy, entire or slightly lobed, white or yellow (orange). ♂ *Flowers:* filaments glabrous. ♀ *Flowers:* Ovary first flask-shaped, soon subglobular, with 4–6 styles connate into a distinct, 1 mm high column, not or slightly free at their apices, each bearing a ± dilatate, bilobed, recurved stigma. *Fruit* subglobose, 1½–2½ cm diam., dull-brownish red or purple, then blackish, with greenish-yellow pulp, enclosing 4–5(–10) flat seeds, tipped with the single, short style-column with 4–6 minute stigma-points.

Distr. Cultivated around villages throughout tropical countries, specially in E. Africa, India, SE. Asia, in *Malaysia* in the Malay Peninsula (Penang, Kedah, Perlis, Trengganu, Kelantan, Perak), occasionally in Sumatra, E. Java, Borneo, P. Kangean, and Luzon.

Not known in wild state, but possibly originated in India (E. Bengal – Assam – Upper Burma). LOUREIRO based *Stigmarota jangomas* on a specimen cultivated in Cochin-China. Already mentioned as cultivated in Bombay by GARCIA DEL HUERTO, Hist. Arom. lib. 2 cap. 5 (1563) 185; he calls the plant *Jamgomas* or *Jangomas*, modifications of the Bombay native name *Jangama*.

Ecol. Cultivated in lowland countries up to 600 m as a fruit tree. *Fl.* March–Oct.

Uses. Fruit with firm, fairly juicy flesh, rather tart when fresh, but making a good marmelade. Leaves and roots, prescribed for diarrhoea, contain tannin. Wood hard, red or orange-red in colour, brittle, capable of receiving a good polish.

Vern. *Indian plum*, E, *kĕrukup*, Palembang, *situ*, Atjeh, *rukĕm*, J. Malay Peninsula: Greater *k(ĕ)rekup* or *kĕlukub*, *k. bakon*, *kurkup*, *okum*, *akar pulasan*, *a. tĕmbĕrak*. Borneo: *katong*, Bajan, *lahu kakang*, Dusun.

5. Flacourtia rukam ZOLL. & MOR. in MOR. Syst. Verz. (1846) 33; MIQ. Pl. Jungh. (1855) 400; CLOS, Ann. Sc. Nat. IV, 8 (1857) 216; MIQ. Fl. Ind. Bat. 1, 2 (1859) 104; HOOK. *f.* & TH. Fl. Br. Ind. 1 (1872) 192; F.-VILL. Nov. App. (1880) 112; BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) 302; VID. Phan. Cuming. Philip. (1885) 94; Rev. Pl. Vasc. Filip. (1886) 49; KING, J. As. Soc. Beng. 59, ii (1890) 117; KOORD. & VAL. Bijdr. Booms. Java 5 (1900) 22; K. SCHUM. & LAUT. Fl. Deut. Schutzgeb. Südsee (1901) 454; RIDL. Agric. Bull. Str. Fed. Mal. St. 5 (1906) 199; VAL. Bull. Dép. Agric. Ind. Néerl. 10 (1907) 34; BACK. Fl. Bat. 1 (1907) 67; Voorl. Schoolfl. Java (1908) 15; GAGNEP. in MOROT, J. de Bot. 21 (1908) 172; Fl. Gén. I.C. 1 (1909) 234; BACK. Schoolfl. Java (1911) 71; KOORD. Exk. Fl. Java 2 (1912) 634; Atlas Baumarten 2 (1914) t. 336; MERR. Philip. J. Sc. 11 (1916) Bot. 97; GILG, Bot. Jahrb. 55 (1918) 282; SLOOT. Bijdr. Flac. (1919) 119; MERR. En. Born. Pl. (1921) 412; BROWN, Min. Prod. Philip. For. 2 (1921) 348, f. 68; RIDL. Fl. Mal. Pen. 1 (1922) 157; KOORD. Fl. Tjibodas 2 (1923) 192; MERR. En. Philip. 3 (1923) 113; SLOOT. Nova Guinea 14 (1924) 191; Bull. Jard. Bot. Btzg III, 7 (1925) 365; DOCTERS V. LEEUWEN, Zoocec. Ned. Ind. (1926) 394; MERR. Philip. J. Sc. 29 (1926) 401 HEYNE, Nutt. Pl. (1927) 1140; GIMLETTE & BURK. Gard. Bull. Str. S. 6 (1930) 366; BURK. & HANIFF, *ibid.* 173; OCHSE & BAKH. V. D. BR. Ind. Groenten (1931) 293, f. 187; Vruchten & Vruchtenteelt (1931) 49, pl. 19; FISCHER, Kew Bull. (1932) 176; BURK. Dict. (1935) 1024; CORNER, Wayside Trees (1940) 307, f. 99, 100; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 84, p. 8; BROWN, Useful Pl. Philip. 2 (1950) 504, f. 236; QUIS. Med. Pl. Philip. (1951) 627.—*F. rukam var. domestica* & *var. erythrocarpa* RIDL. Fl. Mal. Pen. 1 (1922) 158.—*F. rukam var. myriantha* MERR. Philip. J. Sc. 30 (1926) 411.—*F. cataphracta* (*non* ROXB.) BL. Bijdr. (1825) 55.—*F. edulis* GRIFF. Not. 4 (1854) 612.—*Hisingera grandifolia* TURCZ. Bull. Soc. Nat. Moscou 27 (1854) 332; *ibid.* 36 (1863) 554, *in obs.*—*F. inermis* (*non* ROXB.) MERR. Philip. J. Sc. 1 (1906) Suppl. 99.—*F. euphlebia* MERR. *ibid.* 9 (1914) 324; BROWN, Minor Prod. Philip. For. 2 (1921) 346; MERR. En. Philip. 3 (1923) 112; BROWN, Useful Pl. Philip. 2 (1950) 502.—*F. sulcata* ELM. Leafl. Philip. Bot. 7 (1915) 2653.—*F. megaphylla* RIDL. J. Bot. 74 (1936) 223.—*F. peninsula* ELM. Leafl. Philip. Bot. 10 (1939) 3808.—**Fig. 31–33.**

Small tree, 5–15(–20) m; trunk and old branches usually crooked, gnarled and furrowed, branched near the base; when young with strong woody simple or branched thorns, up to 10 cm, on trunk and branches, but occasionally (cultivated forms) thornless, specially when old; bark brown to greyish, smooth, not flaky; ultimate branchlets shortly (hispid-)pilose, with numerous warty, rounded or broad-elliptic lenticels. *Leaves* ovate-oblong or elliptic to oblong-lanceolate, gradually tapered to the long, obtuse tip, rather broadly cuneate to rounded at the base, mostly puberulous at both sides on midrib and nerves, or entirely glabrous, mostly shining above, or dull on both sides, mature ones dark green above, pale green below, young ones shining rose-red or brown, flaccid, drooping, always brown when dry, bitter, rather coarsely toothed, (6½–)10–15(–18) by (3–)4–7(–9) cm; midrib and nerves little prominent, but sometimes markedly impressed above, prominent beneath, nerves 5–7(–8–10–12) pairs, curved-ascending, little or distinctly anastomosing, veins ± transverse and distinct, reticulations rather

Fig. 31. *Flacourtia rukam* Z. & M. *a.* Twig with ♀ flowers, × 2/3, *b.* part of twig with ♂ inflorescences, × 2/3, *c.* ♀ flower, × 7 1/2, *d.* ♀ flower, longitudinal section, × 7 1/2, *e.* fruit, × 2/3, *f.* fruit, seen from top, × 2/3, *g.* fruit, cross-section, × 2/3, *h.* fruit, longitudinal section, × 2/3, *i.* ♂ flower, × 7 1/2 (*a*, *c–d* after BECCARI 671, *b*, *i* after BUWALDA 6974).

dense and mostly somewhat elevated; petiole 5–8 mm, glabrous or mostly subferrugineous-puberulous. *Flowers* greenish-yellow, scentless, in few-flowered, short, axillary, finely pubescent racemes. Bracts oblong-ovate, 1 mm. Pedicels 3–4 mm. *Sepals* (3–)4(–6), ovate-acuminate, 2 mm diam., laxly pubescent on both surfaces. ♂ *Flowers:* disk-lobes 8, fleshy, orange to yellow-white; stamens numerous; filaments glabrous 3–4 mm; anthers very small, yellow. ♀ *Flowers:* stamens mostly none, but sometimes present, then mostly reduced in size (staminodes), very rarely normally developed. *Ovary* flask-shaped, with 4–6(–8) free, suberect styles with a small, indistinctly bilobed stigma. *Fruit* globose to depressed-globose or a little obovate, 2–2½ cm diam., 4–7-sulcate or -angular when dry, 5–8 mm peduncled, light-green to pink or purplish-green to dark-red, with whitish pulp, crowned by the 4–6(–8), small, peg-like spaced styles set in a circle.

Distr. Widely distributed but scattered, both cultivated and wild all over *Malaysia*, apparently rare in the Moluccas and New Guinea, also introduced (?) in Samoa. Neither native in Indo-China nor in Siam or Hainan, as accepted by various authors.

Ecol. Evergreen, primary or secondary forest, also in teak-forests, often along rivers, from the lowland up to *c.* 2100 m in a wild state. *Fl.* June–August, *fr.* Sept.–Nov.

Uses. Cultivated for its edible fruits, good for making jams and pies. The fruit is rather variable in shape, size, and colour. The ripe fruit from cultivated specimens is acid and adstringent, but rubbing it between the hands bruises the flesh and causes a chemical change to take place, which renders it sweet and palatable. Wild forms have smaller, very sour and bitterly tasting fruits. Propagated by root-suckers which are abundantly produced.

In the Philippines the roots are medicinal, and their decoction is given internally to women after childbirth. The adstringent juice of the young fruit is given for diarrhoea and dysentery, also for dysmenorrhoea. The juice of the leaves is applied to inflamed eye-lids.

The wood is very hard, occasionally (Philippines) made into pestles or shafts.

Vern. *Rukĕm, rukam, r. gajah, rasak manggis, kaju piu,* M, *piu tangulan,* Asahan, *mĕdang munungan,* Palemb., *tĕnonosih,* Mentawei, *tonggolen,* Karo-Batak, *tangkulung,* Mentawei, *kupa landak, rukĕm,* S, *(ganda) rukĕm, saradan, djĕnggatan,* J, *landak,* Md, *klang tatah kutang,* Borneo. Philippines: *Salabagin, agasas, banauo,* C. Bis., *amaiit, bitóñgol,* Tag., *kalamasáti, lalamasali,* Sbl., *kalominga, kaluñga,* Ig., *obieng,* Ilk., *lanagon,* Buk., *tangkanyan,* Ina, *balalauan, nuginagin,* Bag., *nanagan,* Sub., *oropag,* Mbo.

Note. The species varies much both in the amount of pubescence and in the shape and size of its leaves. I consider neither the big-leaved forms described as *F. megaphylla* and *F. euphlebia* nor the narrow-leafed forms (*F. peninsula*) to represent distinct species. Sometimes dried material shows strongly impressed nerves (*F. sulcata*), which I suppose due to quick drying of rather young, not yet fully developed leaves.

6. Flacourtia kinabaluensis SLEUM. Blumea 7 (1954) 493.

Slender tree or shrub, 5–6 m, recumbent; young twigs copper-red, glabrous, dull or shining, specially towards the tips covered with varnish. *Leaves* ± tapering into an elongate obtuse acumen, sometimes nearly caudate, rounded at the base, coriaceous, glabrous, shining on both sides; midrib prominent, the two lower pairs of the nerves rising from or nearly from the base, but curved-ascending as are the superior ones and equally prominent on both sides. *Flowers* in axillary, very short, few-flowered racemes, mostly reduced to 2–3-flowered fascicles on tubercled nodes. Pedicels laxly pilose, 4–5 mm. *Sepals* 4(–5) ovate, obtuse, laxly pilose outside, rather densely so inside, 2 mm. ♂ *Flowers* cream. Stamens *c.* 15; filaments glabrous 2 mm. Disk-lobes 8, free, fleshy, truncate. ♀ *Flowers* not seen; developed ovary surrounded at the base by 4 sepals similar to those of the ♂ flowers, globose,

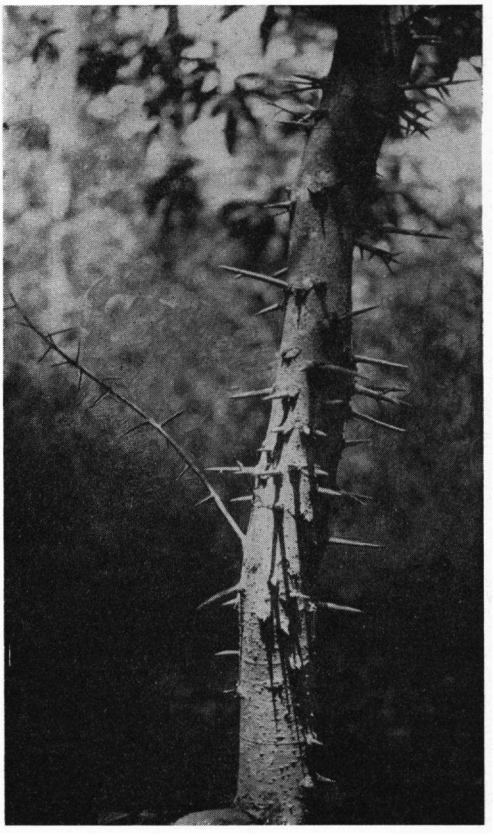

Fig. 32. Spiny stem of *Flacourtia rukam* Z. & M Rawah Bodjong, W. Java (VAN STEENIS, Oct. 1941

Fig. 33. *Flacourtia rukam* Z. & M. Leaves and fruits, × 4/5 (C.H.B. IV-F-115).

with 4(–5), central, 1 mm long styles, radiating and reflexed from the apex. *Fruit* subglobose, 6–8 mm diam., red, with 6–8 flat seeds, each 4 mm diam.

Distr. *Malaysia:* Br. N. Borneo (Kinabalu Penibukan).

Ecol. Jungle ridge, 1300–1650 m.

7. Flacourtia indica (BURM. *f.*) MERR. Interpr. Rumph. Herb. Amb. (1917) 377; Sp. Blanc. (1918) 274; Philip. J. Sc. 19 (1921) 367; BROWN, Min. Prod. Philip. For. 2 (1921) 348, f. 69; MERR. En. Philip. 3 (1923) 112; HALL. *f.* Beih. Bot. Centralbl. 39, ii (1923) 161; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 368; MERR. J. Arn. Arb. 6 (1925) 137; HEYNE, Nutt. Pl. (1927) 1140; MERR. & CHUN, Sunyatsenia 1 (1930) 73; BACK. Onkruidfl. Jav. Suiker. (1930) 455; BURK. Dict. (1935) 1022; MERR. Comm. Lour. (1935) 274; J. Arn. Arb. 19 (1938) 356; BACK. Bekn. Fl. Java (em. ed.) 4A (1942) fam. 84, p. 7; MASAM. Fl. Kainant. (1943) 214; BROWN, Useful Pl. Philip. 2 (1950) 502, f. 234; QUIS. Med. Pl. Philip. (1951) 626.—*Spina spinarum I mas* RUMPH. Herb. Amb. Auct. (1755) 36, t. 19, f. 1–2.—*Spina spinarum II femina* RUMPH. *l.c.* 37.—*Gmelina indica* BURM. *f.* Fl. Ind. (1768) 132, t. 39, f. 5; HOUTT. Nat. Hist. II, 3 (1774) 122.—*Gmelina javanica* CHRISTM. Pflanzensyst. 2 (1777) 134.—*F. ramontchi* HÉRIT. Stirp. Nov. 3 (1785) 59, t. 30, 30 B; F.-VILL. Nov. App. (1880) 12; KOORD. & VAL. Bijdr. Booms. 5 (1900) 19; BACK. Fl. Bat. (1907) 66; Voorl. Schoolfl. Java (1908) 15; Schoolfl. Java (1911) 71; KOORD. Exk. Fl. Java 2 (1912) 634; HALL. *f.* Med. Rijksherb. *no* 12 (1912) 25; KOORD. Atlas Baumarten (1914) t. 333; SLOOT. Bijdr. Flac. (1919) 123; BROWN, Useful Pl. Philip. 2 (1950) 504, f. 235; MEIJER DREES, Comm. For. Res. Inst. 33 (1951) 59.—*Stigmarota africana* LOUR. Fl. Cochinch. 2 (1790) 634.— *F. sepiaria* ROXB. Pl. Corom. 1 (1796) 48, t. 68; Fl. Ind. ed. CAREY 3 (1832) 835; MIQ. Fl. Ind. Bat. 1, 2 (1859) 104; HOOK *f.* & TH. Fl. Br. Ind. 1 (1872) 194; KURZ, For. Fl. Br. Burma 1 (1877) 75; F.-VILL. Nov. App. (1880) 12; VID. Sin. Atl. (1883) 13, t. 7, f. c; Rev. Pl. Vasc. Filip. (1886) 49; GAGNEP. in MOROT, J. de Bot. 21 (1908) 172; Fl. Gén. I.C. 1 (1909) 236; MERR. Fl. Manila (1912) 334; RIDL. Fl. Mal. Pen. 1 (1922) 158; CRAIB, Fl. Siam. En. 1 (1925) 94; GAGNEP. Fl. Gén. I.C. Suppl. (1939) 212.—*F. sepiaria var. frondosa & var. leucophloea* CLOS, Ann. Sc. Nat. IV, 8 (1857) 217.— *F. sapida* ROXB. Pl. Corom. 1 (1795) 49, t. 69; BL. Bijdr. (1825) 55; ROXB. Fl. Ind. ed. CAREY 3 (1832) 835; MIQ. Fl. Ind. Bat. 1, 2 (1859) 104; KURZ, For. Fl. Br. Burma 1 (1877) 75.—*Sideroxylon spinosum* WILLD. Sp. Pl. 1 (1797) 1091.—*Rhamnopsis sepiaria* RCHB. Consp. (1828) 188.—*F. obcordata* ROXB. Fl. Ind. ed. CAREY 3 (1832) 835.—*F. rotundifolia* ROXB. *l.c.* 173, *nomen.*—*Myroxylon decline* BLANCO, Fl. Filip. (1837) 813.—*Stigmarota edulis* BLANCO, Fl. Filip. ed. 2 (1845) 560; *op. cit.* ed. 3 (1879) 221.—*F. heterophylla* TURCZ. Bull. Soc. Nat. Moscou 27 (1854) 331; *ibid.* 36 (1863) 554.—*Mespilus silvestris* BURM. Ind. Univ. Herb. Amb. (1855) 18, *nec* BURM. *l.c.* 14.—*F. rotundifolia* CLOS, Ann. Sc. Nat. IV, 8 (1857) 218; MIQ. Fl. Ind. Bat. 1, 2 (1859) 104; KURZ, For. Fl. Br. Burma 1 (1877) 75.—*F. perrottetiana* CLOS, *l.c.* 218.—*F. frondosa* CLOS, *l.c.* 217.—*F. cataphracta* (*non* ROXB.) ROLFE, J. Bot. 23 (1885) 210; VID. Rev. Pl. Vasc. Filip. (1886) 49.—*F. balansae* GAGNEP. Bull. Soc. Bot. Fr. 55 (1908) 521; Fl. Gén. I.C. 1 (1909) 235, f. 23; *ibid.* Suppl. 1 (1939) 212.—*F. thorelii* GAGNEP. Bull. Soc. Bot. Fr. 55 (1908) 522; Fl. Gén. I.C. 1 (1909) 236; CRAIB, Fl. Siam. En. 1 (1925) 95; GAGNEP. Fl. Gén. I.C. Suppl. 1 (1939) 212.—*F. lenis* CRAIB, Kew Bull. (1916) 259; Fl. Siam. En. 1 (1925) 94; GAGNEP. Fl. Gén. I.C. Suppl. 1 (1939) 212.—*F. parvifolia* MERR. Lingn. Sc. J. 6 (1930) 328.—**Fig. 30h–l.**

Deciduous, polymorphous bush or small tree up to 15 m; trunk and big branches set with branched thorns, but older branches often unarmed; younger branches with axillary, simple thorns, decrescent in size apically; bark greyish-buff, rather fissured and flaky; crown bushy, spreading, with many arching branches with drooping ends and set with tufts of erect twigs, these glabrous or pubescent, laxly set with elliptic lenticels when young, soon covered with grey bark. *Leaves* rather small, variable in form, size, texture and indument, mostly narrow and obovate, blunt, cuneate to the base, coarsely and ± regularly crenate specially towards the apex and set in clusters on the branches of the previous year, others larger, deeply notched and elliptic to heart-

shaped, spaced along the vigorous young shoots and mostly with thorns in their axils, membranous to coriaceous, glabrous to softly tomentose on both sides, rose-red when young, 2–4(–7–8½) by 1½–3(–4–5) cm; (red) midrib and 4–6 pairs of nerves little prominent on both sides, reticulations slight, mostly distinct; petiole red, mostly slender and puberulous, 3–5(–11) mm. *Racemes* short, puberulous, few-flowered, axillary or terminating short, lateral, 3–4-leaved twigs (these sometimes reduced to very short leafless shoots bearing several lanceolate bracts at their base, or transformed into woody thorns). Pedicels puberulous, 3–5(–7) mm. *Sepals* (4–)5–6(–7), ovate, obtuse, mostly nearly glabrous on their back, ± densely hairy at the margin and inside, 1½ mm. ♂ *Flowers:* disk slightly lobulate or crenate. Filaments 2–2½ mm, hairy only at the base. ♀ *Flowers:* disk entire or nearly so. *Ovary* globular, somewhat attenuate at the apex, with 5–6(–7), radiate, thickly, terete, 1 mm long styles each with a slightly bilobed stigma, not or little connate at the base. *Fruit* rather small, globose to ellipsoid, solitary or in small clusters on the short lateral, leafy twigs, *c.* 0.8–1(–1.3) cm diam., ripening dull to blackish red, rather translucent, with 5–6(–7), short styles radiating from a ± short, rather thickened common stalk-like basis. *Seeds* 5–8.

Distr. Widespread and cultivated in tropical and subtropical countries in Africa, India, SE. Asia, and Polynesia, in *Malaysia* in the Malay Peninsula (up to date only known from Kedah and Perlis), frequent in Java, Madura and Luzon, apparently scattered or rare in Banka, Bali, S. Celebes, Timor (Leti Isl.) and Mindoro. No material seen from Sumatra.

Ecol. From the plains near the sea up to 700 m, in mixed forests, teak-forests, brushwood, forest-borders, thickets, along riversides, but mostly in seasonally dry, open, barren places, on limestone, clayey, or sandy soil. *Fl. fr.* Jan.–Dec.

Uses. Frequently cultivated in villages for the edible, but rather adstringent fruit; also medicinal as adstringent. Wood hard, but not used being too small.

Vern. *Madagascar plum, Mauritius plum*, E, *lesser krĕkup*, Mal. Pen., *duri rukam, daun lalambaran*, S, *bogo, baga, rukĕm, rir, ri sisir, saradan*, J, *kĕm*, Bali. Philippines: *bitángol*, Sbl., *bitóngol, bolóng*, Tag., *palútan*, Ibn., *serali, saua-saua*, Bis.

Notes. *F. indica* is accepted here in a wide sense, including *F. ramontchi* HÉRIT. and *F. sepiaria* ROXB., both treated as separate species up to 1917, when MERRILL united them under the name *F. indica*. COOKE (Fl. Bombay 1901, 55) and after him BLATTER (J. Bomb. Nat. Hist. Soc. 31, 1927, 912) and RAIZADA (Ind. For. 79, 1953, 503) insist to distinguish these species as follows:

F. ramontchi: thorns not bearing flowers and fruits.

F. sepiaria: thorns (RAIZADA: usually) with flowers and fruits.

This distinction does not hold, as the small-leaved, deciduous forms usually designed as *F. sepiaria* can bear the inflorescences in the axils of the leaves, at the very base of the thorns, or on the thorns themselves. After having seen a rather large assemblage of Indian and Malaysian material of the so-called *F. sepiaria*, I feel that 'inflorescences on the thorns' are rather an exception than the rule; moreover, thorns (*i.e.* reduced lateral twigs) are not always represented. I cannot find any constant character neither in leaves nor flowers or fruits, which would allow to segregate two species in the *F. indica*-complex, and I am certain that the greater part of the African '*ramontchi*' should also be included in *F. indica*.

It seems that *F. indica* (*F. sepiaria*) prefers rather dry, open places, thickets or scrub-forest, whilst *F. ramontchi* seems to be more frequently attached to evergreen respectively rain-forest-vegetation, but also this may not hold, as RAIZADA states, that *F. ramontchi* occurs 'in Burma in indaing and in dry forests'.

The sterile type-specimen of BURMAN's *Gmelina indica* conserved at Geneva agrees in leaf-characters with *F. sepiaria*. The type material of *F. sepiaria* ROXB. in the Brit. Museum consists of 2 specimens, one of them with thorns and the inflorescence at the base of them, the other without thorns.

Excluded

Flacourtia campbelliana ROXB. Hort. Beng. (1814) 73, *nom. nud.*; VOIGT, Hort. Suburb. Calc. (1845) 84, *nom. nud.*? Sumatra.

Flacourtia camptoceras MIQ. Fl. Ind. Bat. Suppl. (1860) 388.—*Roucheria griffithiana* PLANCH. *cf.* BOERL. Ic. Bog. 1 (1897) 25, t. 7 = *Indorouchera sp., cf.* HALL. *f.* Med. Rijksherb. *no* 35 (1918) 16; Beih. Bot. Centralbl. 39, ii (1923) 50 (*Linaceae*).

Flacourtia magallanensis ELM. Leafl. Philip. Bot. 4 (1912) 1519 = *Worcesterianthus magallanensis* (ELM.) MERR. Philip. J. Sc. 10 (1915) Bot. 270; En. Philip. 2 (1923) 117 (*prob. Icacinaceae*).

17. OSMELIA

THWAITES, En. Pl. Zeyl. (1858) 20.—*Stachycrater* TURCZ. Bull. Soc. Nat. Moscou 31 (1858) 464.—**Fig. 35a–g.**

Dioecious trees. *Leaves* spiral, mostly seemingly distichous, ovate to oblong-lanceolate, mostly entire and abruptly acuminate, triplinerved from the base, penninerved above, the veins not rarely ± cancellate. Stipules mostly minute, linear, caducous, rarely leafy and subpersistent. *Flowers* small, almost sessile,

numerous, in long, terminal or axillary, simple or mostly panicled, ± interrupted, drooping, spike-like racemes, surrounded at the base by a persistent cup formed by a bract and 2 bracteoles. *Calyx*-tube very short, with 4(–5), distinctly imbricate lobes (sepals). Petals 0. ♂ *Flowers:* stamens 8(–10), ± exserted, 4(–5) distinctly alternating with the sepals, the other 4(–5) episepalous and inserted at the inner base of the staminodes; anthers minute, ovate-globose, dorsifix. Staminodes episepalous, scale-like, ± flattened, deeply bifid, hairy. Rudiment of the ovary villous, with 3 short styles. ♀ *Flowers:* similar to the ♂ flowers, but stamens only half the size of the normal ones, not exserted, the anthers without pollen. *Ovary* ovoid or oblong, sessile, densely hairy, with 3 few-ovuled placentas. Styles 3, short, curved, glabrous; stigmas capitellate or mostly reniform-applanate, ± distinctly bilobed. *Capsule* 1 mm pedicelled, subglobose to oblong-trigonous, tomentose, 3-valved, with 1–3(–4) seeds; pericarp subcoriaceous. *Seeds* ellipsoid to subglobose, with a red or yellow, fleshy aril and membranous testa.

Distr. Four *spp.*, 3 of which throughout *Malaysia*, one in Ceylon. Fig. 34.

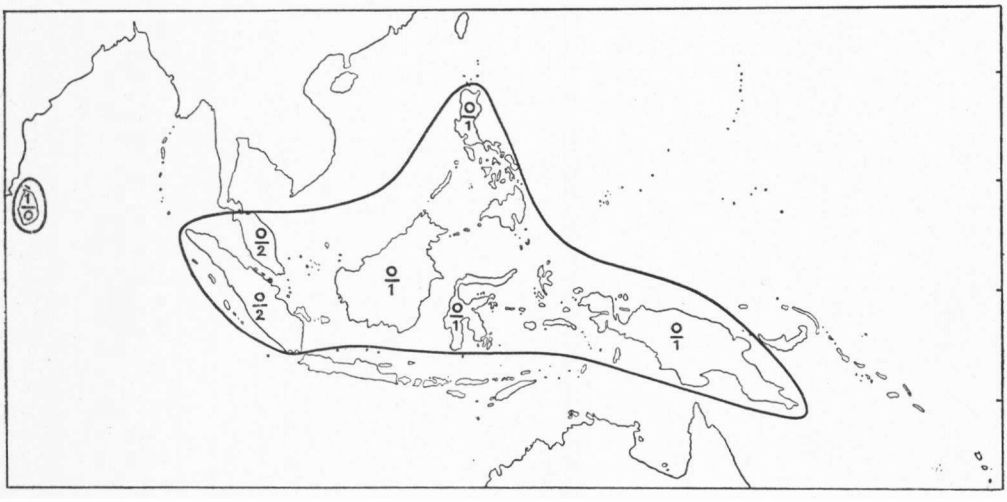

Fig. 34. Distribution of *Osmelia*. The number above the hyphen indicates the number of endemic species in the island, the figure below the hyphen the number of non-endemic species.

KEY TO THE SPECIES

1. Stipules small, mostly linear, early caducous.
 2. Leaves usually olivaceous–tomentose beneath, very rarely ± glabrescent . . **1. O. maingayi**
 2. Leaves usually glabrous, rarely and apparently not persistently pubescent on midrib and nerves beneath . . . . . **2. O. philippina**
1. Stipules ± foliaceous, 2–3, sometimes up to 5 cm long and up to 1½ cm wide, longer persistent. Leaves practically glabrous . . . . . **3. O. grandistipulata**

1. Osmelia maingayi KING, J. As. Soc. Beng. 67, ii (1898) 19; SLOOT. Bijdr. Flac. (1919) 138; RIDL. Fl. Mal. Pen. 1 (1922) 834; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 387; BURK. Dict. (1935) 1610.

Tree 6–20 m; branchlets slender, minutely tawny-tomentose. *Leaves* oblong or elliptic-oblong, shortly ± abruptly acuminate, cuneate to subrotundate at the base, membranaceous, entire or obscurely crenulate, light-green, upper surface glabrous except the ± pilose midrib, lower surface ± densely covered with spreading, yellowish or olivaceous hairs especially on nerves and midrib, the latter still pubescent in old elsewhere glabrescent leaves, 10–20(–25) by (4½–)5½–8 cm; nerves (6–)8–10 pairs, ± mostly suberect and rather close to each other, prominent beneath, veins ± transverse, reticulate but little prominent; petiole (0.6–)1–1.8 cm, rather densely ferrugineous-

pilose. *Panicles* terminal (mostly the ♂ ones), these usually longer than the leaves, *c.* 7–15 (rarely up to 40) cm, or axillary (mostly the ♀ ones, these shorter than the leaves), all slender and spiciform. Flowers ± spaced, small, yellowish-rose. *Calyx*-lobes nearly rounded, pubescent on the back, 1.2 mm long, in the ♀ flowers somewhat smaller. ♂ *Flowers:* stamens 8 in two rows; staminodes broad, yellowish. ♀ *Flowers:* stamens shorter than calyx-lobes. *Ovary* oblong, 2 mm, densely yellowish-tomentose. *Capsule* oblong, narrowed at the apex and base, manifestly 3-ridged, densely yellowish-tomentose when dry, said to be velvety-red and corrugated when fresh, with silvery tinge, (1.2–) 1.5–2 cm long. *Seeds* ellipsoid, 7–8 mm long.

Distr. S. Siam (Chawng), in *Malaysia:* Malay Peninsula (Kedah, Pahang, Selangor, Negri Sembilan, Malacca, Singapore, apparently frequent in Perak), Sumatra (East Coast, Padang), Br. N. Borneo (Sandakan).

Ecol. In dense forests from the lowland up to *c.* 360 m.

Uses. Wood reddish, durable, heavier than water, used for making chairs and house-posts.

Vern. *Bĕrunai ayĕr, mĕdang kĕmantau,* Mal. Pen., *akar laka,* Pahang, *bangas mèrah, chindarong bukit, rambai burong,* Selangor, *mata kanan,* Sandakan.

Note. As more material is coming in, the variation of both *O. maingayi* and *O. philippina* seems to increase, and it is quite possible that in future they cannot be kept separate.

2. Osmelia philippina (TURCZ.) BENTH. (*sphalm. philippinensis*) J. Linn. Soc. Bot. 5 (1861) Suppl. 2, 89; F.-VILL. Nov. App. (1880) 93; VID. Phan. Cuming. (1885) 115; Rev. Pl. Vasc. Filip. (1886) 141; PULLE, Nova Guinea 8 (1911) 672; GILG, Bot. Jahrb. 55 (1918) 284; SLOOT. Bijdr. Flac. (1919) 141; MERR. En. Philip. 3 (1923) 114; SLOOT. Nova Guinea 14 (1924) 193; Bull. Jard. Bot. Btzg III, 7 (1925) 391.—*Stachycrater philippinus* TURCZ. Bull. Soc. Nat. Moscou 31 (1858) 465.—*O. conferta* BENTH. J. Linn. Soc. Bot. 5 (1861) Suppl. 2, 89; ROLFE, J. Bot. 23 (1885) 213; VID. Phan. Cuming. (1885) 115; Rev. Pl. Vasc. Filip. (1886) 141; MERR. En. Philip. 3 (1923) 113.—*O. celebica* KOORD. Minah. (1898) 474, 624; HALL. *f.* Med. Rijksherb. 1 (1910) 3; SLOOT. Bijdr. Flac. (1919) 140; MERR. En. Philip. 3 (1923) 113; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 391; HEYNE, Nutt. Pl. (1927) 1141.—*Dichapetalum spicatum* ELM. Leafl. Philip. Bot. 1 (1908) 299.—*O. euspicata* ELM. Leafl. Philip. Bot. 7 (1915) 2653.—*O. subrotundifolia* ELM. *l.c.* 2655; MERR. En. Philip. 3 (1923) 114.—*O. borneensis* MERR. Philip. J. Sc. 11 (1916) Bot. 98; SLOOT. Bijdr. Flac. (1919) 139; MERR. En. Born. (1921) 412; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 390.—*O. bartlettii* MERR. Philip. J. Sc. 14 (1919) 246; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 388; BARTLETT, Pap. Mich. Acad. Sc. Arts & Lett. 6 (1926) 31.—**Fig. 35a–g.**

Shrub or mostly tree 5–8 m; bark yellowish-grey, peeling-off in plates; branches usually pale grey, glabrous except the young slender cinereous-pubescent innovations. *Leaves* oblong to oblong-elliptic, ± abruptly acuminate, base acute to subrotundate, entire or obscurely crenulate, membranous or mostly chartaceous (rarely subcoriaceous), both surfaces quite glabrous, or sometimes the midrib and the nerves minutely appressed-pilose beneath, 7–15(–17) by (3½–)4–7(–10) cm; green to brownish and slightly shining when dry, nerves (4–)5–7(–8) pairs, prominent, curved, anastomosing, rather distant from each other, veins mostly little reticulate; petiole ± pubescent, 0.6–1 cm. Stipules linear or acicular, densely pubescent, 3–4 mm, early caducous. Staminate and pistillate *racemes* in the uppermost axil (seemingly terminal) or sometimes in the lower axils, spike-like, simple or panicled, many-flowered, pubescent by appressed, pale hairs, 10–20(–30) cm. *Flowers* greenish. *Calyx*-lobes membranous, glabrous or minutely pilose outside, *c.* 2½ mm. ♂ *Flowers:* stamens 8 (–10); filaments *c.* 3 mm; staminodes 1–1½ mm. ♀ *Flowers:* calyx-lobes 2 mm. *Ovary* oblong-elliptic, densely yellowish-tomentose; ovules 2–4. *Capsule* oblong-subglobose, with 3 rounded angles, attenuate at apex and base, 1–1½ cm long, densely covered with grey to yellowish hairs when dry, said to be purpurascent or rich velvety red when fresh; pedicel *c.* 2 mm. *Seeds* 1–2 (sometimes more), ellipsoid, *c.* 5 mm, with fleshy lemon-yellowish aril.

Distr. *Malaysia:* Sumatra (East Coast Res.), Malay Peninsula (Dindings, Singapore), Borneo, Philippines (Luzon, Mindanao, Mindoro, Catanduanes, Leyte, Samar, Tablas, Panay, Surigao, Bohol, Dinagat, Negros), N. & Central Celebes, Moluccas (Aru Isl.: Kobroör), N. & SE. New Guinea.

Ecol. Primary forests, ascending to 500 m.

Uses. Wood pale or yellowish-white, quite hard, odourless and tasteless, used in N. Celebes for house-construction.

Vern. *Kaju si basaon,* Sumatra, *k. goi,* Asahan, *antjerina,* W. Borneo. Philippines: *bariñgorus, maguntáp(a)i,* Bag., *lubí-lubí, tagupala,* C. Bis., *bantulinai,* Sul., *gauai-gauai, apadgag,* Mbo., *malakamáñga, oonog,* Tag., *malatayótes,* S.L.Bis., *sumate,* P. Bis.; *kajuwatu,* Celebes, *madausiep,* Manado, *siwiakuni, karonda kuni,* Malili, *kuwa,* Vailala River, *boh,* Sorong.

Notes. Between the specimens of the above mentioned localities there are slight differences in the tomentum, size of the capsule, leaf-texture and number of nerves, which are not constant and not sufficient for specific distinction.

3. Osmelia grandistipulata SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 388, f. 13; HEYNE, Nutt. Pl. (1927) 1141.

Tree 10–24 m, buttresses 40–60 cm; branchlets appressed-pilose, soon glabrescent; innovations densely ferrugineous-tomentose. *Leaves* oblong- to ovate-elliptic, abruptly short-acuminate, ± rounded to acute at the base, entire or shallow-crenulate, glabrous or laxly appressed-pilose beneath on midrib and nerves, shining above, dull beneath, brownish when dry, 15–33 by 5–10 cm;

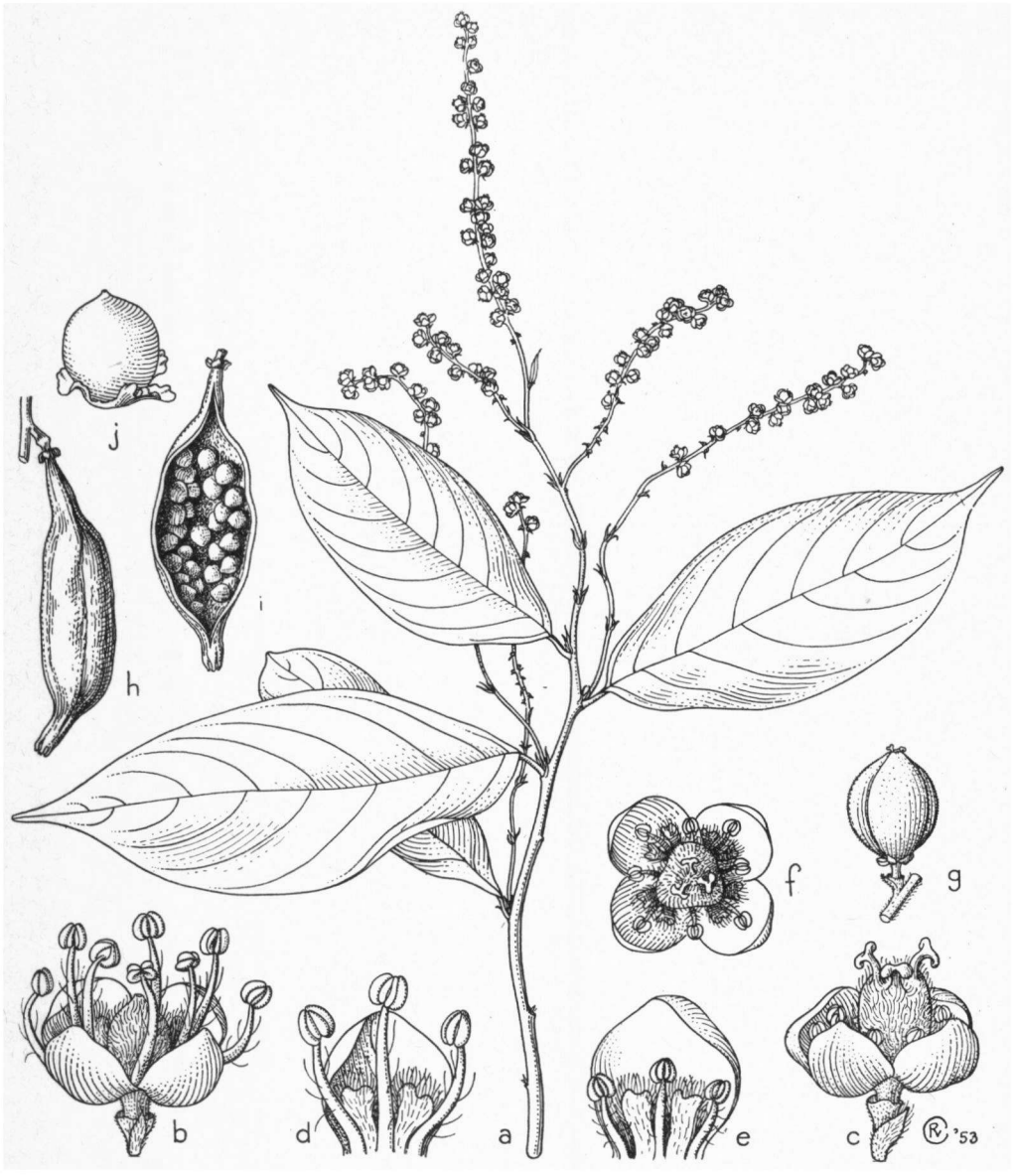

Fig. 35. *Osmelia philippina* (TURCZ.) BTH. *a.* Twig with ♀ flowers, × 2/3, *b.* ♀ flower, × 7, *c.* ♀ flower, × 7, *d.* ♂ flower in section, × 10, *e.* ♀ flower in section, × 10, *f.* ♀ flower from top, × 7, *g.* fruit, × 1 1/2.— *Pseudosmelia moluccana* SLEUM. *h.* fruit, × 2/3, *i.* fruit split lengthwise, showing seeds, × 2/3, *j.* seed with aril, × 3 (*a*, *c*, *e*, *f* after WENZEL B.S. 1912, *b*, *d* after KRUKOFF 4003, *g* after RAMOS, B.S. 24536, *h–j* after the type, KOSTERMANS 1045).

petiole ± pilose, 1 1/2–2 cm. *Panicles* lax, composed of spike-like racemes of spaced flowers; rhachis ± densely dilutely ferrugineous- or grey-tomentose, 15–25 cm. Pedicels *c.* 1 mm. *Calyx*-lobes elliptic, 2 by 1 1/2 mm, nearly glabrous outside, white to greenish-white. ♂ *Flowers:* stamens 8; filaments of the longer ones *c.* 2.7 mm. ♀ *Flowers:* ovary oblong, densely subferrugineous-tomentose. *Capsule* nearly trigonous when young, later oblong to subglobose, attenuate at the base and the apex, densely subferrugineous-tomentose, green to greyish-purplish when fresh, 0.8–1 by 1/2 cm, 1–(rarely 2)-

seeded, very shortly peduncled. *Seed* 6–7 mm long.

Distr. *Malaysia:* Sumatra (Tapanuli, Palembang), Simalur Isl., Lingga Archip.

Ecol. Scattered in mixed forests, at low altitudes, rarely up to 600 m.

Uses. Wood hard, used only for raw posts.

Vern. *Awa saré saré, anang, a. uding, a. pajo, a. étěm, a. balah, a. sěběl fulung, sosotmanu balah, tulian balah*, Simalur.

18. PSEUDOSMELIA

SLEUM. Blumea 7 (1954) 494.—**Fig. 35h–j.**

Shrub or treelet, probably dioecious. *Leaves* alternate, ± distichous, penninerved. Stipules subulate, mostly early caducous. *Flowers* arranged in long, slender, axillary or subterminal or cauline, interrupted spikes, surrounded at the base by a persistent cup formed by a bract and 2 bracteoles as in *Osmelia*. Calyx-tube very short, with 4 distinctly imbricate lobes (sepals). ♂ *Flowers* (seen in bud only): stamens apparently 8, 4 of them slightly longer. Staminodes and rudiment of the ovary apparently present. ♀ *Flowers:* stamens 8, reduced as in *Osmelia*. Staminodes 4, episepalous, scale-like, thick-fleshy, subquadrate, irregularly erose at the top, deeply bifid, hairy. *Ovary* nearly cylindrical, sessile, hairy, with 3 many-ovuled placentas. Styles 3, divergent, each bearing a large, bilobed stigma. *Capsule* fusiform, with 3 short, thick styles, each with a sessile, obscurely bilobed stigma, subtended at the base by 4 subpersistent sepals; pericarp coriaceous; peduncle very short. *Seeds* numerous; testa smooth, thin; aril membranous. Endosperm abundant, albuminous-oily; cotyledons flat, cordate.

Distr. Monotypic, *Malaysia* (N. Moluccas).

1. Pseudosmelia moluccana SLEUM. Blumea 7 (1954) 495.—**Fig. 35h–j.**

Shrub or treelet 2½–3 m; branchlets slender, terete, first laxly appressed-pilose, soon glabrous and covered with a thin greyish cork. *Leaves* elliptic-oblong, shortly (1–1½ cm) cuspidate-caudate and falcate at the apex, cuneate at the base, thinly chartaceous, ± olivaceous to brownish and little shining when dry, paler beneath, entire, glabrous the midrib finely pubescent beneath excepted, 10–16 by 4–6½ cm; midrib impressed above, very prominent beneath, nerves 7–8 pairs, curved-ascending (the lowest pair coming from the leaf-base, the upper 3–4 pairs only anastomosing), obscure above, prominent beneath, veins transverse, reticulations little but distinctly prominent on both sides; petiole slender, ± densely appressed-pubescent, 6–10 mm. Stipules subulate, pilose, 3–4 mm, mostly early caducous. ♂ *Flowers* seen only in bud. ♀ *Flowers:* calyx-lobes 4, broadly ovate, cup-shaped, yellow, 2 mm. Stamens not exserted, with minute, cordate, empty anthers on top of cylindrical, rather thick filaments. Staminodes 2 mm. *Ovary* cylindrical, somewhat inflated in the middle, hairy, (beyond anthesis) 7 by 2 mm. Styles 1 mm. *Fruits* 1 or 2, near or on the top of a 15–20 cm long, slender rhachis markedly thickened towards its apex and densely appressed-pubescent. *Capsule* rather narrow-fusiform, somewhat inflated in the middle, green when fresh, ± glabrous, 5–9 by 1¼–2 cm, rather abruptly contracted at both ends, crowned by 3 thick, *c.* 2–3 mm long styles incurved towards each other in the dry state, each with a minute, thick, ± bilobed stigma; pedicel 1–2 by 1–2 mm. *Seeds* 25–30, ± ovoid, 4–5 by *c.* 3 mm, smooth.

Distr. *Malaysia:* N. Moluccas (Morotai, Halmaheira).

Ecol. Apparently common, in forests, 200–800 m, *fl. fr.* May, June, Sept.

Vern. *Mutingut*, Morotai.

19. CASEARIA

JACQ. En. Pl. Carib. (1760) 4.—**Fig. 36–37.**

Shrubs or mostly small trees. *Leaves* alternate, manifestly distichous, entire, crenate or serrate, often pellucid-punctate and/or -striate. Stipules mostly very small and early caducous, sometimes ± persistent, subulate or lanceolate, or reniform and ± amplectant. *Flowers* axillary, bisexual, small, mostly clustered in ± dense-flowered fascicles or glomerules (these sometimes reduced to a solitary flower), or very rarely clustered on top of a short peduncle, the latter naked or

densely covered by ± imbricate bracts. Pedicels articulated above their base and surrounded there by many, often scale-like bracts, the latter mostly forming a cushion. *Calyx* semi-perigynous, ± deeply 5-lobed; lobes imbricate, persistent, mostly erect-patent, rarely reflexed at or after anthesis. *Petals* 0. *Stamens* (5–)8–10 (–12); filaments whether or not alternately unequal in length. *Staminodes* same in number as the stamens, usually well developed as clavate or flat appendages, mostly hairy, specially on top, alternating with the stamens (in Mal. *spp.*) and united with them at the base in a ± perigynous tube. *Ovary* free, ovoid to columnar; style 0 or very short; stigma capitate (in Mal. *spp.*). *Ovules* few to many. *Capsule* succulent to coriaceous or hard, globose or ovoid or oblong, 3-angled when fresh, mostly 6-ribbed when dry, (2–)3-valved. *Seeds* few to numerous, ovoid or obovoid, angular by mutual pressure, enveloped by a membranous, usually coloured, soft, fimbriate aril; testa ± crustaceous; albumen fleshy; cotyledons flat.

Distr. About 160 *spp.* in tropical and subtropical America, Africa, Asia, Australia, and the Pacific, in *Malaysia* 60 *spp.*. All Malaysian *spp.* belong to the *sect. Pitumba* (AUBL.) BENTH. wich comprises besides the African, Australian and Pacific species the greater part of the American ones.

Ecol. Mostly in lowland rain-forests, also in mountain forests (mossy scrub), always scattered.

A few species are apparently rather indifferent to climate and occur both in the everwet and seasonal forest, *e.g. 28. C. grewiaefolia* VENT. and *22. C. velutina* BL.

Wood anat. DEN BERGER, Bull. Jard. Bot. Btzg III, 9 (1927) 243 (hand lens); MOLL & JANSSONIUS, Mikr. Holzes 3 (1918) 613. See also under family characters.

Uses. The wood of some species is used locally. The bark and fruits of the Javanese species are reported to possess a bitter taste and the fruits are described to be acrid. This seems to hold also for some other species.

Note. As the flowers in *Casearia* are small and the differences in the floral organs are usually minute and often difficult to recognize, and as, moreover, fruits are in many cases unknown, the distinction of the species has been based mainly upon vegetative characters. Lack of sufficient, adequate materials in the herbarium and of field-knowledge make it up till now very difficult to appreciate the amount of variability of these vegetative characters which had to be used in framing the key to the species. I am not wholly convinced that all local-endemic species will stand the test of time.

Many so-called species are known up to date from single collections only and seem to prove a high percentage of endemism. On the other hand, one widely distributed Malaysian species, *C. grewiaefolia* VENT., although varying in the density of the indument and minor leaf-characters, can be recognized; consequently this species possesses an appreciable number of synonyms.

In the descriptions the tufts of hairs found in the axils of the primary nerves at the undersurface in several species are here called *domatia*; apparently they represent a species character.

Almost all species seem to possess pellucid dots in the leaves. However, in some species they are obscured by the thick texture and appear to be absent or very indistinct; in these cases they have been described as 'absent'.

KEY TO THE SPECIES

1. Stipules considerable in size, very conspicuous and at least present at the uppermost 3 or 4 nodes.
 2. Stipules reniform, ± amplectant.
  3. Leaves lanceolate, attenuate at both ends, subentire, 8–11 by 1.7–2½(–2.8) cm . **1. C. auriculata**
  3. Leaves elliptic-oblong to oblong, subcaudate-acuminate at the apex, nearly rounded at the base, obtusely crenate-serrate, 9–15 by 4½–5½ cm . . . . . **2. C. amplectens**
 2. Stipules subulate to lanceolate, not amplectant.
  4. Stipules 3–4 mm wide at the base.
   5. Stipules 5–6 mm long. Leaves entire or nearly so, glabrous . . . . . **3. C. macrantha**
   5. Stipules 7–15 mm. Leaves serrate, ± densely soft-brownish-tomentose beneath. **4. C. rhynchophylla**
  4. Stipules ½–2 mm wide at the base, (3–)4–8 mm long.
   6. Leaves entire or nearly so, *i.e.* very minutely serrulate.
    7. Leaves not or very minutely pellucid-punctate. Fruit *c.* 8 mm long . . . **5. C. microcarpa**
    7. Leaves distinctly pellucid-punctate and -lineate. Fruit 16–20 mm long.
     8. Stipules lanceolate, 2 mm wide at the base. Fruit glabrous . . . . . **6. C. erythrocarpa**
     8. Stipules subulate, ½–1 mm wide at base. Ovary and fruit laxly short-pilose. **7. C. rugulosa**
   6. Leaves distinctly subsinuate-dentate or -serrate . . . . . **8. C. cuspidata**
1. Stipules minute, to 1½ mm long, or absent at the uppermost 3–4 nodes, very early caducous.

9. Flowers set in a fascicle on top of a distinct, (2–)3–5 mm long peduncle, the latter not covered with bracts . . . . . **9. C. pachyphylla**
9. Inflorescence (or solitary flower) not peduncled.
10. Inflorescence represented by one or several distinct, 3–6 mm long axes; these densely covered with bracts and bearing one or few flowers in the axil of the uppermost bracts.
11. Leaves rather deeply (1½–2 mm) sinuate-serrate or -dentate.
12. Leaves glabrous . . . . . **10. C. carrii**
12. Leaves pilose to tomentose underneath . . . . . **11. C. clutiaefolia**
11. Leaves entire or at most minutely denticulate.
13. Leaves pilose to tomentose underneath, at least on midrib and nerves.
14. Petioles up to 3 mm . . . . . **11. C. clutiaefolia**
14. Petioles 5–10 mm.
15. Leaves shortly pilose on midrib and nerves underneath. Calyx-lobes glabrous outside. **12. C. stapfiana**
15. Leaves ± densely patent-pilose to velvety all over the intervenium. Calyx-lobes ± densely pilose outside.
16. Leaves (12–)15–20(–25) by (5–)7–10(–11) cm. Transverse veins very numerous and dense, prominent on both sides . . . . . **13. C. velutinosa**
16. Leaves 5–10(–12) by (2–)3–4 cm. Transverse veins less dense, obscure above. **14. C. lobbiana**
13. Leaves glabrous or practically so.
17. Calyx-lobes entirely glabrous outside.
18. Stamens 8, equal in length. Leaves oblong-lanceolate to oblong-elliptic. **15. C. albicans**
18. Stamens 10, their filaments alternately unequal in length. Leaves ovate-lanceolate. **16. C. papuana**
17. Calyx-lobes ± densely pubescent outside.
19. Flowers sessile or nearly so.
20. Leaves ± distinctly reticulate, 10–20 by 4½–7(–10) cm; petiole 5–7 mm. **3. C. macrantha**
20. Leaves not reticulate, subsessile.
21. Leaves thinly chartaceous, 7–9(–11) by 2–4 cm . . . . . **17. C. arfakensis**
21. Leaves chartaceous to subcoriaceous, 9½–14 by (4½–)5–7(–9) cm. The glabrous form of **11. C. clutiaefolia**
19. Pedicels 1½ mm . . . . . **18. C. brunneo-striata**
10. Inflorescence represented by distinct fascicles or glomerules; these sometimes growing out into very short (1–2 mm), divaricate, densely bracteate axes with age, or fascicles reduced to a solitary flower.
22. Bracts rather large (2–4 mm), mostly concealing the pedicels and/or the flowers at base.
23. Bracts membranous, glabrous.
24. Leaves glabrous.
25. Nerves 6–7 pairs. Leaves yellowish when dry . . . . . **19. C. rinoreoides**
25. Nerves 9–13 pairs. Leaves brownish when dry.
26. Leaves membranous. Petiole 6–8 mm . . . . . **20. C. megalophylla**
26. Leaves chartaceous to subcoriaceous. Petiole up to 3 mm . . . . **11. C. clutiaefolia**
24. Leaves pilose to tomentose beneath . . . . . **11. C. clutiaefolia**
23. Bracts ± chartaceous, the outer ones densely appressed-pubescent . . . . **21. C. trivalvis**
22. Bracts small, up to 1 mm, concealing the pedicels only when they are very short.
27. Leaves pilose to tomentose on the intervenium underneath, or pilose on the midrib and nerves only, or pilose in the inner angles of the nerves with the midrib only (domatia).
28. Leaves manifestly and ± sharply serrate or at least serrulate by glands protruding manifestly beyond the leaf-margin . . . . . **22. C. velutina**
28. Leaves obtusely crenate or denticulate to entire.
29. Leaves ± distinctly inequilateral (mostly cuneate at one side, rounded at the other at the base).
30. Pedicels 1–2 mm.
31. Leaves softly tomentose all over beneath, or at least on midrib and nerves. Nerves 5–7(–8) pairs, impressed above . . . . . **23. C. impressinervia**
31. Leaves hairy only at the inner angles of the nerves with the midrib beneath (domatia). Nerves 8–9(–10) pairs, not or slightly impressed above.
32. Stamens 12. Calyx-lobes glabrous outside or nearly so . . . . **24. C. anisophylla**
32. Stamens 10. Calyx-lobes pubescent outside.
33. Leaves not or very obscurely pellucid-punctate, oblong, (3–)4–6 cm wide. **25. C. hosei**
33. Leaves ± distinctly pellucid-punctate, ovate to ovate-oblong, 5–7½(–9) cm wide.
34. Leaves shallowly sinuate-dentate, their pellucid dots small. Ovary densely pilose. **26. C. globifera**
34. Leaves entire or obscurely crenate, their pellucid dots and lines conspicuous. Ovary glabrous or slightly pilose at the short style only . . . . . **27. C. fuliginosa**
30. Pedicels 3–5(–6) mm.

35. Leaves ± glabrous above, pilose to tomentose beneath. Fruit oblong, (3–)4–6 cm long when full-ripe . . . . . **28. C. grewiaefolia**
35. Leaves soft-tomentose on both sides. Fruit ± ovoid, ± 2½ cm long. **28a. C. grewiaefolia *var.* cinerea**

29. Leaves ± equilateral.
36. Pedicels up to 2 mm, mostly slender.
37. Branchlets grey- to yellowish-velvety at the tips.
38. Leaves with 6–8 pairs of nerves, 5–10(–12) by (2–)3–4 cm; midrib densely pilose above. **14. C. lobbiana**
38. Leaves with 10–12 pairs of nerves, (15–)20–29 by (5–)7–11 cm; midrib glabrous above. **29. C. philippinensis**
37. Branchlets shortly pubescent or hirsutulous or early glabrescent at the tips.
39. Leaves membranous to thinly chartaceous, 7–11(–13) by 3½–5½ cm.
40. Petioles 8–10 mm . . . . . **30. C. elliptifolia**
40. Petioles mostly up to 2, rarely up to 5 mm . . . . . **5. C. microcarpa**
39. Leaves chartaceous to subcoriaceous, 15–25(–30) by (5–)6–10(–11) cm.
41. Leaves densely reticulate beneath . . . . . **31. C. mindanaensis**
41. Leaves not or obscurely reticulate beneath.
42. Nerves (9–)10–12 pairs . . . . . **32. C. phanerophlebia**
42. Nerves *c.* 7 pairs . . . . . **33. C. kostermansii**
36. Pedicels at least 3 mm long, mostly longer and rather thick.
43. Fascicles or glomerules few- to many-flowered.
44. Leaves lanceolate or oblong-lanceolate. Pedicels ± 4 mm.
45. Leaves 13–15 by 3½–4½ cm, pubescent both on the midrib and nerves beneath. **34. C. brassii**
45. Leaves 5–10 by 2½–3½(–4) cm, very slightly pubescent on the midrib beneath. **35. C. monticola**
44. Leaves elliptic or oblong-elliptic. Pedicels 8–14 mm . . . . . **36. C. ripicola**
43. Flowers 1–2 per axil.
46. Leaves ovate-oblong. Pedicels and calyx-lobes ferrugineous-pubescent outside. **37. C. angiensis**
46. Leaves elliptic or subovate-elliptic. Pedicels and calyx-lobes glabrous outside. **38. C. archboldiana**

27. Leaves glabrous beneath.
47. Leaves distinctly prominent-reticulate on both sides.
48. Inflorescences normally on defoliate branchlets.
49. Leaves entire or nearly so.
50. Nerves (10–)12–16 pairs.
51. Petals erect in anthesis . . . . . **39. C. pallida**
51. Petals reflexed in anthesis . . . . . **46. C. flavovirens**
50. Nerves 7–8 pairs . . . . . **43a. C. clarkei *var.* kunstleri**
49. Leaves regularly subserrate-dentate . . . . . **40. C. yatesii**
48. Inflorescence normally on foliate branchlets.
52. Leaves 24–30(–36) by 8–11½ cm. Nerves 14–18(–26) pairs . . . . **41. C. gigantifolia**
52. Leaves up to 22 cm long, but mostly shorter. Nerves 4–9(–10, rarely more: *cf. 46. C. flavovirens*) pairs.
53. Calyx-lobes ± densely greyish-puberulous *inside.*
54. Ripe fruit 3–4(–6) cm long.
55. Leaves elliptic-oblong or oblong, 5½–15 by (3–)4–6 cm . . . . **42. C. tuberculata**
55. Leaves narrow-oblong, 15–25 cm long.
56. Fascicles or glomerules few- to many-flowered.
57. Fruit oblong-ellipsoid. Leaves 5–7½ cm wide . . . . . **43. C. clarkei**
57. Fruit ± obovoid. Leaves ± 4 cm wide . . . . **43a. C. clarkei *var.* kunstleri**
56. Flowers solitary or rarely in twos . . . . . **44. C. macrocarpa**
54. Ripe fruit 1½–2 cm long.
58. Petioles 3–5 mm.
59. Pedicels 2 mm . . . . . **45. C. ledermannii**
59. Pedicels 4–5 mm . . . . . **35. C. monticola**
58. Petioles 8–10 mm. Pedicels ± 4 mm . . . . . **38. C. archboldiana**
53. Calyx-lobes glabrous *inside* or nearly so.
60. Ripe fruit 3½-5(–7, very rarely up to 9) cm long. Pedicels 10–15 mm, very slender. **46. C. flavovirens**
60. Ripe fruit up to 2½ cm long.
61. Flowers solitary or rarely in twos.
62. Nerves 8–9 pairs. Pedicels 8–14 mm . . . . . **36. C. ripicola**

62. Nerves 4–5(–6) pairs. Pedicels shorter.
63. Flowers subsessile . . . . . **47. C. minutiflora**
63. Flowers 4–5 mm pedicelled . . . . . **37. C. angiensis**
61. Fascicles or glomerules few- to many-flowered.
64. Leaves laxly pellucid-lineate, not or obscurely pellucid-punctate.
65. Leaves subcoriaceous, 7 1/2–9 by 2 1/2–3(–4) cm . . . . . **48. C. flexula**
65. Leaves coriaceous, (10–)12–18(–20) by (4 1/2–)5–8(–10) cm . . **49. C. capitellata**
64. Leaves not or minutely pellucid-punctate . . . . . **16. C. papuana**
47. Leaves not or obscurely reticulate above, little to distinctly reticulate beneath.
66. Petiole up to 2 mm long.
67. Petiole *c.* 2 mm thick . . . . . **50. C. brevipes**
67. Petiole 1 mm thick.
68. Flowers sessile. Leaves lanceolate . . . . . **51. C. novo-guineensis**
68. Pedicels 1 1/2–2 mm long.
69. Leaves elliptic to oblong-elliptic . . . . . **52. C. brideliifolia**
69. Leaves lanceolate to ovate-lanceolate . . . . . **16. C. papuana**
66. Petioles at least 3 mm, mostly longer.
70. Flowers solitary or in twos.
71. Petiole 3–5 mm. Leaves denticulate to nearly entire . . . . . **53. C. euphlebia**
71. Petiole (8–)10–15 mm. Leaves ± manifestly serrate-crenate. A form with the flowers reduced in number of . . . . . **28b. C. grewiaefolia *var.* deglabrata**
70. Fascicles or glomerules few- to many-flowered.
72. Leaves distinctly serrate or crenate.
73. Leaves manifestly inequilateral, mostly obscurely pellucid-punctate. Pedicels 5–10 mm. **28b. C. grewiaefolia *var.* deglabrata**
73. Leaves equilateral or practically so.
74. Leaves broadly cuneate to subtruncate at the base. Pedicels 2–3 mm.
75. Calyx-lobes 5 mm. Leaves distinctly pellucid-punctate . . . . **54. C. oreogenes**
75. Calyx-lobes 3–3 1/2 mm. Leaves not or minutely pellucid-punctate **55. C. halmaherensis**
74. Leaves narrower, cuneate into the petiole, not or minutely pellucid-punctate. Pedicels 1 1/2–2 mm. Calyx-lobes 2 mm . . . . . **16. C. papuana**
72. Leaves entire or nearly so.
76. Leaves manifestly inequilateral.
77. Calyx-lobes pubescent outside. Pedicels 2–4 mm . . . . . **56. C. flexicaulis**
77. Calyx-lobes entirely glabrous outside. Pedicels 1 mm . . . . . **57. C. glabra**
76. Leaves equilateral or practically so.
78. Pedicels *c.* 4 mm . . . . . **58. C. urophylla**
78. Pedicels up to 2 mm.
79. Leaves very manifestly and ± densely pellucid-punctate and -lineate.
80. Stamens 8, of the same length . . . . . **59. C. loheri**
80. Stamens 10, the filaments alternately longer and shorter . . . . **60. C. olivacea**
79. Leaves not or very minutely pellucid-punctate or -lineate.
81. Leaves lanceolate . . . . . **51. C. novo-guineensis**
81. Leaves oblong-ovate to lanceolate-ovate . . . . . **16. C. papuana**

1. Casearia auriculata SLEUM. Blumea 7 (1954) 486.

Small tree; branchlets terete, greyish, glabrous. *Leaves* rather long, obtusely acuminate at the apex, attenuate at the base, sessile, subcoriaceous, obscurely and minutely pellucid-punctate, dull and blackish when dry, 8–11 by 1 3/4–2 1/2(–2 3/4) cm; midrib elevated on both sides, nerves 5–6 pairs not or obscurely impressed above, slightly prominent beneath, veins inconspicuous. Stipules 4–5 by 6–10 mm. *Flowers* 2–3 in each axil, surrounded at their base by numerous, glabrous, ovate, membranous bracts 1–2 mm. Pedicel pubescent, 2 mm. *Calyx* tubular, pubescent outside, pink when fresh, in all 5 mm long; lobes oblong, 1.6 by 1.2 mm, patent or somewhat recurved in anthesis. *Stamens* 10; filaments glabrous, alternately 0.5 and 0.3 mm long. Staminodes very short, pilose. *Ovary* columnar, glabrous, 4 by 1 mm.

Distr. *Malaysia:* NW. New Guinea, once found near Ramoi (Sorong).

2. Casearia amplectens SLEUM. Blumea 7 (1954) 484.

Treelet 1 1/2 m; branchlets rather densely yellowish-pilose, soon glabrescent and covered with grey cork. *Leaves* obtusely acuminate and somewhat falcate at the apex, membranous, brown and dull when dry, distinctly pellucid-punctate and -lineate, pubescent at and near the petiole, the midrib and the nerves beneath, glabrous elsewhere, margin obtusely crenate-serrate, the teeth 1 mm high and 3–6 mm distant, 9–15 by 4 1/2–5 1/2 cm; midrib prominent on both sides, nerves 6–8 pairs, curved-ascending and excurrent along the leaf-margin, somewhat impressed above, prominent beneath, veins inconspicuous; petiole *c.* 2 mm or shorter in the uppermost leaves. Stipules 4–6 by 6–8 mm. *Flowers* 1–2 per axil, nearly sessile, seen only in a not yet full developed state. Bracts several, membranous, glabrous, 1 mm. *Calyx* tubular, in all ± 3 mm long, somewhat fleshy, fulvous-sericeous

outside, glabrous inside; lobes oblong, *c.* 1 mm. *Stamens* 10; filaments glabrous, alternately 0.6 and 0.3 mm, dilatate in the middle. Staminodes rudimentary, pilose. *Ovary* columnar, glabrous, *c.* 3 by 1 mm. *Fruit* fleshy, red, 1½–2 by 1 cm; peduncle 2 mm.

Distr. *Malaysia:* N. New Guinea, once found in rain-forest undergrowth of the Idenburg River, 850 m.

3. Casearia macrantha GILG, Bot. Jahrb. 55 (1918) 290, f. 9.

Shrub 1½–3 m; branchlets applanate; younger parts nigrescent or dark brownish, smooth, glabrous, elsewhere soon covered with cork. *Leaves* ovate-oblong or oblong, rarely oblong-lanceolate, shortly gradually acuminate to the apex, broadly cuneate at the base, coriaceous or nearly so, not or obscurely pellucid-punctate, glabrous, entire or inconspicuously and remotely denticulate, 10–20 by 4½–7(–10) cm; midrib nearly flat above, strongly raised beneath, nerves 6–7 pairs, curved-ascending, little or not prominent above, veins ± transverse, little but visibly prominent on both sides as are the reticulations; petiole glabrous, 5–7 mm. Stipules lanceolate, mostly persistent at the upper nodes, sometimes rather early caducous, leaving distinct scars, 5–6 by 3–4 mm. *Flowers* 1–2, white, sessile on top of a short (3–7 mm), solitary axis, the latter densely covered by numerous bracts over its whole length. Bracts membranous, ovate-acuminate, glabrous, ± 2 mm. *Calyx* in all *c.* 6–7 by 3 mm, 5-lobed in the upper half, tubular in the inferior one, ± densely pilose both in- and outside. *Stamens* 10; filaments glabrous, alternately 2 and 1½ mm long. Staminodes subulate, densely pilose, *c.* 1 mm. *Ovary* narrow-ovoid, pilose, 5–6 mm.

Distr. *Malaysia:* NE. New Guinea (Sepik region, Kani Mts, Sattelberg).

Ecol. In dense mountain-forests, 850–1000 m.

4. Casearia rhynchophylla GILG, J. Arn. Arb. 10 (1929) 81; WHITE, *ibid.* 244.

Shrub 1–2½ m, divaricately branched; young branchlets rather densely pilose, soon glabrescent. *Leaves* oblong or obovate-oblong, 1½ cm, obtusely subcaudate-acuminate at the apex, cuneate at the base, little inequilateral, membranaceous to chartaceous, brown and dull when dry, densely pellucid-punctate and -striate, glabrous above, softly and rather densely pilose to tomentose below specially on the midrib and nerves, regularly sinuate-serrate, teeth sharp, 1–1½ mm high and 4–6 mm distant, (10–)12–17 by (4–)5–7 cm; midrib little prominent above, more distinctly so beneath, nerves 11–13 ascending pairs, red on the lower surface of young leaves, veins inconspicuous above, little elevated underneath. Stipules pubescent, acute, finely serrate. *Flowers* several in each axillary cluster, sessile. Bracts membranous, rather numerous, ciliate at the apex, glabrous elsewhere, 1½ mm. *Calyx* oblong, in all *c.* 2½ mm long, laxly pubescent outside, glabrous inside; lobes free, obtuse, 1 mm. *Stamens* 10; filaments glabrous, alternately ½ respectively 0.3 mm long. Staminodes deltoid, pilose at the apex, 0.3 mm. *Ovary* ovoid, pilose at the apex. *Fruit* fleshy, red, 1½ cm long, crowned by the subpersistent, 1 mm long style; peduncle 1 mm.

Distr. *Malaysia:* SE. New Guinea (Vailala River and Sogeri region).

5. Casearia microcarpa SLEUM. Blumea 7 (1954) 489.

Shrub 2 m, branchlets finely pubescent at the tips only, soon glabrescent and covered with grey cork, terete, striate. *Leaves* elliptic-oblong, shortly (1 cm) subacutely acuminate at the apex, cuneate into the petiole, thinly chartaceous, practically not pellucid-punctate, glabrous except the very finely hairy midrib, brownish and dull when dry, entire or nearly so, *i.e.* minutely and remotely serrate at the young leaves only, (6–)8–12(–13) by 3–5(–6) cm; midrib little elevated above, prominent beneath, nerves 6–8 ascending pairs with more or less distinct intercalar ones, ± impressed above, prominent beneath, veins transverse, obscure above, little conspicuous beneath; petiole slightly pubescent, 2–5 mm. Stipules narrowly triangular, minutely pubescent, *c.* 3–5 mm long, *c.* 1 mm wide at the base, subpersistent, becoming firm and corky withage. *Glomerules* 5–8-flowered. Bracts minute, ½ mm. Pedicels slender, glabrous, ± 2 mm. *Calyx* thin, in all 2 mm long, 5-lobed in the upper glabrous. *Stamens* 10; filaments thick-filiform, glabrous or nearly so, alternately ⁴/₅ and ³/₅ mm. Staminodes obconical, densely pilose at the apex, ½ mm. *Ovary* ovoid, *c.* 1½ mm, glabrous in the lower part, somewhat pilose upwards, attenuate into a short columnar style. *Fruit* (? mature) subglobose, glabrous except the hairy apex, *c.* 8 mm diam.

Distr. *Malaysia:* N. New Guinea (Geelvink Bay, Sepik District, Augusta River), W. New Guinea (McCluer Gulf), apparently also in S. New Guinea (Uta).

Ecol. At very low altitude.

6. Casearia erythrocarpa SLEUM. Blumea 7 (1954) 488.

Small tree, 8 m; only the tips of the branchlets fulvous-hirsute. *Leaves* elliptic-oblong, 1–1½ cm obtusely subcuspidate-acuminate at the apex, broadly cuneate at the base, membranous, brownish when dry, densely pellucid-punctate and -striate, above sparsely, underneath more densely soft-hairy specially on midrib and nerves, finely distantly denticulate, 12–18 by 5–8 cm; nerves (10–)11–12(–14) pairs, as the midrib nearly flat above, prominent beneath, veins obscure above, little but well visibly raised underneath; petiole rather thick, fulvous-tomentose 1½–2½ mm. Stipules pubescent, mostly 1–2-dentate at each side. *Flowers* only known from rests persistent under the fruit. *Calyx* in all 2½ mm long, 5-lobed in the upper half, hairy outside, glabrous inside. *Stamens* 10; filaments glabrous, filiform, alternately 0.7 and 0.5 mm long. Staminodes elongate-triangular, barbate at the apex, ½ mm. Ovary not seen. *Fruit* oblong, red, with *c.* 8–10 red-coloured seeds.

Distr. *Malaysia:* SE. New Guinea (Fly River), once found.

Ecol. Rain-forest undergrowth, at 80 m.

7. Casearia rugulosa BL. Mus. Bot. 1 (1850) 255; MIQ. Fl. Ind. Bat. 1, 1 (1855) 712; MERR. En. Born. (1921) 413.—*C. minutidens* MERR. Philip. J. Sc. 11 (1916) Bot. 94; En. Born. (1921) 413.—*C. pubescens* MERR. *l.c.* 95, respectively 413.—*C. lobbiana* (*non* TURCZ.) HEINE in FEDDE, Rep. 54 (1951) 242.—*C. hosei* (*non* MERR.) HEINE *l.c.*

Shrub or small tree, 2–5(–10) m; branchlets slender, somewhat angular, rather densely pilose with spreading, ferrugineous, soft hairs. *Leaves* oblong, rarely ovate-oblong, abruptly (1–2 cm) acutely acuminate at the apex, broadly cuneate to subtruncate or rounded at the base, very rarely subcordate, mostly thinly chartaceous, distinctly pellucid-punctate and -lineate, brownish-olivaceous when dry, dull or slightly shining above, somewhat inequilateral, entire, but when younger with rather numerous very minute glandlike teeth, glabrous on the upper surface except the midrib and nerves, the undersurface laxly beset with ± spreading short ferrugineous hairs, more densely so on the midrib and nerves, (6–)7–20 by (3–)4½–7(–8½) cm; midrib very little raised above, distinctly prominent beneath, nerves (7–)8–10 pairs, ascending, not rarely slightly impressed above, little prominent beneath, veins inconspicuous above, transverse and more elevated beneath, not reticulate; petiole ± tawny, 3–6 mm. Stipules pubescent. *Flowers* whitish or greenish, but purple at the base when fresh, in many-flowered fascicles, 4–5 flowers developed only at the same time. *Calyx* in all 2½–3 mm long, deeply 5-lobed, densely pubescent outside, glabrous inside. *Stamens* (8–)10; filaments glabrous, alternately 0.8 and 0.6 mm. Staminodes 0.5 mm, pilose. *Ovary* ovoid, rather densely pubescent. *Fruit* oblong-elliptic, 1¾–2½(–3½) by 1–1½(–2) cm, sessile or very shortly (up to 2 mm) peduncled, orange or orange-yellow when fresh, laxly shortly pilose. *Seeds* white, embedded in a red pulp.

Distr. *Malaysia:* Borneo.

Ecol. In rain-forest on hilly ground or crests of ridges, 650–1600 m, *fl.* Oct.–Febr., *fr.* Febr.

Vern. *Kundawok*, Sungei.

8. Casearia cuspidata BL. Mus. Bot. 1 (1850) 255; SLOOT. Bijdr. Flac. (1919) 150; Bull. Jard. Bot. Btzg III, 7 (1925) 409 (*excl. syn. C. rugulosa*).—*C. turbinata* BL. *l.c.*—*C. grandifolia* MIQ. Fl. Ind. Bat. 1, 1 (1855) 712; Suppl. 1 (1860) 132.—*C. forbesii* BAK. *f.* J. Bot. 62 (1924) Suppl. 43; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 416.

Shrub or small tree, *c.* 3 m; branchlets terete, glabrous, but somewhat angular and dark-brown velvety at the innovations. *Leaves* oblong or oblong-elliptic, long (1½–2½ cm) and sharply acuminate at the apex, rounded or broadly cuneate, rarely subcordate at the base, ± equilateral, subcoriaceous or firmly chartaceous, pellucid-punctate and -striate, dark-brown and dull above when dry, paler beneath, glabrous above, soft yellowish-brownish tomentose over the whole undersurface, more densely so on midrib and nerves, distinctly and rather regularly sinuate-denticulate (teeth ± protracted towards the leaf-apex, ± 1 mm high, 4–6 mm spaced, with a distinct little gland underneath), 15–25(–30) by (5–)7–10(–13) cm; midrib slightly impressed above, very prominent beneath, nerves 7–10(–13) pairs, ascending, flat or somewhat impressed above, prominent beneath, veins slightly reticulate and little prominent specially above; petiole tomentose 4–8(–12) mm. Stipules subulate, first dark brown-velvety, later glabrescent, 5–7 by 1 mm. *Flowers* pale green, several (rarely 1–2 only) from each axil. Bracts ovate, membranous, rather densely pubescent, 2 mm. *Calyx* yellowish-grey-sericeous in- and outside, in all 2½ mm long, deeply 5-lobed. *Stamens* 10 (–12), equal in length; filaments glabrous, 1 mm. Staminodes triangular-obtuse, ½ mm, barbellate at the apex. *Ovary* broadly conical, ± densely pubescent. *Fruit* orange, elliptic, laxly pubescent, ± 2½ by 1¼ cm; peduncle *c.* 5 mm.

Distr. *Malaysia:* Sumatra (Mts Singalang and Dempo).

Ecol. Rain-forests, 1300–1700 m.

Note. Not in Tonkin as mentioned by GAGNEPAIN (Fl. Gén. I.C. 2, 1921, 1002, based on BALANSA 3187, which represents an undescribed species).

9. Casearia pachyphylla GILG, Bot. Jahrb. 55 (1918) 288, f. 8.

Tree 15–20 m, with a dense flattened crown; young shoots densely fulvous-tomentose, rather tardily glabrescent; branchlets terete, longitudinally striate, with dilute-brownish cork, densely beset with lenticels. *Leaves* ovate-oblong, the very young ones sometimes ovate-lanceolate, shortly obtusely acuminate at the apex, nearly rounded at the base or broadly cuneate into the petiole, entire, sub-coriaceous, the adult ones still ± fulvous-pilose beneath specially at the midrib and nerves, respectively the angles of the midrib with the nerves, finally entirely glabrous, brown and dull when dry, not or obscurely pellucid-punctate, 7–12 by 2½–5 cm; midrib little prominent above, strongly so beneath, nerves 5–6 suberect pairs nearly flat above, prominent beneath, veins manifestly transverse, veinlets densely and finely reticulate on both sides specially beneath. Inflorescence ferrugineous-pubescent. *Flowers* dull yellowish- or brownish-greenish, disposed in 2–5-flowered fascicles on top of a stoutish short peduncle, not all developed at the same time, thus also solitary flowers occasionally occur on top of the above-mentioned peduncle. Pedicels slender, if well developed 5–7 mm long, surrounded at the base by numerous small bracts. *Calyc* deeply 5-lobed; lobes 2½–3 mm, short-hairy in- and outside. *Stamens* 10; filaments laxly pilose, alternately 1½ and 1.2 mm. Staminodes 1.2 mm, subrectangular, fleshy, hairy specially at the apex. *Ovary* ovoid, manifestly attenuate towards the top, rather densely pubescent; stigma thick-capitate. *Fruit* long-peduncled.

Distr. *Malaysia:* NE. New Guinea (Mts Schrader and Saruwaged).

Ecol. In mossy mountain-forest and hilly ground, 1700–2400 m.

Note. This species is unique among the Malaysian *Casearias* by its peduncled inflorescence, a character otherwise known only in some Brazilian species of the genus.

10. Casearia carrii SLEUM. Blumea 7 (1954) 487.

Shrub 3 m; branchlets somewhat angular, minutely pubescent, soon covered with greyish cork. *Leaves* ovate-oblong, 1–1½ cm, subcaudate-acuminate at the apex, cuneate at the base into the petiole, glabrous or practically so, sub-coriaceous, laxly obscurely pellucid-punctate and -striate, brownish and dull when dry, teeth rather regular (1–1½(–2) mm high, 3–6 mm distant), 7–14(–18) by 4–6(–8) cm; midrib slightly raised above, manifestly so beneath, nerves 5–6 pairs curved upwards, flat above, little prominent beneath, veins transverse, conspicuous only on the undersurface; petiole glabrous, 3–6 mm. *Flowers* whitish, 1–2 sessile on top of a short (*c.* 3 mm long) many-bracteate axis. Bracts ovate, acute, membranous, 2 by 1½ mm. *Calyx* nearly cylindrical, in all 4 mm long, 5-lobed in the upper third only and pubescent there in- and outside, ± glabrous elsewhere outside. *Stamens* 10; filaments thick-filiform, glabrous, alternately 1 and 0.7 mm. Staminodes inconspicuous, represented by a few hairs only. *Ovary* elongate-fusiform, 3 by 1 mm, ± densely hairy.

Distr. *Malaysia:* SE. New Guinea (Central Division).

Ecol. In secondary forest, 360–1300 m.

11. Casearia clutiaefolia BL. Mus. Bot. 1 (1850) 255; MIQ. Fl. Ind. Bat. 1, 1 (1855) 711; SCHEFF. Ann. Jard. Bot. Btzg 1 (1876) 24; GILG, Bot. Jahrb. 55 (1918) 284, f. 7; SLOOT. Bijdr. Flac. (1919) 152; Nova Guinea 14 (1924) 193; Bull. Jard. Bot. Btzg III, 7 (1925) 409.—*C. mollis* K. SCHUM. Fl. Kais. Wilh. Land (1889) 50, *non* H.B.K. 1821.

Shrub or small tree 3–10 m; branchlets subangular, first rather densely soft-pubescent with spreading subferrugineous hairs, afterwards glabrous. *Leaves* oblong or elliptic-oblong, or rarely ovate or ovate-elliptic, initially membranous and very conspicuously pellucid-punctate and -striate, but subcoriaceous or at least firmly chartaceous when mature, then laxly pellucid-striate, but little punctate, shortly and mostly bluntly acuminate at the apex, cuneate to nearly rounded at the base, mostly little inequilateral and obscurely serrate or subentire, rarely more conspicuously sinuate-dentate or -serrate, the upper surface mostly greyish and dull when dry, glabrous except the midrib, the whole of the undersurface varying in pubescence from densely yellowish-hairy or -velutinous to nearly glabrous, but with hairs ± persistent on the midrib and nerves beneath, rarely wholly glabrous (then entire), (7–)9–16 (rarely up to 21) by 4½–6(–9½, rarely up to 14) cm; midrib little raised above, very prominent beneath, nerves 10–13 pairs, curved-ascending, not or little prominent above, in very young leaves ± impressed, distinctly elevated beneath, veins transverse and little elevated on the undersurface only, the finer reticulations obscure; petiole 2–3 mm, stout (1–2 mm), ± densely pubescent. *Flowers* whitish or yellowish, crowded on top or at the upper part of a short (2–4 mm) axis densely covered by numerous, ovate, obtuse, membranous, subglabrous bracts (± 2 mm diam.), solitary or in fascicles of 2–3. Pedicel ± 1 mm. *Calyx* in all *c.* 3½ mm long, 5-lobed in the upper ½ to ⅔, pubescent in- and outside. *Stamens* 10; filaments hairy, alternately 0.8 and 0.4 mm long. Staminodes elongate-triangular, 0.3–0.4 mm, densely long-hairy, specially at the apex. *Ovary* narrow-ovoid, 2 by 0.6 mm, laxly hairy; style short and thick. *Fruit* elongate-ovate or elliptic, subtrigonous, orange or yellow, laxly hairy, *c.* 1½ cm long, with the 1–2 mm long peduncle mostly on top of a very short axis from which the bracts have mostly disappeared. *Seeds* several; aril bloodred, laciniate.

Distr. *Malaysia:* New Guinea (apparently rather widely distributed), possibly in the Moluccas (Morotai).

Ecol. In rain-forests, mainly at 10–500 m and near the coast, once found at 850 and 1000 m; *fl. fr.* Jan.–Dec.

Note. GILG figures (*l.c.* fig. 7E) a 'female' flower, which apparently is nothing else than a normal flower beyond anthesis with a developed ovary.

12. Casearia stapfiana RIDL. Kew Bull. (1938) 110.

Small tree or shrub; branchlets angular, glabrous, soon covered with a thin greyish cork. *Leaves* ovate or oblong-ovate, shortly gradually obtusely acuminate at the apex, cuneate to rounded (or rarely slightly cordate) at the base, subcoriaceous or firmly chartaceous, brown when dry, somewhat paler beneath, with numerous minute and mostly rather badly visible pellucid dots (no lines), mostly entire or nearly so, the young ones minutely denticulate, (16–)20–28 by (8–)10–14 cm; midrib slightly prominent above, distinctly so beneath; nerves 6–8 ascending pairs excurrent along the leaf-margin, nearly flat above, prominent beneath, veins rather obscure above, prominent-reticulate beneath; petiole stout, 2 mm diam., 5–8 mm long. *Flowers* several on top of short (3–6 mm) nearly quadrangular axes, these densely covered by numerous, small, pubescent, ovate bracts, 3–6 of these axes fascicled or congested in the leaf-axils. Pedicels 1–2 mm, glabrous. *Calyx* in all 2½ mm long, deeply 5-lobed. *Stamens* 10; filaments glabrous, alternately 0.6 and 0.3 mm. Staminodes 0.3 mm, barbate. *Ovary* elongate-ovoid, 2 by 1 mm, hairy, with a short thick style. *Fruit* 2½–3 by 1½ cm, red, many-seeded; peduncle *c.* 2 mm.

Distr. *Malaysia:* Borneo (Sarawak).

Ecol. In forests up to 300 m.

13. Casearia velutinosa RIDL. J. Str. Br. R. As. Soc. *no* 75 (1917) 34; Fl. Mal. Pen. 1 (1922) 831.

Shrub 1–2½ m; branchlets flexuous, dark brownish-rusty-velvety, terete and striate, the older parts light-brown and glabrescent. *Leaves* oblong to ovate-oblong, abruptly (1–2 cm) acutely acuminate at the apex, broadly cuneate to rounded at the base, thinly coriaceous, not or rather obscurely and laxly pellucid-punctate and -striate, glabrous, dark brown and shining above when dry, initially soft-tomentose beneath, but ± glabrescent except the midrib and nerves, regularly minutely denticulate to entire, (12–)15–20(–25) by (5–)7–10(–11) cm; midrib and 10–12 curved-ascending pairs of nerves mostly slightly impressed above, manifestly prominent beneath, veins very densely transverse and parallel to each other, little but distinctly raised on both faces, other finer reticulations rather inconspicuous; petiole stout (± 2 mm), ± tomentose to glabrescent, 5–6 mm. *Flowers* pale-green, on top of short (3–4 mm), many-bracteate axes, several of these in fascicles and divergent from each other. Pedicels ± 1 mm. *Calyx* 2–2½ mm, deeply 5-lobed, rather densely pilose in- and outside. *Stamens* 8, of equal length; filaments glabrous or nearly so, ½ mm. Staminodes very short, densely long-hairy. *Ovary* ovoid, *c.* 1 mm long, laxly hairy. *Fruit* yellow, laxly pilose, *c.* 1.8 by 1 cm; peduncle 2 mm.

Distr. *Malaysia:* Malay Peninsula (Perak, Dindings, Selangor, Trengganu, Kemaman, Johore), perhaps in Br. N. Borneo (Sandakan).

Ecol. On banks of streams in jungle, from low altitude up to 850 m.

Vern. *Miang*, Trengganu.

14. Casearia lobbiana TURCZ. Bull. Soc. Nat. Moscou 31 (1858) 463; CLARKE, in HOOK. *f.* & TH. Fl. Br. Ind. 2 (1879) 594; KING, J. As. Soc. Beng. 67, ii (1898) 15; RIDL. Fl. Mal. Pen. 1 (1922) 830; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 405; BURK. & HENDERS. Gard. Bull. Str. Settl. 3 (1925) 378.

Treelet or shrub up to 6 m; young branches slender, the tips densely tawny-velvety. *Leaves* oblong or oblong-lanceolate, 1–1½ cm acutely acuminate at the apex, narrowed to rounded at the base, membranous to thinly chartaceous, densely pellucid-punctate and -striate, the upper surface glabrescent except the midrib and nerves, lower surface ± sparsely soft-pubescent, densely so to velvety on the midrib and nerves beneath, entire, olivaceous or brownish when dry 5–10(–12) by (2–)3–4 cm; midrib and nerves flat above or nearly so, little prominent beneath; nerves 8–10 pairs, rather straight and little curved upwards, veins densely transverse, little raised on both faces; petiole tomentose, 6–8 mm long, *c.* 1 mm thick. *Flowers* pale-greenish, in few-flowered glomerules, these somewhat growing out with age to very short (2 mm) axes, on very short (*c.* ½ mm) pedicels. Bracts minute, ovate-acute, ½ mm, appressed-pubescent. *Calyx* puberulous outside, glabrous inside, in all 1½ mm long, deeply 5-lobed. *Stamens* 10; filaments very shortly pubescent to nearly glabrous, alternately ½ and 0.3 mm. Staminodes ½ mm, villous. *Ovary* ovoid, glabrous, 1 mm. *Fruit* almost sessile, glabrous, nearly globose, orange or yellow when ripe, *c.* 1.2 by 0.8 cm. Seeds with crimson aril.

Distr. Malay Peninsula, (Singapore, Malacca, Selangor, Negri Sembilan, Perak, Penang), Riouw (P. Durian), East Coast of Sumatra.

Ecol. Undershrub in lowland-woods up to 900 m; *fl.* Nov.–March, *fr.* July–Nov.

Vern. *Mĕdang kĕrsai, m. kĕrisi*, Mal. Pen., *kaju pidjor dakka, k. sidabu dakka*, Sumatra.

15. Casearia albicans WALL. *ex* CLARKE in HOOK. *f.* & TH. Fl. Br. Ind. 2 (1879) 593, *pr. p. quoad* WALLICH 7197.3; RIDL. J. Str. Br. R. As. Soc. *no* 75 (1917) 34; Fl. Mal. Pen. 1 (1922) 833.

Shrub or small tree up to 10 m, with spreading branches; branchlets glabrous, somewhat angular. *Leaves* oblong-lanceolate to oblong-elliptic, shortly ± obtusely acuminate at the apex, broadly cuneate into the petiole at the base, little inequilateral, firmly chartaceous to subcoriaceous, glabrous, brownish-olivaceous to darkgreen when dry, very shining on both sides, laxly pellucid-lineate, not or minutely pellucid-punctate, entire or slightly crenate, 9–14(–18, rarely up to 20) by (3–)4–6 (–7, rarely up to 9) cm; midrib somewhat impressed above, very prominent and brownish-reddish beneath, nerves *c.* 8 pairs, arcuate-ascending, flat or slightly impressed above, rather prominent beneath, veins and venules densely reticulated and finely elevated on both faces; petiole ± 8 mm, glabrous. *Flowers* white to pale green, on or near the top of short (3–5 mm), many-bracteate axes, these mostly in fascicles of 2 or 3, rarely solitary. Bracts ovate, acute, membranous, short-pilose towards their apex, ± 2 mm. Pedicel ± 1 mm. *Calyx* thin, in all 2–2½ mm long, deeply 5-lobed. *Stamens* 8, equal in length; filaments glabrous, ½ mm. Staminodes as long as the filaments, barbate. *Ovary* elongate-ovoid, glabrous. *Fruit* oblong, orange when fresh, *c.* 1.2 cm long.

Distr. Malay Peninsula (Penang and Perak).

Ecol. In dense jungle, in Perak on limestone, 150–550 m.

16. Casearia papuana SLEUM. Blumea 7 (1954) 491.

Shrub 1–1½ m; branchlets slender, terete, glabrous, the tips dark brown when dry. *Leaves* ovate-lanceolate, gradually acuminate, subfalcate, subacute or blunt at the apex, broadly cuneate into the petiole at the base, rigidly membranaceous to nearly subcoriaceous, not or minutely pellucid-punctate, entire, glabrous, somewhat shining and ± dark or blackish brown when dry, 12–17 by (2½–)3–5 cm; midrib nearly flat above, very prominent beneath, nerves *c.* 7–8 pairs, the inferior 4–5 pairs excurrent along the leaf-margin, the superior ones more distinctly curved and anastomosing, little raised above, more so beneath, veins transverse, venules ± visibly reticulated above, more distinctly so beneath; petiole glabrous, 3–4 (–5) mm. *Flowers* greenish-white, several along

and on top of short, thick, mostly solitary axes, these 3–4 mm long and densely set with minute, ovate, scariose bracts. Pedicel 1½ mm. *Calyx* in all 2 mm long, 5-lobed to the middle, glabrous outside, puberulent inside. *Stamens* 10; filaments thickened, glabrous, alternately 0.9 and 0.6 mm. Staminodes very inconspicuous, represented by some hairs only. *Ovary* elongate-ovoid, 2 mm, pilose; stigma minute, capitellate. *Fruit* ellipsoid, red to orange, 2 by 1 cm.

Distr. W. New Guinea (Geelvink Bay); probably conspecific specimens seen from the Moluccas (Aru Isl.).

Ecol. In rain-forest (also *Agathis*-forest) or in fringing forest on rocky slopes, 100–500 m.

17. Casearia arfakensis SLEUM. Blumea 7 (1954) 485.

Shrub; branchlets rather slender, terete, the tips densely minutely pubescent, soon glabrescent and grey lower down. *Leaves* oblong, *c.* 1 cm obtusely acuminate at the apex, broadly cuneate at the base into a very short (± 2 mm) petiole, thinly chartaceous when mature, brownish to dark olivaceous when dry, laxly and ± well visibly pellucid-lineate (not pellucid-punctate), entire to remotely denticulate by minute glands, glabrous, 7–9(–11) by 2–4 cm; midrib somewhat prominent beneath, nerves 6–7 pairs, flat above or slightly impressed, raised beneath, veins transverse, nearly obscure above, little prominent underneath. Stipules triangular, minute, 1–1½ mm long, sometimes longer persistent, but mostly rather early caducous. *Flowers* single on top of a solitary, short (*c.* 3 mm), many-bracteate axis. Bracts membranous, ovate, subacute, pubescent, 1½ mm. *Calyx* tubular, in all 5 mm long, 1½ mm diam., rather densely pubescent outside, glabrous inside, 5-lobed in the upper half; lobes oblong. *Stamens* 10; filaments thick-filiform, subulate towards their apex, glabrous, alternately 1.2 and 0.9 mm. Staminodes reduced to some hairs. *Ovary* elongate, *c.* 5 mm long, rather densely hairy. *Fruit* (*ex coll.*) 'elongate-elliptic, 4 by 1 cm, seeds several, with bloodred aril.'

Distr. *Malaysia:* NW. New Guinea (Mt Arfak, near Putat), once found.

18. Casearia brunneo-striata GILG, Bot. Jahrb. 55 (1918) 291.

Shrub 1–1½ m; branchlets somewhat applanate, glabrous, fuscous, soon covered with cork, lenticels numerous. *Leaves* oblong, shortly ± broadly acuminate at the apex, broadly cuneate at the base, nearly chartaceous, glabrous, dull when dry, rather densely and minutely denticulate or serrulate, densely pellucid-striate, 12–21 by 5–7 cm; midrib strong, nerves 11–13 pairs, ± at right angles with the midrib, little raised above, prominently so beneath, veins very numerous and densely reticulate, little prominent above, manifestly so beneath; petiole 1–3 mm. *Flowers* yellowish-white, in few- to many-flowered fascicles, these on short (up to 4 mm) axes, which are covered by numerous, small bracts. *Calyx* 2 mm, probably glabrous, 'densely brownish-pellucid striate'. *Stamens* 10(–11), alternately of unequal length, said to be jointed at the base into a prominent hairy ring. *Ovary* ovoid, densely longish-pilose.

Distr. *Malaysia:* NE. New Guinea (Sepik region).

Ecol. In rain-forest along stream, 20–100 m.

Note. No material seen; holotype (B) lost, and no other type-material seems to exist.

19. Casearia rinoreoides SLEUM. Blumea 7 (1954) 491.

Shrub 3 m, glabrous in all parts; branchlets somewhat angular at tips, soon becoming terete, olivaceous-yellowish as are the leaves when dry. *Leaves* ovate-oblong, gradually 1–1½ cm subacutely acuminate at the apex, attenuate into the petiole at the base, subcoriaceous, firm, more pallid and dull beneath, minutely and remotely crenate-serrate to nearly entire, 8–12 by 3–4½ cm; midrib distinctly prominent beneath, nerves 6–7 pairs, curved-ascending, not or little raised above, more distinctly so beneath, veins ± transverse, densely reticulated and elevated on both faces; petiole ± 1 cm long, 1 mm diam. *Flowers* sessile, solitary or 2–3, in a fascicle or mostly on top of a very short (1 mm) many-bracteate axis, surrounded or nearly concealed by numerous ovate, subacute, membranous, glabrous bracts 1–2 mm diam. *Calyx* glabrous, somewhat fleshy, in all 2 mm long, deeply 5-lobed. *Stamens* 10, equal in length; filaments glabrous, ½ mm. Staminodes very short, laxly pilose. *Ovary* thick-ovoid, pubescent. *Fruit* ellipsoid, *c.* 1.8 by 1.2 cm, orange-red.

Distr. NW. New Guinea (Nabire), once found.

Ecol. In rain-forest, 300 m.

20. Casearia megalophylla GILG, J. Arn. Arb. 10 (1929) 81; WHITE, *ibid.* 244.

Large bushy shrub, *c.* 2 m; branchlets angular, glabrous. *Leaves* oblong, *c.* 2 cm obtusely acuminate at the apex, cuneate at the base, thinly chartaceous, with many pellucid dots and lines, brownish when dry, ± inequilateral, glabrous, rather regularly serrate-crenate (teeth obtuse up to 1 mm high, 3–4 mm distant), midrib nearly flat above, prominent beneath, 20–32 by 10–12½ cm; nerves 10–12 pairs, rather straight, upwards curved-ascending towards the leaf-margin, obscure above, conspicuously raised beneath, veins manifestly transverse, little elevated on both faces, finer reticulations obscure; petiole rather thick, glabrous. *Flowers* white, solitary or 2–3 in a fascicle, sometimes on a very short (up to 1½ mm), many-bracteolate stalk. Bracts ovate, acuminate, membranous, subglabrous, *c.* 1½ mm. *Calyx* ± densely sericeous in- and outside, 2 mm, deeply 5-lobed. *Stamens* 10; filaments sparsely pilose, alternately 0.6 and 0.3 mm. Staminodes represented by small hairy tufts. *Ovary* elongate-ovoid, 2 by 1 mm, densely hairy.

Distr. *Malaysia:* SE. New Guinea (Gulf Division).

Ecol. In rain-forest at low elevation.

Note. A similar, perhaps conspecific specimen seen from N. New Guinea (Mamberamo River).

21. Casearia trivalvis (BLANCO) MERR. Sp. Blanc. (1918) 275; En. Philip. 3 (1923) 116.—*Samyda trivalvis* BLANCO, Fl. Filip. (1837) 374, ed. 2 (1845) 263, ed. 3, 2 (1878) 124.—*C. fragilis* (*non* VENT.) F.-VILL. Nov. App. (1880) 93.—*C. solida* MERR. Gov. Lab. Publ. (Philip.) 35 (1906) 46; Philip. J. Sc. 1 (1906) Suppl. 99.—*C. zschokkei* ELM. Leafl. Philip. Bot. 8 (1919) 3083.—*Gelonium pinatubense* ELM. Leafl. Philip. Bot. 9 (1934) 3186.—*Suregada pinatubensis* CROIZ. Bull. Bot. Gard. Btzg III, 17 (1942) 217.

Tree 1½–5(–8) m, shrub-like in habit; branches rigid, crookedly rebranched, divaricate, the tips short brownish-hirsute, soon covered with whitish cork. *Leaves* elliptic or elliptic-oblong or ovate-oblong, rather abruptly and shortly (1–1½ cm) obtusely or acutely acuminate at the apex, cuneate at the base, equilateral, rigidly chartaceous to subcoriaceous, entire or obscurely remotely dentate, very minutely pellucid-punctulate or practically impunctate, sublucid and pale grey-olivaceous when dry, dull and somewhat paler beneath, (6–)8–15(–18) by (4–)5–7(–10) cm; midrib flat or slightly immersed above in dry specimens, strongly prominent beneath, nerves *c.* 5–6(–8) on each side, ascending, their ends strongly curved upward, little prominent only beneath, veins laxly reticulate and little raised on both sides; petiole rather stout, manifestly grooved above, glabrous, (4–)6–9(–15) mm, dull reddish-brown when alive. *Flowers* white or cream, fragrant, in 4–12-flowered glomerules chiefly from the axils of fallen leaves. Bracts very unequal in size and shape, the outer ovate, subacute, densely appressed-pubescent, glabrescent with age, the inner ones thinner. Pedicels stoutish, pubescent, ± 2 mm at anthesis, later elongating up to 4 mm. *Calyx* 2½–3 mm, densely pubescent outside, nearly glabrous inside, deeply 5-lobed, manifestly pellucid-punctate and -striate. *Stamens* 8, equal in length; filaments filiform, glabrous, 1.2–1.5 mm. Staminodes nearly rectangular, thick, densely hirsute, nearly as long as the filaments. *Ovary* conical-ovoid, laxly pilose. *Fruit* subglobose to ellipsoid, trigonous to the apex, *c.* 2 cm long, *c.* 1½ cm diam., bright red, subtended by the accrescent calyx-lobes; peduncle rather slender, subglabrous, *c.* 1 cm.

Distr. *Malaysia:* Philippines (Luzon, Marinduque, Mindoro).

Ecol. In primary forests, up to 800 m; *fl. fr.* Jan.–Dec.

Vern. *Boog-boog, kapikapihan, malagañgyat, malatagyan,* Tag., *marakiuas,* Neg.

22. Casearia velutina BL. Mus. Bot. 1 (1850) 253 incl. *var. pilosiuscula* BL.; MIQ. Fl. Ind. Bat. 1, 1 (1855) 708 incl. *var.* α & β; Suppl. 1 (1860) 132; SLOOT. Bijdr. Flac. (1919) 153; Bull. Jard. Bot. Btzg III, 7 (1925) 406; DOCTERS VAN LEEUWEN Zoocec. (1926) 393.—*Daphne decandra* BL. Bijdr. (1825) 650, *non C. decandra* JACQ. 1760, *cf.* HALLIER *f.* Med. Rijksherb. Leiden 44 (1922) 31. —*C. propinqua* BL. Mus. Bot. 1 (1850) 253; SLOOT. Bijdr. Flac. (1919) 154.—*C. elliptica* (*non* WILLD.) BL. Mus. Bot. 1 (1850) 253; MIQ. Fl. Ind. Bat. 1, 1 (1855) 709, SLOOT. Bijdr. Flac. (1919) 163. —*C. tomentosa* (*non* ROXB.) KOORD. & VAL. Bijdr. Booms. Java 1 (1894) 176 *incl. var. glabra* K. & V. 177; KOORD. Exk. Fl. Java 2 (1912) 635; Atlas Baumart. Java 2 (1914) t. 344; SLOOT. Bijdr. Flac. (1919) 161.—*C. multipunctata* MERR. Pap. Mich. Acad. Sc. 19 (1934) 174.

Shrub or tree, up to 15 m; branchlets angular, ± patently and densely short-hairy to velvety. *Leaves* oblong-elliptic or oblong, rarely ovate, rounded or shortly acuminate at the top (acumen ½–1½ cm, blunt or rather sharp), ± inequilateral, rounded at one side, attenuate at the other, rarely ± cordate at the base, thinly herbaceous, distinctly pellucid-punctate and striate, obscurely or mostly distinctly serrate-dentate, at first ± densely pubescent above, finally pubescent there on the midrib only, or entirely glabrous, the whole of the lower surface, specially on the nerves, velvety, rarely ± glabrescent with age, 5–13(–21) by 2–6(–7½) cm; midrib not or little raised above, distinctly so beneath, nerves (4–5–)6–8(–10) pairs, sometimes a little impressed above, always prominent beneath, veins ± transverse, not or mostly little but visibly raised on both surfaces as are the finer reticulations; petiole densely pubescent, 5–15(–18) mm. *Flowers* rather numerous, fascicled. *Calyx* green or blue-green, ± densely patently pubescent outside, glabrous inside, *c.* 2 mm, deeply 5-lobed. Bracts minute, numerous, densely pubescent, 1 mm. Pedicels slender, pubescent, 4 mm. *Stamens* 5–8; filaments equal in length, pilose, 1.8 mm. Staminodes 1.2 mm, rather flat, hairy at the apex. *Ovary* narrow-ovoid, nearly glabrous, as long as the calyx. *Fruit* ovoid, glabrous, verruculose when dry, 1.2–1.5 cm long, *c.* 1 cm diam.; peduncle rather slender, glabrescent, 5–7 mm.

Distr. *Malaysia:* Sumatra (E. &W. Coast), Java.

Ecol. Both in mixed primary rain-forests, rarely in teak-forests, once on limestone, 200–1500 m; *fl.* Jan.–Dec.

Vern. *Kabanbara, tjikalbalung,* J.

Note. The type specimen of *C. multipunctata* MERR. possesses small, less equilateral leaves than the average but falls within the variability of *C. velutina* BL.

23. Casearia impressinervia MERR. Philip. J. Sc. 11 (1916) Bot. 96; En. Born. (1921) 412.

Tree; branchlets blackish when dry, puberulous on the younger parts, soon glabrescent. *Leaves* oblong, *c.* 1 cm rather sharply acuminate at the apex, acute or cuneate into the petiole at the base, rigid and ± coriaceous, dark-brown when dry, not pellucid-punctate, glabrous and somewhat shining above, paler and softly tomentose with pale spreading hairs underneath at least at the midrib and nerves, domatia always present, entire, 6–8 (–10) by 2–3(–4½) cm; midrib and nerves distinctly impressed above, prominent beneath, veins transverse, visible only on the undersurface, reticulations fine; petiole pubescent, 7–10 mm. *Flowers* pale, *c.* 4–6 in each fascicle. Pedicels slightly pubescent, 2 mm. Bracts very minute, pubescent. *Calyx c.* 3½ mm, pubescent outside,

deeply 5-lobed. *Stamens* 10; filaments glabrous, alternately 1.8 and 1.5 mm. Staminodes narrow-oblong, villose at the apex, nearly 1.8 mm. *Ovary* elongate-ovoid, 3 mm long, laxly pilose towards the top.

Distr. *Malaysia:* Borneo (Sarawak).

Note. Perhaps only a small-leaved form of *C. hosei.*

24. Casearia anisophylla GILG, Bot. Jahrb. 55 (1918) 289.

Treelet 4–6 m; bark grey; branchlets applanate, reddish-nigrescent when dry, minutely pubescent, soon glabrescent, smooth, striate. *Leaves* ovate-oblong to ovate-lanceolate, *c.* 1½ cm and rather broadly acuminate at the apex, rounded and inequilateral at the base, dark olivaceous and somewhat shining above when dry, more dilutely so and dull beneath, subcoriaceous, not or minutely pellucid-punctate, glabrous except yellowish domatia, 14–18 by 4–5 cm; midrib stout, prominent on both faces, nerves 6–7 pairs, slightly impressed above, prominent beneath, veins transverse and venules numerous, minutely prominent on both faces; petiole glabrous, 6–7 by 1½ mm. *Flowers* pale-green, nigrescent when dry, 3–10 per fascicle. Bracts small and dense, pubescent. Pedicels 2–3 mm, glabrous. *Calyx* 2½–3 mm, practically glabrous in- and outside, deeply 5-lobed, lobes ovate-oblong. *Stamens* 12; filaments glabrous, slender, alternately 1.1 and 0.8 mm. Staminodes broadly oblong, densely whitish-hairy on top *c.* 0.6 mm. *Ovary* ovoid, *c.* 2 mm, glabrous except some hairs towards the apex.

Distr. *Malaysia:* NE. New Guinea (Sepik region), once collected.

Ecol. In dense rain-forest, 850 m.

25. Casearia hosei MERR. Philip. J. Sc. 11 (1916) Bot. 93; En. Born. (1921) 412; Pl. Elm. Born. (1929) 210; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 394. —*C. moultonii* RIDL. Kew Bull. (1938) 111.

Tree or shrub, 3–5 m; branchlets minutely grey-pubescent or mostly glabrous, older parts very dark brown-red when dry. *Leaves* oblong or sub-ovate-oblong, distinctly shortly (1–2 cm) acutely, or bluntly acuminate at the apex, ± inequilateral and broadly cuneate to rounded at the base, firmly chartaceous, entire, dark brown when dry, not or very obscurely pellucid-punctate, shining and glabrous above, slightly paler and dull beneath, ± puberulent on midrib and nerves beneath, always with domatia, 10–17 by (3–)4–6 cm; midrib slightly impressed over the whole length above, very prominent beneath, nerves (8–)9–10 pairs, rather obscure and often very slightly impressed above, prominent beneath, curved and ± anastomosing with each other, veins laxly transverse, reticulations fine, specially beneath; petiole puberulent or glabrous, *c.* 8 mm. *Flowers* greenish, blackish when dry, 3–4 per fascicle. Bracts broadly ovate, acuminate, pubescent, 1 mm. Pedicels 1–1½ mm, stoutish, slightly greyish-puberulent. *Calyx c.* 2½ mm, sparingly greyish-pubescent outside, glabrous inside, deeply 5-lobed, lobes oblong, subacute. *Stamens* 10; filaments glabrous or nearly so, alternately 1½ and 1.2 mm. Staminodes oblong-linear, 0.9 mm, pilose specially at their apex. *Ovary* narrow-ovoid, glabrous or slightly hairy towards the top, 2 mm. *Fruit* subglobose, *c.* 8 mm diam., orange-red; peduncle slender, 3–4 mm. *Seeds* few; aril red.

Distr. *Malaysia:* Borneo, Central Celebes.

Ecol. In primary forests, up to 1500 m.

26. Casearia globifera GILG, Bot. Jahrb. 55 (1918) 289.

Shrub or tree; young branches reddish-blackish when dry, applanate, very shortly pilose, soon glabrescent. *Leaves* ovate to ovate-oblong, shortly and broadly acuminate at the apex, broadly cuneate to nearly rounded at the base, chartaceous, shallowly sinuate-dentate, ± manifestly and rather minutely pellucid-punctate, but not -striate, puberulent on midrib and nerves beneath, glabrous elsewhere, dark-brown and dull when dry, 12–18 by 5–7½(–9) cm; midrib little raised above, strongly so beneath, nerves (9–)10–11, flat above, prominent beneath, veins transverse, visibly elevated underneath, reticulations rather fine and little prominent on both faces specially beneath; petiole 7–10 by nearly 2 mm. *Flowers* 1–2 developed simultaneously from a subglobose cushion formed by numerous, small, pubescent bracts; pedicels up to 2 mm. *Calyx* 3 mm, somewhat pilose outside. *Stamens* 10; filaments alternately longer and shorter. Staminodes elongate and densely pilose. *Ovary* ovoid-subglobose, densely pilose, with a short and thick style.

Distr. *Malaysia:* NE. New Guinea (Djamu River), once found.

Ecol. Rain-forests, 300 m.

Note. There is a sterile isotype in Paris; the description of the flowers was copied from the original diagnosis.

27. Casearia fuliginosa (BLANCO) BLANCO, Fl. Filip. ed. 2 (1845) 262, ed. 3, 2 (1878) 123, t. 90; MERR. Philip. J. Sc. 1 (1906) Suppl. 99; Fl. Manila (1912) 335; Sp. Blanc. (1918) 275; En. Philip. 3 (1923) 115.—*Anavinga fuliginosa* BLANCO, Fl. Filip. (1837) 372.—*C. elliptica* (*non* WILLD.) NAVES in BLANCO, Fl. Filip. ed. 3 (1877–83) t. 90; VIDAL, Cat. Pl. Prov. Manila (1880) 31.—*C. moluccana* (*non* ROXB.) MERR. Philip. Bur. For. Bull. 1 (1903) 41.—*C. glauciramea* ELM. Leafl. Philip. Bot. 4 (1912) 1517; MERR. En. Philip. 3 (1923) 115.—*C. densifolia* ELM. Leafl. Philip. Bot. 4 (1912) 1516.—*C. nitens* MERR. J. Philip. Sc. 30 (1926) 412.

Shrub or small tree, 2–6 m; branchlets flexuous, often zig-zag, nigrescent, angular, puberulous on the tips, terete and glabrous elsewhere. *Leaves* generally ovate-oblong, somewhat variable in size and shape, shortly acuminate often slightly falcate at the apex, the tip blunt, ± broadly cuneate to rounded at the base, mostly very inequilateral (often one side rounded, the other cuneate at the base), firmly chartaceous, glabrous except greyish domatia, mostly dark brown to nigrescent

when dry, paler beneath, somewhat shining above, dull beneath, mostly rather densely and conspicuously pellucid-punctate and -striate, (6–)7–15(–20) by (2–)3½–5(–6½, rarely up to 8) cm, entire or ± obscurely crenulate; midrib flat above, very prominent beneath, nerves (7–)8–10 pairs, slightly curved, ± parallel to each other, inconspicuous or somewhat impressed above, raised beneath, veins obsolete above, minutely elevated beneath together with the dense and very fine reticulations; petiole 0.6–1(–1½) cm, mostly pubescent. *Flowers* white to pale green, blackish when dry, in few- to many-flowered clusters. Bracts ovate, small (½ mm), densely greyish-pubescent. Pedicels *c.* 2 mm, pubescent. *Calyx* membranaceous, *c.* 2 mm, deeply 5-lobed, pubescent outside, laxly so inside. *Stamens* 10; filaments thick-filiform, glabrous or laxly hairy, alternately 0.9 respectively 0.6 mm; anthers subglobose, 0.4 mm. Staminodes 0.4 mm, penicillate at the apex. *Ovary* ovoid, laxly pilose at the short style. *Fruit* ovoid to ellipsoid, 1–1.2 by 0.8 cm, red to yellow when mature; peduncle pubescent, 3–4 mm. *Seeds c.* 4.

Distr. *Malaysia:* Philippines (Luzon, Mindoro, Ticao, Sibuyan, Samar, Masbate, Dinagat, Mindanao, Tawi-Tawi).

Ecol. Rather common in thickets and secondary forests below 250 m, also near the sea, often on sandy or gravelly river-banks and along creeks.

Uses. Wood used for casts and bars.

Vern. *Bagna, tapat-tápat, butong-manók, kaluag,* Tag., *baling-káhoi,* C. Bis., *baltik, sangkí,* Ig. *bina kag, pariñgorauan,* Neg., *luyong-lúyong,* S.L. Bis., *malaserésa,* Pamp., *mukok,* Bon., *sigai-sigai, talitan,* Sbl.

28. Casearia grewiaefolia VENT. Choix (1803) 48; BL. Mus. Bot. 1 (1850) 252; MIQ. Fl. Ind. Bat. 1, 1 (1855) 706 *incl. var. grosse-serrata* MIQ.; *ibid.* 707; CLARKE in HOOK. *f.* & TH. Fl. Br. Ind. 2 (1879) 594; KOORD. & VAL. Bijdr. Booms. Java 1 (1894) 173, *incl. var. contermina* K. & V. *l.c.* 175 *et var. subcuneata* (MIQ.) K. & V. *l.c.*; KING, J. As. Soc. Beng. 67, ii (1898) 16; KOORD. Minah. (1898) 472; Jungh. Gedenkb. (1910) 181; Exk. Fl. Java (1912) 635; Atlas Baumarten 2 (1914) f. 342 (*var. contermina*); SLOOT. Bijdr. Flac. (1919) 144; MERR. En. Born. (1921) 412; GAGNEP. Fl. Gén. I.C. 2 (1921) 1003, *pr. p.*; RIDL. Fl. Mal. Pen. 1 (1922) 830; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 395; DOCTERS VAN LEEUWEN, Zoocecid. (1926) 393; CRAIB, Fl. Siam. En. 1 (1931) 736; MALM in FEDDE, Rep. 31 (1934) 281; DOCTERS VAN LEEUWEN, Ned. Kruidk. Arch. 51 (1941) 195. —*Samyda grewiaefolia* POIR. Encycl. Suppl. 5 (1817) 32.—*C. variabilis* BL. Mus. Bot. 1 (1850) 252.—*C. subcuneata* MIQ. Fl. Ind. Bat. 1, 1 (1855) 706.—*C. contermina* MIQ. *ibid.* 707.—*C. microdon* MIQ. Fl. Ind. Bat. Suppl. (1860) 333, 132.—*C. kerrii* CRAIB, Kew Bull. (1911) 55; GAGNEP. Fl. Gén. I.C. 2 (1921) 1002; CRAIB, Fl. Siam. En. 1 (1931) 737.—*C. agusanensis* ELM. Leafl. Philip. Bot. 7 (1915) 2652; MERR. En. Philip. 3 (1923) 114.—*C. confertiflora* MERR. Philip. J. Sc. 13 (1918) 34; En. Philip. 3 (1923) 115.—*C. sogerensis* BAK. *f.* J. Bot. 61 (1923) Suppl. 22.—*C. oblonga* CRAIB, Kew Bull. (1930) 405; Fl. Siam. En. 1 (1931) 738.—**Fig. 36.**

For further synonyms see under the varieties.

var. **grewiaefolia.**

Shrub or tree 2–20(–35) m, fluted at the base when old, buttresses up to 1 m; bark greyish pale-brown or whitish, rough, pustulate; branchlets quadrangular, ± densely rusty-tomentose, soon glabrescent. *Leaves* variable in shape, generally oblong, sometimes ovate-oblong, shortly (1–2 cm) acuminate and mostly rather obtuse at the apex, broadly cuneate to rounded at the base, sometimes truncate or subcordate, always ± distinctly inequilateral, firmly chartaceous, olivaceous or brownish when dry, paler beneath, glabrous above except the midrib, ± densely rusty- to yellowish-, rarely more greyish-pilose to -tomentose beneath, not very glabrescent in the typical form, mostly regularly minutely to rather coarsely crenate, sometimes nearly entire, ± densely pellucid-punctate and -striate specially in young leaves, 8–10(–16) by (3–)3½–6 (rarely up to 8) cm; midrib flat or mostly slightly grooved above, prominent beneath, nerves (8–)10–14 pairs, little curved-ascending and ± parallel to each other, the inferior 2–3 pairs usually from the leaf-base, all not or little raised above, markedly so beneath, veins ± transverse, little prominent on both faces, finer reticulations visible but very little prominent, sometimes nearly obscure; petiole rather slender, 0.7–1½ mm diam., pubescent or glabrescent, 6–10(–12) mm. *Flowers* white to yellowish-greenish, the ovary often galled and then the calyx-lobes and pedicels usually stoutish and enlarged. *Fascicles* many-flowered, but sometimes reduced to few flowers or very rarely to a solitary flower, often in the axils of fallen leaves. Pedicels rather slender, ± pubescent, 5–6(–8) mm. Bracts numerous, pubescent, up to 1 mm diam. *Calyx* appressed-pilose outside, more laxly so inside, 2½–3 mm, deeply 5-lobed. *Stamens* normally 8, rarely 10, slightly differing in length; filaments rather slender, glabrous or a little pubescent, *c.* 1½ mm. Staminodes oblong, thick, densely hairy, specially at the apex, 1 mm. *Ovary* ovoid, glabrous or laxly pilose upwards; style short but distinct. *Fruit* compressed-ellipsoid, orange to yellow when ripe, glabrous, boldly ridged when dry, (2½–)3½–4 by *c.* 1.7–1.8 cm when full developed. *Seeds* several, with orange-red aril.

Distr. Indo-China, Siam, in *Malaysia:* Sumatra, Malay Peninsula (apparently rather rare, in Perak, Dindings & Johore), Java (rather common), Lesser Sunda Islands (Bali), Borneo, Celebes, Moluccas (Sula), Philippines and New Guinea (Sogeri). The *var. deglabrata* also in Melanesia.

Ecol. In not too shady, open, primary and secondary forests and in dry thickets, also in teak-forests, from the lowlands up to 450 m, rarely ascending up to 900, very rarely up to 1300 m, in rather barren and stony localities, often on calcareous soil and marl, also on coral limestone rocks; *fl. fr.* Jan.–Dec.

Fig. 36. *Casearia grewiaefolia* VENT. *a.* Flowering twig, × 2/3, *b.* young flower, × 5, *c.* flower in full anthesis, × 5, *d.* fruit, × 2/3, *e. ditto*, dehisced, × 2/3 (*b–c* after KOSTERMANS 5409, *d* after KOSTERMANS 5926).

Uses. The fruit has a bitter, burning taste. Wood white to pale brown, apparently not used.

Vern. *Madang klapah*, Palemb., *kaju rajah*, Lampongs, *pĕlangas gunung*, Billiton, *ring gupgup*, Sum. E. Coast, *balam pĕlapah*, Sum. W. Coast, *tada-tada*, M, *balung*, *kaju putih*, *rimbangan*, *ki sumarèng*, *ki bĕsi*, *hanja*, *marèmè tanjung*, S, *durènan glam*, *kalak krisik*, *klĕgan*, *kalak usik*, *sĕtjang*, *langsĕp lutung*, *dluwak*, *kĕdu*, *balung*, *balong*, *djangklot kĕpu*, J, *gadungan*, *morron balung*, Md.. Borneo: *Surian*, SE. Borneo, *biling*, Kutei, *tapion angian*, *t. kirabas*, *tapai-tapai*, Dusun. Celebes: *Simpokio*, *kerekere*, *lamboä*, *karikis lawanan*, *k. sela*, *k. putih*, *lĕlean kulu*, *sunsun*, *torosi*, *aladen*, Manado, *wungkabo*, Muna, *siwua*, *Mingkoka*, *simpokio*, *keu*, Barëe, *we-koro*, Tolalaki. Philippines: *ahtig*, Bag., *inignin*, *kaluag*, *k. babáe*, *magaspang*, *malata-moyan*, Tag., *malata-biang*, Neg., *boyboyok*, *malaponti*, Ilk., *matalung*, *bitang*, Sul., *pañgonalaman*, Ibn.. Moluccas: *dongo-dongo*, (*kaju*) *hatibĕsi*, Sula, Ternate, *fatbis*, Sanana. New Guinea: *beggöe*, *bisèmang*, Atam.

var. **cinerea** (TURCZ.) SLEUM. *stat. nov.*—*C. cinerea* TURCZ. Bull. Soc. Nat. Moscou 31 (1858) 462; VIDAL, Phan. Cuming. Philip. (1885) 115; Rev. Pl. Vasc. Filip. (1886) 140; MERR. Philip. J. Sc. 1 (1906) Suppl. 99; Sp. Blanc. (1918) 275; En. Philip. 3 (1923) 114.—*Samyda serrulata* (*non* L.) BLANCO, Fl. Filip. (1837) 374.—*Samyda pubescens* (*non* L.) BLANCO, Fl. Filip. ed. 2 (1845) 263, ed. 3, 2 (1878) 124.—*C. tomentosa* (*non* ROXB.) F.-VILL. Nov. App. (1880) 93.—*C. pilosissima* QUIS. & MERR. Philip. J. Sc. 37 (1928) 171.

Leaves velutinous on both sides. Fruit more ovoid than in the typical species.

Distr. *Malaysia:* Philippines (Luzon, SE. Mindanao).

Ecol. In primary and secondary forests, up to 600 m.

Vern. *Butong-manók*, Bik., *tulibas*, *kaluag*, Tag., *karimbubua*, Ilk., *maraligau*, Bis.

var. **deglabrata** KOORD. & VAL. Bijdr. Booms. Java 1 (1894) 174; KOORD. Minah. (1898) 471; Atlas Baumart. Java 1 (1914) f. 343; SLOOT. Bijdr. Flac. (1919) 149.—*C. uniflora* DECNE, Nouv. Ann. Mus. 3 (1834) 428; Herb. Timor. Descr. (1835) 100; MIQ. Fl. Ind. Bat. 1, 1 (1855) 712; SLOOT. Bijdr. Flac. (1919) 163; Bull. Jard. Bot. Btzg III, 7 (1925) 413.—*C. hexagona* DECNE, Nouv. Ann. Mus. 3 (1834) 429; Herb. Timor. Descr. (1835) 101; BL. Mus. Bot. 1 (1850) 254; MIQ. Fl. Ind. Bat. 1, 1 (1855) 711; SLOOT. Bijdr. Flac. (1919) 160; Bull. Jard. Bot. Btzg III, 7 (1925) 405; MEIJER DREES, Comm. For. Res. Inst. 33 (1951) 106.—*C. hexagona* DECNE *var. gelonioides* BL. Mus. Bot. 1 (1850) 225; MIQ. Fl. Ind. Bat. 1, 1 (1855) 711; SLOOT. Bijdr. Flac. (1919) 160.—*Laurus serrata* BLANCO, Fl. Filip. (1837) 319, ed. 2 (1845) 224, ed. 3, 2 (1878) 55, *non C. serrata* MACF. & SW.—*C. salacioides* BL. Mus. Bot. 1 (1850) 252; MIQ. Fl. Ind. Bat. 1, 1 (1855) 707; SCHEFF. Ann. Jard. Bot. Btzg 1 (1876) 24.—*C. truncata* BL. Mus. Bot. 1 (1850) 252; MIQ. Fl. Ind. Bat. 1, 1 (1855) 707.—*C. variabilis* BL. *var. sphaerocarpa* BL., *var. nudata* BL. Mus. Bot. 1 (1850) 252.—*C. laurina* BL. Mus. Bot. 1 (1850) 253; MIQ. Fl. Ind. Bat. 1, 1 (1855) 708; SLOOT. Bijdr. Flac. (1919) 153; Bull. Jard. Bot. Btzg III, 7 (1925) 394; MERR. En. Born. (1921) 412; MEIJER DREES, Comm. For. Res. Inst. 33 (1951) 105.—*C. glabrata* BL. Mus. Bot. 1 (1850) 253; MIQ. Fl. Ind. Bat. 1, 1 (1855) 708, Suppl. (1860) 132, 334.—*C. angustata* TEYSM. & BINN. Nat. Tijd. Ned. Ind. 2 (1851) 305; Ned. Kruidk. Arch. 3 (1855) 409; MIQ. Fl. Ind. Bat. 1, 1 (1855) 710.—*C. gonocarpa* MIQ. Fl. Ind. Bat. 1, 1 (1855) 1093; Suppl. (1860) 132; SLOOT. Bijdr. Flac. (1919) 156; Bull. Jard. Bot. Btzg III, 7 (1925) 398.—*C. leucolepis* TURCZ. Bull. Soc. Nat. Moscou 31 (1858) 463; CLARKE in HOOK. *f.* & TH. Fl. Br. Ind. 2 (1879) 591; F.-VILL. Nov. App. (1880) 115; VIDAL, Rev. Pl. Vasc. Filip. (1886) 141; Phan. Cuming. Philip. (1885) 115; STAPF, Trans. Linn. Soc. 4 (1894) 164; MERR. Philip. J. Sc. 10 (1915) Bot. 184; *op. cit.* 11 (1916) Bot. 96; En. Born. (1921) 412; RIDL. Fl. Mal. Pen. 1 (1922) 831.—*C. glomerata* (*non* ROXB.) F.-VILL. Nov. App. (1880) 93.—*C. polyantha* MERR. Philip. J. Sc. 1 (1906) Suppl. 99; En. Philip. 3 (1923) 116; Philip. J. Sc. 29 (1926) 401.—*C. crenata* MERR. Philip. J. Sc. 1 (1906) Suppl. 99; Sp. Blanc. (1918) 276; En. Philip. 3 (1923) 115.—*C. subcordata* MERR. Philip. J. Sc. 9 (1914) Bot. 328; En. Philip. 3 (1923) 116.—*C. moluccana* (*non* ROXB.) BAK. *f.* J. Bot. 62 (1924) Suppl. 42.—*C. densifolia* (*non* ELM.) SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 412.—*C. luteocarpa* ELM. Leafl. Philip. Bot. 9 (1934) 3189.

Differing from typical *C. grewiaefolia* by a ± pronounced glabrescence in all parts, and apparently occurring together with it in many localities. The leaves not rarely are somewhat thicker, less or not pellucid-punctate.

Distr. *Malaysia:* Occupies the same area as the type, but extends besides to Lesser Sunda Islands (Lombok, Sumbawa, Timor), the Moluccas (Key, Batjan, Ternate), New Guinea (Arfak), and Melanesia (Admirality Isl., New Britain, Solomon Isl.: Bougainville).

Ecol. Similar to the type variety, mostly in forests at low elevation, up to 900 m.

Vern. See the names mentioned under the type variety.

29. Casearia philippinensis MERR. Philip. J. Sc. 10 (1915) Bot. 329; En. Philip. 3 (1923) 116.

Shrub or small tree, up to 3 m; branchlets slender, softly ferrugineous-tomentose initially, soon glabrescent and covered with greyish-yellowish cork. *Leaves* oblong to oblong-lanceolate, gradually tapering into an acute apex, broadly cuneate at the base, firmly chartaceous, brownish-olivaceous when dry, glabrous above except the midrib, softly brownish-tomentose all over the undersurface, very densely so on the midrib and the nerves, entire, with rather numerous fine, pellucid points, pellucid lines few or absent, 20–29 by 7–10 cm; midrib not or little raised above, prominent beneath, nerves curved-ascend-

ing rather obscure above, prominent and paler beneath, veins ± transverse, inconspicuous above, lax and little raised beneath; petiole robust (1½ mm diam.), tomentose, *c.* 5 mm long. *Flowers* solitary, or mostly 2–3 in a fascicle, yellowish (not seen); pedicels 1–1½ mm at anthesis. Bracts pubescent, 1 mm. *Calyx* 4–5 mm, nearly glabrous in- and outside, deeply 5-lobed. *Stamens* 10, equal; filaments glabrous, 2½ mm. Staminodes villose towards the apex, 1½ mm. *Ovary* ovoid, subglabrous, 3 mm. *Fruit* pink to red, *c.* 2½ by 1½ cm, glabrous, resinous dots well visible in the epidermis with a lens; peduncle 2–3 mm, slender, pubescent.

Distr. *Malaysia:* Philippines (Luzon, Mindanao, Samar).

Ecol. In forests along streams from low elevation up to 850 m.

Vern. *Komombong*, Lanao.

30. Casearia elliptifolia MERR. Philip. J. Sc. 11 (1916) Bot. 92; En. Born. (1921) 412.

Small tree 6 m; branchlets slender, dilutely olivaceous, first somewhat angular and minutely pubescent, soon terete and glabrous. *Leaves* elliptic, rarely oblong-elliptic, *c.* 1 cm subacutely acuminate at the apex, broadly cuneate at the base, ± equilateral, firmly membranous to chartaceous, mostly distinctly pellucid-punctate and -striate, pale olivaceous to brownish when dry, ± shining on both faces, entire, 7–11 by 3½–5½ cm, glabrous or at most with very fine hairs beneath along the midrib and nerves; midrib nearly flat above, prominent beneath, nerves 6–7 pairs curved-ascending along the leaf-margin, inconspicuous above, raised beneath, veins rather closely transverse, little prominent above, conspicuous beneath, veinlets little but manifestly reticulate on both faces; petiole mostly pubescent, slender. *Flowers* pinkish, in few-flowered fascicles, only 1–2 developed at the same time. Pedicels sparingly pubescent, up to 2 mm. Bracts rather numerous, brown, pubescent outside, *c.* 1 mm. *Calyx* sparsely pubescent outside, distinctly pellucid-punctate, 2 mm, deeply 5-lobed. *Stamens* 10, equal; filaments filiform, glabrous, 1 mm. Staminodes triangular-ovate, barbate at the apex, 0.6 mm. *Ovary* ovoid, glabrous, 2 mm. *Fruit* ovoid to ellipsoid, yellow, glabrous, somewhat rugose when dry, up to 1 cm long; peduncle 2 mm. *Seeds c.* 6; aril not lacerate.

Distr. *Malaysia:* Borneo (Sarawak, W. Kutei, Mt Kinabalu).

Ecol. In mountain-forests up to *c.* 2000 m.

31. Casearia mindanaensis MERR. Philip. J. Sc. 20 (1922) 410; En. Philip. 3 (1923) 116.

Shrub or small tree; young branches pubescent at the tips, soon glabrescent and covered with greyish cork, lenticels orbicular-elliptic, distinct, rather numerous. *Leaves* oblong to oblong-elliptic, abruptly (2 cm) obtusely acuminate at the apex, broadly cuneate to obtuse at the base, minutely denticulate in the upper half, entire towards the base, chartaceous, olivaceous and dull above, brownish and somewhat shining beneath when dry, laxly rather obscurely pellucid-punctate and -striate, glabrous above, beset with very short appressed hairs on the undersurface specially on midrib and nerves, glabrescent, 25–30 by 10–12 cm; midrib nearly flat above, very prominent beneath, nerves 8–9 pairs, ± suberect, flat, prominent beneath, veins ± transverse and veinlets obscure above, both densely reticulated and ± manifestly raised beneath; petiole stout (*c.* 3 mm diam.), ± 8 mm long, initially pubescent, soon corticated. *Flowers* apparently few per fascicle. Pedicel very short. *Calyx* (below the fruit) glabrous or nearly so, 4 mm, manifestly pellucid-punctate, deeply 5-lobed. *Fruit* nearly ellipsoid, 1.5–1.8 by 1.2 cm, reddish to yellowish when fresh, glabrous; peduncle 2 mm. *Seeds* 4–5 mm long; aril fimbriate.

Distr. *Malaysia:* Philippines (Mindanao: Zamboanga), once collected.

Ecol. In forests along streams at *c.* 200 m.

Vern. *Dalipa*, Sub.

32. Casearia phanerophlebia MERR. Philip. J. Sc. 10 (1915) Bot. 277; En. Philip. 3 (1923) 116.—*C. wenzelii* MERR. & QUIS. Philip. J. Sc. 76 (1944) 54.

Small tree or shrub; branchlets minutely pubescent on the growing tips, glabrescent elsewhere, first red-brown, greyish-yellowish later, striate longitudinally. *Leaves* oblong or elliptic-oblong, shortly abruptly acuminate at the apex, acute at the base, subcoriaceous, entire or obscurely denticulate, rather dark reddish-brown and ± dull when dry, a little paler beneath, rather densely pellucid-punctate, but the dots sometimes difficult to observe in old leaves, glabrous above, ± densely pubescent by minute, patent hairs beneath on the midrib and nerves, ± glabrescent, 14–24 by (5–)6–10 cm; midrib little prominent above, strongly so beneath, nerves ± curved-ascending, flat or slightly impressed above, prominent beneath, veins distantly transverse somewhat prominent beneath only, veinlets rather obscure; petiole stout (*c.* 2½ mm), 5–8 mm, subglabrous. *Flowers* white to yellowish, crowded in fascicles, these often at the nodes of fallen leaves. Bracts numerous, membranous, ovate, glabrous, *c.* 1 mm, forming a semiglobose cushion. Pedicels 1½–2 mm, pubescent. *Calyx* 4–5 mm, laxly appressed-pubescent outside, deeply 5-lobed. *Stamens* 8 (sometimes 7) equal; filaments filiform, glabrous, 1.8 mm; anthers ovate, 1 mm, apiculate by the protruding connective. Staminodes *c.* 1 mm, glabrous at the base, densely barbate in the upper half. *Ovary* elongate-ovoid, rather densely pilose. *Fruit* ellipsoid, laxly pilose, *c.* 1½ cm long (perhaps not yet full ripe), red; peduncle pilose, 2 mm.

Distr. *Malaysia:* Philippines (Mindanao, Leyte, Luzon: Tayabas).

Ecol. In primary and secondary forests, on moist soil, *c.* 150–500 m.

33. Casearia kostermansii SLEUM. Blumea 7 (1954) 488.

Shrub 3 m; branchlets rather densely short-

pubescent, soon glabrous and longitudinally striate. *Leaves* oblong-ovate, rather abruptly (1 1/2–2 cm) acutely acuminate at the apex, broadly cuneate to nearly rounded at the base, chartaceous to subcoriaceous, densely pellucid-punctate but not -lineate, brown and dull when dry, more pale beneath, entire or very obscurely glandular-denticulate, laxly hairy on the midrib above, more densely so underneath both on midrib and nerves when young, glabrescent but remaining hairy at midrib and nerves underneath, 15–20 by (6–)7–9 (–11) cm; midrib thick, nearly flat above, strongly prominent beneath, nerves curved and excurrent along the leaf-margin, somewhat impressed above, prominent beneath, veins and venules nearly obscure above, reticulated but little raised beneath; petiole pubescent, 1 1/2 mm diam., 5–7 mm long. *Glomerules* nearly globose, formed by many, very short (1–1 1/2 mm), densely and minutely bracteate stems, many-flowered. Pedicel rather thick, 1 1/2–2 mm. *Calyx* yellowish-greenish, nearly 4 mm, glabrous in- and outside, 5-lobed to 2/3 of its height. *Stamens* 10; filaments thick-filiform, glabrous, alternately 0.6 and 0.3 mm. Staminodes 0.2 mm, densely whitish-hirsute. *Ovary* narrow-ovoid, 2.2 mm, densely long-hairy; stigma sessile, elongate, thick, *c.* 1 mm long. Immature *fruit* laxly pilose, more densely so towards the apex; peduncle thick, *c.* 2 mm long.

Distr. *Malaysia:* S. Borneo (Sampit-Balikpapan region), once collected.

Ecol. On dry land or low ridge, on sandy loam soil, 10–40 m.

34. Casearia brassii SLEUM. Blumea 7 (1954) 486.

Tree 4 m; branchlets blackish when dry, rather densely greyish-patent-pilose. *Leaves* lanceolate to oblong-lanceolate, gradually attenuate at the apex into a *c.* 3 cm long acute and somewhat curved acumen, acute at the base, chartaceous, with very conspicuous, pellucid dots and lines, dark red-brown when dry, a little shining above, dull beneath, entire or obscurely undulate, glabrous above except the midrib, rather densely patent-pilose on midrib and nerves underneath, glabrous elsewhere; midrib impressed above, prominent beneath, 13–15 by 3 1/2–4 1/2 cm; nerves 8–9 pairs, the inferior 3–4 suberect, superior ones more curved, all obscurely inarched near the leaf-margin, veins rather densely transverse, visibly raised as well as the finer reticulations, specially beneath; petiole slender, ± 1 cm, pubescent. *Flowers* green, in 4–6-flowered fascicles. Bracts numerous, ovate, 1 mm, pubescent. Pedicels ± 4 mm, pubescent. *Calyx* 3 mm, appressed-pubescent outside, rather deeply 5-lobed. *Stamens* 10 (rarely 12); filaments thick-filiform, glabrous, alternately 2 and 1 1/2 mm. Staminodes similar to the filaments, 1 mm, barbate at the apex. *Ovary* elongate-ovoid, 3 mm, glabrous in the inferior half, pilose towards the short style.

Distr. *Malaysia:* SE. New Guinea (Upper Wassi Kussa River), once collected, in fringing rain-forest.

35. Casearia monticola SLEUM. Blumea 7 (1954) 489.

Tree 6 m or shrub; branchlets slender, nigrescent, entirely glabrous. *Leaves* oblong to lanceolate-oblong, 1/2–1 cm obtusely subfalcate-acuminate at the apex, cuneate at the base, not or slightly inequilateral, thinly chartaceous, dark-brown and rather dull when dry, not or obscurely pellucid-punctate, not or very laxly pellucid-striate, entire or shallowly crenulate, glabrous, sometimes very laxly pilose at the midrib underneath, 5–10 by (2–)2 1/2–3(–3 1/2) cm; midrib flat above, prominent beneath, nerves 4–5 pairs curved-ascending, the lowest pair from the leaf-base, little elevated beneath, reticulations rather dense and finely prominent on both faces; petiole blackish, glabrous, *c.* 5 mm. Uppermost *glomerules* little conspicuous, inferior ones thick, subglobose, up to 4 mm diam., composed of many short axes, many-flowered. Bracts minute, 1/2 mm diam., pubescent. Pedicels slender, nearly glabrous, 4–5 mm. *Calyx* membranous, pale green, 2 mm, ± densely appressed-pilose in- and outside. *Stamens* 8 or 10; filaments terete, pubescent, alternately 0.9 and 0.6 mm; anthers subglobose, 0.3 mm diam. Staminodes clavate, densely subferrugineous-villous, 0.4 mm. *Ovary* narrow-ovoid, 1 1/2 mm, gradually attenuate into a thick style, pubescent in the inferior half, glabrous upwards.

Distr. *Malaysia:* SE. New Guinea (Central Division).

Ecol. In forests, 1500–1650 m.

36. Casearia ripicola SLEUM. Blumea 7 (1954) 492.

Tree 6–15 m; branchlets ferrugineous-tomentose at the tips, soon glabrous and covered with numerous, pale, oblong lenticels. *Leaves* elliptic or oblong-elliptic, rarely oblong, 1/2–1 cm subacutely or obtusely acuminate at the apex, cuneate to rounded at the base, dark brownish and little shining when dry, chartaceous, glabrous above except the nerves, ± densely rufous-tomentose initially beneath, specially on midrib and nerves, entirely glabrescent at maturity the midrib and domatia excluded, entire or minutely distantly denticulate, ± conspicuously pellucid-punctate, not pellucid-lineate, (6–)8–13(–15) by (3–)4–6 1/2 cm; midrib slightly impressed above, strongly raised beneath, nerves 8–9 pairs, ± curved and parallel, reticulations rather dense and little, but visibly raised on both faces; petiole pubescent, *c.* 5 mm. *Flowers* whitish to greenish or yellowish, rather numerous per fascicle, but mostly few developed at the same time. Bracts numerous, 1 mm, forming a nearly semi-globose cushion. Pedicels slender, ferrugineous-pubescent. *Calyx* 3 mm, rusty-pilose outside, laxly so inside, 5-lobed nearly to the base. *Stamens* 10; filaments thick-filiform, pilose, alternately 2 and 1.7 mm. Staminodes similar to the filaments, but barbate at the apex, 1 mm. *Ovary* ovoid, 1 1/2 mm, pubescent, attenuate into a nearly glabrous, columnar, 1 mm long style. *Fruit* ellipsoid, orange-yellow, pilose, 2 1/2 by 1 1/2 cm; pedicel slender, 1–1 1/2 cm.

Distr. *Malaysia:* W. New Guinea (Habbema Lake region), very similar material seen from SE. New Guinea (Central Division).

Ecol. In dense primary and secondary rainforests, on moist, flooded ground, 1900–2700 m.

37. Casearia angiensis SLEUM. Blumea 7 (1954) 484.

Shrub 3 m; branchlets laxly rusty-pilose at the tips, glabrescent elsewhere, nigrescent, lenticels obscure. *Leaves* ovate-oblong, *c.* 1 cm obtusely acuminate at the apex, broadly cuneate to nearly rounded at the base, slightly inequilateral, greenish-olivaceous and somewhat shining when dry, subcoriaceous, conspicuously pellucid-punctate and -striate, glabrous above, laxly pilose on midrib and nerves beneath or entirely glabrescent, but always with yellowish domatia, entire or very minutely and remotely glandular-denticulate towards the apex, (5–)7–9(–10) by 2½–4 cm; midrib and 4–5(–6) pairs of nerves nearly flat above, prominent beneath, veins distinctly transverse, venules densely reticulate-prominent on both surfaces; petiole laxly appressed-pilose, 6–9 mm. *Flowers* greenish, in few-flowered fascicles, 1, rarely 2, flowers developed at the same time. Bracts minute, ½ mm, rusty-pubescent as are the pedicels and the calyx. Pedicel 4–5 mm. *Calyx* 2½ mm, deeply 5-lobed. *Stamens* 10, 5 of these normally developed; filaments filiform, glabrous, 1 mm, 5 others reduced in size, filaments ½ mm only. Staminodes 10, filiform, pilose, more densely so at the apex. *Ovary* ovoid, glabrous, 3 mm; style very short. Immature *fruit c.* 1.2 cm long, glabrous.

Distr. NW. New Guinea (Mt Arfak: Angi Gita Lake), once collected.

Ecol. In moist forests, 1800 m.

38. Casearia archboldiana SLEUM. Blumea 7 (1954) 485.

Treelet 3–8 m; branches long, drooping, branchlets entirely glabrous, younger parts and tips nigrescent when dry, older ones pallid-spotted where parts of the dark epidermis have disappeared. *Leaves* elliptic or subovate-elliptic, 1–1½ cm obtusely subcaudate-acuminate at the apex, attenuate into the petiole, somewhat inequilateral, firmly subcoriaceous, shining on both surfaces, dark-brown when dry, younger ones rather densely and distinctly, mature ones obscurely pellucid-punctate, not pellucid-striate, entire, glabrous, but mostly with distinct domatia, 4½–7½ by (2–)2½–3½ cm; midrib prominent on both faces, nerves 4–5 pairs curved upwards and obscurely joining each other near the leaf-margin, little prominent above, distinctly so beneath, veins and veinlets rather densely reticulated on both surfaces; petiole glabrous 8–10 mm. *Fascicles* few-flowered, 1(–2) flowers developed at the same time. Bracts minute, ½ mm, scarious, pubescent. Pedicels slender, *c.* 4 mm. *Calyx* greenish, glabrous outside, papillose-puberulous inside, *c.* 2 mm, rather deeply 5-lobed. *Stamens* 8, subequal; filaments filiform, glabrous, 1 mm. Staminodes clavate, ½ mm, densely hirsute. *Ovary* narrow-ovoid, glabrous, 1½ mm. *Fruit* ellipsoid, red, 1½–2 by 1 cm; peduncle 4 by 1 mm.

Distr. *Malaysia:* N. New Guinea (Bernhard Camp: Idenburg River).

Ecol. Mossy forests, 1700–1800 m.

39. Casearia pallida CRAIB, Kew Bull. (1930) 406; Fl. Siam. En. 1 (1931) 738.

Tree 7–15(–20) m; branchlets angular and glabrous at the tips, terete and greyish-corticate in the older parts. *Leaves* oblong, shortly obtusely acuminate at the apex, broadly cuneate to rounded or subcordate at the base, ± equilateral, chartaceous to subcoriaceous, shining and pallid-olivaceous when dry, entirely glabrous, entire to shallowly undulate, (15–)20–28 by (5½–)6–9(–10) cm; midrib not prominent above, distinctly so beneath, nerves (12–)14–16 pairs, slightly or not raised above, prominent beneath, curved along the margin, veins transverse, veinlets forming dense reticulations which are rather prominent on both surfaces; petiole glabrous 1½–2 cm. *Flowers* congested in many-flowered fascicles, these composed of many, very short, woody, flower-bearing tubercles, which are united in a semiglobose cushion, beset with very numerous, small (½ mm), pubescent bracts. Pedicels slender, subglabrous, 6–8 mm. *Calyx* 4 mm, greenish-white, glabrous, 5-lobed to the base. *Stamens* 10, equal in length; filaments thick-filiform, 3 mm, nearly glabrous. Staminodes clavate, densely hairy, specially at the apex, 2.2 mm. *Ovary* narrow-ovoid, densely hairy, 4 mm; style glabrous, very short. *Fruit* yellowish, oblong, pilose at the apex, *c.* 4½–7 by 2–3 cm; peduncle *c.* 1½ cm. *Seeds* numerous, *c.* 6 mm.

Distr. Siam, in *Malaysia:* Sumatra (Padang Uplands, *leg.* BECCARI), once collected at *c.* 360 m.

Note. Near to *C. flavovirens* BL. in leaf-characters, but apparently not conspecific.

40. Casearia yatesii SLEUM. Blumea 7 (1954) 492.

Shrub?; branchlets glabrous, soon covered with a grey thin cork. *Leaves* oblong, shortly gradually obtusely acuminate at the apex, broadly cuneate to nearly rounded at the base, subcoriaceous to firmly chartaceous, rather densely pellucid-punctate and -striate, brown and somewhat shining when dry, glabrous, regularly glandular-subserrate-dentate (teeth ½–1 mm high, 4–5 mm spaced), 10–17 by 5–7 cm; midrib and nerves nearly flat or slightly impressed above, distinctly prominent beneath, nerves (8–)9–10 pairs, curved-ascending, veins ± transverse, reticulations fine and rather dense, prominent on both faces; petiole rugose, glabrous, *c.* 1½ cm. *Flowers* in many-flowered glomerules at the nodes of defoliate branchlets. Bracts numerous, ovate, densely hairy, ½ mm, forming a semiglobose cushion. Pedicels rather slender, glabrous, 6–8 mm. *Calyx* 4 mm, glabrous, thin, deeply 5-lobed. *Stamens* 10, equal; filaments thick-filiform, glabrous, 3½ mm. Staminodes thick, clavate, densely hirsute, 1.8 mm. *Ovary* narrow-ovoid, 4 mm, gradually attenuate, towards the top into a short style, ± densely hairy.

Distr. *Malaysia:* E. Sumatra (Asahan), once collected, possibly also in N. Sumatra (Atjeh).

41. Casearia gigantifolia SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 399, f. 14; HEYNE, Nutt. Pl. (1927) 1141.

Tree *c.* 20 m; branchlets glabrous. *Leaves* oblong or oblong-elliptic, gradually attenuate at the apex, rounded to cordate at the base, sometimes very inequilateral, olivaceous-brownish when dry, coriaceous or nearly so, laxly pellucid-punctate and -striate, glabrous, rather shining on both surfaces, entire or slightly crenate, midrib somewhat prominent above, strongly so beneath, nerves strongly curved and ± parallel to each other, veins transverse, finely but distinctly prominent on both faces as are the reticulations; petiole glabrous, 1½–2 cm. *Flowers* dilutely greenish (not seen), apparently in rather many-flowered fascicles in the axils of longer persistent leaves. Pedicels glabrous, up to 9 mm. *Calyx* glabrous, 4 mm, deeply 5-lobed, the lobes oblong, 2 mm wide. *Stamens* (9–)10, equal; filaments 2 mm, shortly hairy towards the base; anthers 1 mm. Staminodes barbate, 2 mm. *Ovary* attenuate-ovate, appressed-pilose, 2 mm. *Fruit* woody, 4–6 by 2½–3 cm, sulcate, with 6 ribs; peduncle 1–1½ cm. *Seeds* numerous.

Distr. *Malaysia:* NW. Sumatra (Simalur Isl.).

Ecol. In marshy forest.

Use. Wood sufficiently durable for house-construction.

Vern. *Kadundun dotan, k. silai, k. pajo, ilifen batu.*

42. Casearia tuberculata BL. Mus. Bot. 1 (1850) 254; MIQ. Fl. Ind. Bat. 1, 1 (1855) 709.—*C. hydnocarpoides* QUIS. Philip. J. Sc. 76 (1944) 54.—*C. coriacea* (*non* VENT.) MIQ. Fl. Ind. Bat. 1, 1 (1855) 708; KOORD. & VAL. Bijdr. Booms. 1 (1894) 179; KOORD. Jungh. Gedenkb. (1910) 181; Exk. Fl. Java 2 (1912) 636; Atlas Baumart. Java 2 (1914) t. 345; SLOOT. Bijdr. Flac. (1919) 157; RIDL. Fl. Mal. Pen. 1 (1922) 832; KOORD. Fl. Tjibodas (1923) 193; SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 402, *pro parte*; BURK. & HEND. Gard. Bull. Str. Settl. 3 (1925) 378; DOCTERS VAN LEEUWEN, Zoocecid. (1926) 392; HEYNE, Nutt. Pl. (1927) 1141; MERR. Contr. Arn. Arb. 8 (1934) 110; BURK. Dict. 1 (1935) 472; BACK. Fl. Java (em. ed.) 4, 2 (1942) fam. 84, p. 4.

Medium-sized tree, 4–20 m; bark smooth, whitish; branchlets glabrous, soon covered with a striate, whitish cork. *Leaves* elliptic-oblong to oblong, sometimes ± obovate, mostly ± acutely and sometimes obliquely acuminate at the apex, attenuate into the petiole at the base, ± equilateral, coriaceous to subcoriaceous, laxly but conspicuously pellucid-punctate and -striate, the younger ones red-brown, similarly in colour when dry, entire or nearly so, 5½–15 by (3–)4–6 cm; midrib little or not prominent above, very so beneath, nerves 5–7(–8) pairs arcuate-ascending, mostly little prominent underneath, veins and veinlets densely prominently reticulated on both surfaces; petiole 1–1½ cm, glabrous. *Fascicles* few- or rarely many-flowered. Bracts numerous, scariose, appressed-pilose outside to nearly glabrous, *c.* 1 mm. Pedicels 3–5 mm, glabrous or sparsely pubescent. *Flowers* white or greenish-white, often galled and becoming larger and hard. *Calyx* 3–4(–5) mm, deeply 5-lobed, glabrous or with a few scattered hairs outside, dawny or papillose-velutinous inside, somewhat accrescent in fruit. *Stamens* (6–)8(–9, rarely 10), equal; filaments stoutish, glabrous, 1½ mm. Staminodes similar to the filaments, 1 mm, fimbriate at the apex. *Ovary* ovoid, glabrous or with a few pale hairs, 2½ mm. *Fruit* oblong-ellipsoid, orange to orange-red when fresh, fleshy, (3–)4–5(–6) by ± 1.6 cm; peduncle 7–8 mm. *Seeds* mostly few, 4–6 mm, aril fiery-red.

Distr. *Malaysia:* Sumatra (Atjeh, Tapanuli, Bencoolen), W. Java, once found in the Philippines (Palawan).

Ecol. In Sumatra and Java in mixed montane rain-forest, 1100–1900 m; *fl. fr.* Jan.–Sept.

Uses. Wood hard, white, not durable and too small in size.

Vern. *Tjangtjanatan, ki tèrong, ki pinang, ki tangkil, ki bontèng,* J, *kaju banitan batu,* M.

Note. The differences between *C. tuberculata* and *C. hydnocarpoides* described from Palawan, are so slight, that I cannot maintain the latter as a distinct species. *C. hydnocarpoides* has been collected 'on forested slopes at low altitude', but no fruits were obtained.

Specimens very similar to *C. tuberculata*, but differing by longer, pubescent pedicels, pubescent calyx outside, and the ovary hairy apically, have been found in E. Borneo also at low elevation. As the fruit is not yet known, it cannot be decided, whether these specimens represent a new species or belong to *C. tuberculata.*

43. Casearia clarkei KING, J. As. Soc. Beng. 67, ii (1898) 18; RIDL. Fl. Mal. Pen. 1 (1922) 833.—*C. albicans* (*non* WALL.) CLARKE in HOOK. *f.* & TH. Fl. Br. Ind. 2 (1879) 593, *pr. p.*

var. **clarkei.**

Tree 10–15 m; young branches striate, glabrous. *Leaves* narrow-oblong, gradually acuminate and subacute at the apex, cuneate at the base, ± inequilateral, coriaceous, brownish when dry, glabrous, shining on both faces, 15–25 by 5–7½ cm, entire or nearly so; midrib slightly prominent above, strongly so beneath, nerves 5–7 pairs, curved below, then ascending-suberect, little raised or slightly impressed above, sharply prominent beneath, veins distantly transverse, finely raised on both faces as are the rather dense reticulations; petiole stout, 8–12 mm. *Glomerules* very condensed, many-flowered. Pedicels 6 mm, glabrous. Bracts small, *c.* 0.7 mm, pubescent. *Calyx* green, *c.* 2½ mm, deeply 5-lobed, glabrous outside, densely greyish-puberulous inside. *Stamens* 8, equal; filaments thick-filiform, glabrous, 1 mm. Staminodes thick, somewhat flattened, ½ mm, nearly glabrous except the minutely pilose apex. *Ovary*

ovoid, glabrous. *Fruit* ovoid to ellipsoid, bright yellow, 5–6 by 2½–3 cm.

Distr. *Malaysia:* Malay Peninsula (Malacca, Singapore, Selangor, Perak, Penang).

Ecol. In forests up to 1000 m.

Note. Specially in leaf-characters similar to *C. capitellata*, but the fruit much bigger.

var. **kunstleri** (KING) RIDL. Fl. Mal. Pen. 1 (1922) 833; BURK. & HEND. Gard. Bull. Str. Settl. 3 (1925) 378.—*C. kunstleri* KING, J. As. Soc. Beng. 67, ii (1898) 17.

Differing from the typical species by the ± pear-shaped fruit, 6–7 by 5 cm. Tree 20–28 m, leaves ± 4 cm wide.

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

Vern. *Pĕtong kĕkora*, Pahang.

44. Casearia macrocarpa CLARKE in HOOK. *f.* & TH. Fl. Br. Ind. 2 (1879) 593; KING, J. As. Soc. Beng. 67, ii (1898) 18; RIDL. Fl. Mal. Pen. 1 (1922) 853.

Small tree *c.* 6 m, glabrous; young branches reddish. *Leaves* narrow-lanceolate, ± acutely acuminate at the apex, narrowed at the base, thinly coriaceous, red-brown when dry, shining, entire, very laxly or not pellucid-punctate and/or -striate, 10–15 by 2½–3(–3½) cm; midrib slightly raised above, prominent beneath, nerves 5–6 pairs, ± erect and excurrent along the leaf-margin, reticulations rather dense and prominent on both surfaces; petiole slender, 6–8(–10) mm. *Flowers* 1–2 per axil. Pedicels *c.* 3½ mm, glabrous. Bracts few, very small. *Calyx* 2½ mm, glabrous outside, minutely grey-velvety inside, lobes oblong, blunt, nearly as long as the calyx-tube. *Stamens* 8, equal; filaments thick, 0.8 mm, pilose at the base; anthers ovate, nearly as long as the filaments. Staminodes ½ mm, densely ferrugineous-hirsute. *Ovary* narrow-ovoid, pilose in the upper half only, 2 mm. *Fruit* narrow-obovoid to ellipsoid, compressed, 3.6–4 by 1.2–1.5 cm. *Seeds* obovoid.

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

Ecol. Hilly forests, local.

Note. Comes near *C. clarkei var. kunstleri*, and perhaps only a narrow-leaved form of it.

45. Casearia ledermannii GILG, Bot. Jahrb. 55 (1918) 286.

Shrub or very slender tree, (1–)1½–5 m; young branchlets applanate, tips minutely pubescent, soon glabrescent, dark-brown to blackish when dry. *Leaves* ovate or ovate-oblong to oblong, ± abruptly subacutely acuminate at the apex, cuneate at the base into the petiole, entire, firmly chartaceous, laxly pellucid-punctate and-lineate, glabrous, but sometimes very minutely pubescent along the midrib beneath, dark-brown to blackish-brown when dry, 6–8(–10) by 2½–4¼ cm; midrib not or slightly raised above, distinctly so beneath, nerves (4–)5–6(–7) pairs, curved upwards, flat above, little prominent beneath, reticulations of veins and venules dense and little but markedly prominent on both surfaces specially beneath; petiole glabrous, *c.* 3 mm. *Flowers* greenish, 1 or 2 on top of a very short (1 mm) axis, this densely covered with membranous, pubescent bracts which do not conceal the pedicel. Pedicel rather slender, minutely pubescent, 2–2½ mm. *Calyx* 1½ mm, minutely pubescent outside, greyish-papillose or -velutinous inside, deeply 5-lobed. *Stamens* 10; filaments filiform, glabrous, alternately 0.5 and 0.3 mm. Staminodes very short triangular, densely pilose. *Ovary* narrow-ovoid, glabrous, 1.8 mm. *Fruit* (not seen) ovoid-subglobose, orange. *Seeds* few, aril blood-red.

Distr. *Malaysia:* NE. New Guinea (Sepik region).

Ecol. In dense, mossy rain-forest, 1000–1150 m.

46. Casearia flavovirens BL. Mus. Bot. 1 (1850) 254, t. 50; MIQ. Fl. Ind. Bat. 1, 1 (1855) 710; KOORD. & VAL. Bijdr. Booms. 1 (1894) 178; KOORD. Exk. Fl. Java 2 (1912) 636; Atlas Baumarten Java 2 (1914) t. 346; SLOOT. Bijdr. Flac. (1919) 155; Bull. Jard. Bot. Btzg III, 4 (1922) 279; *ibid.* III, 7 (1925) 401; BACK. Fl. Java (em. ed.) 4, 2 (1942) fam. 85, p. 3.—*C. odorata* T. & B. Nat. Tijd. Ned. Ind. 2 (1851) 304; Ned. Kruidk. Arch. 3 (1855) 408; MIQ. Fl. Ind. Bat. 1, 1 (1855) 710.—**Fig. 37.**

Large tree, 15–30 m, bark grey. Branchlets glabrous. *Leaves* elliptical-oblong or elliptical-lanceolate, with long-elongate apex, obtuse or rounded at the base, rarely subcordate or cuneate, coriaceous, glabrous, obtusely crenate-serrate (1 mm) or entire, shining specially above, olivaceous-yellowish when dry, pellucid-punctate, 12–22(–25) by 5–8(–9) cm; midrib little prominent above, very so beneath, nerves 12–15 pairs, curved upwards, nearly flat above, prominent beneath, veins ± transverse and veinlets ± densely reticulate and finely prominent on both surfaces; petiole glabrous, 1–1½(–2) cm. *Fascicles* many-flowered, normally axillary, but also recorded from leafless nodes. *Flowers* fragrant, greenish-white, light-green or yellowish-green. Bracts minute, scariose, densely pubescent, rather numerous. Pedicels glabrous, slender, 10–15 mm in anthesis. *Calyx* glabrous on both sides, *c.* 5 mm, deeply 5-lobed, lobes reflexed during anthesis. *Stamens* 10; filaments filiform, cream-coloured, 3–4 mm, nearly glabrous; anthers laxly patently hairy, light-yellow. Staminodes light-yellow, clavate, densely hirsute, 3 mm. *Ovary* narrow-ovoid, 5 mm, densely hairy; style 2 mm, glabrescent. *Fruit* ellipsoid, beaked, with 3 strong longitudinal ribs, *i.e.* the edges of the valves, glabrous, hard and hexagonous when dry, orange or yellowish or reddish-orange when ripe, 5–7 (rarely up to 9) by 3–3½ cm; peduncle 1.2–1.5 cm long, *c.* 2 mm diam. *Seeds* numerous, striate with deep-red aril.

Distr. *Malaysia:* Java, Lesser Sunda Islands (Bali).

Ecol. In mixed primary or devastated rain-forest, up to 800 m; *fl. fr.* Jan.–Dec.

Uses. Wood little durable.

Vern. *Rasakadu, huru tulang*, S, *njampu wedi*,

Fig. 37. *Casearia flavovirens* BL., × 2/7 (C.H.B. IV–F–20a).

bĕlung, balung, badung, pĕndjaliran tĕndjang, J. Bali: *putih* (*butu*) *mejong*.

47. Casearia minutiflora RIDL. J. Bot. 62 (1924) 297; HEND. Gard. Bull. Str. Settl. 4 (1926) 97.

Shrub 1½ m; branchlets entirely glabrous, striate, soon covered with a thin, grey cork. *Leaves* oblong-lanceolate, 1–1½ cm obtusely acuminate at the apex, cuneate at the base, glabrous, dark green-brownish when dry, shining on both sides, subcoriaceous, entire, laxly pellucid-striate, not or obscurely pellucid-punctate, 5–10 by 2½–4½ cm; midrib distinctly impressed above, prominent beneath, nerves 4–5(–6) pairs, curved-ascending,

distinctly anastomosing near the leaf-margin, little prominent above, more so beneath, veins and veinlets equally and ± densely reticulate-prominent on both faces; petiole rather slender, blackish, glabrous, *c.* 5 mm. *Flower* 1–2 per fascicle, subsessile, very small, green. Bracts ovate, subacuminate, 1½ mm, membranous, glabrous. *Calyx* 2½ mm, 4 or mostly 5-lobed, the lobes ovate-oblong, obtuse, glabrous on both sides. *Stamens* (6–)8, equal; filaments thick-filiform, subulate towards the apex, glabrous, *c.* 0.9 mm; anthers minute. Staminodes oblong, pilose specially at the apex, 0.6 mm. *Ovary* ovoid, glabrous. *Fruit*, apparently not quite mature, 1½ by 1 cm, nearly sessile, probably yellow, with 3–4 rather big red *seeds*.

Distr. *Malaysia:* Malay Peninsula (known with certainty only from the type-locality: Fraser Hill, Pahang).

Ecol. Mountain-forest, 1200–1300 m.

Note. Possibly only a few-flowered form of *C. flexula* RIDL.

48. Casearia flexula RIDL. Fl. Mal. Pen. 1 (1922) 832, f. 67.—*C. flexuosa* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 41, *non* CRAIB 1911.

Shrub; branches flexuous, with pale bark, branchlets glabrous. *Leaves* lanceolate, narrowed at both ends, subacute at the apex, thinly coriaceous, glabrous, shining, brownish when dry, laxly pellucid-striate, not or obscurely pellucid-punctate, entire, midrib slightly prominent above, strongly so beneath; nerves 4–5(–6) pairs, nearly flat above, little raised beneath; reticulations dense and rather prominent on both sides; petiole 5–8 mm, slender. *Fascicles c.* 20-flowered. Bracts numerous, membranous, acute, ciliate. Pedicels 2–3 mm, slender, glabrous. *Calyx* 2½ mm, glabrous. *Stamens* 8, equal; filaments glabrous, 0.8 mm; anthers apiculate by the thick connective. Staminodes oblong-linear, villous at the tips only, ½ mm. *Ovary* glabrous *c.* 1.6 mm. *Fruit* ellipsoid, said to be apricot-coloured when fresh, *c.* 1.8 cm long; peduncle 5 mm.

Distr. *Malaysia:* Malay Peninsula (known with certainty only from the type-locality: Kedah Peak = G. Jerai), 660–1200 m.

Note. Very similar specimens I saw from G. Angai, Negri Sembilan, 700 m, and G. Tahan, Pahang, 1000–1200 m, G. Hijau, Perak, 1440 m. Also specimens from W. Sumatra: G. Kerintji and G. Talakmau, 1750–2000 m, and Borneo: Mt Kinabalu, 1800 m, Mt Kemul, 1800 m, seem to belong to *C. flexula*, which may be a mountain-form of *C. capitellata* BL. with smaller, less coriaceous leaves.

49. Casearia capitellata BL. Mus. Bot. 1 (1850) 254; MIQ. Fl. Ind. Bat. 1, 1 (1855) 709; MERR. En. Born. (1921) 412.—*C. latifolia* RIDL. J. Str. Br. R. As. Soc. *no* 75 (1917) 34, *obs.*; Fl. Mal. Pen. 1 (1922) 831.—*C. albicans* (*non* WALL. *ex* CLARKE *quoad* WALLICH 7197.2, 7197.3) KING, J. As. Soc. Beng. 67, ii (1898) 16 *quoad* WALLICH 7197.1, 7432.—*C. borneensis* MERR. J. Str. Br. R. As. Soc. *no* 86 (1922) 333; Pl. Elm. (1929) 210.

A big shrub or treelet, 3–4 m, with flexuous white slender branches, quite glabrous. *Leaves* elliptic-ovate to elliptic-oblong, rather abruptly (1½–2 cm) acuminate and mostly subacute at the apex, broadly attenuate to rounded at the base, thinly coriaceous, flexuous, dark green to brownish when dry, shining on both surfaces, (10–)12–18 (–20) by (4½–)5–8(–10) cm, very laxly or not pellucid-punctate and -striate, entire; midrib grooved or little prominent, strongly raised beneath, nerves *c.* 8 pairs curved-ascending, little or not prominent above, sharply so beneath, reticulations close, finely but distinctly raised on both faces; petiole rather slender, dark when dry, 6–10(–15) mm. *Flowers* pale-green or white, in mostly many-flowered fascicles. Bracts ovate, acuminate, subacute, 1 mm, pubescent. Pedicels slender, glabrous, 4–5 mm. *Calyx* 2–2½ mm, glabrous in- and outside, lobes ovate-oblong. *Stamens* 8, equal; filaments filiform, glabrous, 1 mm; anthers minute. Staminodes subrectangular, a little flat, ½ mm, pilose at the apex. *Ovary* ovoid, glabrous. *Fruit* oblong-ellipsoid, in fascicles of 2–3, yellow to orange when mature, 1½–2 by 1 cm; peduncle 5 mm. *Seeds* few.

Distr. *Malaysia:* Sumatra (also Simalur & Banka Islands), Malay Peninsula (Penang, Pahang, Selangor, Perak, Wellesley, Trengganu, Kemaman), Borneo.

Ecol. Hill forests, 100–500 m.

Vern. *Mĕlilien*, Banka, *ielah-ielah uding*, *tutun kadundun*, *t.k. buluh*, *arelah uding*, *kadundun sitobulung*, Simalur.

50. Casearia brevipes MERR. Philip. J. Sc. 9 (1914) Bot. 326; En. Philip. 3 (1923) 114.

Small tree or shrub; branchlets slender, minutely pubescent, soon glabrous and brownish to greyish-corticate. *Leaves* oblong or oblong-lanceolate, gradually acuminate and subacute at the apex, broadly cuneate to nearly rounded at the base, chartaceous, glabrous, light-brownish when dry, somewhat shining, densely pellucid-punctate, not or very little pellucid-striate, entire or minutely glandular-denticulate, 14–20 by 4–7 cm; midrib prominent above in the inferior half, very so beneath, nerves 8–10 pairs, straight in the basal part, apically curved upwards, flat above, prominent beneath, reticulations little visible above, distinctly so beneath; petiole *c.* 2 mm long and thick. *Fascicles* few-flowered, on prominent, densely bracteate tubercles. Bracts small, *c.* 0.7 mm diam., pubescent. Pedicels glabrous, *c.* 3 mm. *Calyx* 3 mm, glabrous on both sides, deeply 5-lobed. *Stamens* 10, equal; filaments thick, glabrous, 0.8 mm; anthers ovate, as long as the filaments. Staminodes 0.4 mm, thick, pilose at the apex. *Ovary* narrow-ovoid, 2 mm, glabrous or with a few hairs. Fruit ovoid-ellipsoid, *c.* 1 cm, orange subsessile. *Seeds* red.

Distr. *Malaysia:* Philippines (Luzon, Basilan).

Ecol. In forests along streams at low elevation.

51. Casearia novo-guineensis VAL. Bull. Dép. Agric. Ind. Néerl. 10 (1907) 35; SLOOT. Bijdr.

Flac. (1919) 156; Nova Guinea 14 (1924) 94; Bull. Jard. Bot. Btzg III, 7 (1925) 412.

Small tree or shrub; branchlets initially finely pubescent, glabrescent. *Leaves* elliptic-lanceolate to elliptic-oblong, shortly ± obtusely acuminate at the apex, cuneate at the base, subinequilateral, practically glabrous but very minutely pubescent on the midrib beneath, chartaceous, blackish-brown when dry, obscurely crenulate to entire, not pellucid-punctate or -striate, 11–15 by 3½–5 cm; midrib nearly flat above, prominent beneath, nerves 8–9 pairs, curved upwards, little prominent beneath, veins transverse, rather obscure on both surfaces; petiole glabrous, *c.* 5 mm. *Flowers* few per fascicle. Bracts small, 1 mm, numerous, ovate, subacute, membranous, sparsely pubescent. Pedicels ½ mm. *Calyx* 2½ mm, glabrous, the upper half 5-lobed. *Stamens* 10; filaments filiform, shortly pubescent, alternately 1 and 0.6 mm. Staminodes very short, barbate. *Ovary* narrow-ovoid, 1.6 mm, ± densely hairy.

Distr. NW. New Guinea (P. Jatuwar near Wakobi, Geelvink Bay), in rain-forests.

52. Casearia brideliifolia SLEUM. Blumea 7 (1954) 487.

Shrub 2 m; branchlets laxly beset with minute hairs, practically glabrous, nigrescent when dry, older parts covered with a thin grey cork. *Leaves* elliptic or oblong-elliptic, 1 cm subacutely acuminate at the apex, cuneate into the very short petiole at the base, dark-brown when dry, dull, glabrous, subcoriaceous, the younger rather densely and minutely pellucid-punctate and -striate, mature ones ± without pellucid dots, (10–)12–18 by (5–)6–9 cm, entire to shallowly undulate; midrib prominent beneath, nerves *c.* 9 pairs, curved upwards toward the margin, prominent beneath, veins ± transverse and distant, a little raised beneath only; petiole rather thick, *c.* 2 mm, glabrous. *Fascicles* 3–4-flowered. Pedicels rather thick, *c.* 2 mm, glabrous. Bracts small, ciliate, 1 mm. *Calyx* 2 mm, deeply 5-lobed, glabrous in- and outside. *Stamens* 10; filaments filiform, glabrous, alternately 0.6 and 0.4 mm; anthers minute. Staminodes elongate-triangular, applanate, fimbriate at the apex, ½ mm. *Ovary* ovoid, glabrous, 1½ mm; style short but distinct. Immature *fruit* red, glabrous, on a 2–3 mm long peduncle.

Distr. *Malaysia:* NW. New Guinea (Nabire, Geelvink Bay), once collected.

Ecol. Rain-forest, *c.* 400 m.

53. Casearia euphlebia MERR. Philip. J. Sc. 13 (1918) Bot. 34; En. Philip. 3 (1923) 115.

Shrub *c.* 2 m; young branches slender, pallid, pubescent at the tips, soon covered with peeling, greyish cork. *Leaves* oblong-ovate to oblong-elliptic, 1 cm rather abruptly obtusely acuminate at the apex, very broadly cuneate to rounded at the base, ± equilateral, olivaceous when dry, somewhat shining above, dull beneath, ± firmly chartaceous, distinctly pellucid-punctate and -striate, minutely denticulate to nearly entire, 6–13 by (3½–)4–6 cm; midrib little prominent above, strongly so beneath and sometimes minutely pubescent at the base, nerves *c.* 7 pairs, rather straight-ascending and subparallel to each other, slightly impressed above, markedly prominent beneath, veins laxly transverse obscure above, little raised beneath; petiole glabrous or minutely pubescent, 3–5 mm. *Flowers* solitary. Pedicels stoutish, 2–2½ mm. Bracts very small, few. *Calyx*-lobes elliptic-rounded, *c.* 4 mm, minutely pubescent or nearly glabrous outside. *Stamens* 8 subequal; filaments filiform, glabrous, *c.* 1½ mm; anthers minute, oblong. Staminodes triangular-oblong, truncate, thin and flat, *c.* 1½ mm long, 0.7 mm wide at the base, pilose at the apex. *Ovary* glabrous, ovoid. Young *fruit* red, oblong, *c.* 1½ cm.

Distr. *Malaysia:* Philippines (Leyte, Samar).

Ecol. In forests at low altitude.

54. Casearia oreogenes SLEUM. Blumea 7 (1954) 490.

Small tree or shrub; branchlets angular, nigrescent, minutely pubescent at the tips, glabrous elsewhere, older parts grey-corticate. *Leaves* subovate-elliptic-oblong, gradually obtusely acuminate at the apex, very broadly cuneate to truncate at the base, but protracted into the petiole at the very base, subcoriaceous, rather densely pellucid-punctate and -striate, glabrous except the finely pubescent midrib of the immature leaves, somewhat shining on both surfaces, dark-brown when dry, entire or minutely sinuate-denticulate, 15–20 by 6–9 cm; midrib stout beneath, nerves 10–11 pairs, little curved, straight-ascending towards the leaf-margin and ± parallel to each other, veins transverse, rather obscure above, more conspicuous beneath, reticulations visible underneath only; petiole stoutish, laxly pubescent, 4–7 mm. *Fascicles* 3–4-flowered. Bracts rather few, ovate, pubescent, 1 mm. Pedicels blackish when dry as is the calyx, firm, glabrous, 2–3 mm. *Calyx* subcoriaceous, glabrous outside, puberulous inside, 5 mm, rather deeply 5-lobed, the lobes oblong subacute. *Stamens* 10; filaments filiform, glabrous, alternately 2 and 1½ mm; anthers subglobose, 0.4 mm diam. Staminodes triangular-oblong, applanate, densely whitish-hirsute, 1 mm. *Ovary* ovoid, densely whitish-hairy as is the receptacle, 2 mm, stigma sessile. *Fruit* ellipsoid, laxly pubescent to glabrescent, red, *c.* 1.8 by 1.5 cm; peduncle 3 mm.

Distr. *Malaysia:* NE. New Guinea (Sattelberg region), once found.

Ecol. In hill forest, 600–900 m.

55. Casearia halmaherensis SLOOT. Bull. Jard. Bot. Btzg III, 7 (1925) 410, f. 15.

Treelet or tree, 2½–24 m; branchlets glabrous or nearly so, compressed, blackish when dry. *Leaves* oblong to oblong-ovate, ± abruptly obtusely acuminate at the apex, broadly cuneate to rounded at the base, ± equilateral, firmly chartaceous or subcoriaceous, blackish-brownish when dry, glabrous, shining on both surfaces, not or minutely pellucid-punctate, entire, 10–16 (rarely up to 22) by 4½–6 (rarely up to 10) cm; midrib flat above,

prominent beneath, nerves 9–10 pairs, rather straight and subparallel to each other, obscure or slightly impressed above, prominent beneath, veins distantly transverse, nearly inconspicuous above, little prominent beneath, reticulations fine and dense beneath only; petiole 4–6 mm, glabrous. *Fascicles* many-flowered, seen in buds only. Bracts rather few, ovate, acute, ciliate, 1 mm. Pedicels 2–3 mm, glabrous. *Calyx* glabrous outside, nigrescent, *c.* 3 mm. *Stamens* 10; filaments slightly pilose, alternately 1 and 0.7 mm. Staminodes 1/2 mm, barbate towards the apex. *Ovary* glabrous. *Fruit* ovoid-oblong, *c.* 1.2–2 by 1.1–0.8 cm, yellowish to orange when fresh, nigrescent when dry; peduncle 5–7 mm.

Distr. *Malaysia:* Moluccas (Halmahera, Ternate).

Ecol. Scattered in young forests, up to 350 m.

Vern. *Tu uhi*, Halmah., *dongo-dongo*, Ternate.

56. Casearia flexicaulis K. SCHUM. in SCHUM. & LAUT. Nachtr. Fl. Deut. Schutzgeb. Südsee (1905) 320; GILG, Bot. Jahrb. 55 (1918) 289.

Small tree, 10–12 m, trunk and branches flexuous; branchlets slender, ± densely minutely pubescent, brownish when dry, terete. *Leaves* oblong or lanceolate-oblong, sometimes ovate-oblong, broadly obtusely acuminate at the apex, cuneate at the base, ± inequilateral, coriaceous to subcoriaceous, yellowish-brown when dry, paler beneath, shining above, not pellucid-punctate, entire, 6–10 by 3–4 1/2 cm; midrib slightly prominent above, distinctly so beneath, nerves 5(–6) pairs, curved-ascending, flat, little prominent beneath, veins distantly transverse, nearly inconspicuous above, minutely raised beneath as are the finer reticulations; petiole slender, glabrous, 5–7 mm. *Fascicles* many-flowered, from small, subglobose tubercles. *Flowers* greenish. Bracts small, 1/2 mm diam., pubescent. Pedicels slender, laxly pilose, 3–4 mm. *Calyx* 3 mm, deeply 5-lobed, pubescent outside, glabrous inside. *Stamens* 10; filaments alternately 1 and 0.6 mm, nearly glabrous. Staminodes 1/2 mm, densely villous. *Ovary* narrow-ovoid, 2 mm, glabrous or nearly so, the stigma sessile.

Distr. *Malaysia:* NE. New Guinea (Sattelberg, Morobe Distr.).

Ecol. In forests, 1000–1100 m.

Note. WHITE (J. Arn. Arb. 10, 1929, 244) mentions *C. flexicaulis* from British Papua, but his specimen is not conspecific, the nerves being more numerous.

57. Casearia glabra ROXB. Hort. Beng. (1814) 33, *nomen*; Fl. Ind. 2 (1832) 421, *descr.*; MERR. Philip. J. Sc. 11 (1916) Bot. 293.—*C. moluccana* BL. Mus. Bot. 1 (1850) 255; MIQ. Fl. Ind. Bat. 1, 1 (1855) 711; SLOOT. Bijdr. Flac. (1919) 159; Bull. Jard. Bot. Btzg III, 7 (1925) 404; MEIJER DREES, Comm. For. Res. Inst. 33 (1951) 106.

Shrub or small tree, *c.* 3 m; branchlets slender, minutely puberulent. *Leaves* ovate to oblong-ovate, gradually acuminate towards the apex, subacute, broadly or mostly rounded at the base, somewhat protracted into the petiole at the very base, subcoriaceous, entirely glabrous, mostly shining above, ± dark brown when dry, practically not pellucid-punctate, entire to obscurely crenate, (8–)12–16(–20) by (3–)5–8(–10) cm; midrib slightly or not raised above, prominent beneath, nerves 8(–9) pairs, curved and ± parallel to each other, prominent beneath, veins transverse, little conspicuous above, more so beneath as are the fine rather dense reticulations; petiole finely pubescent, *c.* 5 mm. *Fascicles* 4–6-flowered, showing a tendency to grow into very short axes with age. Bracts dense, ovate, acuminate, 1 mm, nearly glabrous. Pedicel glabrous, 1 mm. *Calyx* entirely glabrous, 2 1/2 mm. *Stamens* 10; filaments glabrous alternately 0.9 and 0.6 mm. Staminodes triangular, densely pilose as is the receptacle, 1/2 mm. *Ovary* narrow-oblong, laxly pilose towards the apex; style short. *Fruit* oblong-elliptic, *c.* 1.2 by 0.8 cm; peduncle 2 mm. *Seeds* few.

Distr. *Malaysia:* Moluccas (Amboina, W. Ceram, Buru: Kajeli).

Ecol. Preferably in evergreen forests up to 1500 m.

58. Casearia urophylla GILG, Bot. Jahrb. 55 (1918) 287.

Treelet 8–10 m; branchlets angular, laxly and very shortly pilose, soon covered with a thin yellowish-greyish cork. *Leaves* oblong or oblong-lanceolate, narrowly and *c.* 2 cm acutely acuminate at the apex, long-attenuate at the base, chartaceous to membranaceous, glabrous, laxly pellucid-punctate and longish pellucid-striate, blackish-brown when dry, 7–10 by 2 3/4–3 1/4 cm, entire; midrib prominent on both sides, nerves 8–9(–11) pairs, not raised above, little so beneath, veins numerous and densely reticulated, little or not conspicuous above, prominent beneath; petiole 7–10 mm. *Flowers* yellowish-greenish, numerous in dense fascicles on short (up to 1 mm) axes, these covered with minute, ciliolate bracts. Pedicels slender, sparsely pubescent. *Calyx* 2 mm, short-pilose, deeply 5-lobed. Well-developed flowers and fruits not yet known.

Distr. *Malaysia:* NE. New Guinea (Sepik region: Aprilfluss), once found in rain-forest 60 m.

Note. The species was described with stamens and ovary transformed into sterile leaf-whorls.

59. Casearia loheri MERR. Philip. J. Sc. 9 (1914) Bot. 327; En. Philip. 3 (1923) 115.—*C. elliptifolia* (*nec* MERR. 1916) ELM. *ex* MERR. En. Philip. 3 (1923) 115, *in obs. pr. syn.*; Leafl. Philip. Bot. 10 (1939) 3738, *descr.*—*C. paucinervia* MERR. & QUIS. Philip. J. Sc. 82 (1953) 331.

Small shrub-like tree, 4–6 m; branchlets slender, minutely pubescent, dark brown, the elder parts greyish. *Leaves* oblong-ovate to elliptic, mostly subabruptly obtusely acuminate at the apex, broadly attenuate to rounded at the base, chartaceous, brown and dull when dry, paler beneath, initially very laxly pilose on the midrib beneath, entirely glabrous at maturity, densely, minutely

pellucid-punctate, entire, 8–16(–18) by 4–6(–8) cm; midrib a little impressed above, prominent beneath, nerves (4–)5–6(rarely up to 8) pairs, curved-ascending, obscure above, little raised beneath, veins distantly transverse, somewhat elevated beneath, reticulations ± distinct; petiole laxly pubescent, 4–7 mm. *Fascicles* few-flowered. Bracts broad-ovate, pubescent, 0.6 mm. Pedicels 1½–2 mm, pubescent. *Calyx* yellowish-green, laxly pilose outside, glabrous inside, very pellucid-punctate, *c.* 3½ mm. *Stamens* 8, equal; filaments filiform, glabrous, 1.4 mm; anthers oblong-ovate, 0.8 mm. Staminodes oblong, thick, *c.* 0.9 mm, hirsute towards the apex only. *Ovary* ovoid, 1.2 mm, densely subferrugineous-pilose in the upper half, glabrous towards the base. *Fruit* ovoid-ellipsoid, yellow or reddish, glabrous, *c.* 1.2 by 0.8 cm; peduncle 2 mm. *Seeds* 8–12(–15), red, *c.* 5 mm.

Distr. *Malaysia:* Philippines (Luzon, Mindanao, Samar).

Ecol. In primary forests, up to 660 m.

Use. Wood moderately hard, yellowish-white.

60. Casearia olivacea SLEUM. Blumea 7 (1954) 490.

Small tree 4–5 m; branchlets slender, terete, glabrous, brownish. *Leaves* ovate-oblong, 1½–2 cm subcaudate-acuminate and acute at the apex, attenuate at the base into the petiole, chartaceous, olivaceous and dull when dry, very densely and rather minutely pellucid-punctate (not -striate), entire, glabrous, (9–)10–15 by 3–5 cm; midrib little elevated above, manifestly so beneath, nerves (4–)5–6 pairs, curved-ascending and excurrent along the leaf-margin, the superior 2–3 slightly in-arched, all obscure above, little prominent beneath, veins ± transverse and distant, somewhat raised beneath, reticulations inconspicuous. *Fascicles* 4–6-flowered. *Flowers* white. Bracts minute, ½ mm, densely whitish-pubescent, forming small glomerules. Pedicels laxly pilose, ± 1½ mm. *Calyx* laxly pilose outside, puberulous inside, the 5 lobes *c.* 3 mm. *Stamens* 10; filaments thick-filiform, very laxly pilose, alternately 1.1 and 0.8 mm; anthers subglobose, 0.4 mm diam. Staminodes ½ mm, whitish-hirsute. *Ovary* narrow-ovoid 2½ mm, rather densely pilose; style very short. *Fruit* ellipsoid, glabrous or nearly so, red with yellow or greenish streaks, 3–3½ by 2–3 cm when ripe; peduncle pubescent, 4 mm.

Distr. *Malaysia:* SE. New Guinea (Fly River and Sogeri region).

Ecol. Rather common in rain-forest undergrowth, sometimes on low ridges, below 100 m.

Excluded

Casearia coriacea VENT. Choix (1803) 45, t. 45. —*C. fragilis* VENT. *ibid.* 47.—*C. fasciculata* BOJ. Hort. Maur. (1837) 71.

C. coriacea was described by VENTENAT after a specimen said to be collected at 'Batavia' by RICHE, one of the botanists of the voyage by 'La Recherche' and 'L'Espérance' (1791–1794). Subsequently, other material from Java was referred to VENTENAT's species, *e.g.* by KOORDERS & VALETON and by VAN SLOOTEN. None of them examined VENTENAT's type specimen. The latter reduced *C. tuberculata* BL. and *C. capitellata* BL. to the so-called *C. coriacea.*

The examination of the holotype of *C. coriacea,* preserved at Geneva, revealed, that *C. coriacea* is not conspecific with the Javanese plant, but distinctly so with *C. fragilis* VENT. from Réunion and Mauritius. It is now clear, that the type-specimen was not collected in Java, but in Mauritius, touched by the same expedition on their return voyage.

Casearia esculenta ROXB. Hort. Beng. (1814) 90, *nom. nud.*; Fl. Ind. 2 (1832) 422, *descr.*

C. esculenta was described from the Circar Mts (NE. Deccan); neither a type-specimen nor an original drawing seem to exist. Following the description by GAMBLE, Fl. Madras 3 (1919) 521, and concluding from Indian material, *C. esculenta* ROXB. is not represented in Malaysia, as *e.g.* KING, RIDLEY and VAN SLOOTEN were inclined to accept. Malaysian material formerly identified as *C. esculenta* belongs to *C. capitellata* BL., *C. minutiflora* RIDL., *C. tuberculata* BL. or other species.

Casearia tinifolia VENT. Choix (1803) 47, t. 47.—*Samyda tinifolia* POIR. Encycl. Suppl. 5 (1817) 32.—*Chaetocrater tinifolia* RAF. Sylv. Tell. (1838) 149.

This species was described by VENTENAT on the basis of a specimen assumed to have been collected in Java by LAHAYE, but material corresponding to the excellent plate in VENTENAT's work has never been collected again in Java. The type-specimen at Geneva is identical with material collected by COMMERSON (*no* 300) in Mauritius and preserved in the Paris Herbarium. The specimen of LAHAYE, who also joined the expedition of 'La Recherche' and 'L'Espérance', was apparently wrongly localized and came from Mauritius.

Casearia luzonensis WARB. in E. & P. Nat. Pfl. Fam. III, 6a (1893) 51, f. 19 D–F (*fr.*).

Unrecognizable; no description has been published.

GENERA AND SPECIES EXCLUDED

Dovyalis macrodendron GILG, Bot. Jahrb. 55 (1918) 282, f. 5; in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 441, f. 202.

Distr. NE. New Guinea (Sepik River), 100–200 m.

Note. The type: LEDERMANN 7400 (B) has been destroyed; no isotype seems to exist.

This species was described and figured with flowers in fascicles *opposite* the leaves. As *Dovyalis* has always axillary flowers, the species does not belong to this genus. Apparently not belonging to the *Flacourtiaceae*, perhaps to *Euphorbiaceae*.

Quadrasia euphorbioides ELM. Leafl. Philip. Bot. 7 (1915) 2656.

Described as a monotypic genus from the Philippines. MERRILL (En. Philip. 2, 1923, 430) reduced it to *Claoxylon* (*Euphorbiaceae*).