REVISION OF THE SAPOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

IV [1]). Ganua Pierre ex Dubard

by

J. VAN DEN ASSEM

(Leiden)

(Issued 18. XII. 1953)

GENERAL PART.

1. Historical notes.

Within the Sapotaceae, the tribe of the *Madhuceae* presents a very homogeneous group. One point of view is to consider it a single polymorphous genus. The opposite opinion was expressed by Pierre, who distinguished a number of small genera, many on futile characters. Amongst those which stood later criticism is the genus *Ganua* which was, however, not published by Pierre but by Dubard (1907, 1908a, 201 and 1908b, 407), who adopted Pierre's Ms names and made use of his extensive annotations.

The name *Ganua* is derived from the word ganu, the native name for latex produced by a tree, "used for falsifying the valuable products of 'gutta terbu'" (f. Errington de la Croix in schedula; cf p. 389).

Dubard (1908a, 201) describes *Ganua* as a genus whose most important features are the very low inserted ovules and the imperfectly closed cells of the conoidal ovary, the partitions of which ascend into the style like internal wings, thus leaving a central cavity above the placenta: "..... ce qui caractérise le mieux ce genre, c'est l'ovaire claviforme en continuité avec la base du style, les ovules sont insérés très bas et les cloisons séparatrices des loges sont libres au dessus de cette insertion, au lieu de confluer vers un axe central".

Among other important features given by Dubard (l. c.) are the thin pericarp, and the nervation of the leaves. Two more or less easily distinguishable, though unnamed, groups were mentioned by him in this respect: one with slender and fairly crowded nerves, transversal nervation, if any, hardly distinguishable, thus approaching the type of *Payena*; the other group with a wider and more prominent nervation, the minor nerves more distinctly transversal as in the section *Dasyaulus* of *Madhuca*.

The following species were recognised as *Ganuas* in the first publication on the genus (Dubard 1908b, 407): *G. chrysocarpa* Pierre ex Dubard

[1]) I—III in Blumea VI, 3, 1952, pp. 547—595.

(now *G. curtisii* [K. & G.] H. J. L.); *G. coriacea* Pierre ex Dubard; *G. motleyana* (de Vriese) Pierre ex Dubard; *G. rubiginosa* Pierre ex Dubard (now *G. fusca* [Engler] Merrill); *G. beccarii* Pierre ex Dubard; *G. sarawakensis* Pierre ex Dubard; *G. prolixa* Pierre ex Dubard; *G. boerlageana* (Burck) Pierre ex Dubard.

The three first mentioned species show a nervation like *Payena*, the others that of *Dasyaulus*.

Some extension to the genus was given by Lam who in his first study on Malaysian Sapotaceae (Lam 1925, 118) added the following species: *G. sessilis* (K. & G.) H. J. Lam; *G. scortechinii* (K. & G.) H. J. Lam (now *G. motleyana* [De Vriese] Pierre ex Dubard); *G. pallida* (Burck) H. J. Lam.

Later on, Lam (1927, 424) added two more species: *G. glaberrima* (H. J. L.) H. J. L. (now *G. kingiana* [Brace] Van den Assem) and the incompletely known *G. ligulata* H. J. L. (now *Madhuca ligulata* [H. J. L.] H. J. L.).

The publications of Dubard and Lam referred to in the present paper are abbreviated as follows:

Dubard 1907 = M. Dubard, Sur la délimitation et les relations des principaux genres d'Illipéées — C. R. A. S. 1907, 1058.

Dubard 1908a = M. Dubard, Les Sapotacées du groupe des Illipéées — Rev. Gén. Bot. XX 1908, 201.

Dubard 1908b = M. Dubard, Description de quelques types nouveaux ou peu connus de Sapotacées (Illipéées), d'après les documents de L. Pierre — Bull. Mus. Hist. Nat. XIV, 1908, 407.

Lam 1925 = H. J. Lam, The Sapotaceae, Sarcospermaceae and Boerlagellaceae of the Dutch East Indies and surrounding countries — Bull. Jard. bot. Buitenz., Sér. III, VII, 1925, 118.

Lam 1927 = H. J. Lam, Further studies on Malayan Sapotaceae I — Bull. Jard. bot. Buitenz., Sér. III, VIII, 1927, 424.

Lam 1945 = H. J. Lam, Notes on the historical phytogeography of Celebes — Blumea V, 3, 1945, 600.

2. Morphology and delimitation of the genus.

The combination of characters which together mark the genus *Ganua* as recognised by us, makes in general the genus pretty well distinguishable from other *Madhuceae*, though each of the characters shows a gradual transition to situations realised in other genera. The originally most stressed *Ganua* character, the often glabrous, conoidal ovary with the ovules inserted low in imperfectly closed cells, is not a constant one. The central cavity above the placenta can be larger or smaller and, moreover, the cavity tends to become larger with the age of the flower; in some species, such as *G. kingiana* and *G. curtisii*, the variability in this character within the species can be so wide that the ovary cells can even be completely closed and the central cavity wanting, a condition normally found in all other *Madhuceae*.

In the number of flower parts *Ganua* and *Madhuca* resemble each other. *Ganua* generally has 7—8 corolla lobes, in *G. kingiana* and *G. pierrei* up to 12; *Madhuca* has 8—12. The stamens in *Ganua* are generally 16, in *G. motleyana* and *G. curtisii* up to 22, in *G. pierrei* up to 24, in *G. kingiana* according to the original description by King and

Gamble up to 36. In *Madhuca* the number of stamens varies (according to literature) between 16 and 40. Of several *Ganua* species, however, corolla and stamens are unknown.

A reasonably good and easily recognisable *Ganua* character, represented in most of the species, is the rather distinct tuft of hairs at the apices of the calyx lobes. The pericarp which in Ganua is thin, dry and woody, together with the shape and nature of the seeds, are other important features. In *Madhuca* the pericarp is much thicker, a transition being found in *G. kingiana*; in addition, the fruit of that species has generally more cells than is the average in the genus. The seeds of *Ganua* have a very thin testa, a linear scar, a membranous or thin albumen and thick cotyledons; *Madhuca* is in this respect rather like *Ganua*. Unfortunately the fruits and seeds of several *Ganua* species are yet unknown.

Leaf characters like shape, thickness etc. are rather variable. In the nervation, however, a more constant character is to be found, useful also for distinguishing certain groups of species (see underneath). There is a type recalling that of *Payena* sect. *Ganuopsis*, another that of *Madhuca* sect. *Dasyaulus*. At least one *Ganua* species (*G. pachyphylla*) shows a resemblance to the nervation type found in *Burckella*.

Several *Ganua* species show a very distinct terminal bud with conspicuous large scales. Laterally the scales may possess stipular organs as are found in some of the uppermost leaves. Bud scales of such a size are, so far as we are aware, not known in other genera of the *Madhuceae*. Generally the stipules are caducous.

Summarising we may state that *Ganua* is distinguished by the following set of characters: terminal vegetative bud often with conspicuous bud scales, often with stipules; tertiary nervation mostly longitudinal; sepals mostly with distinct dark hair tufts; ovary gradually contracted into the hollow style, septa almost always imperfect, leaving the basal placenta free; pericarp thin and dry; testa of seeds thin, scar linear; albumen membranous.

For full generic description, see p. 369.

3. Distribution of the genus (cf. *Fig. 1*).

Ganua is known to be represented in the following areas: Sumatra, Malay Peninsula, Riau, Banka, Belitong, Borneo, Palawan, Luzon, Moluccas and New Guinea. From the Sumatran west coast, which differs geologically from the older and much lower east coast, only one doubtful specimen is known (*G. motleyana*).

The genus is apparently of Western origin, having its greatest diversity in the western parts of the archipelago, notably in western Borneo (Sarawak), but it is not limited to the Sunda-shelf. The genus was already known from the Moluccas; new localities prove it to be also represented in New Guinea. Remarkable is the gap of Celebes in the list of localities. Maybe his condition is due to imperfect knowledge, the alternative possibility being that *Ganua* reached the eastern parts of the archipelago via a migration track from North Borneo through the Philippines and the Moluccas (cf. Lam 1945, 600).

The possibility of a bi- or polyphyletic origin of the genus in the sense that the western species and the eastern ones should be convergent, seems doubtful, since there is, in my opinion, a rather distinct relationship between *G. orientalis* (New Guinea), *G. boerlageana* (New Guinea, Moluccas), *G. monticola* (Palawan), *G. beccarii* (Sarawak) and *G. sessilis* (Borneo, Belitong, Malay Pen.).

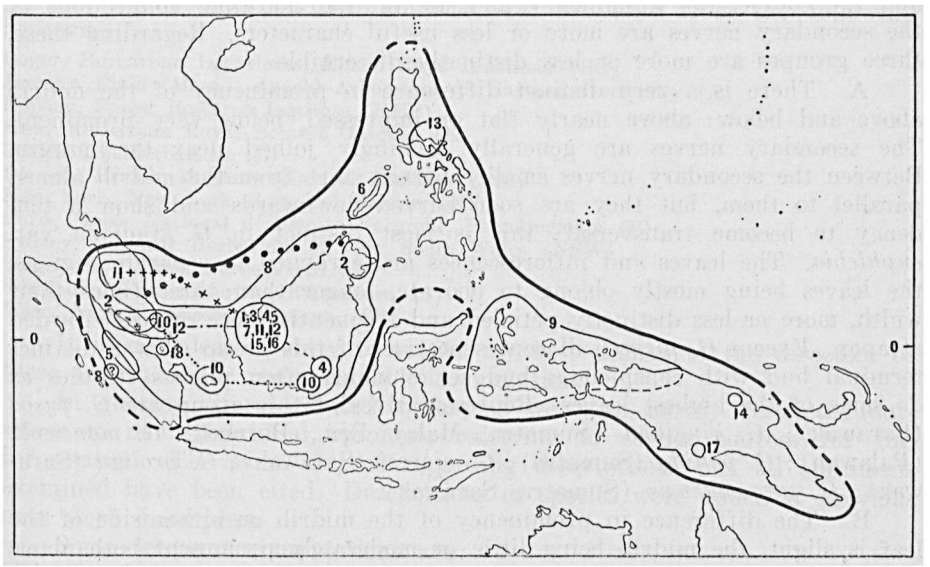


Fig. 1. Areas of *Ganua* species — 1. *fusca*; 2. *kingiana*; 3. *prolixa*; 4. *sarawakensis*; 5. *pallida*; 6. *monticola*; 7. *beccarii*; 8. *motleyana*; 9. *boerlageana*; 10. *sessilis*; 11. *curtisii*; 12. *coriacea*; 13. *obovatifolia*; 14. *pachyphylla*; 15. *pierrei*; 16. *daemonica*; 17. *orientalis*; 18. *nov. spec.* ?

4. Delimitations and interrelationships of the species.

Floral characters being rather uniform in the genus, these are next to useless regarding relationships inside the genus. More valuable seem several vegetative characters e. g. the proportion of length and width of the adult leaves and the characters of the petioles whose variability seems, in most species, slight.

The general arrangement of the leaves in relation to that of the inflorescences, however, seems of some importance. Concerning this point two types are discernible: one type with leaves and inflorescences more or less regularly dispersed along the branchlets, most inflorescences being inserted in the axils of leaves (*G. beccarii, boerlageana, coriacea, curtisii, motleyana, orientalis, pachyphylla, prolixa* [at tips of branchlets], *sessilis*); and one type in which the leaves are apically conferted, the inflorescences being inserted in a lower, distinctly separated area and mostly close together (*G. fusca, kingiana, monticola, obovatifolia, pallida, pierrei, sarawakensis*). Transitions are found in *G. curtisii* and *G. motleyana* and more or less

in *G. daemonica*. However, not of all species flowering branchlets have been examined.

The nature of nervation of the leaves procures, in my opinion, several characters indicating a possible relationship, as was already pointed out by Dubard (1908a, 201). However, not only the tertiary nervation, to which Dubard exclusively refers is of some importance, also the type and degree of prominency of the midrib on either side of the leaf, the petiole, and the course, the prominency and the mutual marginal connections of the secondary nerves are more or less useful characters. Regarding these, three groupes are more or less distinctly discernible:

A. There is a very distinct difference in prominency of the midrib above and below: above nearly flat or impressed, below very prominent. The secondary nerves are generally archingly joined near the margin. Between the secondary nerves smaller nerves start from the midrib almost parallel to them, but they are soon curved downwards and show a tendency to become transversal; this is most distinct in *G. kingiana* var. *euphlebia*. The leaves and inflorescences are arranged in separate regions, the leaves being mostly oblong to obovate, longer than three times their width, more or less distinctly petioled and frequently more or less crowded at apex. Except *G. pierrei* all representatives of this group show a distinct terminal bud with conspicuous bud scales which often possess stipules as do some of the highest leaves. Representatives of this group are *G. fusca* (Sarawak); *G. kingiana* (Sumatra, Malay Pen., Borneo); *G. monticola* (Palawan); *G. pallida* (Sumatra); *G. pierrei* (Sarawak); *G. prolixa* (Sarawak); *G. sarawakensis* (Sumatra, Sarawak).

B. The difference in prominency of the midrib on either side of the leaf is slight, the midrib being little or moderately prominent both above and below. The secondary nerves run straight up to the margin where they are distinctly archingly joined. The tertiary nerves are distinctly parallel to the secondary ones (most so in *G. daemonica*) and reticulate close near the margin. To this group belong: *G. coriacea* (Sumatra, Riau, Borneo); *G. curtisii* (Malay Pen., Borneo); *G. daemonica* (Sarawak); *G. motleyana* (Sumatra, Malay Pen., Riau, Banka, Belitong, Borneo).

C. As in B, there is no distinct difference in prominency of the midrib below and above, the midrib being little prominent on either side. The secondary nerves are prominulous on either side, sometimes flattened above, joined near the margin but never by a continuous intramarginal nerve. One or few tertiary nerves start about parallel to the adjoining secondary ones but they are soon curved downwards, though never tending to become transversal. There is a reticulate nervation all over the leaf which can be very dense (*G. beccarii*) to very loose (*G. boerlageana*). Leaves and inflorescences are inserted in the axils of leaves; flowers, as far as known, are rather small. Representatives are: *G. beccarii* (Sarawak); *G. boerlageana* (Moluccas, New Guinea); *G. monticola* (Palawan), cf. sub A; *G. orientalis* (New Guinea); *G. sessilis* (Malay Pen., Belitong, Borneo). Maybe *G. pierrei* (Sarawak) also belongs to this group on account of its nervation which is not very clearly transversal; it also shows a loose reticulation all over the leaf (cf. sub A).

The position of *G. pachyphylla* and *G. obovatifolia* is not clear. In

both species the tertiary nervation is little conspicuous and the midrib is little prominent on either side. Though *G. obovatifolia* shows a striking resemblance with *G. coriacea* in shape of the leaves, there is no relation in more important features.

TAXONOMIC PART.

For the present revision material was available from the following herbaria:

Bogor, Herbarium Bogoriense, Kebun Raya Indonesia (BO)
Jamaica Plain (Mass.), Arnold Arboretum of Harvard University (A)
Kepong, Forest Research Institute (KEP)
Kew, Herbarium Royal Botanic Gardens (K)
Leiden, Rijksherbarium (L)
London, British Museum (Natural History) (BM)
New York, New York Botanical Garden (NY)
Paris, Musée National d'Histoire Naturelle, Phanérogamie (P)
Sydney, National Herbarium of New South Wales (NSW)
Singapore, Botanic Gardens (SING)
Stockholm, Naturhistoriska Riksmuseet (S)
Wien, Naturhistorisches Museum (W)

It is my pleasant duty to tender my best thanks to the directors of these institutes for their valuable co-operation.

In quoting literature and synonyms we have mostly restricted ourselves to new facts and opinions, referring to earlier sources for full information. The same is true regarding descriptions, but all specimens examined have been cited. Descriptions of species were added if previous ones were incomplete.

Some frequent abbreviations are:
FD = Forest Department Singapore.
NIFS = Netherlands Indian Forestry Service.

Ganua Pierre ex Dubard, Rev. Gén. Bot. XX, 1908, 201; Lam 1925, 118; Lam 1927, 424.

Type species: *G. curtisii* (K. & G.) H. J. L.

Several *Ganua* species were originally described under *Bassia* L., *Burckella* Pierre, *Dasyaulus* Thw., *Illipe* Koen., *Isonandra* Wight, *Madhuca* Gmelin and *Payena* DC.

Trees with latex; *stipules* almost always caducous, sometimes still found at base of uppermost leaves and laterally in scales of terminal buds: *leaves* mostly glabrous (in one species only [*G. fusca*] densely tomentose below); secondary nerves ascending from midrib, mostly archingly joined near margin; tertiary nerves ascending from midrib, as strong as or more slender than secondary ones, starting more or less parallel to secondary ones, in some species up to margin, in others soon curved downwards and sometimes becoming more or less distinctly transversal; *inflorescences* fasciculate, in axils or leaves or their scars, dispersed along branchlets between leaves or more or less limited to a leafless lower part of branchlet; *sepals* 4, biseriate, apex almost always tufted by some dark and stiff hairs; *corolla* usually not or little exsert, lobes 7—8(—12), glabrous except for apices, tube more or less cylindrical or funnel-shaped, rather narrow,

glabrous without, throat sometimes densely villous; *stamens* 16—20(—24), in 2 rows which are close together, filaments usually short, anthers ovate to oblong, mucronate at apex; *style* long exsert in open flower, hollow; *ovary* mostly glabrous, sometimes pubescent, conoidal, gradually contracted into style, cells 5—8(—12), almost always imperfect from immediately above placenta, the partitions rising as internal wings into the style canal; *fruits* with persistent, not or little enlarged, style and calyx, glabrous or pubescent, 1—few-seeded, sometimes more or less furrowed (*G. kingiana*), pericarp always thin and dry, septa imperfect (as far as known; closed cells sometimes in *G. kingiana* and *G. curtisii*), testa of seeds very thin, scar linear, hilum apical; albumen membranous, somewhat more substantial around the radicle only, cotyledons thick; radicle exsert, usually cylindrical and long.

17 or 18 species in the Malay archipelago from Sumatra to the Philippines and New Guinea. Not known from Java, the Lesser Sunda Islands and Celebes.

Key to the species.

1a. Leaves densely ferruginously tomentose below (*Borneo*).
1. G. fusca (Engler) Merrill

b. Leaves glabrous below 2

2a. Leaves 3 or more times longer than wide 3

b. Leaves up to 3 times longer than wide 10

3a. Midrib very prominent below, at upper side flat or hardly prominent; leaves mostly crowded at apex of branchlets 4

b. Midrib up to moderately prominent below, never showing a clear difference in prominency at the two sides; leaves dispersed along branchlets or limited to apical part but never crowded there 8

4a. Secondary nerves slightly impressed above, prominulous below, distinctly archingly joined; tertiary nerves mostly transversal, particularly near margin; pedicels pubescent and rather stout (*Sumatra, Malay Pen., Borneo*).
2. G. kingiana (Brace) Van den Assem

b. Secondary nerves little but unmistakeably prominulous on either side, never a distinct intramarginal nerve; tertiary nerves more or less parallel to secondary ones, particularly near midrib, reticulate near margin 5

5a. Petioles longer than 4 cm, rough at base, at apex above flat with two faint lines descending from midrib; pedicels densely yellowish-grey tomentose (*Borneo*).
3. G. prolixa Pierre ex Dubard

b. Petioles shorter than 4 cm, in some cases rough at base, never with faint lines above, pedicels glabrous 6

6a. Midrib distinctly impressed above; petioles broadly canaliculate above, 1.6—1.8 cm long; secondary nerves 10—16, not quite distinctly archingly joined near margin (*Borneo*). . . . . **4. G. sarawakensis** Pierre ex Dubard

b. Midrib flat or slightly prominent above; petioles flat or slightly convex near apex above, up to 1.6 cm long; secondary nerves 9—18 7

7a. Secondary nerves up to 12; leaves nearly sessile; petioles shorter than 1 cm (*Sumatra, Borneo*) . . . . . **5. G. pallida** (Burck) H. J. Lam

b. Secondary nerves 12—18; leaves distinctly petiolate; petioles 1.2—1.6 cm long (*Palawan, Sibuyan?, Borneo?*) . . . . **6. G. monticola** (Merrill) H. J. Lam

8a. Reticulate nervation the same all over the leaf; petioles narrowly winged in the upper part, rough at base and mostly ferruginously tomentose; pedicels glabrous; base of leaf long decurrent (*Borneo*).
7. G. beccarii Pierre ex Dubard

b. Reticulate nervation not similar all over the leaf, most conspicuously so near margin; petioles not ferruginously tomentose; pedicels glabrous; base of leaf more or less decurrent 9

9a. Midrib on upper side with distinct median edge; tertiary nerves generally parallel to secondary ones which are distinctly archingly joined; no or little nervation outside the intramarginal nerve (*Sumatra, Malay Pen., Riau, Belitong, Borneo*) . . . . . **8. G. motleyana** (de Vriese) Pierre ex Dubard

b. Midrib on upper side flat or slightly convex; tertiary nerves reticulate, not conspicuously parallel to secondary ones; there is no continuous intramarginal nerve joining the secondary ones; plenty of tertiary nervation outside joints (*Moluccas, New Guinea*) . . . . **9. G. boerlageana** (Burck) Pierre ex Dubard

10a. Leaf apex always distinctly rounded, sometimes emarginate 11

b. Leaf apex always more or less acute or acuminate 14

11a. Leaves fairly well sessile, petioles 0.2—0.5 cm long; secondary nerves 7—9 (*Malay Pen., Belitong, Borneo*) . . . . **10. G. sessilis** (K. & G.) H. J. Lam

b. Leaves distinctly petiolate; petioles 0.6—2.6 cm long; secondary nerves 8—18 12

12a. Petioles longer than 1.5 cm; secondary nerves 11—18; pedicels more or less pubescent (*Malay Pen., Borneo*) . . . . . **11. G. curtisii** (K. & G.) H. J. Lam

b. Petioles up to 1.5 cm; secondary nerves 8—12; pedicels glabrous 13

13a. Tertiary nerves parallel to secondary ones; secondary nerves 9—12; petioles 0.6—1.1 cm long; leaves more or less scattered along branchlets, rather dark when dry, pedicels less than 0.7 cm long; sepals conspicuously broadly acuminate (*Sumatra, Riau, Borneo*) . . . . . **12. G. coriacea** Pierre ex Dubard

b. Tertiary nerves inconspicuous, not parallel to secondary ones; secondary nerves 8—10; leaves more or less limited to upper parts of branchlets but not crowded, more or less reddish when dry; petioles 1.0—1.5 cm long; pedicels 1.0—1.8 cm long; calyx globular, more or less acute (*Luzon*).
13. G. obovatifolia (Merrill) Van den Assem

14a. Tertiary nerves hardly or only little discernible; secondary nerves not joined, tangential to leaf margins, at least at base; leaves relatively large and broad (*New Guinea*) . . . . . **14. G. pachyphylla** (Krause) H. J. Lam

b. Tertiary nerves faint but conspicuous, at least underneath; secondary nerves mostly archingly joined but not always by a more or less straight intramarginal nerve 15

15a. Petioles more or less broadly and shallowly canaliculate above at apex; midrib far more prominent below than above; leaves more or less restricted to apical region of branchlets (*Borneo*) . . . . . **15. G. pierrei** Van den Assem

b. Petioles flat or convex above at apex; no considerable difference in prominency of midrib above and below; leaves either more or less restricted to apical region of branchlets or scattered 16

16a. Tertiary nerves distinctly parallel to secondary ones, reticulate near margin only; secondary nerves archingly joined by a continuous intramarginal nerve; leaves more or less coriaceous 17

b. Tertiary nerves not distinctly parallel, mostly starting at greater angles from midrib than secondary ones, reticulation extant even near midrib; secondary nerves mostly not archingly joined, leaves more or less membranous . . . 19

17a. Leaves conspicuously long acuminate, midrib moderately prominent and convex below; pedicels 0.6—0.9 cm (*Borneo*) . . . **16. G. daemonica** Van den Assem

b. Leaves more or less acuminate; midrib little or not prominent above or, if prominent, not convex; pedicels 0.9 cm or longer 18

18a. Midrib above with median edge, at least at base; pedicels glabrous; pericarp glabrous (*Sumatra, Malay Pen., Riau, Banka, Belitong, Borneo*).
8. G. motleyana (de Vriese) Pierre ex Dubard

b. Midrib flat or hardly prominent above, never with median edge; pedicels more or less pubescent; pericarp with a golden appressed indumentum (*Malay Pen., Borneo*) . . . . . **11. G. curtisii** (K. & G.) H. J. Lam

19a. Leaves rather long acuminate; midrib reddish below when dry; secondary nerves flat or slightly impressed above; pedicels 0.5—0.8 cm; corolla lobes acute at apex (*New Guinea*) . . . . . **17. G. orientalis** Van den Assem

b. Leaves acuminate, mostly dark when dry; midrib dark and little prominent on either side; secondary nerves flat or prominulous above; pedicels 1.5—2.5 cm long; corolla lobes more or less rounded at apex (*Moluccas, New Guinea*).
9. G. boerlageana (Burck) Pierre ex Dubard

18. Ganua spec., cf. p. 399

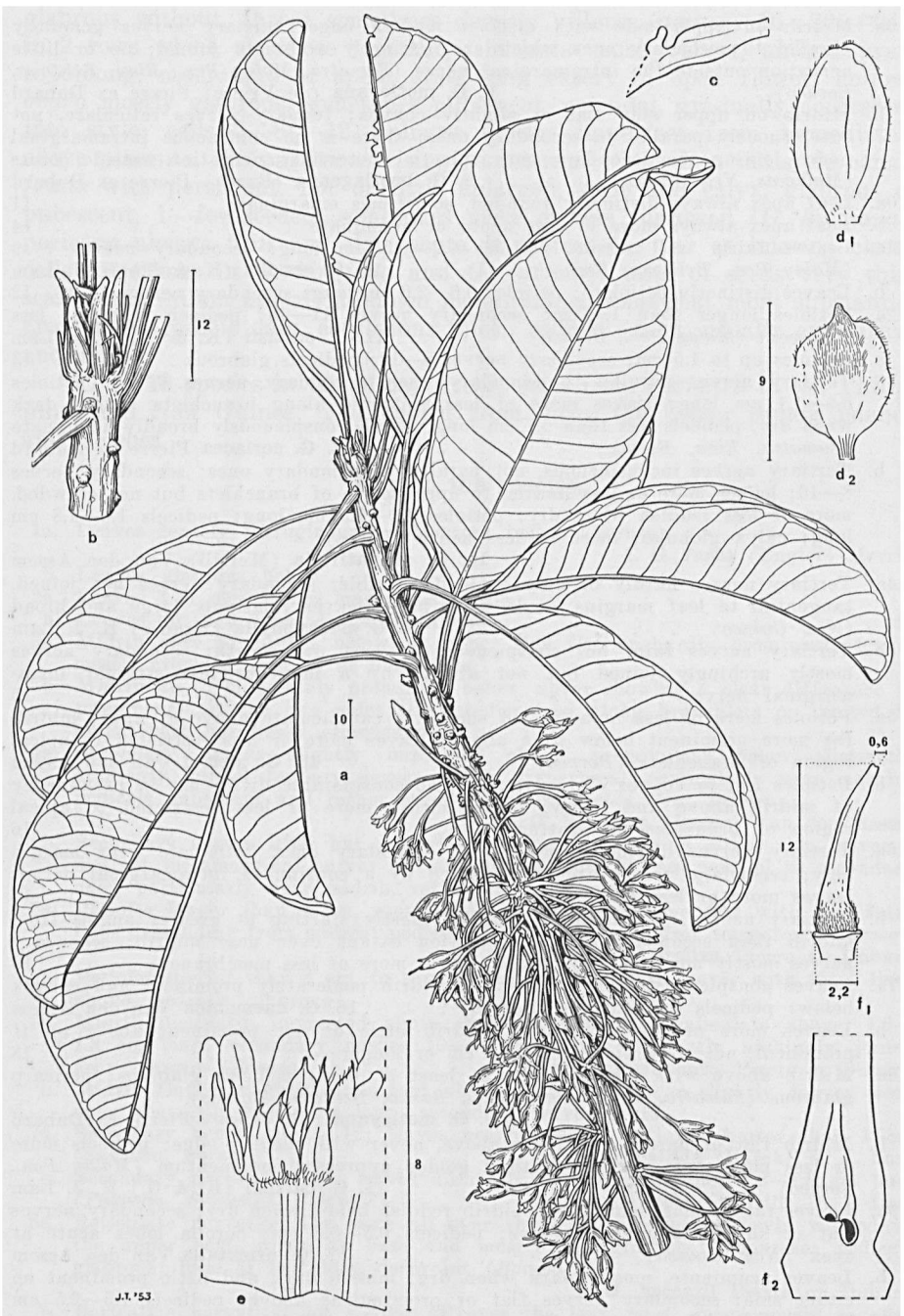


Fig. 2. *G. fusca* — a. branchlet with leaves and flowers; b. terminal bud; c. base of petiole with stipular organ; d. 1. outer sepal outside; d. 2. inner sepal outside; e. part of corolla inside; f. 1. ovary and style; f. 2. longitudinal section of ovary. From *type specimen*. Dimensions in mm.

1. Ganua fusca (Engler) Merrill, Enum. Born. Pl., Journ. As. Soc. Straits, Spec. Nr. Sept. 1921, 478; Lam 1925, 120; Lam 1927, 424.

Type specimen and basonym: *Beccari 3503,* type of *Illipe fusca* Engler — *Fig. 2.*

Distribution: W. Borneo.

Tree?; *terminal buds* conspicuous, scales about 1.4 cm long, swollen at base and there 0.5 cm wide, slightly tomentose, sometimes glabrescent, their stipules 0.5—0.7 cm long, about 0.1 cm wide at base, resembling those on petioles of the uppermost leaves; *leaves* conferted towards tips of branchlets but not crowded, elliptic to ovate; apex slightly acuminate, base broadly cuneate, not decurrent; petioles 2.6—3.4 cm long, apex narrowly canaliculate above, downwards slightly flattened, convex below, base swollen and ferruginously tomentose; blade 11—15 by 4.8—5.8 cm, glabrous above, densely ferruginously tomentose below, coriaceous; midrib impressed above, very prominent below; secondary nerves 12—16, prominulous above, prominent below, more or less curved towards apex, starting from midrib at angles of 70°—80°, in general in middle part of leaf archingly joined near margin; tertiary nerves on both sides not very conspicuous, starting from midrib almost parallel to secondary ones, reticulate and more or less transversal near margin; *inflorescences* rather close together below leaf region, 5—11-florous; pedicels 2.2—2.7 cm long, about 0.1 cm in diam., densely ferruginously tomentose; *sepals* ovate, about 0.8 by 0.5 cm, apex acute to distinctly broadly acuminate, outer sepals densely ferruginously tomentose outside, glabrous inside except for some hairs at base, inner ones with long appressed ferruginously coloured hairs, glabrous inside, fringed margins glabrous and thin; *corolla* tube funnel-shaped, glabrous, villous at throat, lobes oblong, as long as or longer than tube, apex more or less rounded, glabrous except for some hairs at tips; *stamens* 16, filaments villous, anthers pilose, connective sharply mucronate; *pistillum* 1.2 cm long, ovary densely ferruginously pubescent at base with 8 imperfectly closed cells, style glabrous and rather blunt; *fruit* not seen..

BORNEO. Sarawak, Kuching: *Beccari 3503 (type spec.)* (FI, S), fl. II.

2. Ganua kingiana (Brace) Van den Assem, comb. nov. — *Bassia kingiana* Brace, in King & Gamble, Journ. As. Soc. Beng. LXXIV, 2, Extra nr. 17, 1905, 179 (contin. 388); Ridley, Fl. Mal. Pen., II, 1923, 267 — *Madhuca kingiana* (Brace) H. J. Lam, 1925, 159 — *Madhuca glaberrima* H. J. Lam 1925, 263 — *Ganua glaberrima* (H. J. Lam) H. J. Lam 1927, 428, fig. 11; Merrill, Univ. Calif. Publ. Bot. 15. 1929. 239 — *Ganua euphlebia* Merrill, MS.

Type specimen and basonym: *King's coll. 3314,* type of *Bassia kingiana* Brace.

Distribution: E. Sumatra, Malay Peninsula, N. Borneo.

Var. **kingiana** — Synonymy as in species, except for *G. euphlebia* Merrill MS.

Distribution: E. Sumatra, Malay Peninsula. — *Fig. 3.*

Terminal bud conspicuous, scales 0.5—1.0 cm long and 0.4—0.8 cm wide, triangular to lanceolate, stipular organs none; *leaves* crowded at apex, oblong to obovate, shortly acuminate at apex, base not decurrent;

petioles rough at base, narrowly canaliculate at apex above; midrib impressed above, very prominent below; secondary nerves 18—24, only prominent below, conspicuously archingly joined near margin; tertiary nerves starting from midrib almost parallel to secondary ones, near margin transversal; for *inflorescences* etc. see Remarks.

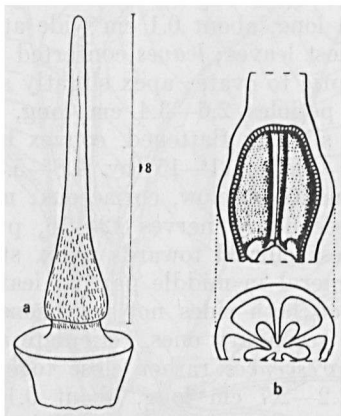


Fig. 3. *G. kingiana* var. *kingiana* — a. ovary and style; b. longitudinal section of ovary. From *Ridley 6238*. Dimensions in mm.

SUMATRA. East Coast, Asahan, Masihi: *NIFS bb 6341* (L).
MALAY PENINSULA. Perak, Larut: *King's coll. 3414* (*type spec.*) (KEP), fl. IX; ibidem: *King's coll. 3678* (KEP), fr. XII; Johore, Bukit Tinjau Laut.: *Comer s.n.* (SING); Singapore, Bukit Timah for.: *Comer s.n.* (SING); ibidem: *Ridley s.n.* (SING), young fr.; ibidem: *Ridley 6238* (BM), young fr.

Remarks: As Lam (1927) already pointed out this species does not quite fit in either *Ganua* or *Madhuca*. I decided to insert it into the former genus for reasons of nervation and flower characteristics, above all, however, because the cells of the ovary are found to be not quite closed. Since Lam stated that they are, it must be assumed that, like in *Ganua curtisii*, this character is a variable one here. The conoidal and pubescent ovary, which is gradually contracted into the glabrous style, the basally inserted ovules as well as the type of pubescence of the calyx lobes are also in favour of *Ganua*. The same may be said of the fruit, a rather thin walled, globose berry, however with many cells (up to 12), which are not perfectly closed. I did not see any seed.

The nervation is *Ganua*-like in so far as the tertiary nerves, starting more or less parallel to the secondary ones, are concerned. Towards the margins, however, they are generally transversal.

A large tree, up to 20 m high, with spreading branches, leaves rough in feeling, dark green, flowers pale with white, scented (King's coll.), fruit deep brown.

Vernac. name: putatat putatat (Sumatra). *Habitat*: open jungle, generally on low hills, in alt. up to 150 m.

Var. **euphlebia**, var. nov. — *G. euphlebia* Merrill, MS.

Type specimen: *Elmer 21571* (L).

Distribution: N. Borneo.

Nervi secundarii 26—34; *nervi tertiarii* distinctius transversi, unus medianus tantum prope costam secundariis parallelus; *inflorescentiae* pauciflorae.

Differs from the type variety by the following details: *secondary nerves* 26—34; *tertiary nerves* more distinctly transversal, only close to midrib being more or less parallel to secondary ones; *inflorescences* few-florous.

BORNEO. Elphinstone prov., Tawao: *Elmer 21571* (*type spec.* of var.) (L, S, SING), fr. X to III; Sandakan. Kabili for. res.: *Kadir A 609* (KEP, SING), fr. XI; ibidem: *Puasa FD 4840* (SING), fr. VI.

Remarks: Tree, up to 15 m high, fruit olive green.

Vernac. names: natu, nyatoh (Sandakan). *Habitat*: on hill top, up to 40 m alt.

3. **Ganua prolixa** Pierre ex Dubard, Bull. Mus. Hist. Nat. XIV, 1908, 409; Lam 1925, 130; Lam 1927, 427 — *Ganua elongata* Pierre in schedula in Herb. Beccari.

Type specimen: *Beccari 2446*. — *Fig. 4.*

Distribution: W. Borneo.

Scales of *terminal buds* conspicuous, about 1 cm long, a few mm wide at base, light-coloured, glabrous, without distinct stipules; *leaves* conferted at tips of branchlets, oblong, apex shortly acuminate, base cuneate, slightly decurrent; petioles 5—6.5 cm long, about 0.2 cm thick, base slightly swollen and rough, at upper side at apex flat with two faint grooves which fade out downwards, basal part cylindrical; blade 19.5—24 by 5.8—7.8 cm, entirely glabrous; midrib prominulous or flat above, very prominent below; secondary nerves 17—20, prominulous above, prominent below, starting from midrib at angles of about 80°, slightly curving to apex; tertiary nerves slightly prominulous above, most conspicuous below, starting from midrib almost parallel to secondary ones, more or less transversal near margin; *inflorescences* in axils of leaves at tips of branchlets, 5—7-florous; pedicels 1.3—1.8 cm long, about 0.15 cm thick, densely yellowish-grey tomentose; sepals oblong-ovate, apex acute or hardly acuminate, densely yellowish-grey tomentose outside, glabrous within, inner ones thinner; *corolla* and *stamens* unknown; *ovary* (and basal part of *style*) villous, 7—8-celled, cells imperfect.

BORNEO. Sarawak, Kuching: *Beccari 2446* (*type spec.*) (FI), old fl. VIII.

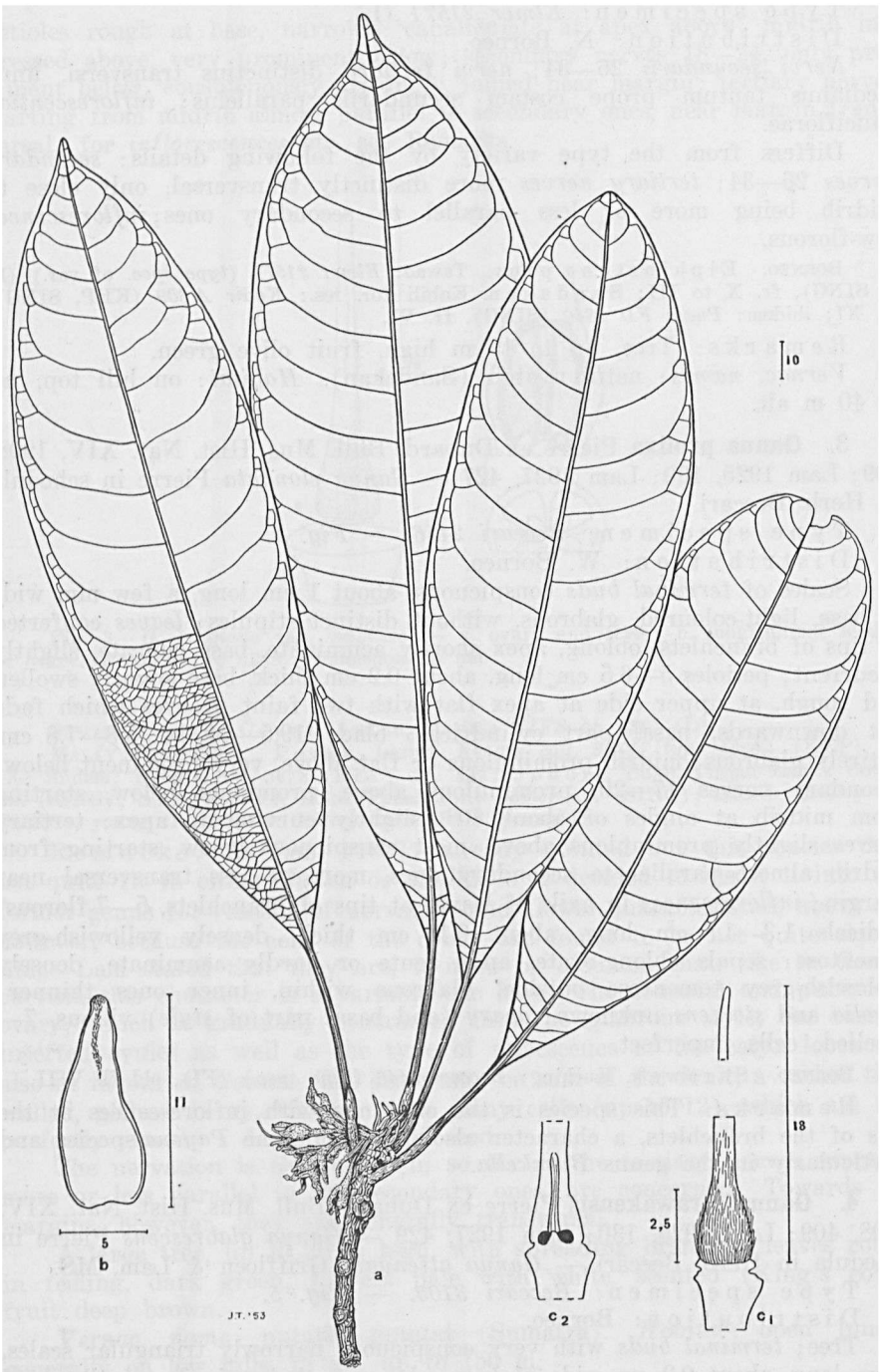
Remarks: This species is the only one with inflorescences at the tips of the branchlets, a character also found in some *Payena*-species and particularly in the genus *Burckella*.

4. **Ganua sarawakensis** Pierre ex Dubard, Bull. Mus. Hist. Nat. XIV, 1908, 409; Lam 1925, 130; Lam 1927, 429 — *Ganua glabrescens* Pierre in schedula in Herb. Beccari — *Ganua attenuata* Griffioen & Lam, MS.

Type specimen: *Beccari 3105*. — *Fig. 5.*

Distribution: Borneo.

Tree; *terminal buds* with very conspicuous narrowly triangular scales, 1 cm long, about 0.3 cm wide at base, glabrous, their stipules smaller and


10
11
5
b
a
18
2,5
c 2
c 1
J.T. '53

narrower; *leaves* crowded at apex of branchlets, oblong to obovate, not or hardly acuminate, base decurrent; petioles short, 0.6—1.6 cm long, about 0.3 cm thick, swollen and rather rough at base, near apex broadly canaliculate above, glabrous; blade 12—25 by 3—6 cm, glabrous on both sides; midrib impressed or flat above, prominent below; secondary nerves 10—16, prominulous above, prominent below, starting from midrib at angles of 50°—70°, gradually curving towards the apex, no continuous intramarginal nerve joining secondary nerves; tertiary nerves slender, starting from midrib almost parallel to secondary ones, reticulate near margin; *inflorescences* close together, in axils of leaves and scars below leaf region, 5—10-florous; pedicels 1.5—3.5 cm long, glabrous; *sepals* ovate to elliptic, obtuse or slightly acuminate at apex, sparsely hairy, margins ciliate, darkly tufted at apex; *corolla* white, tube glabrous, except in throat, lobes 8, oblong, as long as tube, apex obtuse and sparsely pubescent; *stamens* 16, filaments 0.05—0.1 cm long, pubescent, anthers with some hairs, connective slightly protruding and mucronate; *pistillum* 1.2 cm, ovary (sparsely) villous, imperfect cells 7—8, leaving considerable internal space above placenta, style glabrous; *fruit* not seen.

BORNEO. Sarawak, Kuching: *Beccari 3105 (type spec.)* (FI), fl. II; ibidem: *Haviland 2318* (BM, L), fl. I; S. & E. Borneo, Beru betumu Air: *De Zwaan (NIFS bb. 18999)* (L).

Remarks: A large tree up to 30 m high, corolla white. In the Beccari specimen the pedicels are shorter than in the Bartlett one, averaging 2—3.5 cm, the leaves being relatively broader. The identity of *NIFS bb. 18999* (sterile) is not beyond doubt but its nervation is quite identical with that of the type.

Vernac. name: putat gunung (S. & E. Borneo). *Habitat* in S. & E. Borneo: never inundated, sandy soil, steep country, common tree, scattered in primary forest, alt. 200 m.

Maybe some specimens of this species have been distributed under the name *G. attenuata* Griffioen & Lam, which is a *nomen nudum*.

5. Ganua pallida (Burck) H. J. Lam 1925, 127, fig. 36; Lam 1927, 427.

Type specimen and basonym: *Burck s.n. (H. L. B. 908. 225—6)*, Sumatra, Mt Singgalang, type of *Bassia pallida* Burck.

Distribution: Sumatra, Borneo (Sarawak, f. Lam 1927).

Terminal bud with distinct narrowly triangular scales, about 1 cm long and 0.3 cm wide, glabrous, their stipules half as long and 0.1—0.15 cm wide, the petioles of uppermost leaves sometimes provided with similar stipules; in fertile twigs *leaves* crowded at apex; *inflorescences* close together below leaf region.

SUMATRA. East Coast, Petani: *Van Romburgh 78* (L); ibidem, Bandar baru: *Lörzing 6823* (L, SING), fl. VII; West Coast, Mt Singgalang: *Burck s.n. (type spec.)* (L), fr. VIII.

Remarks: A tree of about 15 m high, leaves bright green, corolla

Fig. 4. *G. prolixa* — a. branchlet with leaves and flowers; b. outer sepal outside; c. 1. ovary and style; c. 2. longitudinal section of ovary. From *type specimen*. Dimensions in mm.

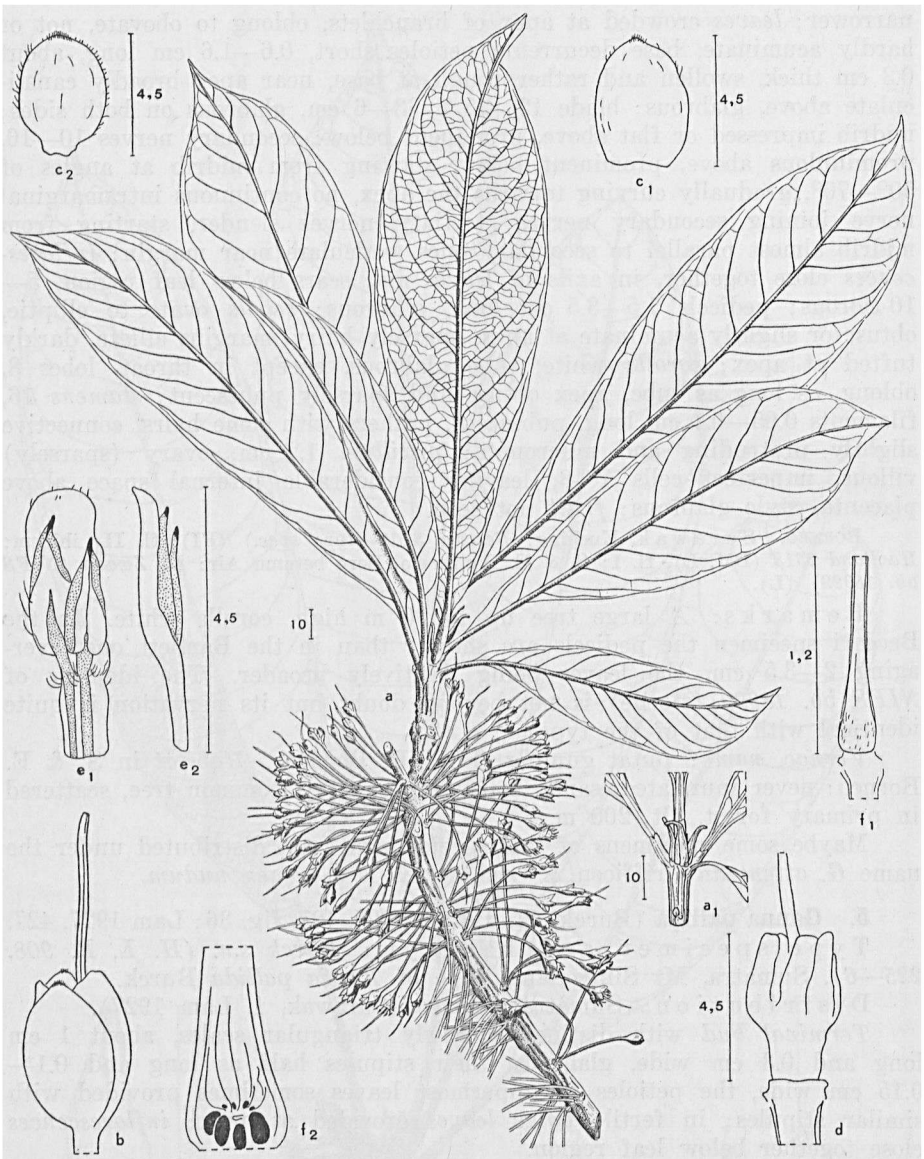


Fig. 5. *G. sarawakensis* — a. branchlet with leaves and flowers, a. 1. terminal bud; b. calyx; c. 1. outer sepal outside; c. 2. inner sepal outside; d. corolla outside; e. part of corolla and stamens inside; f. 1. ovary and style; f. 2. longitudinal section of ovary. a. from *Haviland 2318*, b.—f. from *type specimen*. Dimensions in mm.

bright yellow-green, tips of lobes whitish, flowers fragrant, latex white, young leaves chocolate-coloured.

Vernac. names: majang sudu or susudu (Batak), majang ketapang

(Mal.). *Habitat:* in forest, alt. 1200 m. The specimen from Borneo, quoted by Lam, was not examined and its whereabouts are unknown.

6. **Ganua monticola** (Merrill) H. J. Lam, comb. nov. — *Bassia monticola* Merrill, Phil. Journ. Sci. Bot. X, 1915, 56 — *Madhuca monticola* (Merrill) Merrill, Enum. Phil. Flow. Pl. III, 3, 1923, 277; Lam 1925, 180; as a synonym of *Ganua boerlageana* (Burck) Pierre ex Dubard in Lam 1927, 427. — *Fig. 6.*

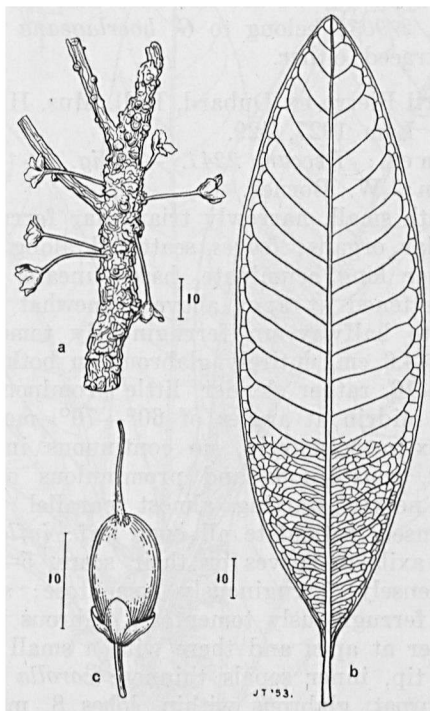


Fig. 6. *G. monticola* — a. branchlet with fruiting calyces; b. leaf and nervation; c. fruit. From *Merrill 9622*. Dimensions in mm.

Type specimen and basonym: *Merrill 9622,* type of *Bassia monticola* Merrill.

Distribution: Palawan, Sibuyan? (f. Merrill), Borneo? (cf. Note).

Scales of *terminal bud* about 0.7 cm long, about 2 mm broad at base, slightly pubescent at margins; uppermost leaves sometimes with small stipular organs, 0.2 cm-long; *leaves* crowded at tips of branchlets, oblong to oblong-lanceolate; petioles 1.0—1.6 cm long, cylindrical, somewhat swollen at base; blade 8.8—15.5 by 2.7—5 cm, apex obtuse, base cuneate; midrib prominulous above, prominent below; secondary nerves 13—18, slender, prominulous on both sides; *pedicels* 1.2—2.2 cm long, glabrous,

densely furfuraceously pubescent at base; young *fruits* ovoid to oblong-ovoid (f. Merrill 1915).

PALAWAN. Silanga: *Merrill 9622 (type spec.)* (BM, L, NSW), fr. V.

Note. Of some specimens from British North Borneo (*Apostal 22, Wood 1261, 1889*) and from Sarawak (*Garaman 2311, 2789*), annotations by Lam were found in the Rijksherbarium. Unfortunately, however, the specimens themselves could not be traced anymore, which is the more regrettable since they would mean new localities. Merrill mentions the species also from Sibuyan but we are not sure that the specimens concerned (*For. Bur. 22498, 27903*) belong to *G. boerlageana* or to *G. monticola*. They could not be traced either.

7. Ganua beccarii Pierre ex Dubard, Bull. Mus. Hist. Nat. XIV, 1908, 408; Lam 1925, 130; Lam 1927, 429.

Type specimen: *Beccari 2241.* — *Fig. 7.*

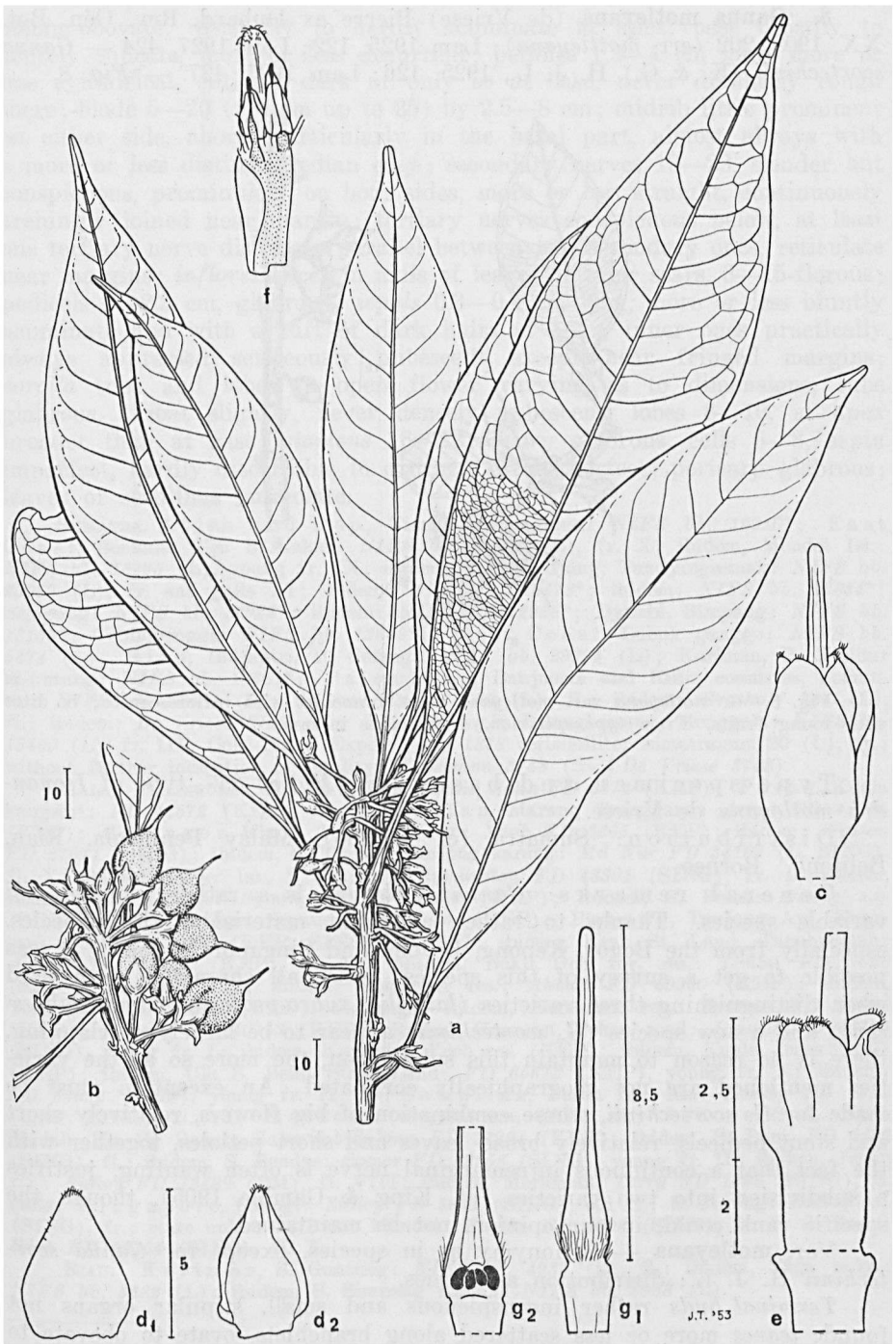
Distribution: W. Borneo.

Terminal bud with small, narrowly triangular ferruginously tomentose scales, without stipular organs; *leaves* scattered along branchlets, elliptic to oblong, apex rather long acuminate, base cuneate, decurrent; petioles 2.0—2.8 cm long, flattened at apex above, somewhat swollen and rough at base, from base to halfway up ferruginously tomentose, glabrescent; blade 11.2—17 by 3—4.6 cm, entirely glabrous on both sides, rather thin; secondary nerves 13—16, rather slender, little prominent above, prominent below, starting from midrib at angles of 60°—70°, more or less straight, curving towards apex near margin, no continuous intramarginal nerve; tertiary nerves faint, conspicuous and prominulous on both sides, near midrib some minor nerves starting almost parallel to secondary ones, tertiary nervation densely reticulate all over leaf; *inflorescences* scattered along branchlets, in axils of leaves or their scars, 5—8-florous; pedicels 0.6—1.0 cm long, densely ferruginously tomentose; *sepals* ovate, about 0.5 cm long, densely ferruginously tomentose, glabrous within, except near margins, mostly darker at apex and there with a small tuft of dark hairs, margins ciliate near tip, inner sepals thinner; *corolla* tube about 0.3 cm long, pubescent at throat, glabrous within, lobes 8, more or less ribbon-shaped, about 0.28 cm long, villous at apex on both sides; *stamens* 16, filaments 0.1 cm long, relatively broad, pilose, anthers oblong, about 0.1 cm long; *pistillum* about 8.5 mm long, ovary ferruginously pubescent, cells 8, imperfect; pedicels of fruit thickened, about 1 cm long, 0.2 cm in diam., woody; *fruit* more or less globose, densely ferruginously tomentose, about 1.2 cm long, 0.7 cm in diam., cells imperfect, 1- or 2-seeded.

BORNEO. Sarawak, Kuching: *Beccari 2241 (type spec.)* (FI), fl. VII; ibidem: *Beccari 2958* (FI), fr. XII.

Remarks: Mainly on account of nervation a relation to *G. sessilis* and *G. boerlageana* may be supposed.

Fig. 7. *G. beccarii* — a. branchlet with leaves and flowers; b. branchlet with fruits; c. calyx; d. 1. outer sepal outside; d. 2. inner sepal outside; e. corolla outside; f. part of corolla and stamens inside; g. 1. ovary and style; g. 2. longitudinal section of ovary. a, c—g. from *type specimen*, b. from *Beccari 2958*. Dimensions in mm.


f
10
b
10
a
c
8,5
2,5
2
5
d_1
d_2
g_2
g_1
J.T. '53
e

8. Ganua motleyana (de Vriese) Pierre ex Dubard, Rev. Gén. Bot. XX, 1908, 202 (err. *mottleyana*); Lam 1925, 122; Lam 1927, 424 — *Ganua scortechinii* (K. & G.) H. J. L., 1925, 126; Lam 1927, 427. — *Fig. 8.*

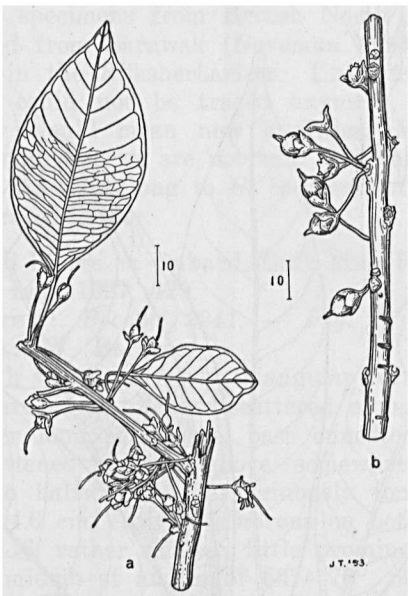


Fig. 8. *G. motleyana* var. *motleyana* — a. branchlet with inflorescences; b. ditto with young fruits. From *type specimen*. Dimensions in mm.

Type specimen and basonym: *Motley 857*, type of *Isonandra motleyana* de Vriese.

Distribution: Sumatra (cf p. 366), Malay Peninsula, Riau, Belitong, Borneo.

General remarks: *Ganua motleyana* is a rather common and variable species. Thanks to rather abundant material of this species, especially from the Bogor, Kepong, Leyden and Singapore herbaria, it was possible to get a survey of this species. Since all characters Lam used when distinguishing three varieties (*latifolia, rubro-pedicellata* and *glabrescens*) and a new species (*G. scortechinii*) appear to be largely overlapping, there is no reason to maintain this subdivision, the more so as the varieties mentioned are not geographically correlated. An exception must be made for *G. scortechinii*, whose combination of big flowers, relatively short and stout pedicels, relatively broad leaves and short petioles, together with the fact that a continuous intramarginal nerve is often wanting, justifies a subdivision into two varieties (cf. King & Gamble 1905), though the specific rank could, in our opinion, not be maintained.

Var. **motleyana** — Synonymy as in species, except for *Ganua scortechinii* H. J. L.; distribution as species.

Terminal buds rather inconspicuous and small, stipular organs not found; *leaves* more or less scattered along branchlets, ovate to obovate to

oblong-obovate, distinctly to hardly acuminate at apex, base broadly to acutely cuneate, more or less decurrent; petioles 1.3—4 cm long, more or less cylindrical, entirely dark or only so at base, never distinctly rough there; blade 5—20 (f. Lam up to 25) by 2.5—8 cm; midrib little prominent on either side, above, particularly in the basal part, almost always with a more or less distinct median edge; secondary nerves 13—23, slender but conspicuous, prominulous on both sides, more or less straight, continuously archingly joined near margin; tertiary nerves conspicuous below, at least one tertiary nerve distinctly parallel between two secondary ones, reticulate near margins; *inflorescences* in axils of leaves or their scars, 3—15-florous; pedicels 1—2.3 cm, glabrous; *sepals* 0.3—0.4 cm long, more or less bluntly acuminate and with a tuft of dark hairs at apex, inner ones practically always appressed sericeously pubescent except near fringed margins; *corolla* tube and lobes in open flower varying as to dimensions, tube glabrous, throat slightly, never densely pubescent, lobes 8—10, at apex broader than at base; *stamens* 16—22; *ovary* glabrous, cells 6—8, septa imperfect, hardly discernible to distinct, rarely perfect; pericarp glabrous; leaves of seedlings lanceolate.

SUMATRA. Atjeh and Dep., Tiamang, Tengulun: *NIFS bb. 12210**; East Coast, Benkalis, Ulu S. Lakar: *NIFS bb. 12842* (L), fr. X; ibidem, Mendol Isl.: *NIFS bb. 13795* (L), young fr. IX; ibidem, Selatpandjang, Tandjungsemak: *NIFS bb. 25559* (L), fr. and galls XI; ibidem: *NIFS bb. 12478**; ibidem: *NIFS bb. 13834**; Selapung: *NIFS bb. 12924**; ibidem: *NIFS bb. 12928**; Djambi, Simpang: *NIFS bb. 13136**; Tebingtinggi: *NIFS bb. 13649**; West Coast, Lubuk ganggo: *NIFS bb. 5474* (L); Riau, Indragiri, P. Gelang: *NIFS bb. 29094* (L); Kariman, P. Kundur Si-untung: *NIFS bb. 10661**; Palembang, Banjuasin and Kubu countries, Semuntul: *NIFS bb. 15487* (L); ibidem: *Endert 356* (L), fl.; ibidem: *Grashoff 765* (L), fl.; ibidem: *De Vriese 3748* (L); Lampongs, Tulangbawang, Menggala: *NIFS bb. 15460* (L), fr. III; Coll. Plant. Expos. *Paris 1878* verisimiliter sumatranum 20 (L), fr.; without further indication of locality: *Teysmann 3748* (= ? *De Vriese 3748*).

MALAY PENINSULA. Kedah, Yan Kechil, *Salih FD 8974* (KEP); Perak. Kuala kangsari: *FD 41572* (KEP), fr.; Kelantan, Marang Trengganu: *Arnot FD 44785* (KEP); Selangor, Klang, Telok for. res.: *Yeob FD 3265* (KEP); ibidem: *Walton FD 27071* (SING); ibidem, S. Tinggi, Tanjong karang: *Md Nur FD 34107* (L, SING), fl. X; ibidem, Carey Isl., K. Langat: *Symington FD 43301* (SING), fr. I; ibidem, Klang, Olar Limpit: *Symington FD 43689* (KEP); ibidem, S. Pelek: *Denny s.n.* (SING), fl. IX; ibidem, Sepang: *Denny s.n.* (KEP); Pahang, Tanjong Api, Kuantan: *Yeob FD 3605* (KEP, SING), fr. XII; ibidem, Ktan St. Land, Tanahpamah: *Awang FD 17225* (KEP), fl. IX; ibidem, Bukit Goh for. res.: *Ismail FD 9626* (SING), seedlings VII; ibidem, Kemansut res.: *Ahmat FD 29960* (KEP); ibidem, Temerloh: *FD 29958* (KEP), seedlings; ibidem, Kemansut res.: *Browne FD 40685* (KEP); ibidem: *FD 40713* (KEP); ibidem, Kuantan, Pekan road: *Jaamat FD 43195* (SING), young fr. I; ibidem, Kuantan: *Yeob s.n.* (KEP); ibidem, Kuala Jasek: *coll?* (KEP); ibidem, Ulu S. Belat State Land: *FD 65673* (KEP), young fr. X; ibidem: *FD 65692* (KEP), young fr. II; N. Sembilan, Pasoh for. res.: *Kinsey FD 1918* (KEP, SING), fl. VI; Malacca: *Griffith s.n.* (BM), fl.; Johore, S. L. Kirih Mudah, Ulu Sg Benut; *Zakaria-b-Sulong FD 72904* (KEP); ibidem, S. Ban: *FD 6496* (SING), fl.; ibidem, S. Pendas: *Comer FD 32253* (SING), young fr. II; ibidem, Jenan riv.: *Ridley FD 13489* (BM), fl. VIII; ibidem, Merleman, *Terry FD 1026* (SING), fl. galls; Singapore, Changi: *Ridley FD 5645* (SING), old fl.; S. Jurong: *Ridley s.n.* (SING), fr.; state unknown, Bukit Mandai: *Bayliss FD 5896* (SING), fr. I; S. Kaya: *Kiah FD 32154* (SING), fl. X.

RIAU. Karimon, S. Guntung: *NIFS bb. 4939* (L), fl.; ibidem, Taga radja: *NIFS bb. 5382* (L); ibidem, S. Simpang Kanan: *NIFS bb. 9968* (L).

* Not seen by me personally but based upon annotations by Lam.

BANKA. Lobok besar: *Anta 146* (BO, L), fr. VIII; ibidem: *Anta 157* (BO, L), fr. VIII; ibidem: *Anta 319* (BO, L, SING), fl. IX; ibidem: *Kostermans 18* (BO, L); ibidem: *Kostermans 21 (NIFS bb. 33959)* (BO,L), fl. VIII; ibidem: *De Vriese s.n.* (BO, L); Blinju: *Grashoff s.n.* (L).

BELITONG. *W. A. Riedel s.n.* (FI), fl. buds X; ibidem: *Teysmann 11099* (L); ibidem: *Teysmann s.n.* (L, SING), fl. fr.

BORNEO. West Borneo, Pontianak, Kubupari: *NIFS bb. 6359* (L); ibidem: *NIFS bb. 2022* (L); ibidem: *Akbor 2340* (L), galls; ibidem: *Akbar bin Adan 2022* (L), buds VIII; Lower Matan, S. Kendawangan: *NIFS bb. 14412**; Pemankat, Paloh: *NIFS bb. 11337**; Sarawak: *Baring Gould S 22* (SING), old fl.; British North Borneo, Jesselton: *coll.*? (SING), fr. III; Kg Hindian, Maraba: *Melegrito FD 2308* (BO), fl. VII; Sandakan, Kimanis for. res.: *Kwan Ting A 354* (L, SING), buds V; South and East Borneo, Tidung countries, Supil: *NIFS bb. 17773* (L); ibidem, Seputuk: *NIFS bb. 17829* (L); ibidem, Malinau: *NIFS bb. 17861* (L); ibidem, Pembiliangan: *NIFS bb. 18139* (L); ibidem: *NIFS bb. 18263**; Kutai, Kembang Djanggul: *NIFS bb. 15689* (L); ibidem, Longbleh: *NIFS bb. 16042* (L); ibidem, Mujup: *NIFS bb. 16757* (L); ibidem: *NIFS bb. 16821* (L); ibidem: Kelumpang: *NIFS bb. 16997* (L); ibidem, S. Gong Djohoa, Longbleh: *NIFS bb. 24020* (L, SING); ibidem: *NIFS bb. 24021* (L, SING); ibidem, Kg Djanggung: *NIFS bb. 24662* (L, SING); ibidem, Rapahnasah: *NIFS bb. 24664* (L, SING); ibidem: *NIFS bb. 24665* (L); ibidem: *NIFS bb. 17861*; Djeniau: *Endert 5087* (L), old fl. XI; Buntok, Madarabaru: *NIFS bb. 21264* (L); Muarateweh: *NIFS bb. 28082* (L); ibidem: *NIFS bb. 28083* (L, SING), fr. V; Lower Dajak, S. Mentan: *NIFS bb. 27757* (L, SING); ibidem, Danau ranah: *NIFS bb. 13482**; Amuntai: *NIFS bb. 7797* (L), old fl. XII; ibidem: *NIFS bb. 7797* (L); Banjermasin: *Korthals s.n.* (L), fl. fr. VIII; Martapura: *Korthals s.n.* (L), fr. VIII; Berau, Telukdaun, S. Kasei: *NIFS bb. 12206**; Banjermasin: *Motley 857 (type spec.)* (L, P), fl. fr.; Sampit: *Buwalda 29 (NIFS bb. 32406)* (BO, L), fl. IX; ibidem: *Buwalda 7840* (BO, L), old fl. IX; ibidem: *Buwalda 7850* (BO, L), fl. IX; ibidem, Dukusati, Saranan: *NIFS bb. 12470**, young fr.; ibidem, Sungeidalung: *NIFS bb. 14579**, fr.; L. Dayak, Danau Ranah: *NIFS bb. 13482**; ibidem: *Versteegh s.n. (NIFS bb. 33064)* (L, SING), old fl. IX; Kuala Kapuas Sungeimasulan: *NIFS bb. 15076* (L), fl. XI; no loc.: *NIFS bb. 2364* (L).

Remarks: A large tree, up to 30 m high. Buds yellow-green to reddish-yellow, flowers yellow or green, fruits yellow-green, green, or reddish, latex white. Bark brown inside, grey outside, sapwood pale, wood yellowish. Buttresses are reported (*NIFS bb. 33959*) as well as knee roots, sometimes swollen into knobs (*FD 43301*).

Vernac. names: djulutu (Sumatra), basong (Malay Pen.), benku (Sumatra, Malay Pen.), katiau or ketiau (Sumatra, Riau, Banka, Borneo), kahan, nyatoh, gedis, satan, babi, luba (Borneo), nyatoh tanjong (Malay Pen.). *Habitat:* Fairly common in lower areas up to 50 m alt. Scattered or few specimens together in primary forest, localities frequently inundated in the wet season, soil peaty or sandy, flat country, swampy; on borderline of *Agathis* forest and peat forest (Banka). Only one specimen (*Anta 319,* Lubuk ganggo) reported from 600 m alt.

Var. **scortechinii** King & Gamble, Journ. As. Soc. Beng. LXXIV, 2 Extra nr. 17, 1905, 178 — *Ganua scortechinii* (K. & G.) H. J. L. 1925, 126; Lam 1927, 427.

Type specimen: *King's coll. 5454.*

Distribution: Malay Peninsula.

Differs from the type in the following characters: *leaves* larger and broader, 13—17 by 5.5—8.5 cm; petioles shorter (1.6—2.2 cm); secondary nerves 14—16, less slender and near margin often joined in a more complex way; *flowers* larger; sepals 0.5—0.6 cm long, triangular and relatively narrow (f. Lam 1925).

MALAY PENINSULA. Perak: *King's coll. 5454* (*type spec.* of var.) (SING), fl. I.

Remarks: Large tree, 20—25 m high, leaves glossy deep green, flowers white, fruit dark green, 1.3 cm in diam..

Habitat: dense jungle, low wet grounds below 30 m alt.

9. **Ganua boerlageana** (Burck) Pierre ex Dubard, Rev. Gén. Bot. XX, 1908, 201; Lam 1925, 129; Lam 1927, 427.

Type specimen and basonym: *Burck s.n.* in Hort. Bog. cult., type of *Payena boerlageana* Burck — *Fig. 9a.*

Distribution: Moluccas, New Guinea.

Var. **boerlageana** — Synonymy as in species; distribution ditto, except New Guinea.

Terminal bud rather conspicuous, scales narrowly triangular, glabrous, without stipular organs; *leaves* dispersed along branchlets, oblong-obovate to elliptic, base cuneate up to 30°; blade 14—24 by 4—7 cm, more than 3 times longer than wide; midrib little prominent on either side; secondary nerves prominulous on either side, starting from midrib at angles of 70°—80°, straight, curving towards apex near margin, 7th and 8th secondary nerve 0.7—1.5 cm apart; generally one tertiary nerve in its basal part more or less parallel to the two adjoining secondary nerves, additional tertiary nerves starting at greater angles from midrib, loose reticulation all over the leaf, densiest near margin; *inflorescences* scattered along branchlets; pedicels 1.5—2.5 cm long, glabrous; flowers relatively slender; *sepals* ovate, apex acute, ciliate, glabrous within, inner sepals thinner, especially near margin, fringed; *corolla* lobes more or less rounded at apex, appressedly pubescent on either side, margins fringed; ovary 6-celled (type specimen), cells imperfect; no *fruits* seen.

MOLUCCAS. Sula Isl., Mangoli, Lampau: *NIFS bb. 29906* (L, SING); Morotai, W. slope of G. Sabatai: *Lam 3541* (L); Halmaheira: *Teysmann 5652* (L); Gebeh: *Teysmann 7818* (L); Amboina, Waai: *NIFS bb. 25976* (L, SING); ibidem: *NIFS bb. 10100* (BO, L); ibidem: *NIFS bb. 10105* (L); ibidem: *coll.?* (L); ibidem, Salahutu: *Eyma 3050* (BO); Cult. in Hort. Bot. Bog.: *Burck s.n.* (*type spec.*) (BO, L, NY, SING), fl.

Remarks: The annotation on the type specimen "Java" is most probably erroneous. Flowers greenish white.

Vernac. names: arupah merah (Amboina), arupa putih (ibidem), raka (Morotai). *Habitat:* reported from localities below 125 m.

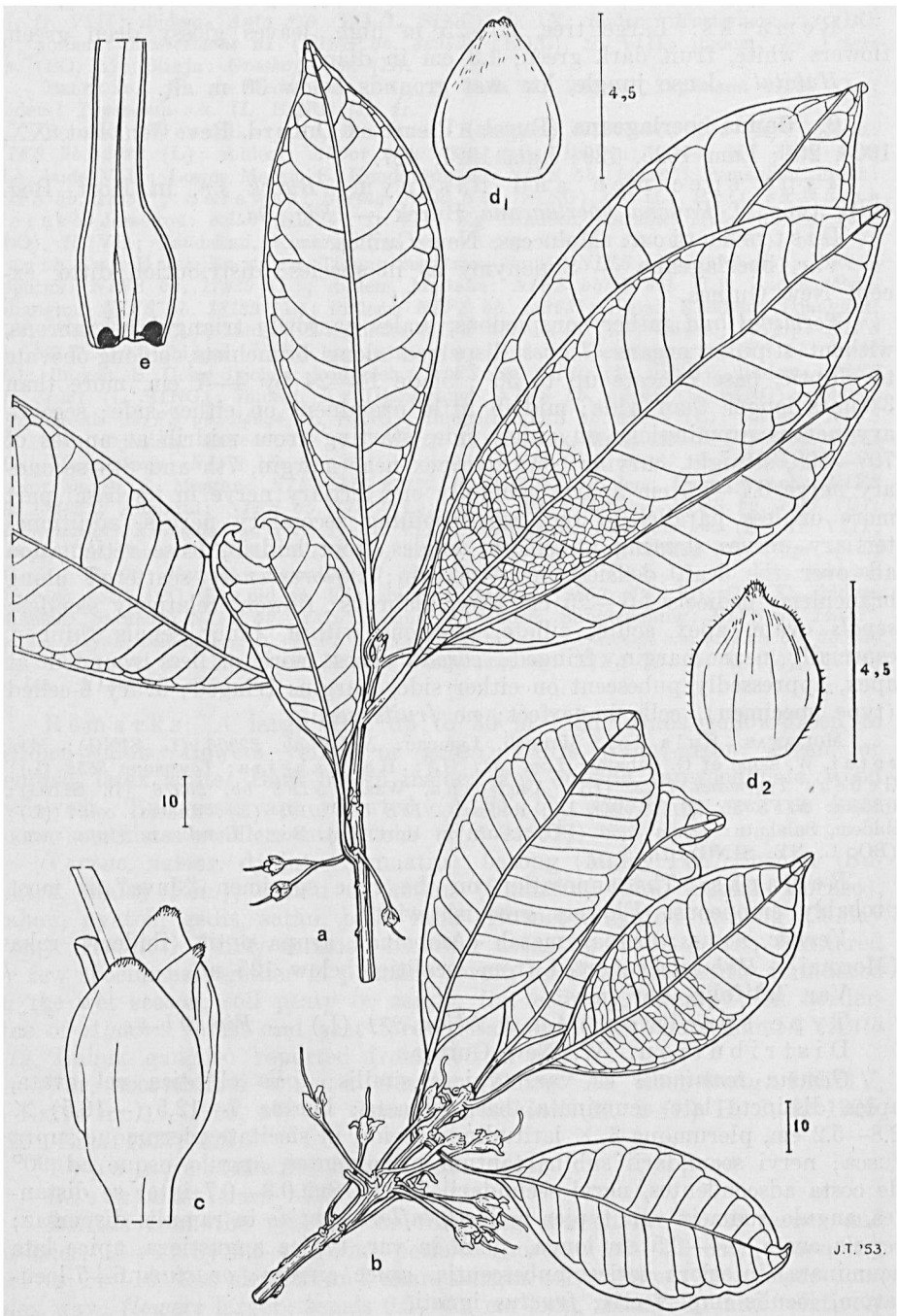
Var. **latifolia**, var. nov..

Type specimen: *Aet & Idjan 871* (L) — *Fig. 9 b—e.*

Distribution: W. New Guinea.

Gemma terminalis ea var. typicae similis; *folia* elliptica vel ovata, apice distincte late acuminata, basi cuneata; lamina 7—12.5 (—16.5) × 2.8—5.2 cm, plerumque 3 × latitudine brevior, in siccitate plerumque supra fusca; nervi secundarii subtus tantum prominentes, angulo usque ad 90° de costa adscendentes, nervi secundarii 7mi et 8vi 0.3—0.7 inter se distantes, angulo quam in var. typica maiore; *inflorescentiae* in ramulis dispersae; *sepala* ovata, 0.4—0.5 cm longa, quam in var. typica angustiora, apice late acuminata, interiora sericeo-pubescentia, apice cirrosa; *ovarium* 6—7-loculatum, loculis imperfectis; *fructus* ignoti.

Terminal bud as in var. *boerlageana*; *leaves* elliptic to ovate, apex


4,5
d1
e
4,5
d2
10
a
c
10
b
J.T. '53.

more or less distinctly broadly acuminate, base cuneate (angle 40° or more); blade 7—12.5 (—16.5) by 2.8—5.2 cm, majority of leaves shorter than 3 times their width, in a dry state mostly with a characteristic brown colour above; secondary nerves prominent only below, flat or slightly impressed above, starting at angles up to 90° from midrib, 7th and 8th secondary nerves 0.3—0.7 cm apart; most tertiary nerves, if conspicuous at all, starting at greater angles from midrib than secondary ones: *inflorescences* scattered along branchlets; *sepals* ovate, 0.4—0.5 cm long, relatively narrower than in type variety, apex broadly acuminate, inner ones sericeously pubescent, apex tufted; *ovary* 6—7-celled, cells imperfect; no ripe *fruit* seen.

NEW GUINEA. Babo: *NIFS bb. 21821* (L); Meosnoem: *NIFS bb. 30957* (A, L), old fl. X; ibidem: *NIFS bb. 30936* (L, SING); ibidem: *NIFS bb. 30958* (KEP, L, SING); ibidem: *NIFS bb. 30972* (L, SING), old fl. X; Biak Isl.: *NIFS bb. 30860* (L, SING); ibidem: *NIFS bb. 30886* (L); ibidem: *NIFS bb. 30753* and *bb. 30892*, old flow. IX; Japen Isl., Seroei: *NIFS bb. 30340* (L); ibidem: *NIFS bb. 30739* (A, L, SING), old fl. IX; ibidem: *NIFS bb. 30893* (A, L, SING); ibidem: *NIFS bb. 30263* (L, SING); ibidem, Dowai, Ansoes: *NIFS bb. 20060* (L); ibidem, Marialtoe: *NIFS bb. 30372* (L, SING); ibidem, Arijom, *Aet & Idjan* (*Exp. Van Dijk*) *911* (BO, L), old fl. IX; ibidem: *Aet & Idjan* (*Exp. Van Dijk*) (*type spec.* of var.) (BO, L), old fl. IX; Hollandia, Berap: *NIFS bb. 28904* (L).

Remarks: The main differences between the two varieties are found in leaf characteristics (dimensions, base, nervation, colour). The number of secondary nerves (11—20) and the terminal bud are identical. In var. *latifolia* the pedicels are much stouter than in var. *boerlageana*. It must be borne in mind that of var. *latifolia* only old flowers (no ripe fruits) are known, which implies the possibility of some influence of fruit formation on the stoutness of the pedicels.

The new localities include the first records of *Ganua boerlageana* from New Guinea.

Habitat: collected at alt. up to 800 m alt.

10. Ganua sessilis (K. & G.) H. J. Lam 1925, 120, fig. 34; Lam 1927, 424.

Type specimen and basonym: *Ridley 5076*, type of *Payena sessilis* K. & G.

Distribution: Malay Peninsula (Singapore), Belitong, Borneo (S. & E. Borneo).

Scales of *terminal bud* conspicuous, lanceolate to narrowly triangular, 0.4—0.5 cm long, a few mm wide at base; no stipular organs; *leaves* and *inflorescences* more or less scattered along branchlets.

MALAY PENINSULA. Singapore: *Ridley 5076* (*type spec.*) (SING), fr. III.
BORNEO. Lupok, Kuala Kapuas: *Delmaar 2329* (L), fr. IV.

Remarks: The Borneo specimen is identical with the type specimen. The Belitong specimen (Lam 1927, 424) could not be checked with the type. On account of nervation characters (reticulate tertiary nerves) a relation to *G. beccarii* is supposed.

Fig. 9. *G. boerlageana* var. *boerlageana* — a. branchlet with flowers —var. *latifolia* — b. branchlet with leaves and flowers; c. calyx; d. 1. outer sepal outside; d. 2. inner sepal outside; e. longitudinal section of ovary. From *type specimens*. Dimensions in mm.

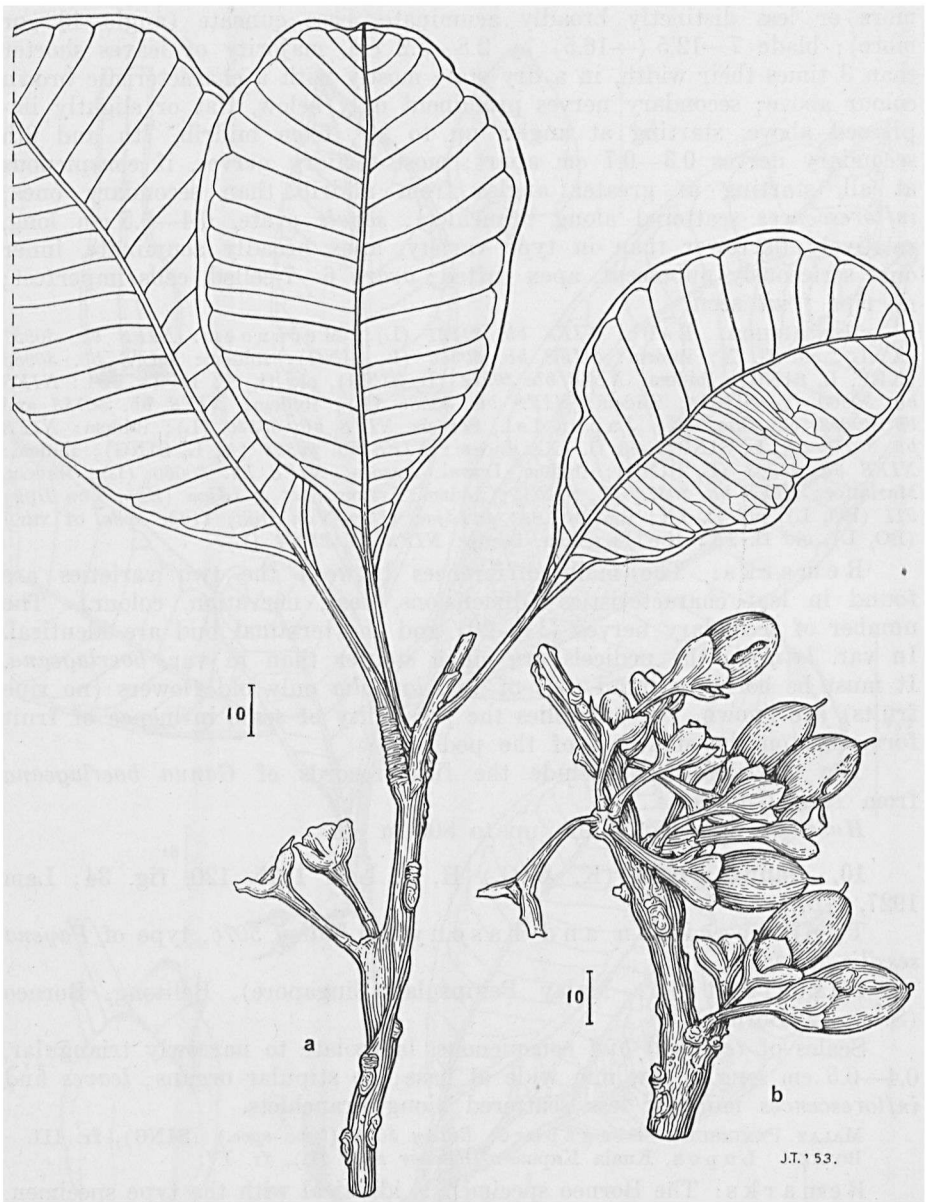


Fig. 10. *G. curtisii* — a. branchlet with fruiting calyces; b. ditto with fruits. From *NIFS bb. 11366.* Dimensions in mm.

11. Ganua curtisii (K. & G.) H. J. Lam 1925, 126; Lam 1927, 425 — *Ganua chrysocarpa* Pierre ex Dubard, Bull. Mus. Hist. Nat. XIV, 1908, 407; Lam 1927, 429. — *Fig. 10.*

Type specimen and basonym: *Curtis 1451*, type of *Bassia curtisii* K. & G. (the *lectotype* being *1451a*).

Distribution: Malay Peninsula, Borneo.

Terminal bud small, without distinct stipular organs; *leaves* scattered along branchlets; petioles 1.5—2.6 cm long, not or hardly swollen at base, glabrous, apex more or less rounded; blade 9—15 by 3.6—6.9 cm, relatively broad, coriaceous; midrib above flat or hardly prominent, always lacking the sharp median edge of *G. motleyana*; secondary nerves 11—18; tertiary nerves parallel to secondary ones, reticulate in marginal region; *inflorescences* in axils of leaves or their scars, 3—12-florous; pedicels 0.9—1.2 cm long, pubescent as are flower buds and ovary; flower characteristics rather variable; *fruit* with a brown-golden velvet indumentum.

MALAY PENINSULA. Penang, Government hill near turn off to Cray Holet: *Ridley s.n.* (BM), fl. III 1915; ibidem, highlands: *Ridley s.n.* (BM), fl.; Highland Res.: *Curtis 3531* (SING), X 1900; ibidem, Government hill: *Curtis 1451a* (*lectotype* of *Bassia curtisii*) (SING), III 1893; ibidem: *Curtis 1451b* (SING), fr. VIII 1901; ibidem: *Curtis 3536* (SING), fl. VI 1900; ibidem: *Curtis 1451c* (SING), fl. V 1893; ibidem: *Curtis 1451d* (SING), fl. IV 1901; ibidem: *Curtis 1451e* (SING), fl. fr. III 1888; ibidem: *Curtis 1451f* (SING), VII 1893; ibidem: *Curtis s.n.* (SING), X 1900; Perak, Lahat, Waterfall hill behind Taipeng: *Mme Errington de la Croix 62* (*type spec.* of *G. chrysocarpa*) (L, P), fl. II; ibidem: in *Herb. L. Pierre 6122* (P); Taipeng: *De Zylva 9609* (SING), fr. XII; Larut hills: *Derry (Curtis 3695)* (SING), fr. IX 1900; ibidem, fr. IX 1901; Taipeng, Waterfall hill: *Wray 512* (SING), fl. s.d.; ibidem, *coll.?* (SING).

BORNEO. Pamankat, Paloh: *NIFS bb. 11366* (L), fr..

Remarks: Judging from leaf nervation and fruit characters this species is undoubtedly a *Ganua*. The flowers, however, are rather variable, also in important features: corolla lobes 8—10, stamens 16—22, ovary cells 8(—10). The latter are mostly distinctly imperfect (cf. Dubard 1908a, b) and the ovary is gradually contracted into the style. In some specimens, however, (e. g. *Curtis 1451d*, Penang highlands, April 1901) the cells are perfectly closed, the ovary being moreover swollen and contracted rather abruptly into the style; this is more like *Madhuca*. Similar indications of a vague generic delimitation are revealed by *Ganua kingiana* (see there). As to other characters (such as leaf nervation, pericarp, etc.), however, the specimens with perfect and those with imperfect ovary cells are fully identical.

Ganua chrysocarpa, long the name of an incompletely known species could be definitely disposed of, after comparing the types from Paris and Singapore, *curtisii* K. & G. (1905) having the priority over *chrysocarpa* Pierre ex Dubard (1908).

Large tree, leaves dark green, petals greenish or white, fruit reddish brown, latex bluish, at first very sticky. Mme Errington de la Croix reports that the latex (gutta ganu) is used for falsifying the economically valuable latex exuded by other Sapotaceae (gutta terbu; we were not able to identify this name with any of the known species).

Vernac. names: mentua tabau (Taipeng), sanggai ketiau (Pamankat). *Habitat:* frequently reported from hills in the Malay Peninsula in alt. of 50 up to 800 m. In Borneo collected at 4 m alt.

12. Ganua coriacea Pierre ex Dubard, Bull. Mus. Hist. Nat. XIV, 1908, 408; Lam 1925, 121, fig. 35; Lam 1927, 424.

Type specimen: *Beccari 3085.*

Distribution: E. Sumatra, Riau, W. Borneo (Sarawak).

Terminal bud small, without distinct stipular organs; *leaves* more or less together in apical region of branchlets but not crowded, apex rounded; *inflorescences* in axils of leaves or their scars; *flowers* with characteristic and dense tufts at tips of sepals.

SUMATRA. East Coast, Labuhanbatu, Sei Palas: *NIFS bb. 11490* (L), fl. VI; ibidem, Pasar Tiga: *NIFS bb. 11487* (L).

RIAU. Belimbing: *NIFS bb. 28484* (L).

BORNEO. Sarawak, Kuching: *Beccari 3085* (*type spec.*) (FI, P), fl. I; ibidem: *Haviland 2118* (BM, L, W), fl. I; ibidem: *Haviland 2139* (BM, L), fl. I; ibidem, Entayut riv.: *Hose 413* (BM), fl. XII.

Remarks: A large tree, about 30 m high, knee roots are reported from Sumatra (*NIFS bb. 11487*), latex white and abundant, flowers white and fragrant. The Sumatra, Riau and Borneo specimens, are more or less identical. So far this species was only known from Borneo.

Vernac. names: majang pinang, kenari (Sumatra). *Habitat:* collected in alt. of 5 and 6 m.

13. Ganua obovatifolia (Merrill) Van den Assem, comb. nov. — *Bassia obovatifolia* Merrill, Phil. Journ. Sci. Bot. X, 1915, 57 — *Madhuca obovatifolia* (Merr.) Merrill, Enum. Phil. Flow. Pl. III, 3, 1923, 277; Lam 1925, 180; Lam 1927, 462.

Type specimen and basonym: *Alvarez 21426,* type of *Bassia obovatifolia.* — *Fig. 11.*

Distribution: Luzon.

Terminal bud small without stipular organs; *leaves* in apical region of branchlets but not crowded, ovate, apex rounded, base cuneate, decurrent; petioles 1.0—1.5 cm long, flattened above, convex below, dark at base, glabrous; blade 6—13 by 3—7.2 cm, glabrous on either side, distinctly coriaceous, reddish-brown when dry; midrib prominulous above, slightly but distinctly prominent below; secondary nerves 8—10, not quite conspicuous above at least near margin, slightly but distinctly prominulous below, archingly joined near margin, starting from midrib at angles of about 60°, straight, curving towards apex near margin; tertiary nerves hardly conspicuous, more or less parallel to secondary ones near midrib, reticulate near margin; *inflorescences* in lowest part of leaf region and below it, 5—7-florous; pedicels 1.0—1.8 cm long, about 0.8 mm in diam., glabrous; *sepals* 0.45—0.50 cm long, more or less ovate, not or hardly acuminate at apex, rather thick and almost glabrous with some scattered dark hairs which are somewhat densier towards apex so as to form a small dark tuft, inner sepals with thinner margins, fringed; *corolla* tube 0.25 cm long, glabrous except in throat, lobes 8, 0.25 cm long, more or less ribbon-shaped, pubescent on both sides of rounded apex; *stamens* 15, filaments short and more or less cylindrical, anthers about 0.2 cm with rather blunt apex, not conspicuously mucronate, pilose on dorsal side, thecae oblong; *pistillum* 1.1 cm long, ovary glabrous except for a few hairs at base, 0.13 cm in diam., imperfect cells 5—6; *fruits* 2 cm long, pericarp thin, glabrous, seeds oblong, testa thin, albumen membranous; pedicels 2.2 cm long, under sepals 0.25 cm in diam., woody as are the persistent sepals.

PHILIPPINES. Luzon, Tayabas, Guianayangan: *Escritor 20769* (BM, L, NY, P), fl. III; ibidem, Camarines, near Deat: *Alvarez 21426* (*type spec.*) (P), fr. V; ibidem: *Alvarez 21454* (L), fr. V.

Remarks: The leaves of *Alvarez 21454* are less reddish than those of the type. Merrill (l. c. 1915) supposes an affinity to *Madhuca (Bassia)*

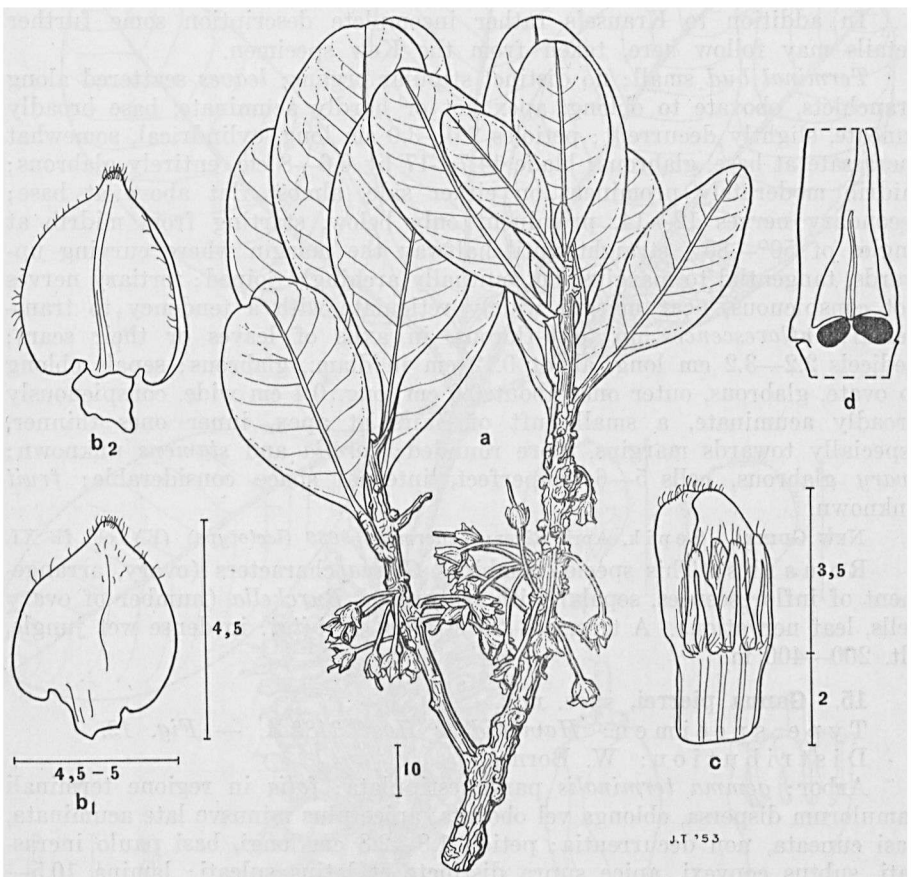


Fig. 11. *G. obovatifolia* — a. branchlet with leaves and flowers; b. 1. outer sepal outside; b.2. inner sepal outside; c. part of corolla and stamens inside; d. longitudinal section of ovary. From *Escritor 20769*. Dimensions in mm.

coriacea (Merr.) Merr. (*10008*, Principe, l. c.), an opinion I was unable to check. An affinity to any other *Ganua* species is not clear, except that the leaves of *G. obovatifolia* resemble those of *G. coriacea* in shape. In more important details, however, such as nervation, there is no clear relation.

14. Ganua pachyphylla (Krause) H. J. Lam, Blumea VI, 3, 1952, 592 (excluded from *Burckella*) — *Illipe pachyphylla* Krause, Engl. Bot. Jahrb.

58, 1923, 467 — *Burckella pachyphylla* (Krause) H. J. L., Enum. Sap., Nov. Guinea XIV, 4, 1932, 555, Tab. CI.

Type specimen and basonym: *Ledermann 9633*, type of *Illipe pachyphylla*. Since the Berlin type specimen has been destroyed I propose that the type duplicate in Herb. Kew serve as a lectotype.

Distribution: N. New Guinea.

In addition to Krause's rather incomplete description some further details may follow here, taken from the Kew specimen.

Terminal bud small; no distinct stipular organs; *leaves* scattered along branchlets, obovate to oblong, apex not or hardly acuminate, base broadly cuneate, slightly decurrent; petioles 2.0—3.0 cm long, cylindrical, somewhat incrassate at base, glabrous; blade 14.7—17 by 6.6—8 cm, entirely glabrous; midrib moderately prominent on either side, almost flat above at base; secondary nerves 12—14, prominent only below, starting from midrib at angles of 50°—85°, straight until halfway the margin where curving upwards, tangential to margins, not mutually archingly joined; tertiary nerves not conspicuous, near margin widely reticulate with a tendency to transversal; *inflorescences* up to 6-florous, in axils of leaves or their scars; pedicels 2.2—3.2 cm long, about 0.12 cm in diam., glabrous; sepals oblong to ovate, glabrous, outer ones about 0.6 cm long, 0.4 cm wide, conspicuously broadly acuminate, a small tuft of hairs at apex, inner ones thinner, especially towards margins, more rounded; *corolla* and *stamens* unknown; *ovary* glabrous, cells 5—6, imperfect, internal space considerable; *fruit* unknown.

New Guinea. Sepik, April River: *Ledermann 9633* (*lectotype*) (K), old fl. XI.

Remarks: This species combines *Ganua* characters (ovary, arrangement of inflorescences, sepals) with features of *Burckella* (number of ovary cells, leaf nervation). A tree, 20—25 m high. *Habitat:* in dense wet jungle, alt. 200—400 m.

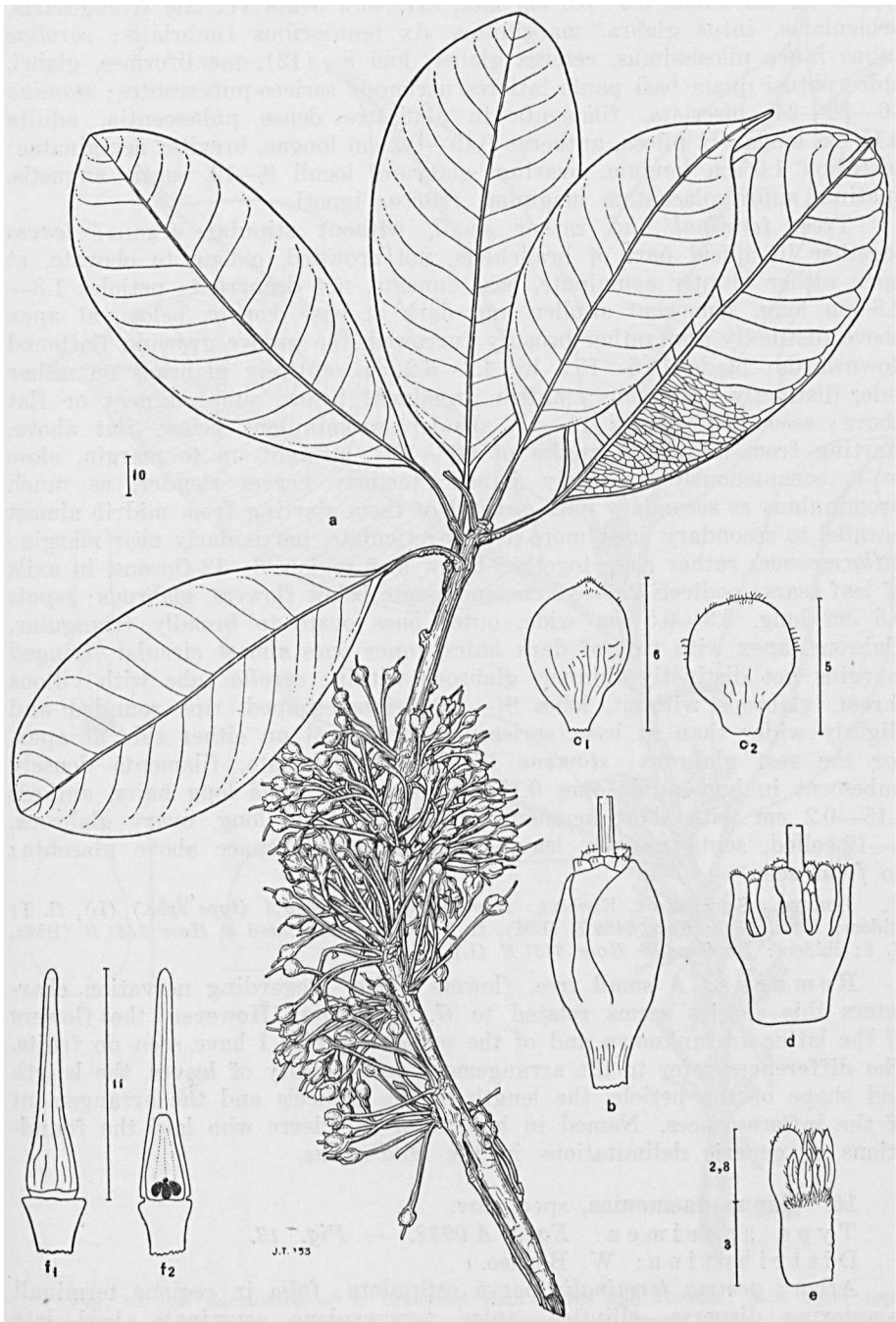
15. Ganua pierrei, spec. nov..

Type specimen: *Haviland & Hose 3482 A.* — *Fig. 12.*

Distribution: W. Borneo.

Arbor; *gemma terminalis* parva estipulata; *folia* in regione terminali ramulorum dispersa, oblonga vel obovata, apice plus minusve late acuminata, basi cuneata, non decurrentia; petioli 1.8—2.8 cm longi, basi paulo incrassati, subtus convexi, apice supra distincte et latius sulcati; lamina 10.5—15.5 × 4.2—6.2 cm, utrimque glabra, distincte coriacea; costa subtus prominens, supra paulo prominens vel plana; nervi secundarii 11—17, graciles, subtus prominentes, supra plani, angulo 60°—80° de costa adscendentes, marginem versus distincte arcuatim coniuncti; nervi tertiarii nervi secundariis similes, prominentes, plerumque ad marginem plus minusve reticulati; *inflorescentiae* sub foliorum regione confertae, 6—12-florae, axillis cicatricium foliorum insertae; pedicelli 2.8—3.5 cm longi, apice incrassati, glabri;

Fig. 12. *G. pierrei* — a. branchlet with leaves and flowers; b. flower; c. 1. outer sepal outside; c. 2. inner sepal outside; d. corolla outside; e. part of corolla and stamens inside; f. 1. ovary and style; f. 2. longitudinal section of ovary. From *type specimen*. Dimensions in mm.


10
a
6
c1
5
c2
b
d
11
f1
f2
2,8
3
e

sepala 0.5 cm longa, 0.3—0.5 cm lata, exteriora ovata vel late triangularia, orbicularia, intus glabra, marginibus vix tenuioribus fimbriatis; *corollae* tubus fauce pilosissimus, ceterca glaber, lobi 8—(12), taeniiformes, glabri, apice obtusi quam basi paulo latiores utrimque sericeo-pubescentes; *stamina* 16—22—24, biseriata, filamenta in alabastro dense pubescentia, adulta 0.15 cm longa vix pilosa, antherae 0.15—0.2 cm longae, breviter acuminatae; *pistillum* 1.0 cm longum, ovarium glabrum, loculi 8—12, septis angustis, spatium supra placentam magnum; *fructus* ignoti.

Tree, *terminal bud* rather small, without stipular organs; *leaves* together in apical part of branchlets, not crowded, oblong to obovate, at apex rather bluntly acuminate, base cuneate, not decurrent; petioles 1.8—2.8 cm long, somewhat swollen and dark at base, convex below, at apex above distinctly and rather broadly furrowed, the groove growing flattened downwards; blade 10.5—15.5 by 4.2—6.2 cm, entirely glabrous on either side, distinctly coriaceous; midrib prominent below, subprominent or flat above; secondary nerves 11—17, slender, prominulous below, flat above, starting from midrib at angles of 60°—80°, straight up to margin, close to it conspicuously archingly joined; tertiary nerves slender, as much prominulous as secondary ones, several of them starting from midrib almost parallel to secondary ones, more or less reticulate, particularly near margin; *inflorescences* rather close together below leaf region, 6—12-florous, in axils of leaf scars; pedicels 2.8—3.5 cm, incrassate below flowers, glabrous; *sepals* 0.5 cm long, 0.3—0.5 cm wide, outer ones ovate to broadly triangular, glabrous, apex with tuft of dark hairs, inner ones almost circular, fringed margins not distinctly thinner, glabrous within; *corolla* tube with villous throat, glabrous without, lobes 8(—12), ribbon-shaped, tips rounded and slightly wider than at base, sericeously pubescent on either side at apex, for the rest glabrous; *stamens* 16—22—24, biseriate, filaments densely pubescent in bud, adult ones 0.15 cm long with some long hairs, anthers 0.15—0.2 cm with short acumen; *pistillum* 1.0 cm long, ovary glabrous, 8—12-celled, septa narrow, leaving a considerable space above placenta; no *fruit* seen.

BORNEO. Sarawak, Kuching: *Haviland & Hose 3482 A (type spec.)* (L), fl. I; ibidem: *Haviland & Hose 3482 B* (BM), fl. I; ibidem: *Haviland & Hose 3481 B* (BM), fl. I; ibidem: *Haviland & Hose 3481 E* (L), fl. I.

Remarks: A small tree, flowers white. Regarding nervation characters this species seems related to *G. monticola*. However, the flowers of the latter are unknown and of the present species I have seen no fruits. The differences refer to the arrangement and rigidity of leaves, the length and shape of the petiole, the length of the pedicels and the arrangement of the inflorescences. Named in honour of L. Pierre who laid the foundations of generic delimitations in the *Madhuceae*.

16. Ganua daemonica, spec. nov..

Type specimen: *Egar A 0932.* — *Fig. 13.*

Distribution: W. Borneo.

Arbor; *gemma terminalis* parva estipulata; *folia* in regione terminali ramulorum dispersa, elliptica, apice perconspicue acuminata, basi late cuneata, paulo decurrentia; petioli 1.6—2.5 cm longi, subcylindrici, apice

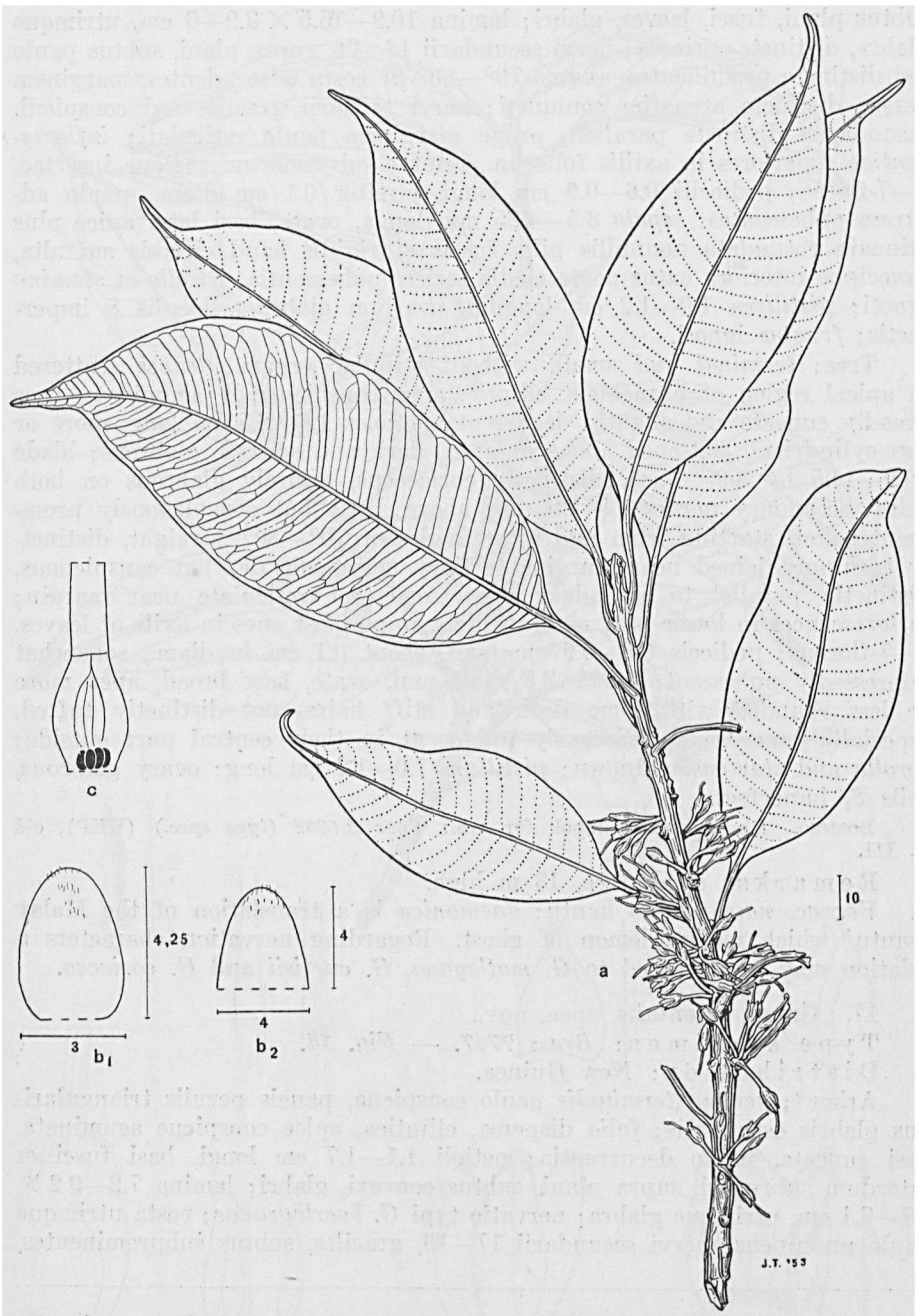


Fig. 13. *G. daemonica* — a. branchlet with leaves and flowers; b. 1. outer sepal outside; b. 2. inner sepal outside; c. longitudinal section of ovary. From *type specimen*. Dimensions in mm.

subtus plani, fusci, laeves, glabri; lamina 10.9—15.5 × 3.9—6 cm, utrimque glabra, distincte coriacea; nervi secundarii 14—20, supra plani, subtus paulo sed distincte prominentes, angulo 70°—80° de costa adscendentes, marginem versus distincte arcuatim coniuncti; nervi tertiarii graciles sed conspicui, secundariis distincte paralleli, prope marginem paulo reticulati; *inflorescentiae* superiores in axillis foliorum, ceterae sub foliorum regione insertae, 4—7-florae; pedicelli 0.6—0.9 cm longi, circiter 0.1 cm diam., paulo adpresse pubescentes; *sepala* 3.5—4.25 mm longa, ovata, basi lata, apice plus minusve rotundata nonnullis pilis fuscis et rigidis haud cirrosis suffulta, praecipue interiora extus parte media sericeo-pubescentia; *corolla* et *stamina* ignoti; *pistillum* 1.0—1.2 cm longum, ovarium glabrum, loculis 8 imperfectis; *fructus* ignoti.

Tree; *terminal bud* small, without stipular organs; *leaves* scattered in apical region of branchlets, elliptic, apex conspicuously acuminate, base broadly cuneate and slightly decurrent; petioles 1.6—2.5 cm long, more or less cylindrical, flattened above at apex, dark and smooth, glabrous; blade 10.9—14.5 by 3.9—6 cm, distinctly coriaceous, entirely glabrous on both sides; secondary nerves 14—20, flat above, little but conspicuously prominent below, starting from midrib at angles of 70°—80°, straight, distinctly archingly joined near margin; tertiary nerves slender but conspicuous, distinctly parallel to secondary ones, somewhat reticulate near margin; *inflorescences* in lower part of branchlets, uppermost ones in axils of leaves, 4—7-florous; pedicels 0.6—0.9 cm long, about 0.1 cm in diam., somewhat appressedly pubescent; *sepals* 3.5—4.25 mm, ovate, base broad, apex more or less rounded with some dark and stiff hairs, not distinctly tufted, especially inner ones sericeously pubescent in their central part outside; *corolla* and *stamens* unknown; *pistillum* 1.0—1.2 cm long; ovary glabrous, cells 8, imperfect.

BORNEO. Sarawak, Setapok for. res.: *Egar A 0932* (*type spec.*) (KEP), old fl. III.

Remarks: small tree, 13 m high.

Vernac. name: ketio hantu; *daemonica* is a translation of the Malay 'hantu' which means demon of ghost. Regarding nervation characters a relation may be supposed to *G. motleyana*, *G. curtisii* and *G. coriacea*.

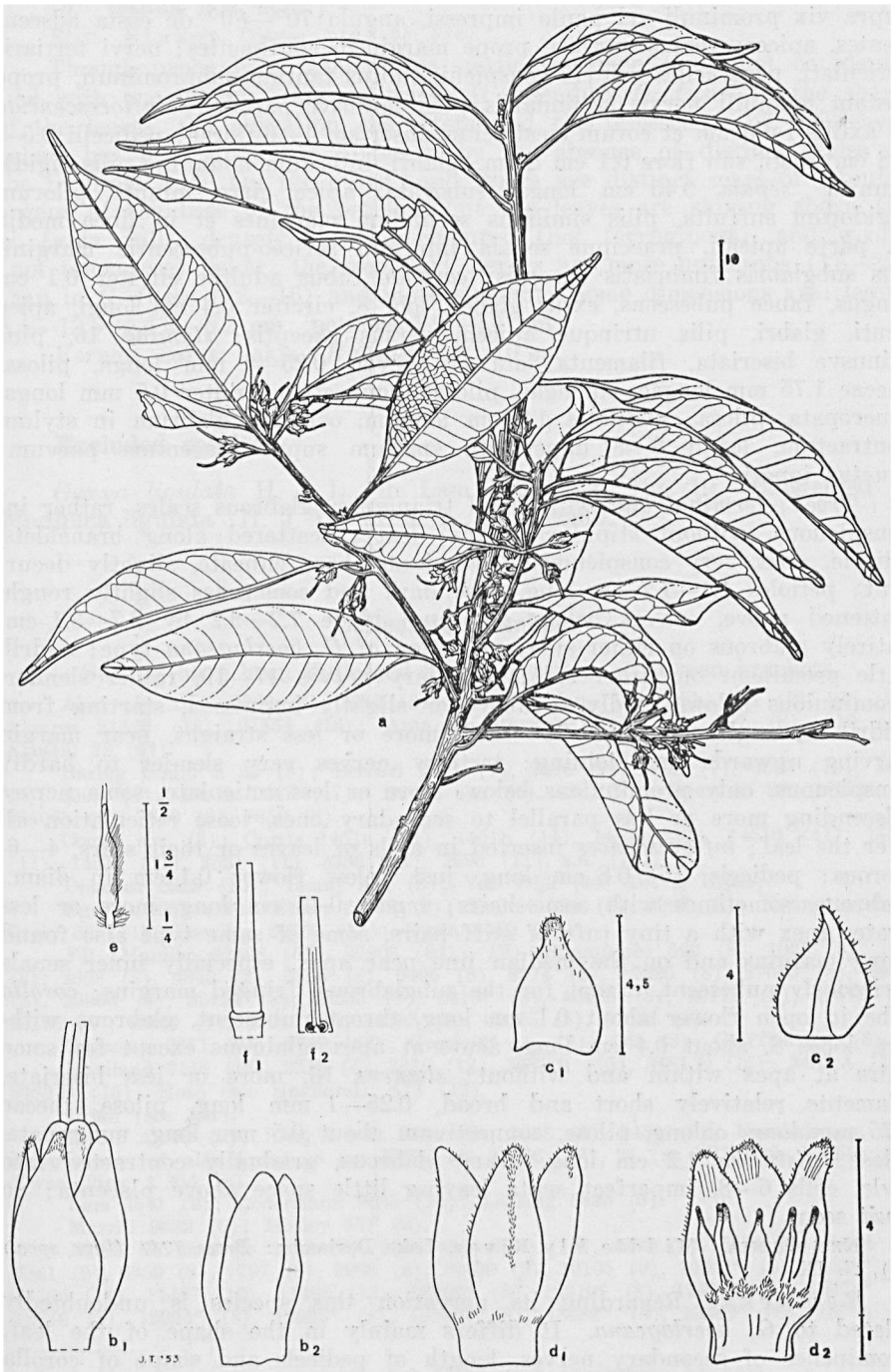
17. Ganua orientalis, spec. nov..

Type specimen: *Brass 7747*. — *Fig. 14.*

Distribution: New Guinea.

Arbor?; *gemma terminalis* paulo conspicua, paucis perulis triangularibus glabris estipulatis; *folia* dispersa, elliptica, apice conspicue acuminata, basi cuneata, paulo decurrentia; petioli 1.1—1.7 cm longi, basi fusci et interdum subrugosi, supra plani, subtus convexi, glabri; lamina 7.2—9.2 × 2.7—3.1 cm, utrimque glabra; nervatio typi *G. boerlageanae*; costa utrimque paulo prominens; nervi secundarii 17—19, graciles, subtus subprominentes,

Fig. 14. *G. orientalis* — a. branchlet with leaves and flowers; b. flower; c. 1. outer sepal outside; c. 2. inner sepal outside; d. 1. corolla outside; d. 2. corolla and stamens inside; e. stamen; f. 1. ovary and style; f. 2. longitudinal section of ovary. From *type specimen*. Dimensions in mm.


10
a
1/2
1 3/4
1/4
e
f1
f2
4,5
c1
4
c2
b1
b2
d1
d2
4
1
J.T.'53

supra vix prominuli vel paulo impressi, angulo 70°—80° de costa adscendentes, apicem versus curvati, prope marginem confluentes; nervi tertiarii reticulati, pergraciles vel vix conspicui, subtus tantum subprominuli, prope costam nonnulli nervis secundariis plus minusve parelleli; *inflorescentiae* in axillis foliorum et eorum cicatricium insertae, 4—6-florae; pedicelli 0.5—0.8 cm longi, sub flore 0.1 cm diam., glabri, interdum nonnullis pilis rigidis muniti; *sepala* 0.45 cm longa, subovata, apice cirro minuto pilorum rigidorum suffulta, pilis similibus secundum margines et in linea media in parte apicali, praecipue sepala interiora sericeo-pubescentia marginibus subglabris fimbriatis exceptis; *corollae* tubus adultae circiter 0.1 cm longus, fauce pubescens, extus glaber, lobi 8, circiter 0.4 cm longi, apice acuti, glabri, pilis utrinque apicem versus exceptis; *stamina* 16, plus minusve biseriata, filamenta lata et brevia, 0.25—1 mm longa, pilosa, thecae 1.75 mm longae, oblongae, pilosae, connectiva circiter 0.5 mm longa, mucronata, pilosa; *pistillum* 1.2 cm longum, ovarium glabrum in stylum contractum, loculi 6—8 imperfecti, spatium supra placentam parvum; *fructus* ignoti.

Tree?; *terminal bud* with small triangular, glabrous scales, rather inconspicuous, without stipular organs; *leaves* scattered along branchlets, elliptic, apex very conspicuously acuminate, base cuneate, slightly decurrent; petioles 1.1—1.7 cm long, base dark and sometimes slightly rough, flattened above, convex below, glabrous; blade 7.2—9.2 by 2.7—3.1 cm, entirely glabrous on either side; nervation of *G. boerlageana* type; midrib little prominent on either side; secondary nerves 17—19, rather slender, prominulous below, hardly so above or slightly impressed, starting from midrib at angles of about 70°—80°, more or less straight, near margin curving upwards and joining; tertiary nerves very slender to hardly conspicuous, only prominulous below, more or less reticulate, some nerves adscending more or less parallel to secondary ones, loose reticulation all over the leaf; *inflorescences* inserted in axils of leaves or their scars, 4—6-florous; pedicels 0.5—0.8 cm long, just below flower 0.1 cm in diam., glabrous, sometimes with some hairs; *sepals* 0.45 cm long, more or less ovate, apex with a tiny tuft of stiff hairs, some of same type also found along margins and on the median line near apex, especially inner sepals sericeously pubescent, except for the subglabrous, fringed margins; *corolla* tube in open flower about 0.1 cm long, throat pubescent, glabrous without, lobes 8, about 0.4 cm long, acute at apex, glabrous except for some hairs at apex within and without; *stamens* 16, more or less biseriate, filaments relatively short and broad, 0.25—1 mm long, pilose, thecae 1.75 mm long, oblong, pilose, connectivum about 0.5 mm long, mucronate, pilose; *pistillum* 1.2 cm long, ovary glabrous, gradually contracted into style, cells 6—8, imperfect septa leaving little space above placenta; no *fruit* seen.

New Guinea. Middle Fly River, Lake Daviambu: *Brass 7747 (type spec.)* (L), fl. IX.

Remarks: Regarding its nervation this species is undoubtedly related to *G. boerlageana*. It differs mainly in the shape of the leaf, prominence of secondary nerves, length of pedicels and shape of corolla lobes.

18. Ganua nov. spec.?

RIAU. Sinkep, Djago: *NIFS bb. 3940.*

Though probably a *Ganua*, this sterile specimen could not be identified with one of the known species. It resembles *G. fusca* in the shape of the leaves, the nervation characters and the pubescence of the leaves below, but it is distinctly different by the absence of distinct scales in the terminal bud. On the other hand, there are distinct scars of stipular organs at the base of the petioles, but the leaves are shining above (in *G. fusca* dull), densely chocolate-coloured (not ferruginous), and woolly (not tomentose) below; the secondary nerves are more numerous (17—22) than in *G. fusca* (12—16) and more straight. Some dimensions are: leaves 8.4—12.6 × 4.3—6.2 cm; petioles 1.9—2.4 cm.

Vernac. name: lakis. *Habitat:* alt. 10 m.

Excluded species.

Ganua ligulata H. J. L., in Lam 1927, 426, fig. 10, transferred to **Madhuca ligulata** (H. J. L.) H. J. L., nov. comb.

Collectors' numbers.

Species have been indicated by their number between brackets.

Abar bin Adan 2022 (8), 2340 (8); Aet & Idjan (Van Dijk) 871 (9), 911 (9); Alvarez 21426 (13), 21454 (13); Anta (Kostermans) 146 (8), 157 (8), 319 (8); Apostal 22 (6?).

Baring Gould S 22 (8); Beccari 2241 (7), 2446 (3), 2958 (7), 3085 (12), 3105 (4), 3503 (1); Brass 7747 (17); Burck s.n. (5), s.n. (9); Buwalda 29 (NIFS bb. 32406) (8), 7840 (8), 7850 (8).

Comer s.n. (2); Curtis 1451a (11), 1451b (11), 1451c (11), 1451d (11), 1451e (11), 1451f (11), 3531 (11), 3536 (11), 3695 (11), s.n. (11).

Delmaar 2329 (10); Denny s.n. (8); Van Dijk (see Aet & Idjan).

Egar A 0932 (16); Elmer 21571 (2); Endert 356 (8), 5087 (8); Errington de la Croix 62 (11); Escritor 20769 (13); Eyma 3050 (9).

FB (Manila) 22498 (6?), 27903 (6?); FD (Singapore) 592 (8), 1026 (8), 1918 (8), 2308 (8), 4840 (2), 5896 (8), 6496 (8), 8974 (8), 17225 (8), 27073 (8), 29626 (8), 29960 (8), 32154 (8), 32253 (8), 34107 (8), 40685 (8), 40713 (8), 41572 (8), 43195 (8), 43301 (8), 43689 (8), 44785 (8), 65673 (8), 65692 (8).

Garaman 2311 (6?), 2789 (6?); Grashoff s.n. (8); 765 (8); Griffith s.n. (8).

Haviland 2118 (12), 2318 (4), 2319 (12), 3481 B (15), 3481 E (15); 3482 A (15); 3482 B (15); Hose (see Haviland), 413 (12).

Idjan (see Aet).

Kadir A 609 (2); King's coll. 3414 (2), 3678 (2), 5454 (8); Korthals s.n. (8); Kostermans (cf. also Anta) 18 (= NIFS bb. 33956) (8), 21 (= NIFS bb. 33959) (8); Kwan Ting A 354 (8).

Lam 3541 (9); Ledermann 9633 (14); Lörzing 6823 (5).

Merrill 9622 (6); Motley 857 (8).

NIFS bb.-numbers 2022 (8), 2364 (8), 3940 (18), 4939 (8), 5382 (8), 5474 (8), 6341 (2), 6359 (8), 7797 (8), 9968 (8), 10100 (9), 10105 (9), 10661* (8), 11337* (8), 11366 (11), 11487 (12), 11490 (12), 12206* (8), 12210* (8), 12470* (8), 12478* (8), 12842 (8), 12924* (8), 12928* (8), 13136* (8), 13482* (8), 13649* (8), 13795 (8),

* Not seen by me personally but based upon annotations by Lam.

13834* (8), 14412* (8), 14579* (8), 15076 (8), 15460 (8), 15487 (8), 15689 (8), 16042 (8), 16757 (8), 16821 (8), 16997 (8), 17773 (8), 17829 (8), 17861 (8), 18139 (8), 18263* (8), 18999 (4), 20060 (9), 21264 (8), 21821 (9), 24020 (8), 24021 (8), 24662 (8), 24664 (8), 24665 (8), 25559 (8), 25976 (9), 27757 (8), 28082 (8), 28083 (8), 28484 (12), 28904 (9), 29094 (8), 29906 (9), 30263 (9), 30340 (8), 30372 (9), 30739 (9), 30753 (9), 30860 (9), 30886 (9), 30892 (9), 30893 (9), 30936 (9), 30957 (9), 30958 (9), 30972 (9), 32406 (8), 33048 (8), 33064 (8), 33956 (8), 33959 (8).

Ridley 5076 (10), 5645 (8), 6238 (2), 13489 (8), s.n. (11), s.n. (11), s.n. (2), s.n. (8); Riedel s.n. (8); Van Romburgh 78 (5).

Teysmann 5652 (9), 7818 (9), 11099 (8), s.n. (8), s.n. (8).

Versteegh s.n. (8), De Vriese 3748 (8).

Wood 1261 (6?), 1889 (6?); Wray 512 (11).

Zakaria b. Sulong s.n. (8); De Zwaan s.n. (4); De Zylva 9609 (11).

Index.

New species, new varieties and new combinations are denoted by an asterisk; accepted taxa are in roman, synonyms in italics. Numbers are those of species in the text.