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

V [1]). Haplolobus

by

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I. GENERAL PART.

1. Introduction.

More than twenty years have elapsed since the senior author (H. J. Lam) recognized *Haplolobus* as a genus separate from *Canarium*. In the mean time much newly collected material has become available and in view of the intended revision for Flora Malesiana, the time has come to sum up our present knowledge.

It must be said first of all that this knowledge, in spite of a considerable progress, is still far from satisfactory. Not only is much of the material sterile, but the genus however small it is, more and more proves to be an extremely difficult one to handle in a practicable way. Whether or not this is due to its phylogenetic youth is of little consequence. The fact stands that we have to deal with a genus in which the subgeneric limits, even if intuitively recognizable to the experienced eye, are so evasive as to make it extremely difficult to show them clearly to the man of practice who has to work with the species and the names attributed to them.

The present review it therefore particularly unsatisfactory from a practical point of view. We have tried to find the most sensible course between the Scylla of too much lumping and the Charybdis of too much splitting. This is, of course, not equally applicable to all species. There are some which are — or now seem — to be well delimited. Others, however, such as the group comprising *H. microphyllus, glandulosus, monticola, ledermannii, monophyllus,* and *nubigenus,* and the group formed by *H. moluccanus, celebicus, floribundus,* and *anisander,* are particularly nasty in this respect.

[1]) I—IV in Blumea VII, 1, 1952, 154—170.

2. Pen portrait of the genus.

To the expert who has grown familiar with the genus, there is little doubt as to the generic identity, even of sterile specimens. The absence of resiniferous vascular ducts in the medulla of the branchlets, together with the presence of such ducts in the medulla of the petioles — which can easily been seen and counted on making a cross section with a sharp pen knife and examining the cut with an ordinary 10 x pocket lense —, as well as the absence of stipules, makes the generic identification of specimens from or near the generic area fairly certain.

In addition, certain characters of leaf shape and venation, which are difficult to describe, may be of some help. One of them is that the leaves are rarely more than 4½-jugate.

In fertile material there is some help from the inflorescences, c. q. infrutescences. These are mostly axillary, often but not exclusively to the uppermost leaves; in a few cases terminal or subterminal inflorescences are known. The latter sometimes show an obsolete and overtopped vegetative bud and may be either terminal on branches of "herbarium size" or on smaller axillary ones. In a few cases these axillary shoots bear a small leaf.

The most striking character of the inflorescences, however, and particularly of the axillary ones, is that they are only rarely more or less long pedunculate. In most cases they are branched from near their base.

On the other hand, while the flowers hardly show any usable specific difference, the fruit yield the only perfectly trustworthy generic character by which *Haplolobus* can be distinguished from the related genera *Canarium, Dacryodes* and *Santiria*: the pericarp is dry and thin, the pyrenes are papyraceous and connate, and there is never more than one seed, which occupies the whole fruit, pressing the empty pyrenes aside, the cotyledons being entire, thick and planoconvex.

It is remarkable fact of historical importance that these generic characters, particularly those of the fruit, were recognized as such by the famous botanist and collector Odoardo Beccari as early as 1872 (cf quotations under *H. acuminatus* and *leeifolius*) on material from New Guinea. Although Beccari collected fruiting material even earlier (1866) in Borneo, he failed to recognize it (*H. beccarii*, see there) as apart from *Canarium* or *Santiria*.

The following morphological (anatomical) particulars are noteworthy:

a. Leaves. Mostly glabrous. Pubescence is only found in *H. acuminatus* and in a lesser degree *H. beccarii* and *robustus*.

The leaves are mostly (1½—)2½—4½-jugate (5—9 leaflets). Leaves with 11 leaflets have been found in *H. moluccanus*, with 13 in *H. beccarii*. On the other hand leaves with 2 or 1 leaflets are not rare. Unifoliolate leaves are found exceptionally in *H. anisander, clementium, maluensis*, and *nubigenus*. In *H. monophyllus* they are in the majority and next to some trifoliolate leaves bifoliolate ones are found.

The tertiary venation of the leaflets is always transverse.

b. Nectaries and "domatia". In some species two phenomena were found which, while apparently related mutually, are unknown to us

in any other genus of the *Burseraceae*: foliar nectaries and hairtufts (domatia) in the nerve axils.

The foliar nectaries are most pronounced in *H. glandulosus* and *microphyllus*, where they seem to be restricted to the nerve axils, hollow on the lower leaf surface, convex and bullate on the upper one. In the closely related *H. monticola* they are not always present but in addition to those in the axils of the secondary nerves there are occasionally accessory and shallower ones on the blade between the nerves.

In some cases these "glandular pits" are rare or extremely tiny (*H. nubigenus*), in others they are provided with a more or less hairy rim (*H. monticola*), thus forming a transition to the "domatia" which are situated in the nerve axils and are most conspicuous and frequent in *H. monophyllus*, much smaller and rare to very rare in *H. aneityensis* and *anisander*.

c. Resiniferous ducts in petioles. The number of resiniferous ducts (r.d.) in the medulla of the petioles is, to a certain extent, useful as a group character. In almost half the number of species (10 out of 21) it does not surpass 5 and in some species (*H. monophyllus* and *nubigenus*) it is restricted to 1, as far as our experience goes.

In many other species, however, this number may be subject to a considerable variability. This may correlate with a general variability of the species in question (e.g. *H. aneityensis*: 1—9; *acuminatus*: 2—17; *celebicus*: 1—9; *floribundus*: 1—11) or whether or not in addition it may be due to the tendency of these ducts particularly those on the lower (convex) side of the petiole, to coalesce and join into a few or even one single crescent-shaped duct (of annotation under *H. acuminatus*). This may be the case in such species as *H. megacarpus* (5—12), *hussonii* (3—11), *versteeghii* (3—7), and *maluensis* (about 9).

The largest numbers of petiolar resiniferous ducts are found in *H. robustus* (about 15), *beccarii* (15—20), and above all *H. moluccanus* (10—40!), in which either or both of the two phenomena just described (variability and coalescence) may occur.

It would be worth while to study in detail the anatomy of these ducts. There seem to be both collateral and amphivasal ones and there may well be some correlation with other characters. Unfortunately we had no opportunity to carry out an investigation of this kind which can probably be made even on herbarium material.

d. Inflorescences. The ♂ inflorescences are usually larger, more widely branched and more-flowered than the ♀ ones. Their generic variability is considerable, but in the majority of species they are axillary and often branched from near the base. Only in one species (*H. floribundus*) have terminal or subterminal inflorescences (as are not rare in *Dacryodes*) been found. This character, which is still insufficiently known owing to lack of material, seems to be rare, if present at all, in its strictest sense. It seems to be often accompanied by the presence of apparently obsolete vegetative buds. Should these develop, the once terminal inflorescence is automatically broken up into a combination of lateral ones and it is therefore not surprising that in a few cases such inflorescences

(themselves axillary to a leaf) are provided with a small leaf instead of a bract.

Inflorescential vegetative buds have been found in *H. glandulosus, floribundus, leeifolius,* and *monophyllus.*

e. Flowers and fruits. These are quite uniform and provide little or no characters of specific value (cf diagnosis on p. 419). The fruits are usually ellipsoid or ovoid, rarely (sub)globular (*H. leeifolius*) or pointed at apex (*H. aneityensis*) but other species show these characters as well, though in a lesser degree. The fruits are mostly small, 0.7—2.2 cm long and 0.5—1.3 cm in diam. Only in *H. megacarpus* are they "as large as an olive", viz 2.3—2.8 × 1.3—1.8 cm. For a detailed description with figures of a *Haplolobus* fruit, see under *H. leeifolius* (cf Lam, 1932a, fig. 102 C 1, sub b [diagr. of fr.] and fig. 105 [fr. and its structure]).

However, flowers and fruits are still unknown in many species. In fact, in only 3 out of the 21 species here accepted are ♂ flowers, ♀ flowers and fruits known, viz of *H. acuminatus, floribundus* and *maluensis.* For the other species the situation is as follows.

\+ known; — unknown; (—) adult or mature only unknown.

	flowers		fruits
	♂	♀	
H. microphyllus	—	+	—
— glandulosus	(—)	(—)	+
— monticola	—	+	—
— ledermannii	+	—	+
— robustus	—	—	+
— beccarii	—	—	+
— moluccanus	+	—	+
— celebicus	+	—	+
— versteeghii	—	—	(—)
— hussonii	—	—	+
— megacarpus	—	—	+
— monophyllus	+	—	—
— nubigenus	+	+	—
— clementium	—	+	+
— aneityensis	+	—	+
— borneensis	+	—	—
— anisander	+	+	—
— leeifolius	+	—	+

Despite the fact that the sexual dimorphism is much less pronounced in the flowers (and inflorescences) of *Haplolobus* than in those of most *Canarium* species, no evidence is available that occasional ♀ flowers (and fruits) are developing on ♂ trees, as is sometimes the case in certain *Canariums.*

3. Distribution, relationships, and ecology (*Fig. 1*).

Of the 21 species, comprised in the present revision 15 occur in New Guinea, of which 14 are endemic in that island. Endemic in Borneo are 2 species (*H. beccarii* and *H. borncensis*), 2 are restricted to the Moluccas (*H. moluccanus*; *H. monophyllus*, Morotai only) and 1 to the Western Pacific islands (*H. aneityensis*). One species (*H. celebicus*) is probably common to Celebes and the Moluccas and there is only 1 "wide" (*H. anisander*) which apparently occurs from Banggai (just east of Celebes) to New Britain. Close relationships between several of these, however, may make

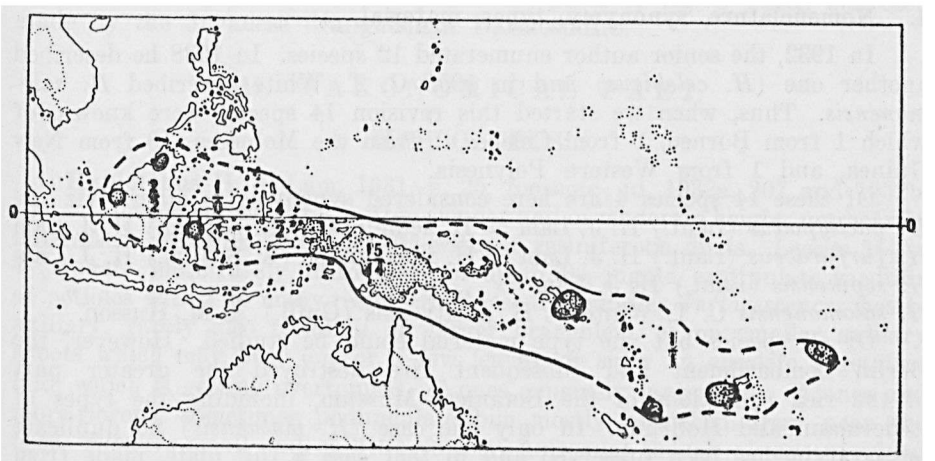


Fig. 1. — Area of *Haplolobus*. Numbers above the line indicate the number of species in the area in question, those below the line show the number of endemics in that area.

geographical limits uncertain (cf Remarks under *H. moluccanus, celebicus. floribundus* and *anisander*).

Of the two Borneo species one (*H. borneensis*) is a mountain tree, apparently of Papuan alliance. Strange as it is. the other one (*H. beccarii*), though indubitably a *Haplolobus* on account of the fruits, shows relations (in its vegetative parts) with certain *Canarium* species rather than with any other *Haplolobus* (cf Lam 1938b).

Of the species from Celebes and the Moluccas *H. celebicus* and *H. moluccanus* are very closely allied with Papuan species, notably *H. anisander*. *H. monophyllus*, a mountain species thusfar only known from Morotai, is closely linked with such Papuan mountain trees as *H. nubigenus, monticola, microphyllus, glandulosus* and *ledermannii*.

The Pacific species (*H. aneityensis*) is undoubtedly related to various Papuan species but it is hard to say with which.

Of the 21 species some 9 are only known from mountainous regions, but this may, at least partly, be due to insufficient collecting. The highest elevation is 1800 m (*H. microphyllus*). Other mountain trees are *H. glandulosus* (1000—1750 m), *H. ledermannii* (850—1000 m), *H. robustus*

(850 m), *H. versteeghii* (1150 m), *H. monticola* (1000 m), *H. clementium* (750—1000 m), all from New Guinea, and *H. monophyllus* (1000 m, Morotai), and *H. borneensis* (1500 m, Mt Kinabalu, North Borneo). *H. nubigenus* (New Guinea) is reported from (200—)850—1500 m. Most of these species have rigid, coriaceous leaflets with a dense and prominent reticulation, and in addition, some of them have extremely small and delicate ones, notably *H. microphyllus* and *H. ledermannii.*

Most other species seem to be lowland trees. Only a few are also reported from the hills, e. g. *H. acuminatus* and *floribundus,* of which some specimens are known from localities between 600 and 900 m.

4. Nomenclature, synonymy, types, material.

In 1932, the senior author enumerated 12 species. In 1938 he described another one (*H. celebicus*) and in 1950 C. T. White described *H. salomonensis.* Thus, when we started this revision 14 species were known, of which 1 from Borneo, 1 from Celebes, 1 from the Moluccas, 10 from New Guinea, and 1 from Western Polynesia.

Of these 14 species 4 are here considered synonyms to others, viz

H. pachypodus (Laut.) H. J. Lam = H. acuminatus (K. Schum.) H. J. Lam
H. furfuraceus (Laut.) H. J. Lam = H. floribundus (K. Schum.) H. J. Lam
H. sepikensis (Laut.) H. J. Lam = „ „ „ „
H. salomonensis C. T. White = H. aneityensis (Guill.) A. M. Husson.

Of all species but one type material could be studied. However, the Berlin bombardment and subsequent fire destroyed the greater part of the rich collections of the Botanical Museum, including the types of Ledermann and Hollrung. In only one case (*H. maluensis*) no duplicate or paratype has been preserved and in that case a full plate, made from that material by the senior author when preparing his 1932 paper has been published in the present paper and has been proposed to serve as a type. For the rest, of 5 species duplicates had to be designated as lectotypes, viz 3 for Ledermann specimens (*H. ledermannii, anisander,* and *leeifolius*) and 2 for specimens collected by Hollrung (*H. acuminatus* and *floribundus*); for 1 species (*H. nubigenus*) a neotype had to be proposed.

In addition, 1 new combination has been made (*H. aneityensis*) and 10 new species have been described here, 5 of which by A. M. Husson and 5 by H. J. Lam. Not less than of 3 of these are based on material collected by Beccari in 1866 and 1875! (*H. beccarii, hussonii,* and *megacarpus*).

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

A	Arnold Arboretum Herbarium, Harvard University, Jamaica Plain, Mass.;
B	Botanischer Garten und Museum, Berlin;
BISH	Herbarium of Bernice P. Bishop Museum, Honolulu;
BM	Department of Botany, British Museum (Natural History), London;
BO	Herbarium Bogoriense, Bogor, Java;
BRI	Queensland Herbarium, Botanic Gardens, Brisbane;
FI	Erbario del Instituto Botanico dell'Università, Firenze;
K	Herbarium, Royal Botanic Gardens, Kew, Surrey;
LAE	New Guinea Forestry Service, Lae;
L	Rijksherbarium, Leiden;
MEL	Botanic Gardens and National Herbarium, Melbourne;
P	Laboratoire de Phanérogamie du Muséum National d'Histoire Naturelle, Paris.

Unfortunately no material could be obtained from Wroclaw (Breslau), where the Lauterbach types ore — or were — preserved.

In addition, some of the material quoted in previous papers by the senior author failed to turn up. The *Warburg specimens* (cf Lam 1932b, p. 419) from Mt. Sibela, Batjan (Moluccas) are unfortunately lost with the Berlin collections. We were also unable to unearth the sterile New Guinea specimens *Docters van Leeuwen 10655, 10765,* and *11186,* cited on the same page, which were thought to perhaps represent *H. leeifolius.* For other material of this kind, see under the species in question.

The figures are from the able hand of Mr. H. J. T. Tammel, staff artist of the Rijksherbarium, with the exception of fig. 8 which has been made by the Javanese draughtsman Darmosudiro.

II. TAXONOMICAL PART.

HAPLOLOBUS.

Haplolobus H. J. Lam, 1931, p. 25, footnote; id. 1932a, 207 and 1932b, 404. — Dioecious forest trees, often slender and of moderate height, not heavily buttressed. Medulla of branchlets without resiniferous ducts. *Leaves* 1½—4½-jugate, more rarely unifoliolate, or up to 6½-jugate, exstipulate, medulla of petioles with 1 to many resiniferous vascular bundles. *Inflorescences* mostly axillary, rarely also terminal on larger branchlets, or on smaller axillary shoots which may bear one or a few leaves, or show an obsolete vegetative bud, which is getting overtopped, ♂ ones generally larger than ♀ ones and more-florous, sometimes pedunculate but mostly branched from near the base. *Flowers* small and of little variety, unisexual though always provided with the organs of the other sex. *Calyx* with 3 more or less distinct teeth or subtruncate, permanent and spreading in fruit. *Petals* 3, valvate or slightly imbricate in the middle part, the apex mostly somewhat thickened and inflexed. *Stamens* 6, mono- or slightly didynamous and in that case the shorter (younger) ones epipetalous and slightly higher inserted; filaments inserted on the outside of the disk or free outside it; anthers basi- or dorsifix, little reduced in size in ♀ flowers but probably always sterile. *Disk* more or less 6-lobed or undulate or truncate, flattened and spreading under the fruit. *Ovary* glabrous, 3-celled, with thin septa and a sessile or subsessile 3-lobed or truncate stigma, in ♂ flowers mostly little reduced in size but probably always sterile, even though small ovules may be present; cells with two collateral axile epitropous ovules with ventral raphe and superior micropyle. *Fruits* rarely larger than 2.5 cm long, mostly ovoid or ellipsoid, more rarely globular or pointed at apex, always 1-seeded; pericarp thin and dry, putamen with entirely connate pyrenes, apparently without axial intrusion (as occurs in *Canarium*), 3-celled, extremely thin, papyraceous, pressed against the walls by the solitary seed which is shaped as the fruit; seeds with a very thin testa, the hilum usually little above the middle; albumen wanting or very scanty, cotyledons planoconvex, thick, entire, the separating plane radial. Some 21 species in *Borneo, Moluccas, New Guinea* and *Western Polynesia.*

Type species: *H. moluccanus* H. J. Lam.

Key to the species.

1a. Leaflets with glandular pits in the axils of the secondary nerves below, sometimes also on the blade between the nerves (Note. Sometimes these pits are very minute or wanting in some of the leaflets; in other cases there are hairy tufts (domatia) in their stead. For doubtful cases and in cases in which only "domatia" are found, nr. 14 of this key should also be consulted) . . . 2

b. No glandular pits extant 3

2a. Leaves 1½—2½-jugate, leaflets narrowly oblong, 3.7—7 × 1.4—2.4 cm, including a narrow acumen of 0.9—1.2 cm; secondary nerves 4—5; reticulation very minute. *New Guinea* . . . . . **1. H. microphyllus**

b. Leaves 1½—2½-jugate, leaflets ovate to ellipsoid, shortly and broadly acuminate, 5—10.5 × 3—5.5 cm; secondary nerves 6—9; reticulation not very minute. *New Guinea* . . . . . **2. H. glandulosus**

c. Leaves 2½—3½-jugate, leaflets oblong to oblong-lanceolate, shortly and broadly acuminate, 10—16.5 × 4.5—5.5 cm; reticulation fairly wide. *New Guinea* **3. H. monticola**

3a. Leaflets very small, narrowly oblong, rigid, distinctly acuminate, 1.6—6 × 0.4—2.5 cm, acumen 0.5—1.5 cm. *New Guinea* . . . . . **4. H. ledermannii**

b. Leaflets larger, if distinctly acuminate acumen much shorter than $^1/_3$—$^1/_4$ of blade 4

4a. Young parts woolly pubescent; leaflets more or less sparsely pubescent underneath, particularly along nerves 5

b. Young parts glabrous or at least not woolly pubescent; leaves entirely glabrous or, if pubescent, then leaflets 21—36 × 7.5—10 cm and petioles with 14—19 resiniferous ducts in medulla 6

5a. Inflorescences: ♂ 17—12, ♀ (also in fruit) 1—4 cm long; leaflets not rigid, not very abruptly acuminate. *New Guinea* . . . . . **5. H. acuminatus**

b. Inflorescences: ♂ unknown, ♀ (infrutescenses) 10—13 cm long, broadly paniculate, lowest ramifications 3.5—8.5 cm long; leaflets rigid, with a small and narrow, abrupt acumen of 0.5—1 cm and very strongly prominent nerves underneath. *New Guinea* . . . . . **6. H. robustus**

6a. Leaves large for the genus, resiniferous ducts in the petioles numerous, 14—25 (—40), leaflets (12—)20—40 cm long, 8—18 cm broad 7

b. Leaflets usually smaller, resiniferous ducts never more than 10 to 12, mostly less 8

7a. Leaflets oblong-lanceolate, 21—36 × 7.5—10 cm, base more or less acute, secondary nerves 25—30, with tertiary ones prominent underneath; leaves (always?) 6½-jugate, petiole at base 1.3 cm thick. *Borneo* . . . . . **7. H. beccarii**

b. Leaflets broadly oblong with rounded to subcordate base, (12½—)24—38 × (6½—)10—17½ cm, secondary nerves (9—)12—18, tertiary ones hardly prominent beneath; leaves (3½—)4½(—5½)-jugate, petiole at base 0.8 cm thick. *Moluccas* . . . . . **8. H. moluccanus**

8a. Resiniferous ducts in medulla of petioles (1—)3—12; leaflets, at least in fertile branchlets fairly large, 10—22 cm long 9

b. Resiniferous ducts in medulla of petioles 1—3(—5); leaflets, at least in fertile branchlets, smaller, 3—12(—18) cm long 13

9a. Inflorescences of both sexes axillary or (sub)terminal, male ones (as far as known) (5—)10—28 cm, female ones or infrutescences (without the fruits) 2.5—13 cm long 10

b. Female inflorescences and infrutescences (without the fruits) 2.5—5.5 cm long, always axillary 11

10a. Male inflorescences widely branched, slender and gracile, many-florous, 10—22 cm long, female ones more stiff, little branched, few-flowered, about 10 cm long; leaves relatively large, mostly 2½—3½(—4½)-jugate, petioles 7—11 cm long, medulla with (1—)4—8(—9) resiniferous ducts; leaflets often greenish when dry with dark-brown midrib and broadly rounded base, ovate to oblong, 9—21 × 4—10 cm, rather thin, reticulation above not dense and minute; fruits small, 1.2—1.6 × 0.7—1.1 cm, dull. *Celebes, Moluccas?* . . . . . **9. H. celebicus**

b. Male inflorescences not many-florous, not widely branched, rather stiff, 5—15 cm

long, female ones 2.5—10 cm; leaves ½—2½(—3½)-jugate, petioles 3—9 cm long, medulla with 10—12 resiniferous ducts; leaflets broad-ovate to obovate with broad base, 5—18(—21) × 5—9 cm, rather thin, reticulation above not dense and minute; fruits larger, dull, up to 2.2 × 1.4 cm. *New Guinea* **10. H. maluensis**

c. Inflorescences stiff, often (sub)terminal, male ones 6—17, female ones (or infrutescences without the fruits) 2.5—14 cm long; leaves (1½—)2½—4½-jugate, petioles 4—9 cm, medulla with 1—3—8(—11) resiniferous ducts; leaflets often with a fairly minute and dense reticulation above, rigid, oblong to ovate-elliptic, 7.5—18(—20) × 4—9 cm; fruits ovoid or subglobular, shining, 1.5—1.9 × 0.9—1.5 cm. *New Guinea* . . . . . **11. H. floribundus**

See also the incompletely known mountain species. *New Guinea* **12. H. versteeghii**

11a. Venation strongly prominent on lower side; infrutescences thick and strong (one known) 7 cm long; branchlets 0.8—0.9 cm thick, heavily pustulate. *New Guinea* **12. H. versteeghii**

b. Venation little or at least not strongly prominent; infrutescences slender, 2.5—5 cm long; branchlets 0.4—0.5 cm thick, not or not heavily verrucose . . . 12

12a. Leaflets oblong, (8—)14—22(—27) × (3.4—)7—9(—9½) cm, secondary nerves 9—17; fruits 1.2—1.6 × 1—1.2 cm. *New Guinea* . . . . . **13. H. hussonii**

b. Leaflets ovate, (8.5—)10—13(—16.5) × 5—7 cm, secondary nerves 7—8; fruits 2.3—2.6 × 1.3—1.8 cm. *New Guinea* . . . . . **14. H. megacarpus**

13a. Leaves ½—2½-jugate, leaflets more or less rigid, acute or gradually acuminate; inflorescences (♂ ones unknown in *H. clementium*) 1—5, infrutescences up to 6 cm long 14

b. Leaves 1½—4½-jugate, leaflets thin or if rigid leaflets small (up to 14 × 6 cm) and ♂ inflorescences long (up to 18 cm) and widely branched 15

14a. Leaves ½(—1½)-jugate, leaflets rigid, 6—12.5 × 2.5—5.7 cm, often (always?) with distinct hairy tufts (domatia) in the nerve axils below, reticulation very minute, petiolules long and slender; secondary nerves 6—9; only 1 resiniferous duct in medulla of petioles; ♂ inflorescences very slender, few florous. *Morotai* **15. H. monophyllus**

b. Leaves ½—2½-jugate, leaflets very stiff, no domatia but in their stead sometimes tiny glandular pits, 3.5—8.3 × 1.3—5 cm; reticulation minute, petiolules short and stout; secondary nerves 6—9; only 1 resiniferous duct in medulla of petioles; even the few-florous ♂ inflorescences fairly rigid. *New Guinea* **16. H. nubigenus**

c. Leaves (½—)1½—2½-jugate, leaflets fairly rigid, oblong, without domatia or pits in the nerve axils, 8.5—17 × 3.5—6.5 cm, reticulation rather lax; secondary nerves 11—14; resiniferous ducts in medulla of petioles 2—5; ♀ inflorescences crowded, many-florous; infrutescences up to 8 cm long; fruits ovoid, 1.2—1.5 × 0.7—0.8 cm. *New Guinea* . . . . . **17. H. clementium**

15a. Leaflets rounded to subcordate at base; ♂ inflorescences many-florous, 5—17 cm long, widely branched 16

b. Leaflets broadly to mostly rather narrowly acute at base; ♂ inflorescences long or short 17

16a. Leaves 2½—4½-jugate, leaflets poplar-shaped, short with a broad base and a gradually contracted apex, (7—)10—15(—20) × (4.3—)6—8(—9) cm; resiniferous ducts in medulla of petioles 1—4(—9); ♂ inflorescences 5—16 cm long, widely branched; infrutescences 2—3 cm long; fruits ovate, acutely pointed, 1.5—2.1 × 0.7—1.1. cm. *Western Polynesia* . . . . . **18. H. aneityensis**

b. Leaves 1½—3½-jugate, leaflets oblong with broad base and abruptly contracted apex, 7—14(—20) × 4—6(—9) cm; ♂ inflorescences crowded, lax, 6—17 (—21) cm long, infrutescences 4—14 cm, fruits ovoid or subglobular, not pointed. *New Guinea* . . . . . **11. H. floribundus**

17a. Leaflets rather rigid and relatively narrow, 3.5—13 × 1.3—5.3 cm; ♂ inflorescences widely branched, many-florous, 6—18 cm long. *Borneo* **19. H. borneensis**

b. Leaflets rather thin, or if more or less rigid, larger 18

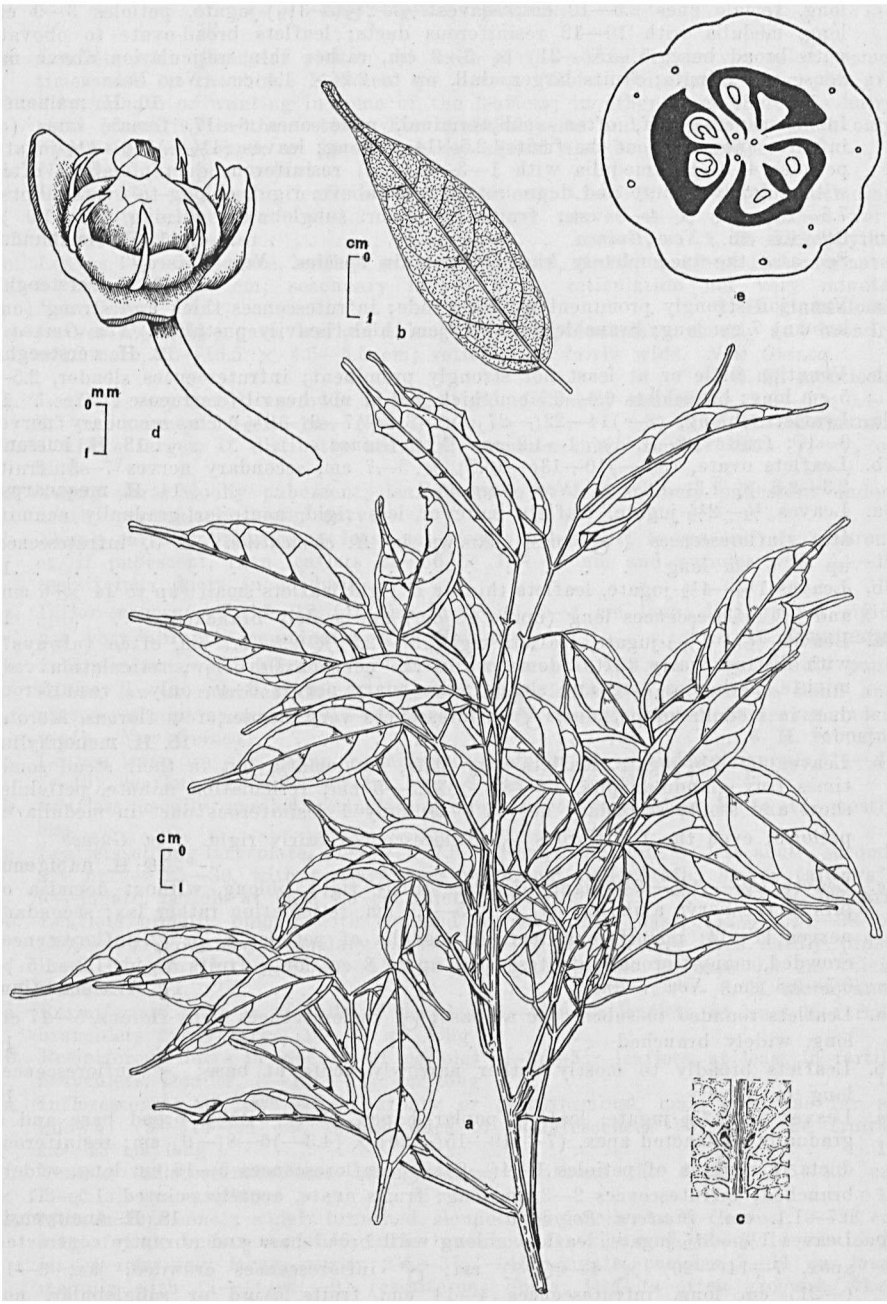


Fig. 2. — *H. microphyllus* A. M. Husson — a. branchlet with leaves; b. leaflet with venation and glandular pits; c. detail of glandular pits; d. ♀ flower without corolla; e. cross section of ovary — from type specimen (*Brass & Versteegh 11198*, L).

18a. Leaflets rather rigid, often broad at base. *New Guinea* . . 11. **H. floribundus**
b. Leaflets thin, often greenish when dried, with long and slender petiolules and slender nerves, 8—15(—21) × (2.5—)4—6(—8.5) cm; ♂ inflorescences few-florous, very slender, not widely branched, 1.5—8 cm long. *Moluccas, New Guinea, New Britain* . . . . . 20. **H. anisander**
c. Leaflets thin but stiff, relatively broad, 7—15.5 × 3.5—7 cm; ♂ inflorescences rather many-florous, widely branched, 4—8 cm long; infrutescences up to 4 cm long; fruits globose, 1.1—1.3 cm in diam.. *New Guinea* . . . 21. **H. leeifolius**

Note. In the literature quoted under the species, the papers by Lam and by Lauterbach have been cited in an abbreviated form, in accordance with the bibliography given at the end of the paper.

Abbreviations in the quotation of specimens are:
NGF New Guinea Forestry Service (Lae)
NIFS Neth. Indies Forestry Service (Bogor = Buitenzorg)
FRI Forest Research Institute (Bogor).

The latter two are practically identical; both use so-called bb.-numbers.

1. H. microphyllus A. M. Husson, nov. spec. — *Fig. 2.* — Arbor altiuscula. *Ramuli* graciles, ca 1½—3—(5) mm diam., lenticellati, alabastro terminali glabro aut minute pulverulento, medulla compacta aresinosa. *Folia* glabra, 1½—2½-jugata; petioli teretes lenticellati supra conspicue deplanati (subcanaliculati), 2.5—3.5 cm longi, rachidis partes interjugales 1.5—2.4 cm longae, petiolorum medulla 1(—3) fasciculis resiniferis percursa; foliola chartacea, lanceolata vel oblongo-lanceolata, basi plus minusve inaequalia rotundata ad acuta, apice longe abrupte obtuse acuminata, minute emarginata, 3.7—7 × 1.4—2.4 cm, acumine 0.9—1.2 cm longo, 0.15—0.3 cm lato; petioluli laterales 0.9—1.3 cm, terminales 1.7—2.5 cm longi; costa media supra paulo sulcata subtus conspicue prominens, nervi secundarii utrimque in sicco paulo prominentes, 4—5, angulo 40°—50° de costa adscendentes et a principio curvati, diminuentes, arcuatim conjuncti, in eorum axillis glandulis ovatis supra paulo bullatis praediti; glandulae ca 0.2 mm diam., glabrae, subtriangulares, nervi tertiarii utrimque prominentes, minute reticulati. *Inflorescentiae* ♂ ignotae, ♀ laterales, pauciflorae, glabrae, racemosae, 5 cm longae, ebracteatae (?). *Flores* ignoti, ♀ glabri, pedicelli 0.5—0.7 cm longi, ebracteolati (?). *Calyx* 3-fidus, ca 2.5 mm altus, sepalis brevibus late deltoideis. *Petala* ignota. *Stamina* sterilia 6 paulo didynamia glabra, antheris deltoideis, filamentis vittiformibus, apice angustatis, extus discum crassum 6-undulatum insertis. *Ovarium* cum stylo 6-sulcatum, stigmate capitato 3-lobo. *Fructus* ignoti.

NEW GUINEA. West New Guinea, 15 km SW of Bernhard Camp, Idenburg River, occasional on slopes, primary forest, 1780 m: *Brass & Versteegh 11198*, ♀ flow. (L, *type spec.*: A, type dupl.), tree 20 m, flower yellow-white, bark with a little colourless resin; Jan.

Remarks. Endemic. Undoubtedly close to the equally mountainous *H. ledermannii* whose leaves however, lack the glands. Unknown as yet are ♂ flowers and fruits.

2. H. glandulosus A. M. Husson, nov. spec. — *Fig. 3.*

Description of type specimen. — Arbor alta. *Ramuli* 0.3—0.5 cm diam., teretes, paulo striati et lenticillati, alabastro terminali minute pulveru-

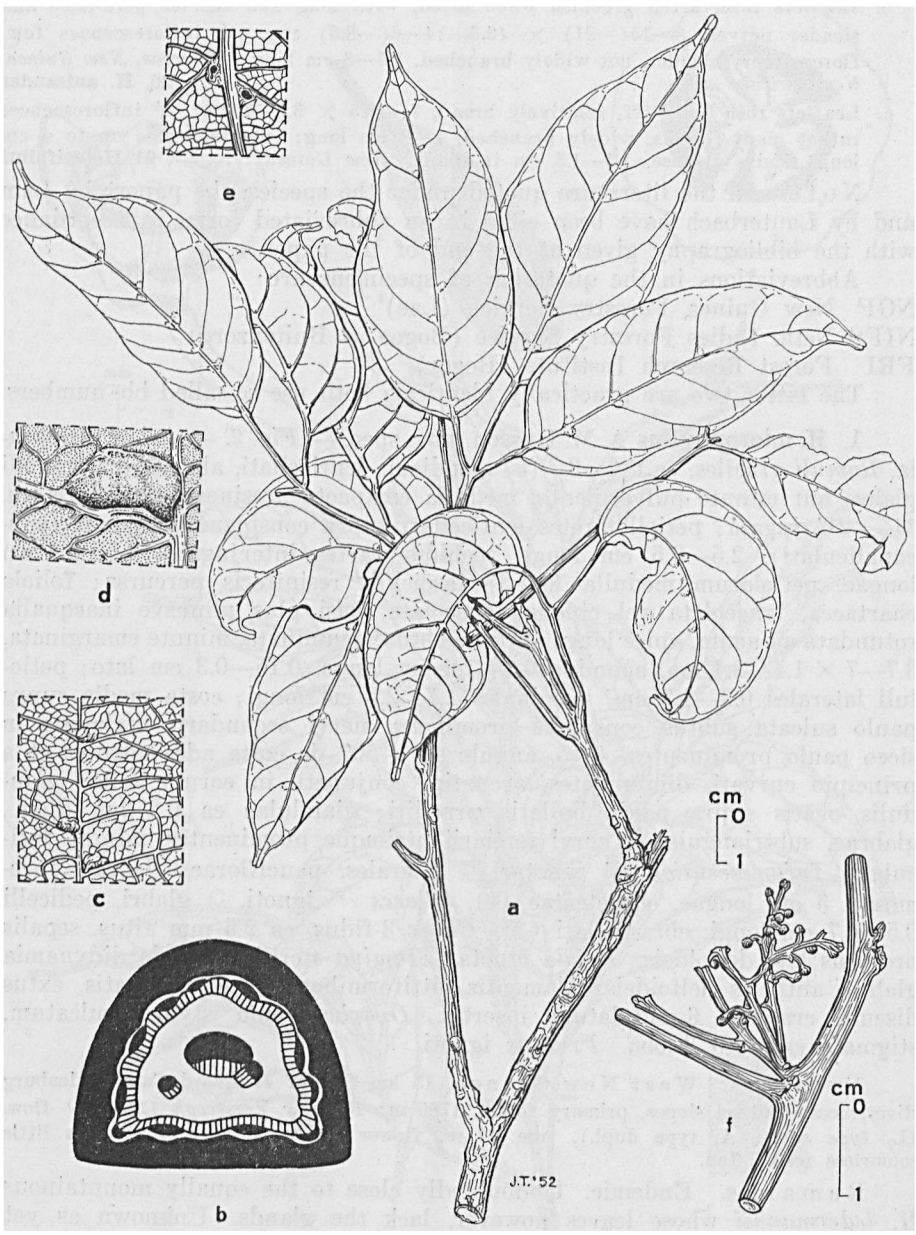


Fig. 3. — *H. glandulosus* A. M. Husson — a. branchlet with leaves; b. cross section of petiole; c, d. parts of leaflet with venation and glands, upper side; e. ditto, lower side; f. young inflorescence (sex undefinable) — a—e. from type dupl. (A), f. from type specimen (*Clemens 4988*, B).

lento, medulla aresinosa. *Folia* glabra, 1½—2½-jugata, 10—15 cm longa, petioli planoconvexi, 2.5—4.5 cm longi, medulla 1—3 fasciculis vasorum resiniferis percursa, rhachidis partes interjugales 1.5—2.5 cm longae; foliola rigide coriacea, ovata vel ellipsoidea, basi rotundata ad late acuta, apice breviter obtuse acuminata, 5—10.5 × 3—5.5 cm, petioluli laterales 1—1.5, terminales 2—3 cm longi; costa media supra haud, subtus vix prominens; nervi secundarii utrimque 6—9, subtus vix prominentes, angulo 50°—80° de costa adscendentes, curvati, prope marginem haud distincte arcuatim conjuncti, in eorum axillis glandulos ovatos supra conspicue bullatos 1—2 mm longos, marginibus saepe pilosellos gerentes; reticulatione utrimque perspicua haud minuta. *Inflorescentiae* (♀ ?, juveniles tantum videmus), furfuraceae, glabrescentes, i. s. atrae, e basi ramosae pauciflorae axillares, 1.5—2.5 cm longae, interdum alabastrum vegetativum, rare folium parvum gerentes. *Flores* adulti *fructus*que ignoti.

New Guinea. East New Guinea, Morobe, Ogeramnang, in village, 1750 m in alt.: *J. & M. S. Clemens 4988*, y. fl. in Jan. (A, type dupl., ster.; B, *type specimen*, y. fl.), same locality: *J. & M. S. Clemens 4941a*, ster. (A).

Remarks. Endemic. *Clemens 4941a* is doubtless conspecific with the type specimen. On account of the peculiar glands in the axils of the nerves and the venation, the present species is obviously related to the equally mountainous *H. microphyllus* from which it differs by the much larger leaflets with much shorter acumina. Most akin, however, is the following species, *H. monticola*, which has still larger leaflets with smaller and hardly bullate glandular pits and a much wider reticulation, 2½—3½-jugate leaves and larger inflorescences without vegetative bud. The last-named character links *H. glandulosus* with *H. floribundus* (and some other species, cf General Part, sub 2d), a mainly lowland species with a considerable variability (see there), with a similar type of venation but without glandular pits. Other indubitable relatives are *H. nubigenus*, also a mountainous species, which is distinguished by much smaller leaves (½—1½-jugate) and smaller and more rigid leaflets, which occasionally show tiny glandular pits; and *H. monophyllus* which has prevailingly unifoliolate, long-petioled leaves, and domatia instead of glandular pits.

Unknown as yet are adult flowers and fruits.

3. **H. monticola** A. M. Husson, nov. spec. — *Fig. 4.*

Description of type specimen. — Arbor. *Ramuli* subgraciles, ca 0.3—0.6 cm diam., lenticellati, glabri, medulla compacta aresinosa suffulta. *Folia* 2½—3½-jugata; petioli robusti, in sicco striati, lenticellati, basi supra deplanati, basi nodisque articulati, 3.5—5 cm longi, rachidis partes interjugales 2—4.5 cm longae; medulla 1—3 fasciculis magnis resiniferis percursa; foliola oblonga vel oblongo-lanceolata, basi subinaequaliter rotundata ad acuta, apice breviter obtuso-acuminata, acumine 0.5—0.7 cm longo, chartacea, glabra, 10—16.5 × 4.5—5.5 cm, petioluli laterales 1.6—2.6 cm, terminales 4 cm longi; nervi secundarii utrimque 10—12, angulo 60°—75° de costa descendentes, supra haud, subtus conspicue prominentes, marginem folii versus curvati, diminuentes, praecipue in apice folii arcuatim conjuncti, in axillis et interdum in lamina inter nervos glandulos interdum margine pilosellos ovato-oblongos 0.5—1 mm longos gerentes; nervi tertiarii

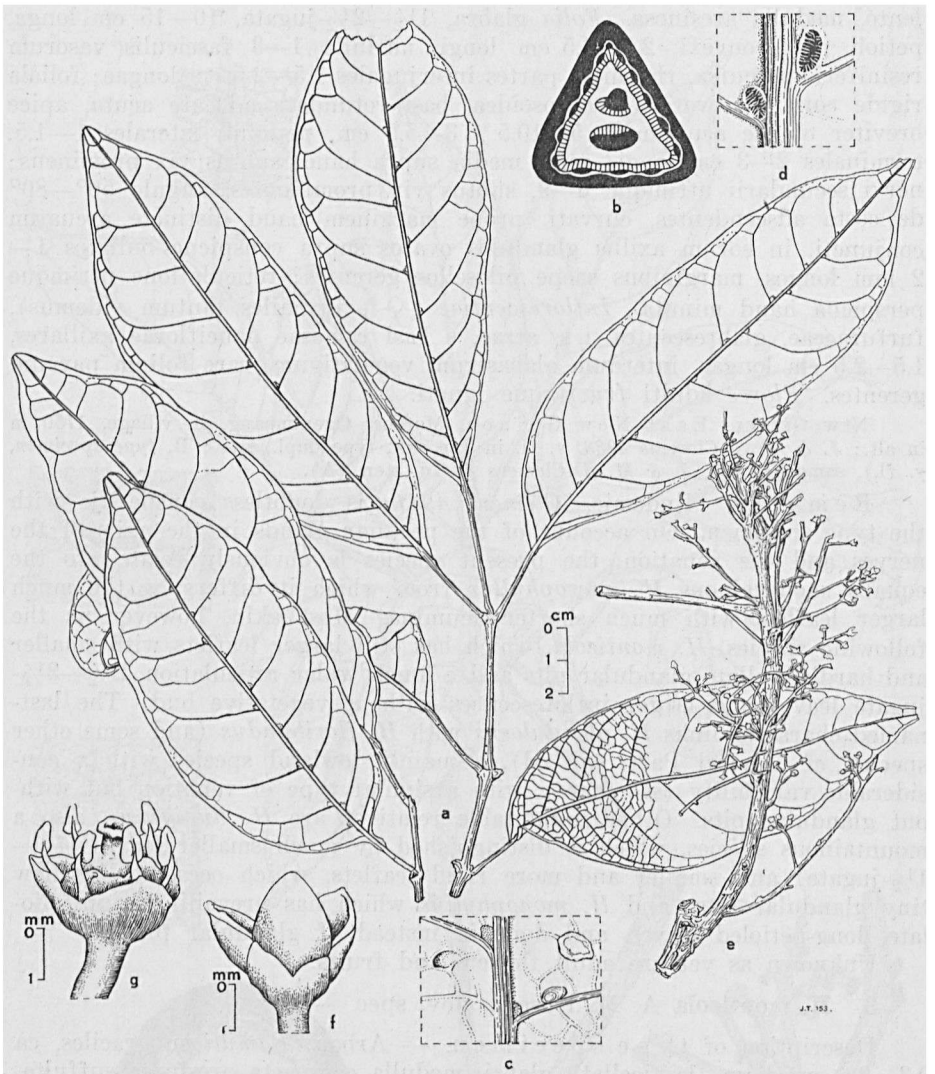


Fig. 4. — *H. monticola* A. M. Husson — a. leaves; b. cross section of petiole; c, d. glandular pits, below; e. branchlet with ♀ inflorescences; f. ♀ flower outside; g. ditto, without corolla — a—b, d—g. from type dupl. (*Clemens 1924*, A), c. from *Brass 13152*, L).

cum reticulatione laxa in sicco utrimque semper paulum conspicui atque subprominuli. *Inflorescentiae* ♂ ignotae, ♀ glabrae axillares, e basi ramosae, late paniculiformes, multiflorae, usque ad 7.5 cm longae, ramis laterales cymosis usque ad 1.5 cm longis, cymulis ultimis trifloris. *Flores* ♂ ignoti, ♀ glabri, minuti, 2 mm diam., pedicelli gracillimi basi bracteolis minutissimis praediti, 2—4 mm longi; *calyx* 3-fidus, sepalis late deltoideis brevibus;

petala 3 subimbricata ovata apice vix inflexo-incrassata obtusiuscula, 1.5—2 mm longa; *stamina* sterilia 6 monodynamia glabra, filamentis elongato-deltoideis basi liberis extus discum insertis, antheris deltoideis quam filamenta brevioribus. Discus crassus 6-undulatus glaber, quam ovarium dimidio brevior. *Ovarium* glabrum. *Fructus* ignoti.

NEW GUINEA. West New Guinea, Idenburg River, 4 km SW of Bernhard Camp, frequent tree of primary forest on ridge, 1000 m alt.: *Brass 13152*, ster. (A, L), tree, 26 m high, 0.6 m diam., bark black, scaly, with little colourless resin. — East New Guinea, Morobe District, Sattelberg, forest trail, about 1000 m: *J. M. S. Clemens 1924* ♀ (A, type dupl.; B, *type spec.*); tree, 24—27 m, diam. breast high 0.6 m, ♀ fl. green, in March.

Remarks. Endemic. *Brass 13152* is certainly conspecific with the type, but the glands in the nerve axils on the few leaflets available, if any, are minute and hairless but there are mostly some larger and shallow additional ones on the blade between the nerves. The present species is undoubtedly related to *H. nubigenus*, which is also a mountain tree, sometimes showing small, hairless glands (*Brass 13152* shows a transition to this condition) in the nerve axils but there the leaves are only ½—2½-jugate, and the leaflets smaller and with much more minute reticulation.

Unknown as yet are ♂ flowers and fruits.

4. H. ledermannii (Lauterb.) H. J. Lam 1932a, 207; id. 1932b, 408. — *Santiria Ledermanni* Lauterbach, 1920, 334. — *Santiria caudata* Lauterb., l. c., 336. — Iconography: Lam 1932b, pl. VIII, fig. 41 (hab. and ♀ infl., part of leafl., ♂ flow., young fr., ripe fr. and cross section).

NEW GUINEA. East New Guinea, Sepik area, Etappenberg 850 m: *Ledermann 9013* old ♀ fl. (K, type dupl. of *Santiria Ledermanni, lectotype*); Lord Peak 1000 m: *Id. 9915* ♀? buds (K, L, type dupl. of *Santiria caudata*); same locality: *Id. 9877* ♀ (K, type dupl. of *S. caudata*).

Not examined (cf Lam 1932b): *Ledermann 11484, 12442a* ♀, *12506a* ♂ (all from Sepik area, type material of *Sant. caudata*).

Remarks. Endemic. It is proposed to select the Kew type duplicate of *Ledermann 9013* as the lectotype.

A characteristic mountain species with exceptionally small and delicate, yet 2½—4½-jugate leaves and only 1(—2) resiniferous ducts in the medulla of the petioles. Its nearest ally is probably *H. microphyllus*, which is distinguished by 1½—2½-jugate leaves with glandular pits on the leaflets.

Unknown as yet are ♀ flowers.

5. H. acuminatus (K. Schumann) H. J. Lam 1932a, 207; id. 1932b, 410. — *Santiria acuminata* K. Schumann in Schumann & Hollrung, Flora Kais. Wilh. land 1889, 64; Schumann & Lauterbach, Fl. D. Schützgeb. Südsee 1901, 378; Ridley, Transact. Linn. Soc. Lond., Bot. IX, 1916, 25; Lauterbach 1920, 337; idem, Nova Guinea XIV, 1924, 135; White, Journ. Arn. Arbor. 10, 1929, 227. — *Canarium pachypodum* Lauterb. 1920, 324. — *Haplolobus pachypodus* (Lauterb.) H. J. Lam 1932a, 207; id. 1932b, 411. — Iconography: Lam 1931, fig. 46 (vasc. supply of flow.); Lam 1932b, pl. VIII, fig. 43 (hab. and infl., ♂ flow., ♀ flow., infrut., *H. acum.*), fig. 44

(leafl., cross sections of branchlet and of petiole, ♂ infl. and flow., *H pachyp.*); the present paper *Fig. 5* (fr.).

NEW GUINEA. West New Guinea, Andai: *Beccari P.P. 542* (= *Herb. Fir. 2220, 2220 A*), y. fr. (FI); Arfak Mts, Poetat (Putat), 300—600 m: *Beccari P.P. 876* (= *Herb. Fir. 2223, 2223 A, 2223 B*), fr. (FI), Oct.; Japen, Seroei, Mariattoe, 370 m: *NIFS bb. 30470*, ster. (BO, L); Mamberamo-area, "Pionierbivak": *Lam 705*, ♀ fl. in July (BO, L) — East New Guinea, Sepik-area: Malu, low alt.: *Ledermann 10390*, y. fr. in March (L); April riv., 200—400 m: *Ledermann 9724*, ♂ fl. in Nov., typ. dupl. of *Can. pach.* (K, L); Augusta riv.: *Hollrung 737*, ♂ fl., typ. dupl. of *Sant. acum.* (K, *lectotype*; L, MEL [one leaflet only], P); Garamambu: *NGF 3754*, ster., tree up to 24 m, buttressed to 0.6 m, diam. breast high up to 0.45 cm, bole usually curved, wood white, one of the commonest trees round Garamambu, but millable trees are rare (BO, L); Papua, Iawawere, 450 m alt.: *Brass 685* (corrected from 625), ♂ fl. in Nov. (A).

Not examined (cf Lam 1932b): *Boden Kloss s.n.* ♂ (S. New Guinea, foot of Mt Carstensz); *Ledermann 7806, 10393* fr., *11548* ♂ (all Sepik area).

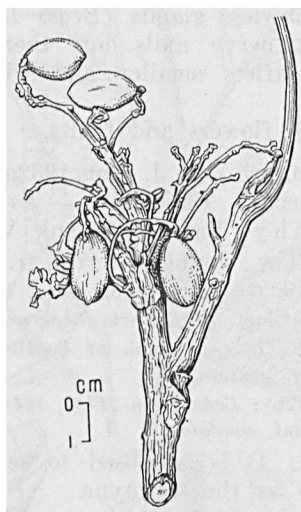


Fig. 5. — *H. acuminatus* (K. Schum.) H. J. Lam — branchlet with infrutescences and fruits — from *Beccari P.P. 876* (FI).

Remarks. Endemic. As the Berlin type has got lost, it is suggested to select the Kew duplicate of *Hollrung 737*, which is the best preserved and most complete one, as the lectotype.

The types of *Santiria acuminata* and *Canarium pachypodum* are undoubtedly conspecific, though in the latter the leaves seem to be generally somewhat less pubescent. The number of resiniferous ducts in the medulla of the petioles, which in some species is fairly constant, is strongly variable here: we found 2—17 ducts in petioles of one type specimen (*Ledermann 9724*) and 4—5 in the other (*Hollrung 737*). This variability is due to the degree of confluence of the ducts on the lower (round) side of the petiole.

Certainly conspecific are also *Ledermann 10390* (2—6 res. ducts),

Lam 705 (10 r. d.), *Beccari 876* (6—8 r. d.), and *Brass 685* (8—9 r. d.).

In all the above-mentioned specimens, the leaflets are rather large and dark reddish brown when dry, with 10—20 secundary nerves. In the other specimens, however, this colour is more or less greenish or at least not reddish brown and the leaflets are mostly smaller and narrower and with fewer secondary nerves (7—11), the pubescence being also generally more dense, but as there are transitional forms regarding all of these characters and fundamental differences seem to be wanting, we could give these specimens not even varietal rank. The number of resiniferous ducts in the petiole is 7—9 in *Beccari 542* and *NIFS bb. 30470* and 9—13 in *NGF 3754*. The last-named specimen has larger and more brownish leaflets.

Beccari 542 states on separate labels: "gen. nov.?" and, after a short diagnosis in italian: "Cotiledoni crassi piano-convessi — questo carattere diff. dalle Sintiria". (sic; the field label says *Santiria*). See also remarks under *H. leeifolius*.

In general, *H. acuminatus* seems to be a rather variable and widespread endemic species of the lowland and the lower hills. It is most clearly characterised by the pubescence on young parts and inflorescences and on the petioles, rachides, and lower side of the leaflets, the upper side showing a more or less distinct pulverulence on the midrib only, if any. The leaves are 1½—3½-jugate and the leaflets, which are not too rigid, show a marked prominence of the nervation underneath. The inflorescences of both sexes are comparatively short, the more or less dense and many-flowered ♂ ones up to 12, the more lax ♀ ones only up to 7 cm (even in fruit), the lateral ramifications being relatively short in either case. Mature fruits are 1.3—1.9 by 0.8—1.2 cm (*Fig. 5*) and are said to be olive-green (*Beccari 876*) or red (Ledermann 1920, 337).

Its relation is with *H. robustus* which differs by its rigid leaflets with abrupt and short acumens and its longer and much broader (♀) inflorescences; and probably with *H. maluensis* which is different by its want of pubescence (leafshape and nervation are much like those in *H. acuminatus*) and its longer and more lax inflorescences.

6. H. robustus H. J. Lam, nov. spec. — *Fig. 6.* — Arbor. Innovationes, inflorescentiae, folia dense fusco-pubescentes. *Ramuli* teretes c. 1 cm crassi medulla aresinosa. *Folia* 2½—3½-jugata, petioli cum rhachide dense lanuginosi planoconvexi, 7 cm vel ultra longi, c. 0.4 cm crassi, medulla fasciculis resiniferis c. 15 percursa; rhachidis partes interjugales 3—4 cm longae; foliola rigida oblonga, terminalia oblongo-obovata, omnia basi aequaliter vel paulo oblique rotundata ad paululo cordata, apice breviter abrupte obtuse acuminata, subtus omnino lanuginoso-pubescentia, supra costa media pubescente excepta glabra, i. s. brunneo-griseo-viridia, subtus subfusca, 14—21 cm longa, 6—9 cm lata, petiolulis pubescentibus 0.3 cm crassis rigidis haud articulatis, lateralibus c. 1 cm, terminalibus 2.5—3.5 cm longis, acuminibus gracilibus 0.5—1 cm longis; costa media cum nervis secundariis subtus valde prominens, supra minute canaliculata; nervi secundarii 12—16, angulo c. 70° de costa adscendentes, mox curvati, marginem versus diminuti, in apice folii tantum leviter arcuatim conjuncti, tertiarii supra per reticulationem minutam superficialem vix conspicui, subtus prominuli

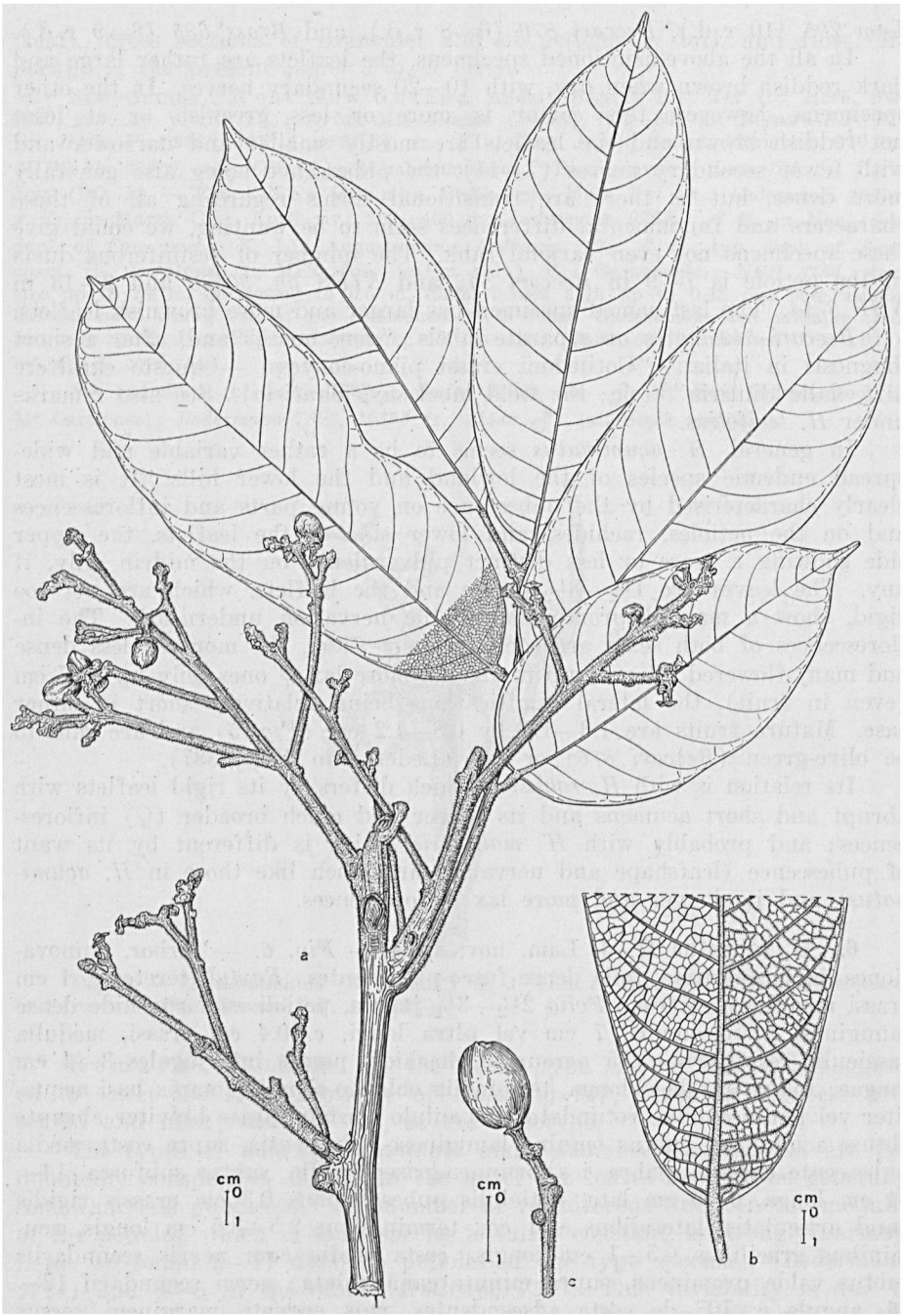


Fig. 6. — *H. robustus* H. J. Lam — a. branchlet with leaves and infrutescences; b. part of leaflet showing venation and pubescence; c. fruit — from type specimen (*Brass & Versteegh 13111*, L).

perspicui, transversi, angulo c. 150° de costa divergentes, haud proximi, prope costam eam perpendiculariter affluentes, reticulatione paulo conspicua. *Inflorescentiae floresque* ignoti. *Infrutescentiae* axillares robustae dense lanuginoso-pubescentes, rigidae, 10—13 cm longae, ramificationes infimae 3.5—8.5 cm longae, pedunculo 0.3—0.7 cm crasso, pedicellis 0.3—0.4 cm longis, 0.2—0.3 cm crassis. *Calyx* persistens extus pubescens, intus glaber, c. 0.4 cm diam.. *Fructus* maturi subpisiformes 1—1.3 × 0.7—1 cm, nigri, pericarpio tenui, monospermi, cotyledones planae, crassae.

NEW GUINEA. West New Guinea, North slope of Central Range, Idenburg Riv., 4 km SW of Bernhard camp, in primary rain forest on flat plain, 850 m alt.: *Brass & Versteegh 13111* ♀ (L, *type spec.*; A), frequent tree, 19 m high, 41 cm diam., bark 0.9 cm thick, brown, scaly, with some colourless resin, wood light yellow, ripe fruit black, March 1939.

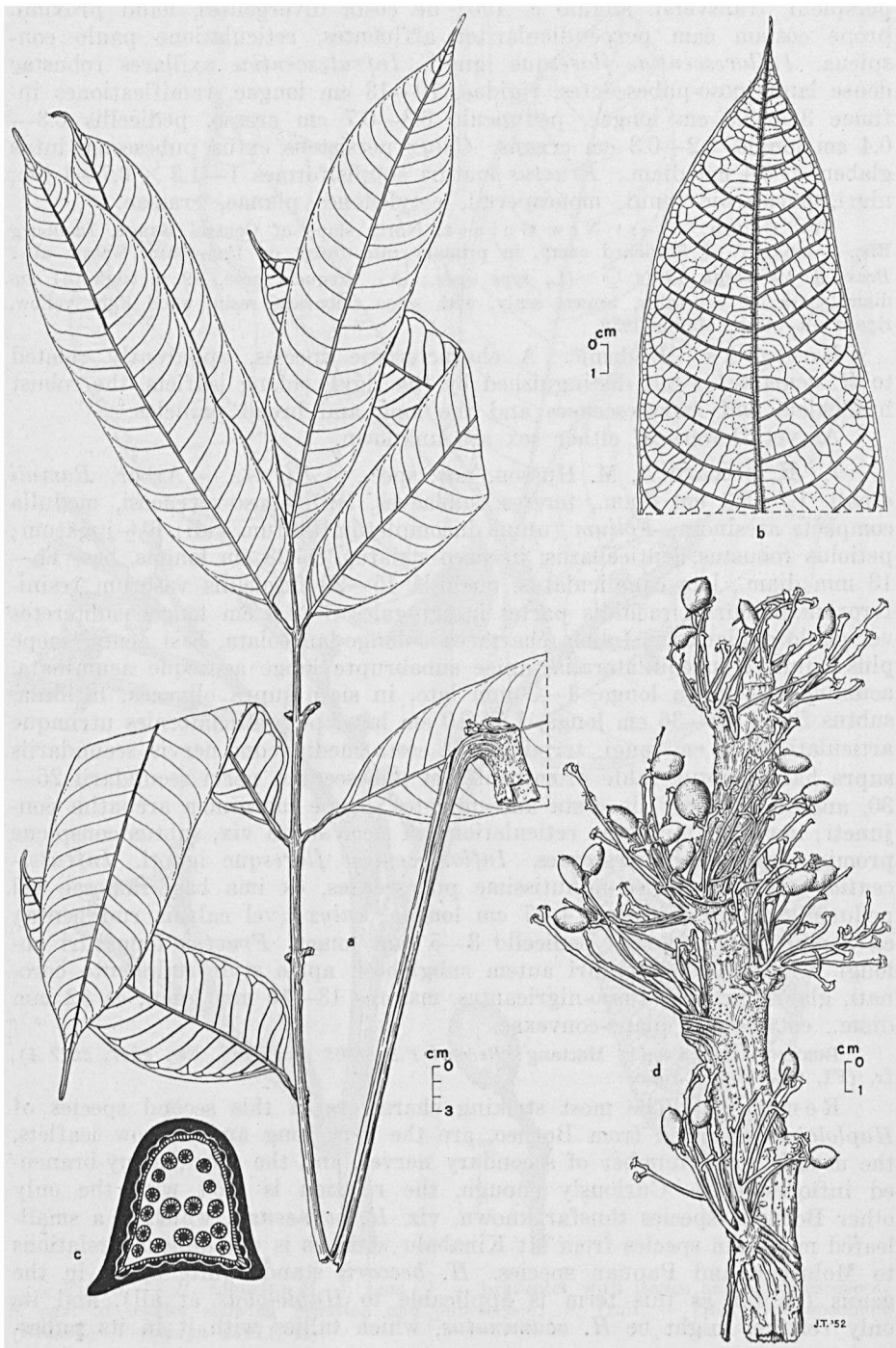
Remarks. Endemic. A characteristic species, apparently related to *H. acuminatus* but distinguished by the rigid, oblong leaflets, the robust branchlets and infrutescences and the long and broad panicles.

As yet flowers of either sex are unknown.

7. **H. beccarii** A. M. Husson, nov. spec. — *Fig. 7.* — Arbor. *Ramuli* crassi, 1.7—2.2 cm diam., teretes, sublaeves, lenticelloso-verrucosi, medulla compacta aresinosa. *Folium* (unum incompletum tantum vidi) 6½-jugatum; petiolus robustus, lenticellatus, in sicco striatus, ca 23 cm longus, basi 11—13 mm diam., late canaliculatus, medulla 15—20 fasciculis vasorum resiniferorum percursa, rachidis partes interjugales 8—8.5 cm longae subteretes vel paulo deplanatae; foliola chartacea oblongo-lanceolata, basi acuta, saepe plus minusve inaequilaterallia, apice subabrupte longe acuteque acuminata, acumine 1.5—2 cm longo, 1—3 mm lato, in sicco supra olivacea, nitidula, subtus fusca, 21—36 cm longa, 7.5—10 cm lata; petioluli laterales utrimque articulati, ca 2 cm longi, terminales?; costa media cum nervis secundariis supra haud, subtus valde prominentes et pubescentes, nervi secundarii 25—30, angulo 70°—80° de costa adscendentes, prope marginem arcuatim conjuncti; nervi tertiarii cum reticulatione in sicco supra vix, subtus conspicue prominentes et subpubescentes. *Inflorescentiae floresque* ignoti. *Infrutescentiae* axillares, dense minutissime pubescentes, ex ima basi ramosae vel pedunculo brevi suffultae, 4—7 cm longae; *calyx* (vel calycis rudimenta) ca 3 mm diam., fructus pedicello 3—5 mm longo. *Fructus* immaturi oblongi vel ellipsoidei, maturi autem subglobosi, apice styli rudimento coronati, glabri, in sicco fusco-nigricantes, maiores 13—15 mm longi, ca 12 mm diam., cotyledones plano-convexae.

BORNEO. Sarawak, Mattang: *Beccari P.B. 1803* (= *Herb. Fir. 2217, 2217 A*), fr. (FI, *type spec.*), June.

Remarks. The most striking characters of this second species of *Haplolobus* recorded from Borneo, are the very long and narrow leaflets, the usually great number of secondary nerves, and the short, many-branched inflorescences. Curiously enough, the relation is not with the only other Bornean species thusfar known, viz. *H. borneensis,* which is a small-leafed mountain species from Mt Kinabalu with, as is not unusual, relations to Moluccan and Papuan species. *H. beccarii* stands quite apart in the genus (as far as this term is applicable to *Haplolobus* at all), and its only relation might be *H. acuminatus,* which tallies with it in its pubes-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cence and short inflorescences but is otherwise quite different. The exceptionally large and multifoliolate leaves recall certain *Canarium* species.

Flowers of either sex are thusfar unknown.

Named in honour of its discoverer, whose name should, on account of his extraordinary scrutiny, have been used to form the generic name, had the material not been stored away a long time. It is due to the tracking sense and the organisatory talent of Dr. C. G. G. J. van Steenis (cf. lit. 9) as well as to the kind and energetic cooperation of the Director of the Florence Herbarium Prof. R. E. G. Pichi-Sermolli, that the rich material of this gifted botanist and collector is now open to investigation. For quotations from Beccari's field labels see under *H. leeifolius* and *H. acuminatus*.

8. **H. moluccanus** H. J. Lam 1932a, 207; id. 1932b, 407. — Iconography: Lam 1931, fig. 45 (♂ flow. and its vascular supply); id. 1932a, fig. 60 (♂ flow. and diagr.); idem 1932b, pl. VIII, fig. 40 (leafl., cross sect. of petiole, ♂ infl., and fr.).

MOLUCCAS. Halmaheira, W. Pitu, 40 m: *Beguin 2225* ♂ Oct. (L, *type spec.*; BO); W. Tobelo, 30 m: *Beguin 2301* ster. (BO, L); Weda, Tiloppe, fairly frequent in old forest on slope, 25 m: *NIFS bb. 24847* ♂ Apr. (BO, L), tree, 16 m high, diam. 0.35 m, bark with some black resin, nat. n.: damar tai babi (mal.), ode mayoko (tob.) — Morotai, West Coast, frequent in old forest, 20—130 m: *Lam 3550, 3583, 3653*, all ster. (BO, L); Ai N. Totoduku, old forest on slope, 30 m: *NIFS bb. 33782* (= *Kostermans 88*), ster. (BO, L), tree, 23 m high, 0.30 m diam., nat. n.: liana (tob.). — Batjan, Masurung, in old forest on steep river bank, 500 m: *NIFS bb. 23153*, ster. (BO, L), nat. n.: dian (alf.).

Not examined (cf Lam 1932b): *Beguin 1902* fr. (Halmaheira, BO). The tree grown in Hortus Bogoriensis sub VI. B. 83 is not an *Haplolobus* but probably a *Canarium*.

Remarks. Though several specimens are sterile, the conspecifity of all quoted above seems to be beyond doubt. *H. moluccanus* belongs to a large and wide-spread population of forms in which specific delimitations are very hard to distinguish. Any subdivision seems more or less arbitrary. This group ranges from Celebes to East New Guinea and perhaps New Britain. Generally speaking, the size of the leaflets, their width, and the dimensions of the inflorescences seem to decrease from W to E, and the same is true for the number of resiniferous ducts in the petiole. There are, however, some irregularities and in cases of — the numerous — sterile specimens it is offen impossible to state their proper taxonomic position.

In the population under discussion, *H. moluccanus* is characterized by large, rather thin, broad leaflets, up to 38 × 18 cm, and about 2—2½ times as long as wide, and with a broad, more or less rounded base and a rather abrupt apex. The number of resiniferous ducts is rather variable but always high. Some examples are: *Beguin 2225*: 15—18; *Beguin 2301*: 25—40!; *NIFS bb. 24847*: 14—19; *Lam 3583*: 20; *Lam 3653*: 16; *Lam 3550*: 20; *NIFS bb. 33782*: 10—12!; *NIFS bb. 23153*: 18—19.

As to the other species of the group there is some doubt and some

Fig. 7. — *H. beccarii* A. M. Husson — a. leaf; b. part of leaflet showing venation and pubescence; c. cross section of petiole; d. branch with infrutescences and fruits — from type specimen (*Beccari P.B. 1803*, FI).

particular difficulty. They are *H. celebicus, H. anisander, H. floribundus* and *H. maluensis.* The doubt concerns the possible conspecifity of *H. celebicus, H. anisander* and *floribundus,* the difficulty is due to the fact that the type material of *H. maluensis* seems to be lost, the only evidence of the characters and relationship of this species being its description by Lauterbach (1920) and Lam (1932b) and a plate, made under the latter's supervision, parts from which were published in his paper just quoted and elsewhere (see p. 436). Female flowers are still unknown.

For the time being we preferred to keep on the safe side and con-

	leaflets	nr of resin. ducts in pet.	inflorescences (infrutescences)
H. moluccanus (Moluccas)	large and broad, i.s. often greenish, 12—38 × 7—18 cm, base more or less rounded	10—40	large, lax, slender, manyflorous, axillary. ♂ : 23–32 cm long ♀ : 7–19 cm long (fr.)
H. celebicus (Celebes; Moluccas?)	smaller and narrower, i.s. often greenish, 9—21 × 4—10 cm, base or less acute	(1—)4—9	large, lax, slender, manyflorous, axillary. ♂ : 10–22 cm long ♀ : ± 10 cm long (fr.)
H. maluensis (New Guinea)	broad ovate with rounded base; 5—21 × 2—8 cm	10—12	rather large, rigid, not manyflorous, axillary. ♂ : 5–13 cm long ♀ : 2.5–10 cm long
H. floribundus (New Guinea)	oblong, rather narrow and rigid, i.s. mostly brownish, with dense reticulation above, base more or less broadly acute, apex long acuminate, 7—19 × 3—9 cm	1—4(—11)	large and rigid, axillary and terminal. ♂ : 8–23(–28) cm long ♀ : 4–14 cm long, few-flowered
H. anisander (Moluccas, New Guinea, New Britain)	small and thin, base often acute, i.s. mostly greenish, 6—12 × 2—5 cm	1—4(—5)	small, slender, axillary, few-flowered. ♂ : 1–8 cm long ♀ : ± 4 cm long

sider these species separate. The main difficulty is that the type specimens are widely different, but these are almost gaplessly linked by many unidentifiable sterile specimens. More flowering and fruiting material will be necessary to decide where the specific and geographic borderlines, if any, lie. For further particulars the reader may be referred to the "Remarks" under the species in question. Provisionally, the following gross distinction, mainly based on the type specimens, may serve as a guide (cf Table on p. 434).

9. **H. celebicus** H. J. Lam, 1938a, 111, with plate.

CELEBES. Central Celebes, Malili, Toletole, Kawata, 250 m: *FRI Cel./V-208,* ♂ fl. Oct., (BO; L, *type spec.*); ibidem, 200 m, steep slope: *FRI Cel./V-312,* fr. March (BO, L), tree 25 m high, 0.3—0.35 m in diam.; ibidem, Usu, 25 m, old forest on slope: *FRI bb. 32604,* ster. (BO, K, L), tree 30 m, diam. 0.7 m, nat. n.: bakata putih; ibidem: *FRI bb. 32598,* ster. (BO, L), tree, 20 m high, 0.45 m diam., nat. n.: tapitapi; Masamba Mina, 50 m: *NIFS bb. 24500,* ster. (BO, L); Poso, Dondo, 35 m alt.: *NIFS bb. 31901,* ster. (BO, L).

Distribution: Celebes, Moluccas?

Remarks. The nearest relative is *H. moluccanus,* which differs from *H. celebicus* by its generally broader leaflets with much more numerous resiniferous ducts in the medulla of the petioles. Whether a certain specimen should be named *celebicus* or *moluccanus,* however, is sometimes doubtful as broader leaflets approaching the *moluccanus* type are sometimes found in sterile specimens from Celebes (*bb. 31901*), in which case the number of resiniferous ducts (in casu: 5—8) has been assumed as the decisive character. In one case of a sterile specimen the choice had even to be made on the locality:

CELEBES. Central Celebes, Poso, 30 m alt.: *NIFS bb. 31850,* ster. (BO, L), leaflets rather broad and short, leaves slender like those of *H. anisander* (see there!); r. d. 5.

In the typical *celebicus* the leaflets are rather thin, ovate to narrowly oblong, often greenish when dry with a dark midrib, with a more or less acute base and a blunty acuminate apex, the number of resiniferous ducts being 4—9; only in one case (*FRI Cel./V-312*) this number was found to be 1—4 (cf. Remarks under *H. moluccanus,* where the lowest number found is 10—12). In *H. celebicus* the leaflets are 12—21 × 3.5—8.5 cm but the smaller and narrower ones are in the majority. On the other hand, *H. celebicus* is clearly allied with *H. floribundus* and *H. anisander* which have both leaflets of the same type as the narrower *celebicus* specimens. *H. floribundus,* however, has stiffer leaflets and fairly large and spreading, often subterminal inflorescences, and seems restricted to New Guinea. *H. anisander,* on the other hand, in the delimitation here accepted, occurs from the Moluccas to East New Guinea or even New Britain and is particularly difficult to keep apart from *H. celebicus* in sterile specimens. Its inflorescences are much smaller than in the last-named species, and the number of resiniferous ducts is mostly low (1—5). For further particulars see under *H. floribundus* and *H. anisander.*

So far, ♀ flowers are still unknown.

The following specimens are inserted here with doubt. They are certainly conspecific amongst themselves, but they could as well belong

to *H. celebicus* (though the leaflets are generally smaller and more rigid and also more brownish when dry than in the typical specimens of that species) as to *H. floribundus* (from which they slightly differ in the nervation) whose area we hesitated to extend beyond the Papuan mainland, since the New Guinea specimens show a more dense and more prominent reticulation on the upper side of the leaflets (r. d. = resiniferous ducts):

MOLUCCAS. Sula, Sanana, Fowata, along Wai Busa, 260 m alt.: *NIFS bb. 28840*, ster. (BO, L), r. d.: 1; ibidem, Sanana, Kabau, 150 m alt.: *NIFS bb. 28871*, ster. (BO, L), r. d.: 1—2 — Batjan, Saoran Domut, very frequent in old forest, on slope, 50 m alt.: *NIFS bb. 23182*, ster. (BO, L), r. d.: 1, nat. n.: palano putih — Morotai, Kali Sangowo, frequent, 150 m alt.: *Main & Aden (Exp. Kostermans) 1417*, ster. (A, BISH, BM, BO, BRI, CAL, K, LAE, L, NY, P, PNH, SING), r. d.: 1; tree 25 m, diam. 0.5 m, wood pale yellow.

The leaflets of all of these doubtful specimens (which seem conspecific amongst themselves) are smaller than is usual in the species (6—12—17 × 2—5—6.5 cm) and the number of resiniferous ducts is only 1—2. They are mostly oblong, with a broadly to narrowly acute base, and their reticulation is not dense but rather like that of *H. celebicus*.

10. H. maluensis (Lauterb.) H. J. Lam 1932a, 208; id. 1932b, 416. — *Santiria maluensis* Lauterbach 1920, 334. — Iconography: Lam 1932a, fig. 97 (♂ and ♀ flow.); idem 1932b, pl. VIII, fig. 49 (leafl. and ♀ inflor., cross sect. of petiole, infrut.); the present paper, *Fig. 8*.

Distribution: New Guinea. N.E. Guinea, Sepik region, Malu, April river.

Remarks. We did not see any material of this species. However, in the collection of the Rijksherbarium there is an unpublished figure made under the supervision of the senior author, showing leaves, fruits, male and female flowers of the type of this species. All the type material having been destroyed during the Berlin Herbarium fire and none of the other herbaria, which we asked for informations concerning type duplicates, possessing any such material, the only data available concerning the species are the descriptions by Lauterbach and Lam, the small figures published by Lam and the above mentioned unpublished figure. For this reason it seems worth while to publish the latter. It is proposed to consider this plate the type specimen in case no duplicate turns up. It is made from Ledermann's type material (*Ledermann 6548* fr., *7804* ♀, *8082* fr., *9691* ♂). In addition we did not examine (cf. Lam 1932b): *Ledermann 6605, 7794, 8612, 10396, 10708* (all fruiting from Sepik area). For relations to other species see under *H. moluccanus*. It may be added here that there is possibly also a relation to *H. acuminatus* in leaf shape and nervation, but the leaflets show no trace of pubescence.

Possibly the following specimen belongs here:

NEW GUINEA, West New Guinea, Geelvink bay, Nabire, in rain forest 2 m in alt.: *Kanehira & Hatusima 11522*, fr. black in Febr. 1940, small tree, 3 m high (A.). — Three leaflets (14—19 × 8—9 cm) and infrutescences (3—5 cm long) with olive-shaped fruits (2 × 1.4 cm), cotyledons planoconvex.

11. H. floribundus (K. Schum.) H. J. Lam 1932a, 207; id. 1932b, 412. — *Santiria floribunda* K. Schumann in Schumann & Hollrung, Fl. Kais.

Fig. 8. — *H. maluensis* (Lauterb.) H. J. Lam — a. branchlet with young infrutescences; b. young fruit; c. ditto, cross-section; d. ♀ flower; e. ditto, longitudinal section; f. stamens and disc of ♀ flower; g. branchlet with ♂ inflorescences; h. ♂ flower; i. ditto, longitudinal section; k. stamens and disc of ♂ flower; l. branchlet with infrutescences; m. cross-section of branchlet; n. ditto of petiole; o. fruit; p. ditto, with cross-section — from Lauterbach's type material: a—c. *Ledermann 7804* ♀; d—f. *idem 8082* ♀; g—k. *idem 9691* ♂; l—p. *idem 6548* ♀.

Wilh.land 1889, 63; Schumann & Lauterbach, Fl. D. Schutzgeb. Südsee 1901, 378; Lauterbach 1920, 333 — *Canarium furfuraceum* Lauterbach 1920, 325 — *Santiria sepikensis* Lauterbach 1920, 333 — *H. furfuraceus* (Lauterb.) H. J. Lam 1932a, 207; id. 1932b, 409 — *Haplolobus sepikensis* (Lauterb.) H. J. Lam 1932a, 208; id. 1932b, 416 — Iconography: Lam 1932a, fig. 62 (♂ flow., *H. sepik.*), fig. 63 (♀ flow., *H. furf.*); idem 1932b, pl. VIII, fig. 48 (leafl., infrut., ♂ flow., and fr. of *H. sepik.*), fig. 42 (leafl., ♂ infl., ♂ and ♀ flow. of *H. furf.*), and fig. 45 (branchl. with ♂ infl. and ♂ flow. of *H. florib.*).

The three type duplicates left, viz. *Hollrung 543* (*Sant. flor.*), *Ledermann 9796* (*Can. furf.*), and *Ledermann 10455* (*Sant. sepik.*) are hard to compare. The two former represent ♂ plants with large and broad, axillary or subterminal inflorescences, the latter is a ♀ one with short, subterminal infrutescences and a few leaflets. Much additional material, however, has in the mean time come to our knowledge, more or less clearly linking up the scanty types just quoted, as well as the descriptions, given by Lauterbach and Lam (l. l. c. c.). It may be listed as follows:

NEW GUINEA, West New Guinea, Manokwari, Momi, old forest on flat land, scattered, 10 m alt.: *NIFS bb. 33437*, ster. (BO, L), tree, nat. n.: bowi; ibidem, fairly frequent: *NIFS bb. 33465*, ster. (BO, L), buttressed tree, nat. n.: jakko; Biak, Seroei, 50 m alt.: *NIFS bb. 30840*, ster. (BO, L); ibidem: *NIFS bb. 30692*, ster. (A, BO, L); ibidem: *NIFS bb. 30694*, ster. (BO, L); ibidem, 80 m alt.: *NIFS bb. 30722*, very young infl. Sept. (BO, L); ibidem: *NIFS bb. 30777*, ster. (A, BO, L); ibidem: *NIFS bb. 30764*, young infl. (prob. ♂), (A, BO, L); Mamberamo-area, "Pionierbivak", 35 m alt.: *NIFS bb. 31079*, ster. (BO, L); Hollandia, 50 m alt.: *NIFS bb. 25088*, infr. with immature fr. (BO, L) and ♀ inflor. (A), July; ibidem 40 m, old forest on slope: *NIFS bb. 25096*, flowerless infl. in July (A, BO, L), young tree, 10 m high; ibidem, Nimboeran, Berap: *NIFS bb. 28970*, ster. (BO, L); ibidem, along road from Netar to coast, in Cyclope Mts, 900 m: *NIFS bb. 25015*, young infrut. (BO, L) — South New Guinea, Upper Digoel, 15 m alt.: *NIFS bb. 14536*, ster. (BO, L); Papua, Koitaki, 450 m alt., in forest: *Carr 12247*, fr. purplish black in May (BM, L) — East New Guinea, Sepik area, Malu, 50—100 m: *Ledermann 10455*, fr. in Jan. (L, type dupl. of *Sant. sepik.*); ibidem, April riv., 2—400 m: *Ledermann 9796*, ♂ buds in Nov. (L, type dupl. of *Can. furf.*); Morobe dist., Lae: *NGF 925*, ster. (LAE, L); same locality, rain forest, 8 m alt.: *NGF 1564*, ♀ (LAE, L), tree, 30 m high, bole 18 m, buttressed to 1 m, diam. 0.75 m, bark brownish with grey patches, gum colourless, sapwood pale yellow-brown darkening gradually to a brownish heart, flow. (♀) greenish yellow; Constantinhafen: *Hollrung 543*, ♂ flow. (K, *lectotype*; MEL, P, type dupl.): Sattelberg, above Heldsbach, cart road jungle, 450—600 m alt.: *J. & M. S. Clemens 846*, ♂ flow. (A, B, L), buds green, in Nov.; same locality, 600—900 m: *Clemens 1752*, ♂ flow. (L) in June; Milne Bay, ½ mile S of Waigani Plantation, swampy flat, 9 m alt.: *NGF* 1312, fr. (LAE, L), tree 36 m, bole 24 m, buttressed to 1.8 m, diam. 0.6 m, bark greyish, gum whitish or colourless, sapwood white to pale straw, heartwood straw coloured, fr. blackish, nat. n.: ratitunga.

Not examined (cf Lam 1932b): *FRI bb. 15892* (Manokwari: sub *H. furfuraceus*): *Ledermann 7507, 7766* ♀, *8041, 10398* ♂, *12249* ♀ (all from Sepik area; sub *H. furfuraceus*, type material of *Can. furf.*); *Ledermann 7397* ♂, *10646* fr. (both from Sepik area, sub *H. sepikensis*; *7397, type spec. Sant. sepik.*).

Remarks. In the above delimitation *H. floribundus* seems to be a widely spread and variable species, endemic in New Guinea. Since the type specimen seems to be destroyed, it is proposed to assume the Kew duplicate of *Hollrung 543* as the lectotype of the species. *H. floribundus* seems to be mainly a lowland species, but this impression may be due to

insufficient collecting; three widely apart localities (Cyclope Mts, Sattelberg, Papua) mention altitudes between 450 and 600—900 m.

The variability is wide and involves both leaves and inflorescences. However, the nervation of the leaflets, which are mostly fairly rigid, generally shows a characteristic more or less minute reticulation particularly on the lower side. Their shape may vary between small and narrowly oblong (e. g. 10 × 3.5 cm) to larger and broad (e. g. 15—17 × 6.5—9 cm), but there are specimens (*NIFS bb. 25088*) in which they are very long and narrow (up to 20 × 5.5 cm). In the Biak specimens they are of the small and narrow type (cf Remarks to *H. anisander*), though larger and broader ones are sometimes found on the same specimen (e. g. *NIFS bb. 30692*). In the sterile *NIFS bb. 31079* they are small and broad (up to 8 × 4.5 cm) with 1—2 r. d. in the petiole.

The number of resiniferous ducts in the medulla of the petioles varies between 1 and 11. The Biak specimens have mostly only 1, sometimes 2 r.d., *NIFS bb. 25088* varies between 4 and 11, the Hollandia specimens between 1 and 4 and the others between 3 and 8 (cf Remarks under *H. acuminatus* and *H. celebicus*).

As far as the material available allows to state, a striking characteristic of *H. floribundus* is the sometimes terminal (next to axillary) inflorescences. This feature is common to both sexes. For the male one it is particularly found in the type duplicate of *Canarium furfuraceum* (*Ledermann 9796*). Obsolete vegetative buds are not rare in these inflorescences, as may occasionally occur in some other species (cf. General Part, sub 2 d). The following specimens may be mentioned here in these respects.

NIFS bb. 30722, Biak: very young inflorescences axillary; nothing can be inferred from these.

NIFS bb. 30764, Biak: very young, possibly ♂ inflorescences axillary and terminal, the latter with a distinct vegetative terminal bud (which involves that on development of this bud the inflorescences would automatically become separated and individually axillary); axillary ones are 1.5 cm long, the whole terminal inflorescence, which is furfuraceous, 3 cm long and 2 cm wide. The same is true for *NIFS bb. 25095,* the sex of which is unknown since all flowers have fallen.

NIFS bb. 25088, Hollandia: this specimen is particularly interesting since one sheet shows a short ♀ inflorescence with almost mature flower buds and the other long infrutescences with immature fruits. This demonstrates the difference in length. The female inflorescence is axillary to the uppermost leaf, furfuraceous, and 3.5 cm long, 1.5 cm wide. There is no vegetative terminal bud. The three infrutescences, equally without a distinct terminal bud, are axillary to the uppermost leaves, mostly branched from the base (as are the young inflorescences), and 10—14 cm long without the fruits, the lowest ramifications measuring 5—8.5 cm.

NIFS bb. 25015, Hollandia: young infrutescences on axillary, few-leafed shoots with a vegetative terminal bud, both near and some distance from the branch tip, the whole shoot 4.5—8 cm long and branched from the base.

Carr 12247, Papua: infrutescences with mature fruits, which are shining black when dry, several together in the upper leaf axils, widely

branched from the base with often an apparently obsolete and overtopped vegetative bud near the base, 8—12 cm long, lower ramifications 5—8.5 cm long; branches black when dry, angular and glabrous; fruits olive-shaped.

Ledermann 10455 (type dupl. of *Sant. sepik.*), Sepik area: infrutescences axillary to uppermost leaves (fruits detached), 5.5—6 cm long, some apparently (sub)terminal.

Ledermann 9796 (type dupl. of *Can. furf.*), Sepik area: ♂ inflorescences axillary and distinctly terminal without distinct vegetative bud, axillary ones about 8 cm long, pedunculate, terminal ones widely branched, at least 21 cm long and 16 cm wide on the sheet.

NGF 1564, Lae: young ♀ inflorescences terminal on one-leafed axillary shoots, which are 7—8 cm long, subglabrous and dark-brown when dry.

Hollrung 543 (type of *Sant. flor.*), Constantinhafen, has large and broad ♂ inflorescences in the upper leaf axils, 8—13.5 cm long and without vegetative buds.

In the Clemens specimens (*Clemens 846* and *1752*), Sattelberg, the ♂ inflorescences are of the same type but longer (up to 17 cm long) and less broadly branched at the base, thus resembling those of *Ledermann 9796,* the type duplicate of *Canarium furfuraceum.* Moreover, *Clemens 846* generally recalls *H. aneityensis* from the Western Pacific (see there).

NGF 1312, Milne Bay: infrutescences axillary to the uppermost leaves, without the fruits only 4—6 cm long, branches black and angular, glabrous, branched from the base; fruits ovoid to subglobular.

In the above material the leaves are, within the limits of variability, stated above, perfectly conformable.

12. H. versteeghii H. J. Lam, nov. spec. — *Fig. 9.* — Description of type specimen. — Arbor glabra. *Ramuli* 0.8—0.9 cm crassi, cum inflorescentiis petiolisque lenticellato-pustulati; medulla aresinosa, alabastro terminali fusco-furfuraceo. *Folia* 4½-jugata usque ad 45 cm longa, petioli teretes basi vix deplanati, cum rhachidibus minute lenticellati, 7½—9 cm longi, 0.4, basi inflata 0.8 cm diam., medulla 3—7 fasciculis vasorum resiniferis percursa; partes rhachidis interjugales 3—5 cm longae; foliola rigida, in sicco supra griseo-viridia, subtus brunnea, 9.5—19 × 4.5—7.5 cm, ovata ad oblonga, basi paulo inaequaliter rotundata vel late acuta, apice breviter obtuse acuminata, petioluli laterales 1—1.5, terminales c. 3 cm longi; costa media supra paulo, subtus cum nervis secundariis valde prominens; nervi secundarii utrimque 10—15, angulo 60°—70° de costa adscendentes, paulo curvati, prope margines plus minusve distincte arcuatim conjuncti; nervi tertiarii distanter transversi prope costam ea subperpendiculares, subtus conspicue prominentes, reticulatione minuta utrimque conspicua. *Inflorescentiae floresque* ignoti. *Infrutescentia* (unam tantum incompletam videmus) axillaris, a basi ramosa, rami solidi lenticellati, tota 7 cm longa; *fructus* immaturus (unum tantum videmus) *Haplolobi* typi 1.2 cm longus.

New Guinea. West New Guinea, Idenburg-river, 6 km SW of Bernhard Camp, frequent in primary forest, in valley, 1150 m alt.: *Brass & Versteegh 12546,* y. fr. in Febr. (A; L, *type specimen*), tree, 23 m high, 0.55 m in diam., bark brown, scaly, with some resin, sapwood white, heartwood red-brown, fr. green; same locality, 1170 m: *Brass & Versteegh 12544,* ster. (A, L), tree, 26 m high.

Remarks. The two specimens are doubtless conspecific. The

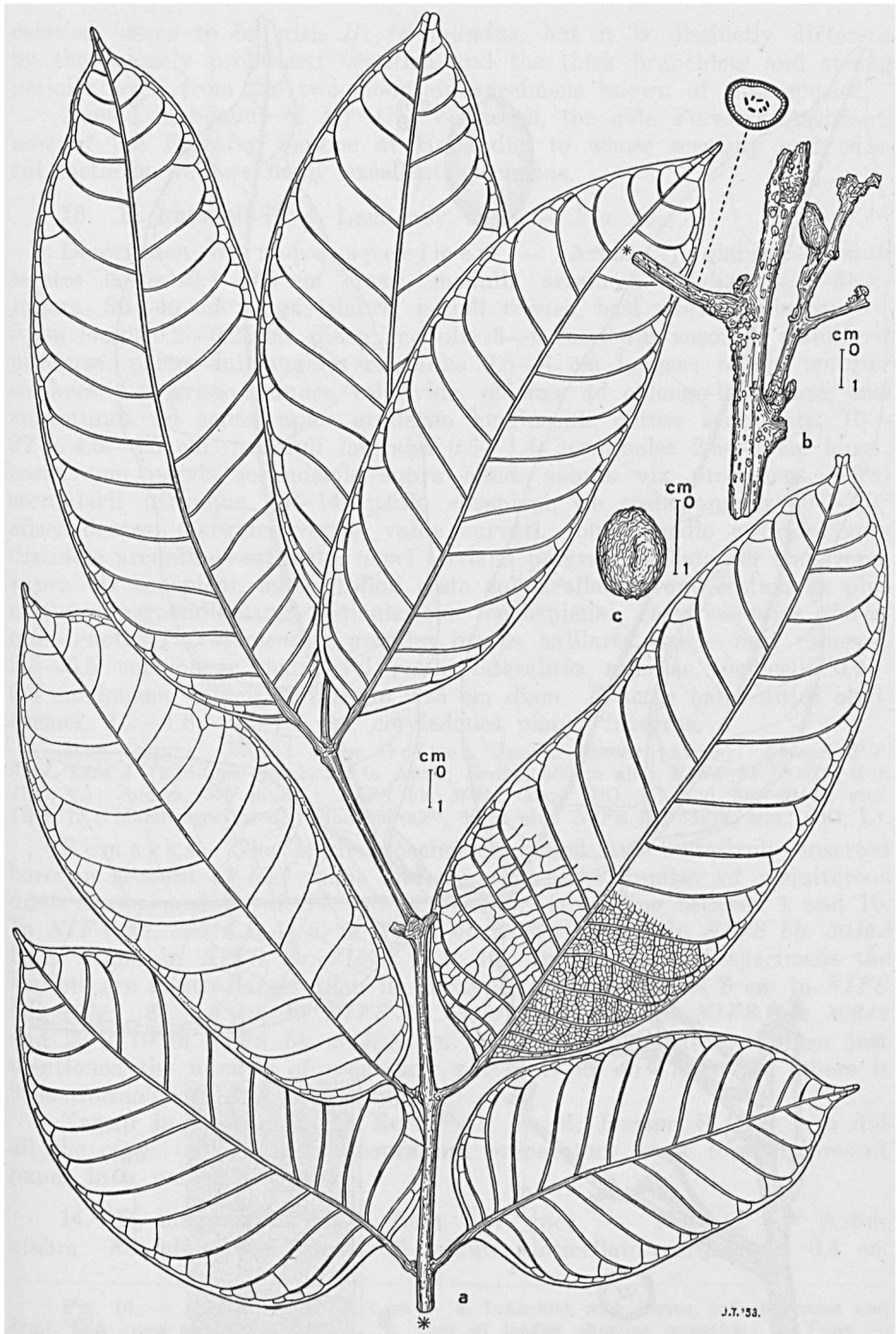
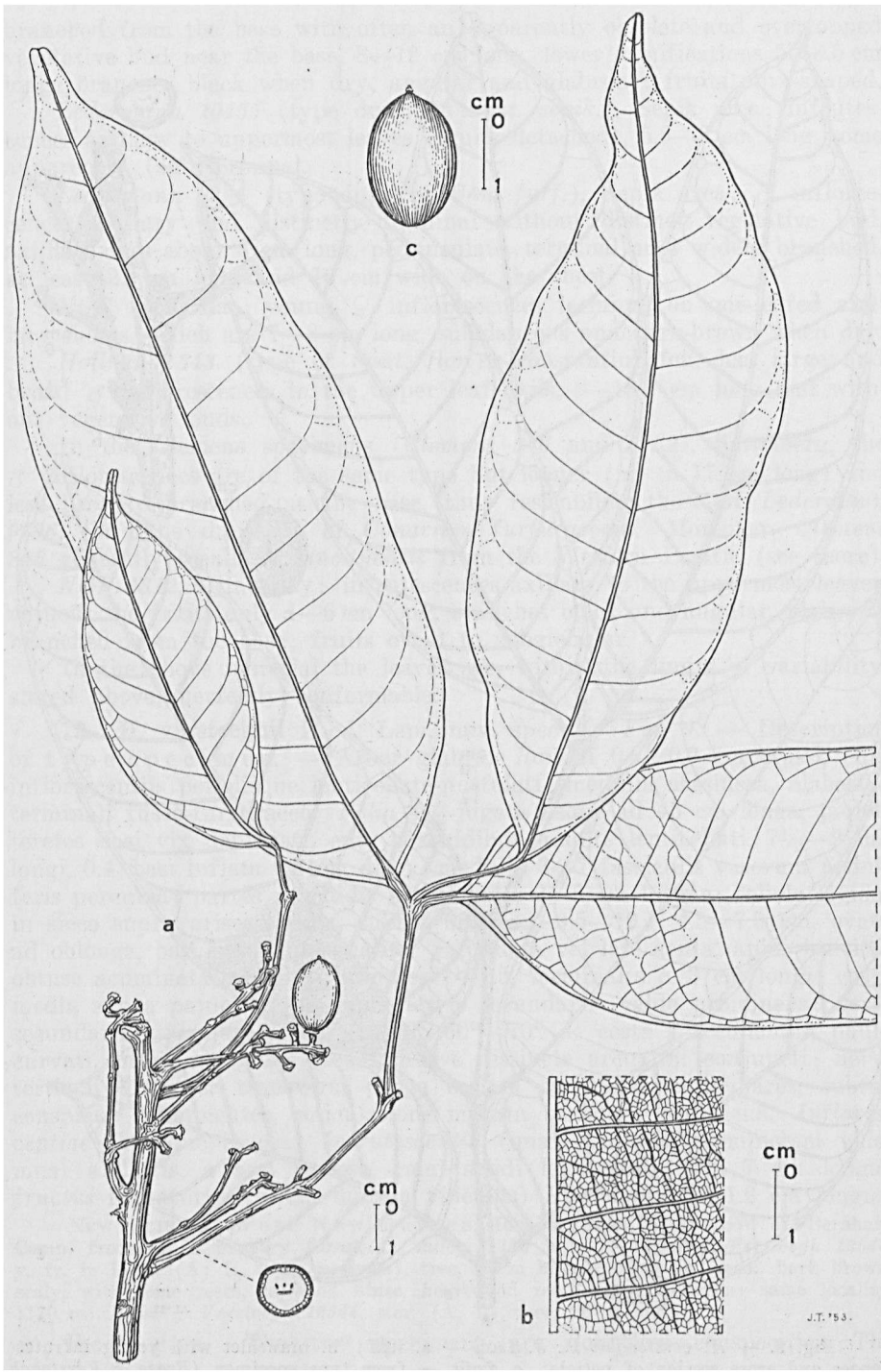


Fig. 9. — *H. versteeghii* H. J. Lam — a. leaf; b. branchlet with young infrutescences and cross section of petiole; c. fruit — from type specimen (*Brass & Versteegh 12546*, L).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relation seems to be with *H. floribundus,* but it is distinctly different by the coarsely prominent venation and the thick branchlets and strong petioles, even from the two mountain specimens known of that species.

Named in honour of Mr. Ch. Versteegh, the able Forestry Assistent, now of the Forestry Service at Hollandia, to whose scrutiny and careful methods we owe many excellent specimens.

13. H. hussonii H. J. Lam, nov. spec. — *Fig. 10.*

Description of type specimen. — Arbor (?) glabra. *Ramuli* teretes laeves 0.4—0.5 cm crassi, medulla aresinosa. *Folia* 2½(—3½)-jugata, 30—40 cm longa, glabra, petioli teretes, basi paulo deplanati 4—5 cm longi, 0.2—0.25 cm diam., medulla 3—6 fasciculis vasorum resiniferis percursa, partes interjugales rhachidis 2.5—4 cm longae; foliola tenuiter coriacea, i. s. griseo-brunnea vel livida, oblonga ad oblongo-lanceolata, basi subrotunda ad acuta, apice gradatim longiuscule obtuse acuminata, 10—22 × 4.5—8.5 cm, petioluli laterales 0.5—1.4, terminales 2.5—5 cm longi; costa cum nervis secundariis supra haud, subtus vix prominens, nervi secundarii utrimque 10—14, paulo conspicui, de costa angulo 60°—90° adscendentes, margines versus valde curvati, folioli medio et apice subdistincte arcuatim conjuncti; nervi tertiarii pergraciles distanter transversi, supra vix conspicui, medio folioli costa subparalleli, prope costam ea plus minusve perpendiculares, reticulatione inconspicua. *Inflorescentiae floresque* ignoti. *Infrutescentiae* graciles breves axillares, saepe basi ramosae, 2.5—5.5 cm longae, haud vel paulo lateraliter ramosae, pedicelli 0.2—0.4 cm longae, calycis rudimento 0.25 cm diam. *Fructus* haud nitidi oliviformes, 1.2—1.6 × 1—1.2 cm, cotyledones planae integrae.

NEW GUINEA. West New Guinea, Japen, Ansoes (Ansus): *Beccari P.P. 2224, 2224 A* (FI, *type spec.*), fr. in April; Seroei, 350 m alt.: *NIFS bb. 30515,* ster. (BO, L); ibidem. 370 m alt.: *NIFS bb. 30371,* ster. (BO, L) and *bb. 30462,* ster. (BO, L); Mamberamo area, "Pionierbivak", 30 m alt.: *NIFS bb. 31471,* ster. (BO, L).

Remarks. The sterile specimens quoted are tentatively inserted here on account of leaf shape and venation. The number of resiniferous ducts in the medulla of the petiole, however, is varying between 1 and 10. In *NIFS bb. 30515* it is 6, in *NIFS bb. 30371* it is 4, in *NIFS bb. 30462* it is 1 and in *NIFS bb. 31471* it is 10. In these sterile specimens the leaflets are mostly larger than in the type, viz. up to 30 × 8 cm in *NIFS bb. 30515,* 23 × 9 cm in *NIFS bb. 30371,* 26 × 8.5 in *NIFS bb. 30642* and 23 × 10 in *NIFS bb. 31471.* In the second and third specimen just mentioned the number of secundary nerves is up to 17, in the others it is conformable to that in the type.

Named in honour of the Rev. Fath. A. M. Husson S. C. J. who did all the often tedious and discouraging preparatory work for the present paper in a painstaking way.

14. H. megacarpus H. J. Lam, nov. spec. — *Fig. 11.* — Arbor glabra. *Ramuli* teretes laeves vel minute lenticellato-verrucosi, c. 0.4 cm

Fig. 10. — *H. hussonii* H. J. Lam — a. branchlet with leaves, infrutescences and fruit, and cross section of petiole; b. part of leaflet showing venation; c. fruit — from type specimen (*Beccari P. P. 2224 A,* FI).

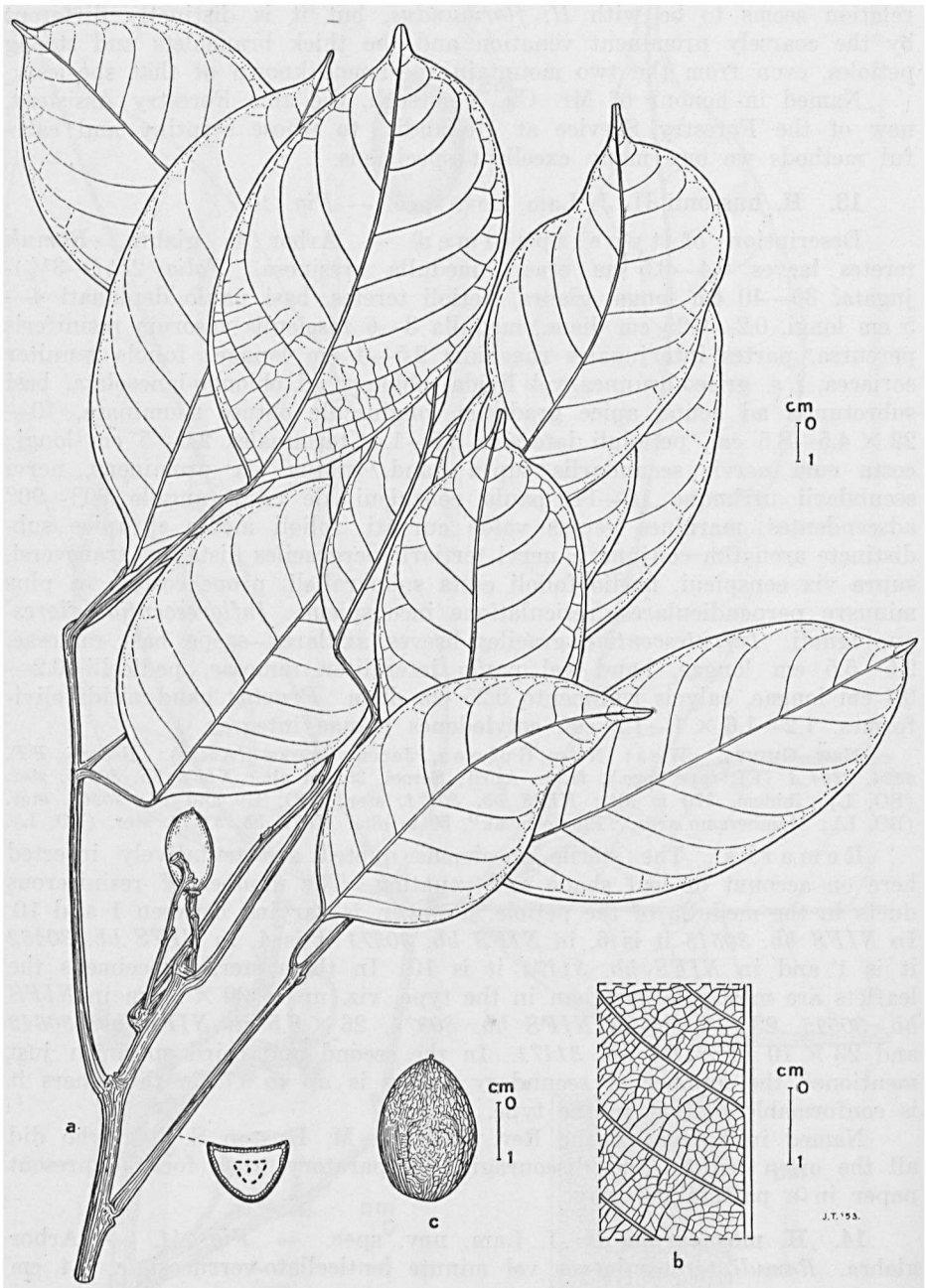

Fig. 11. — *H. megacarpus* H. J. Lam — a. branchlet with leaves, infrutescences and fruit, and cross section of petiole; b. part of leaflet showing venation; c. fruit — from type specimen (*Beccari PP 2225 A*, FI).

diam., medulla aresinosa. *Folia* 30—35 cm longa, (1½—)2½—3½-jugata, petioli 6—10 cm longi, supra distincte deplanati, 0.2—0.3, basi usque ad 0.5 cm crassi, medulla 5—12 fasciculis vasorum resiniferis percursa, rhachidis partes interjugales 3—5 cm longae; foliola ovata vel ovato-oblonga, i. s. brunnea, supra nitidula, subtus haud ita, basi plerumque late acuta saepe abrupte contracta, apice abrupte acuminata, (8.5—)10—13(—16.5) × 5—7 cm, acumine 0.5—1.4 cm longo; petioluli graciles, laterales 1.5—2, terminales 3—5 cm longi; costa cum nervis secundariis supra haud, subtus vix prominens, nervi secundarii utrimque 7—8, angulo 50°—60° de costa adscendentes, margines versus paulo curvati, haud arcuatim conjuncti; nervi tertiari transversi supra haud, subtus vix conspicui, reticulatione inconspicua. *Inflorescentiae flores*que ignoti. *Infrutescentiae* in foliorum ultimorum axillis insertae, breves, subrigidae 2.5—5 cm longae, saepe prope basin ramosae paucifructae; pedicelli crassi c. 0.5 cm longi, calycis rudimento 0.3 cm diam. *Fructus* pro genere magni oliviformes 2.3—2.8 × 1.3—1.8 cm, typi *Haplolobi.*

NEW GUINEA. West New Guinea, Japen, Ansoes (Ansus): *Beccari P.P. 2225, 2225 A, 2225 B* (FI, *type specimen*), fr. in April; tree, mature fruits like black olives, edible, nat. n.: au; same locality: *Beccari P.P. 2226* (FI), fr. only, same date.

Remarks. When dry the leaves have the undescribable colour, many *Meliaceae* show in the herbarium. Perhaps related to *H. leeifolius* which differs by the much smaller fruits and the less numerous resiniferous ducts in the petiole.

15. H. monophyllus H. J. Lam, nov. spec. — *Fig. 12.* — Arbor parva glabra. *Ramuli* graciles teretes laeves 0.2—0.4 cm diam., medulla aresinosa, gemmis vegetativis apiculatis furfuraceis. *Folia* ½—1½-jugata (i. e. 1-, 2-, vel 3-foliolata), bi- et unifoliolata ut apparet praesertim apices ramulorum versus; petioli (in foliis 2- vel 3-foliatis) 2.7—3.3 cm longi, medulla 1 fasciculo vasorum resinifero semi-orbiculari percursa; foliola coriacea, subrigida ovata, basi late acuta, saepe abrupte contracta articulata, apice gradatim vel subabrupte obtuse acuminata, 6—12.5 × 2.5—5.7 cm, petioluli laterales 1.5—1.7, terminales 2—3.5 cm longi, in foliis bifoliatis 1.5—2, in unifoliolatis 1.5—2.8 cm longi; costa media supra vix, subtus praecipue folioli basi conspicue prominens; nervi secundarii utrimque 6—9, angulo 65°—80° de costa adscendentes, supra haud subtus paulo prominentes, margines versus valde curvati et diminuti, interdum tenuiter arcuatim conjuncti, in eorum axillis distalibus fasciculos pilorum fuscorum (domatia) gerentes; nervi tertiarii transversi a reticulatione minuta densa utrimque praecipue subtus conspicua vix distinguendi. *Inflorescentiae* ♀ ignotae, ♂ in foliorum superiorum axillis insertae pergraciles, i. s. atrae, 0.7—5 cm longae, pauciflorae, breviter pedunculatae plerumque prope basin ramosae, interdum alabastro vegetativo abortivo suffultae, pedunculo rufo-furfuraceo, rami laterales usque ad 2 cm longi; bracteae minutae squamiformes. *Flores* parvi in siccitate c. 1 mm longi, 1.5 mm lati; *calyx* 3 lobis $^1/_2$—$^1/_3$ altitudinis metientibus latis deltoideis juvenalibus extus sparse pilosulis mox glabrescentibus; *petala* ovata 3 apice breviter reflexa paulo incrassata. *Stamina* 6 submonodynamia, antherae in alabastro ovarii rudimentum includentes, filamenta brevia disci minuti margine extus adnata.

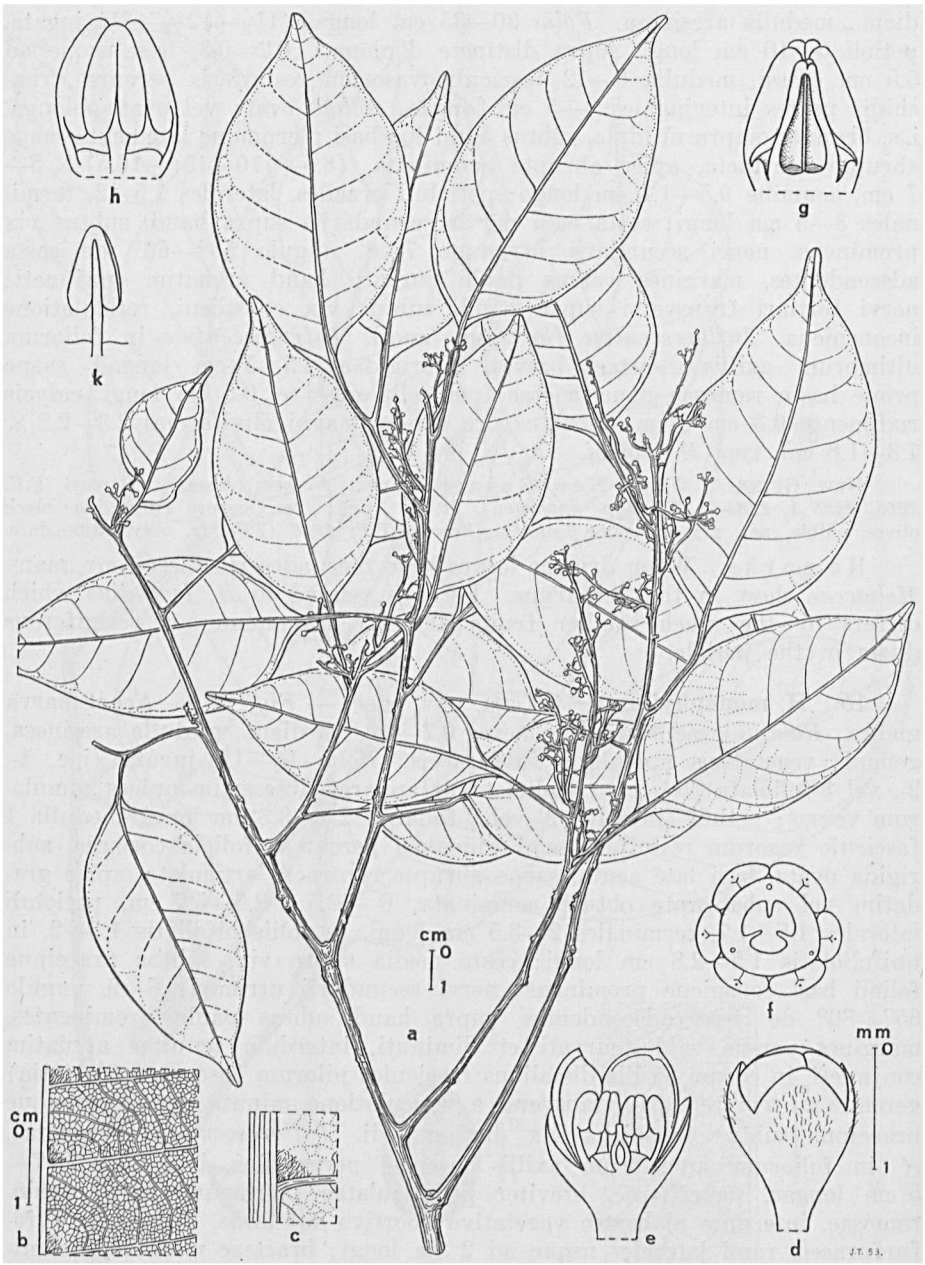

Fig. 12. — *H. monophyllus* H. J. Lam — a. branchlets with leaves and ♂ inflorescences; b. part of leaflet showing venation and domatia; c. domatium; d. ♂ flower-bud; e. adult ♂ flower, longitudinal section; f. cross section through young androeceum and sterile ovary with imperfect septa; g. ditto, longitudinal section; h. androeceum from outside; k. stamen from outside — a—c. from type dupl. (BO), d—k. from type specimen (*Main & Aden 1316*, L).

Ovarii rudimentum quam stamina adulta dimidio brevior, sterile, septis incompletis. *Infrutescentiae fructus*que ignoti.

MOLUCCAS. Morotai, G. Parepare, 1000 m alt.: *Main & Aden (Exp. Kostermans) 1316* (A, BISH, BG, BRI, CAL, K, LAE; L, *typ. spec.*; P, PNH), y. ♂ fl. in May, frequent tree, 10 m high, 0.2 m in diam., bark grey, flowers yellow, fruit (not seen) lilac.

Remarks. Fruits are, despite the fact that the specimen represents a male tree, mentioned on the field label. They have probably not been collected and if so, they probably do not belong to the specimen here cited.

A mountain species, remarkable for its in majority unifoliolate leaves with conspicuous "domatia" in most of the nerve axils, particularly in those near the base of the leaflets. On account of the very few-foliolate leaves, the dense reticulation, the single resiniferous duct in the medulla of the petiole and the short few-flowered inflorescences the present species is undoubtedly most closely allied with *H. nubigenus* from New Guinea. The very striking domatia link it both with the gland-bearing mountain species *H. glandulosus, monticola,* and *microphyllus,* and again with *H. nubigenus* which is sometimes provided with tiny glands.

16. H. nubigenus (Lauterb.) H. J. Lam 1932a, 208; id. 1932b, 415. — *Santiria nubigena* Lauterbach 1920, 335 — *S. triphylla* Lauterbach 1920, 336 — Iconography: Lam 1932a, fig. 61 (♀ flow.), and 1932b, pl. VIII, fig. 47 (hab. and ♀ infl., ☿ flow., y. fruit, and ♂ flow. bud).

NEW GUINEA. East New Guinea, Sepik area, 1000 m in alt., forest: *Ledermann 9989* (L, *neotype*), y. ♂ flow.; same locality, 2—400 m, forest: *Ledermann 9703* ♀ (L, *type dupl. Sant. triph.)*; same locality, 850 m alt.: *Ledermann 9565* (L), ster. — Papua, Boridi, c. 1500 m, forest: *Carr 13338* (BM, L), infr., tree c. 18 m high, buds yellow-green in Sept. (not found with the specimens).

Not examined (cf Lam 1932b): *Ledermann 10323* ♀ (Sepik area, *type* of *Sant. nubig.*).

Remarks. Endemic. The type specimen (*Ledermann 10323*) is probably lost, the only authentic specimen being *Ledermann 9989,* which, though included by Lauterbach with some doubt, is proposed here as a neotype. Though the above mentioned material is scanty and rather variable, it seems unwise to try and distinguish separate species. Common characters are the small and rigid leaflets, the solitary resiniferous duct in the medulla of the petiole, and the dense reticulation.

The variability involves particularly the number of leaflets and their shape. In the neotype the leaves are 1½—2½-jugate (the type description says: folia 2- vel 3-juga) and the leaflets are rather narrow (e.g. 8 × 2.5 cm). On the lower side there are occasionally one or two shallow pits which are probably nectaries, but they are not situated in the nerve axils as is the case in *H. glandulosus* and related species.

In the type specimen of *Sant. triphylla* the leaves bear 1—3 leaflets (½—1½-jugate), which are somewhat broader (viz. 9 × 3.5 cm) and show similar nectaries as are found in the neotype.

In the third Ledermann specimen spared (*Ledermann 9565*) there is only one (trifoliolate) leaf with broad leaflets (up to 8.5 × 4.5 cm) with some doubtful nectaries.

In the above-quoted specimens the bases of the leaflets are generally acute, in *Carr 13338* acute to rounded, and there are occasional minute

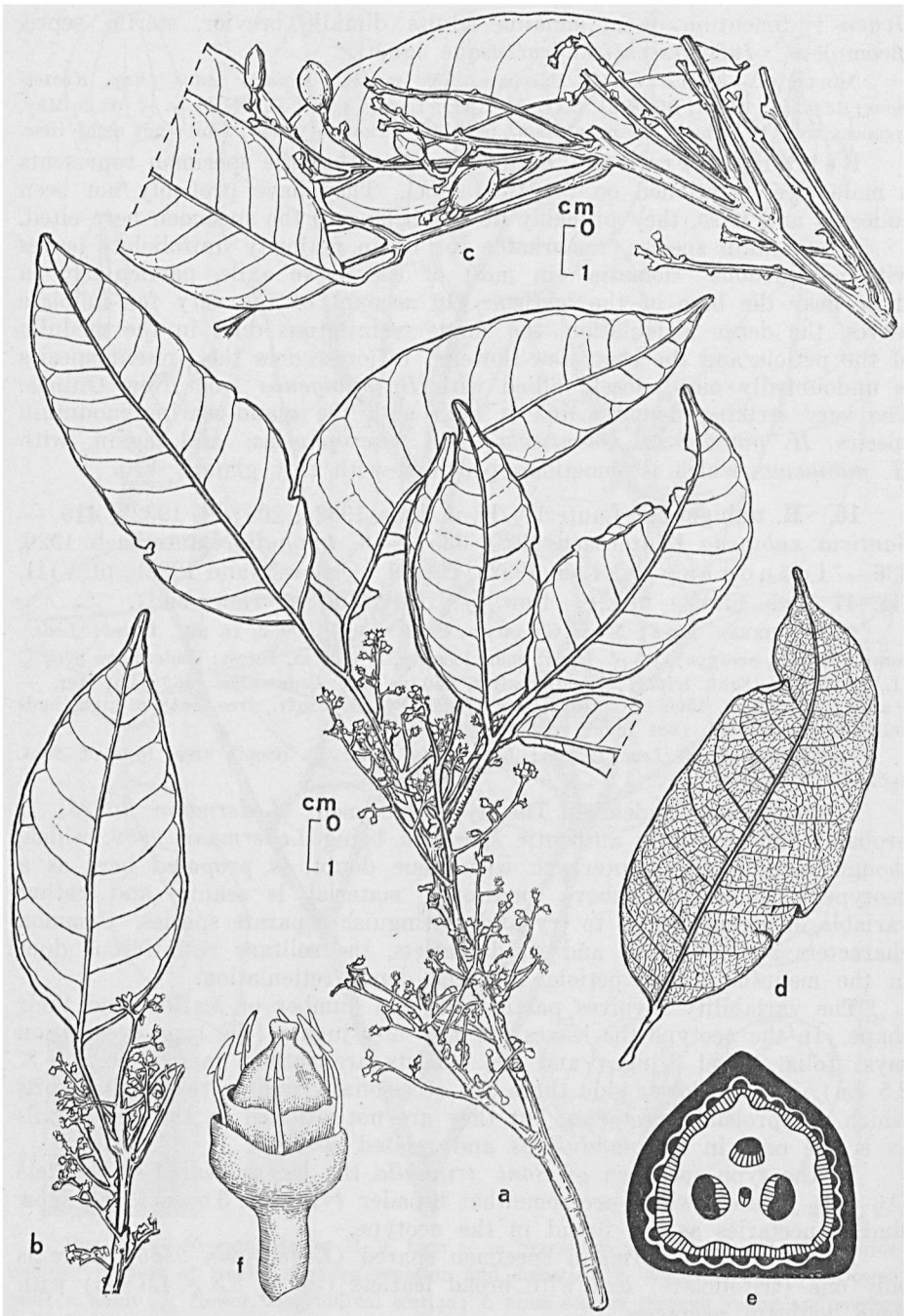

Fig. 13. — *H. clementium* A. M. Husson — a. branchlet with leaves and ♀ inflorescences; b. ditto, with unifoliolate leaf; c. ditto, with infrutescences; d. leaflet showing venation; e. cross section of petiole; f. ♀ flower — a, b, d—f. from type dupl. (*Clemens 1768*, A), c. from *Docters van Leeuwen 10800* (BO).

though unmistakeable glandular pits in the nerve axils which seem to make a transition to *H. glandulosus* c.s. (cf. Remarks under that species). The leaves are 1½—2½-jugate. Mature fruits are still unknown.

17. H. clementium A. M. Husson nov. spec. — *Fig. 13.*

Description of type specimen. — Arbor innovationibus exceptis glabra. *Ramuli* subgraciles, 0.3—0.5 cm diam., minute lenticellati, glabri, medulla compacta aresinosa. *Folia* ½—1½-jugata; petioli teretes basi plus minusve deplanati 1.8—4.5 cm longi, rhachidis partes interjugales c. 2 cm longae, medulla c. 5 fasciculis resiniferis percursa; foliola chartacea, oblongo-lanceolata basi late inaequaliter acuta, 7—12.5 cm longa, 2—5.3 cm lata, in sicco brunnea, apice subabrupte breviter obtuso-acuminata, acumine 5—7 mm longo, petioluli laterales 0.7—1.2, terminales 1.4—2.2 cm longi; nervi secundarii cum costa media utrimque conspicui sed paulo prominentes, 9—12, sub angulo ca 70°—80° a costa deviantes, margines folii versus curvati, nonnumquam prope marginem arcuatim conjuncti; nervi tertiarii cum reticulatione laxa conspicui transversi prope costam nonnulli ea perpendiculares, subtus distincte ad paulo conspicue prominentes. *Inflorescentiae* (♂ ignotae) ♀ breves paniculatae, multae in axillis foliorum plerumque caducorum, 2.5—4 cm longae plerumque a basi ramosae, nonnumquam gemmula terminali abortiva suffulta, cum calycibus dense minutissime pubescentes glabrescentes, bracteis perminutis munitae. *Flores* (♂ ignoti) ♀ 1—1.5 mm diam., pedicellis gracillimis glabris bracteolatis 1.5—2 mm longis. *Calyx* 3-fidus, 1 mm altus, sepalis late deltoideis obtusissimis brevibus. *Stamina* sterilia 6 univerticillata ovarium vix superantia, filamenti tenuibus glabris, antheris sagittatis acutis multo longioribus. *Discus* annularis glaber tenuis quam ovarium dimidio brevior. *Ovarium* 3-loculare, loculis 2-ovulatis. Cetera desunt.

NEW GUINEA. West New Guinea, Nassau range, "Explorateursbivak", in forest, 1000 m alt.: *Docters van Leeuwen 10800*, fr. reddish in Oct. (BO, L) — East New Guinea, Morobe District, Wareo, in forest, 750 m: *J. & M. S. Clemens 1768* ♀ (A, type dupl.; B, *type spec.*), tree, 30—60 cm in diam. breast high, flow. green white, fruit (not with the specimens examined) dull red in February.

Remarks. We have little or no doubt that *Docters van Leeuwen 10800* is conspecific with the type. The shape and nervation of the leaflets is identical, the difference being that the leaves are 1½—2½-jugate, the leaflets somewhat larger (8.7—17 × 3.5—6.5 cm), the number of resiniferous ducts 2—3, and that of secondary nerves 11—16. The infrutescences are, naturally, somewhat longer than the ♀ inflorescences, viz. 5—6 cm. The fruits are of the ordinary *Haplolobus*-type, more or less shining and black when dried, 1—1.5 × 0.7—1 cm, oblong and occasionally somewhat obliquely pointed with three small ribs, at the apex.

A mountain species characterised by its longish pointed leaflets and crowded short inflorescences (♀), named in honour of Chapl. J. and Mrs. M. S. Clemens, who enriched our herbaria with so many well-collected specimens both from New-Guinea and from elsewhere.

18. H. aneityensis (Guill.) A. M. Husson, nov. comb. — *Canarium aneityense* Guillaumin, Journ. Arn. Arb. 14, 1933, 54 — *Haplolobus salomonensis* C. T. White, Journ. Arn. Arb. 31, 1950, 92. — *Fig. 14.*

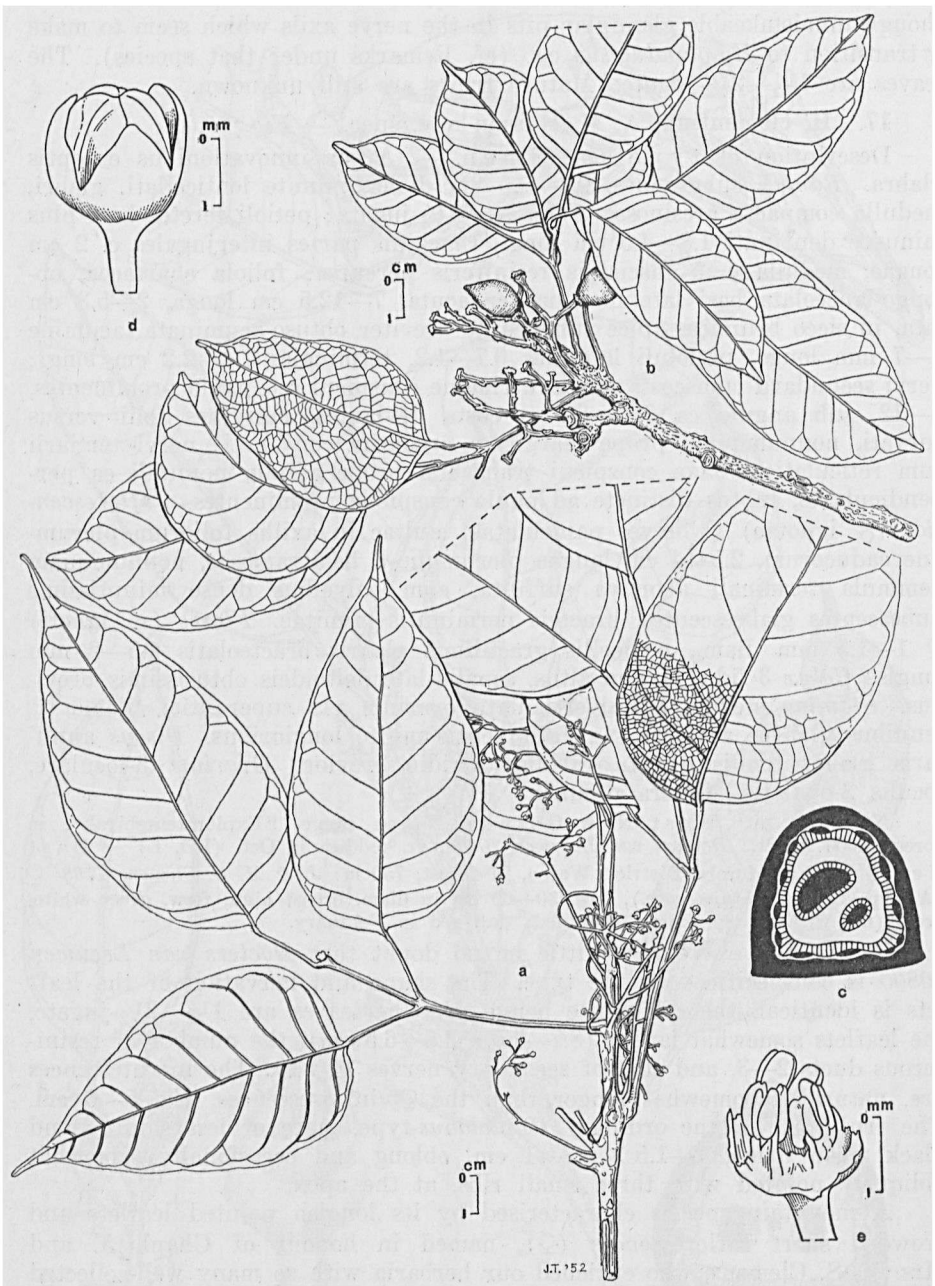

Fig. 14. — *H. aneityensis* (Guill.) A. M. Husson — a. branchlet with leaves and ♂ inflorescences; b. ditto, with infrutescences and fruits; c. cross section of petiole; d. ♂ flower; e. ditto, without corolla — a, c, d, e. from type spec. (*Kajewski 943*, A) b. from *A. C. Smith 6160* (A).

SOLOMON ISLANDS. Guadalcanal, Beaufort Bay, Kimbau riv., on ridge in rain forest, 200 m alt.: *F. S. Walker B.S.I.P. 242*, ♂ flow. (BRI, *type spec.* of *H. salom.*; L, type dupl.), tree with short buttresses, flow. green in Febr.

NEW HEBRIDES. Aneityum, Anelgauhat Bay, in rain forest, 150 m alt., common: *Kajewski 943*, ♂ flow. (A, *type spec.*; P), large tree, yielding a valuable cabinet wood, nat. n.: inyat, flow. green-white in March — Santa Cruz Group, Vanikoro, common in rain forest, 100 m alt.: *Kajewski 574*, ♂ (?) flow. (A), tree up to 20 m high, midrib yellowish-green underneath, flowers (insect-eaten) in Nov.

FIJI. Viti Levu, Mba, in dense forest along trail from Nadarivatu to Lewa, 750—850 m alt.: *A. C. Smith 6160*, fr. (A), tree, 20 m high, fr. in Sept.; same locality, dense forest between Nggaliwana and Tumbeindreketi Creeks, east of sawmill at Navai, 725—800 m alt.: *A. C. Smith 5858*, fr. (A), slender tree, 5 m high, "nggalinggawa" (nat. n. ?), fr. in Sept.; Rewa Province nr summit of Korombaba, 500 m in alt.: *Gillespie 2314*, ster. (BISH).

SAMOA. Savaii, above Sili, medium wet forest, 150 m alt.: *Christophersen 3279*, ster. (BISH, K), tree, 6 m high, bark very fragrant, nat. n.: a'a matie.

Remarks. All specimens quoted, though showing some variability, are perfectly conspecific with the type.

Apparently, *H. aneityensis* is a wide-spread tree in the Western Pacific; it is the only representative of the genus east of New Guinea (but for the doubtful New Britain specimen of *H. anisander*) and may generally be characterized as follows:

Leaves (1½—)2½—3½(—4½)-jugate, petioles slender, terete except at the very base, 2.5—9 cm long, with 1—5(—9) resiniferous ducts in the medulla; leaflets chartaceous, oblong to obovate with a broadly acute to rounded base and a more or less long and narrow blunt acumen (0.5—2 cm long), in some though not all cases very much like a leaf of certain *Populus* species ("populneus" would have been a very adequate specific name), (7—)10—15(—20) × (4.3—)6—8(—9) cm, with slender, transverse tertiary nerves and a faint and lax reticulation, secondary nerves 6—10; petiolules long and slender, articulate under the leaflets, lateral ones (1—)1.7—2.7(—3.7), terminal ones (1.3—)3.5—5(—7) cm long. *Inflorescences* (♂) axillary, lax, broadly ramified mostly from the base, black when dried, 5—16 cm long, ♀ ones unknown; *infrutescences* axillary, little branched, stiff, 1—7 cm long, pedicels 0.7—1 cm long, calyx 0.25—0.3 cm in diam., fruits ovoid, rounded at base, more or less acutely pointed at apex, 1.5—2.1 × 0.7—1.1 cm. Female flowers are so far unknown.

Individual differences may be inferred from the following annotations (r.d. = number of resiniferous ducts in the medulla of the petiole):

The male specimens quoted show little variability except that the leaflets are now more poplar-like (*Walker 242*, r.d.: 1; *Kajewski 943*, r.d.: 2—3), now more oblong (*Kajewski 574;* r.d.: 5), but the two types are often found on the same branch and even on the same leaf, the terminal leaflet being mostly more oblong, but lateral ones may be so as well. In the fruiting specimen *A. C. Smith 6160* the leaflets are of both types, the leaves being rather smaller than in the male plants, r.d. 4—9; the infrutescences are 1—3 cm long. In the fruiting specimen *A. C. Smith 5858*, however, the leaves are large, 3½—4½-jugate, with large oblong leaflets (up to 13.5 × 6 cm) and long petiolules (up to 3.7 cm), r.d. 5, infrutescences up to 7 cm, the fruits being similar with those of *A. C. Smith 6160*.

Even larger leaves of the same type has the sterile *Christophersen*

3279: leaflets thin, up to 19 × 8.5 cm, petiolule 3 cm, r. d. 2—3. In *Gillespie 2314* (r. d.: 3) they are smaller and oblong-obovate.

As Christophersen states (B. P. Bish. Mus. Bull. 128, 1935, p. 113, Flow. Pl. of Samoa) there are, in his *n. 3279*, occasionally little hair tufts in the nerve axils underneath as are found in *H. monophyllus* and occasionally in *H. anisander*. For the rest the specimen is exactly like *A. S. Smith 6160*.

In view of the native name used by Yuncker (Plants of the Manua Islands, Bernice P. Bishop Museum Bull. 184, 1945, 44) for a *Canarium* species occurring in Tau Island, American (Eastern) Samoa, it is possible that this is identical with *Christophersen 3279* and equally belongs to *H. aneityensis*.

H. aneityensis seems most related to *H. floribundus* (cf. *Clemens 846* under the last-named species).

19. H. borneensis H. J. Lam, 1932b, 418. — Iconography: Lam l. c. pl. XIV, fig. 93 (branchlets with ♂ infl., cross sect. of branchl. and pet., ♂ flow.).

BORNEO. North Borneo, Mt Kinabalu, Tenompok, 1500 m: *J. & M. S. Clemens 29338*, ♂ flow. (L, *type spec.*; BM), tree, 12 m high, flow. cream green with purple tinge, in Apr.; same locality: *J. & M. S. Clemens 29338 A* (L), young (♂ ?) flow. greenish white, in Apr.; Gurulau Spur, 1500 m: *J. & M. S. Clemens 50563*, ♂ flow. (BM), tree, flow. cream green, anthers golden, in Dec.; same locality: *J. & M. S. Clemens 50441*, ♂ flow. (BM), tree, 24 m high, flow. cream green, lemon anthers, in Nov.; Penibukan ridge, 1500 m: *J. & M. S. Clemens 50242*, ♂ flow. (B, BM, L), tree, 27 m high, 0.9—1.2 m in diam., flow. cream green, in Nov.

Remarks. Female flowers and fruits are still unknown. A mountain species, only known from Mt. Kinabalu, characterized by its small and narrow leaflets which are acute at base and acuminate at apex (3.5—13 × 1.3—5.3 cm), with 7—10 secondary nerves and 1—5 resiniferous ducts in the medulla of the petioles; and by its axillary, often large and widely branched ♂ inflorescences (6—18 cm long), with fairly large flowers for the genus (2—2.5 mm in diam.).

Its relation seems to be with Papuan species, rather than with the second Borneo species (*H. beccarii*), but it is difficult to state which Papuan species is nearest. The ♂ inflorescences resemble those of *H. floribundus* but the leaves are quite differently shaped, and the reticulation is more lax.

20. H. anisander (Lauterb.) H. J. Lam 1932a, 207; id. 1932b, 414. — *Santiria anisandra* Lauterbach 1920, 339 — Iconography: Lauterbach 1920, fig. 4, sub *Sant. anis.* (branchl. with leaves and ♂ infl., ♂ flow.; infl. are too heavy, androeceum of ♂ flow. is not correct, cf. Lam 1932b; same fig. in Engl. & Prantl, Nat. Pfl. Fam. 2nd Ed. 19a, 1931, 454, fig. 218); Lam 1932b, pl. VIII, fig. 46 (leafl. with venation, ♂ flow.).

Note. Unfortunately the specific epithet refers to an incorrect observation. In fact, the androeceum, like in all other species of the genus, is monodynamous, at least in adult flowers, and all stamens are inserted outside the fleshy disk.

MOLUCCAS. Banggai, Pongian, 85 m alt.: *NIFS bb. 31878,* ster. (BO, L) — Halmaheira, Weda, Tilope, 25 m alt.: *NIFS bb. 24882,* flow. (BO, L), in May; same locality, frequent in old forest on limestone: *NIFS bb. 24852,* ♂ flow. (BO, L), in April, tree, 26 m high, 0.37 m in diam., flow. yellow, with sweet taste; Weda, Luku Lamo, 10 m in alt.: *NIFS bb. 24939,* ster. (BO, L) — Morotai, G. Parepare, 1000 m in alt.: *Main & Aden (Exp. Kostermans) 1253,* flow. (BO, L), tree 5 m high, flow. white, in May — Batjan, alt. 15 m: *FRI bb. 16456,* ster. (BO, L), part of leaf only — Buru, Kak Tua forest: *NIFS bb. 22832,* ster. (BO, L) — Ceram, Kiandarat, 60 m alt.: *NIFS bb. 25878* and *25841,* both ster. (BO, L); same locality, Kiandarat, Rumaga, 60 m alt., fairly frequent in old forest on slope: *NIFS bb. 25925* (= *Buwalda 580*), ster. (BO), tree, nat. n.: lawai.

NEW GUINEA. West New Guinea, Meosnoem, 200 m in alt.: *NIFS bb. 30973,* ♂ flow. (BO, L), in Oct.; Biak: *NIFS bb. 30824,* ster. (A, BO, L); Japen, 700 m in alt.: *NIFS bb. 30306,* ster. (A, BO, L) — East New Guinea, Sepik area, "Schichtberg", 400 m in alt.: *Ledermann 7719,* flow. (K, *lectotype*), flow. in July; same locality, 3—400 m: *Ledermann 7483,* ♂ (K).

NEW BRITAIN. Jacquinot Bay: *NGF 162,* ster. (LAE, L), tree, 27 m high, 0.38 m diam., flanges to 0.9 m, bark light and mottled, smooth, yellow and brown inside.

Remarks. As the type has evidently got lost, it is proposed to select the Kew duplicate of *Ledermann 7719* as the lectotype.

As has been stated elsewhere (cf. Remarks to *H. moluccanus, floribundus,* and *celebicus*) the specific limits towards the three species just mentioned are indistinguishable in some sterile specimens. The difficulty is increased by the fact that the areas as accepted in the present paper, are overlapping, even though an attempt has been made to make taxonomical and geographical border lines correlate. This is, for instance, why the Moluccan specimens of *H. celebicus* — all sterile — have been inserted in that species with doubt.

In drawing the limits to *H. anisander* the following remarks may be useful (r. d. = resiniferous ducts):

H. anisander is characterized by (½—1½—)2½(—3½)-jugate leaves with slender petioles with 1—4(—5) r. d., thin leaflets with acute bases and acuminate tips, 8—12 secondary nerves and a little conspicuous, rather lax reticulation, gracile and rather long petiolules and very slender and short, axillary inflorescences, male ones more slender than female ones, both mostly branched from the base, ♀ (only one known) 4.5 cm long, ♂ 1.5—8 cm long. Infrutescences and fruits are thusfar unknown.

The leaflets are mostly rather small e. g. in the lectotype 8—11 × 2.5—3.5 cm, with petiolules of 0.8—1.2 cm (lat.), in several other specimens little larger (particularly the terminal one, e. g. in *NIFS bb. 31878* up to 14 × 6.3 cm, petiolules 0.8—1.5 (lat.) and 3—4.5 cm (term.). Larger leaflets, however, are found in specifically undubitable specimens, such as *NIFS bb. 24882,* which bears female inflorescences and has leaflets up to 20 × 8 cm with petiolules up to 2 cm (lat.). This renders identification of sterile specimens almost impossible. In *NIFS bb. 24939* (r. d.: 4) and *16456* (r. d.: 2—3), for instance, the leaflets are very much the same as those of the smaller types of *H. celebicus* (r. d.: [1—]4—9) and the insertion in one or the other species is rather arbitrary (cf. the case of *NIFS bb. 31850* mentioned under *H. celebicus*). Like in that case the choice has been based mainly on the evidence of the locality, once it had, for safety's

sake, been decided that indubitable *celebicus* is thusfar only known from Celebes proper.

On the other hand, the cases of *NIFS bb. 24939* and *16456* are supported by *Main & Aden 1253* (r. d.: 2—3) which has similar leaflets in connection with tell-tale ♂ inflorescences. The last-named specimen is of further interest since in one of the Leiden sheets the (sole) leaf is unusually large (petiole 9 cm, r. d. 3, leaflets 20.5 × 8.3 cm, petiolules lat. 3.5, term. 6.5 cm); in the other sheet of the same number the size is of the ordinary smaller type. As additional evidence, *NIFS bb. 22832* has leaflets of various sizes on the same branchlet, and others, such as *NIFS bb. 25878, 25841,* and *25925* have intermediate sizes (all with 2—4 r. d.).

Typical thin-leaved specimens, exactly tallying with the lectotype are known from widely separated localities such as Banggai (close to the Celebes mainland: *NIFS bb. 31878,* ster.; in most Moluccan flowering specimens the leaflets are rather approaching the intermediate size), Meosnoem (New Guinea, Geelvink Bay: *NIFS bb. 30973,* ♂) and the Sepik area (*lectotype,* ♂).

On the other hand, intermediate-sized leaflets are by no means restricted to the Moluccan area, as is shown by *NIFS bb. 30973* and some of the Biak specimens. In addition, the latter seem to show some affinity to *H. floribundus* by their thicker and more rigid leaflets, whose shape, however, is that of *H. anisander.*

A noteworthy feature of *Main & Aden 1253* is that in some nerves of some leaflets small "domatia" are found of the type which is found in some other species (*H. aneityensis, H. monophyllus*).

More or less doubtful is the New Britain specimen (*NGF 162*) with some 4½-jugate leaves with narrow, (when dry) b l a c k leaflets (usually greenish) and 1—3 r. d.

21. H. leeifolius (Lauterb.) H. J. Lam 1932a, 208; id. 1932b, 417. — *Santiria leeaefolia* Lauterbach 1920, 335 — I c o n o g r a p h y: Lam, l. c. pl. VIII, fig. 50 (leafl., ♂ infl. and flow.); the present paper, *Fig. 15.*

New Guinea. W e s t N e w G u i n e a, Arfak Mts, Poetat (Putat): *Beccari P.P. 862* (= *Herb. Fir. 2222*), fr. (FI), in Oct.; same locality: *Beccari P.P. 918* (= *Herb. Fir. 2221*), y. (prob. ♂) flow. (FI), in Oct. — E a s t N e w G u i n e a, Sepik area, April riv., 2—400 m: *Ledermann 9760,* ster. (L, type dupl. of *Sant. leeaef., lectotype*).

R e m a r k s: Endemic. As the type specimen has probably been destroyed, it is proposed to consider the only type duplicate left the lectotype. The type specimen bore ♂ flowers but unfortunately the only type duplicate is sterile.

The two Beccari specimens seem perfectly conspecific with the lectotype. In the latter, however, the colour of the dried leaflets is greyish (leaves 2½-jugate, t. Ledermann), in the Beccari specimens it is light brown (leaves 2½—3½-jugate).

H. leeifolius is characterized by terete and slender branchlets, 0.2—0.4 cm in diam. and more or less striate. The whole plant is glabrous except the young parts which are pulverulent to pilose. The leaves are 2½—3½-jugate, petioles (with 1—5 resiniferous ducts) 3—3.5 cm long, leaflets chartaceous, rather thin, ovate with acute base and long, narrowly

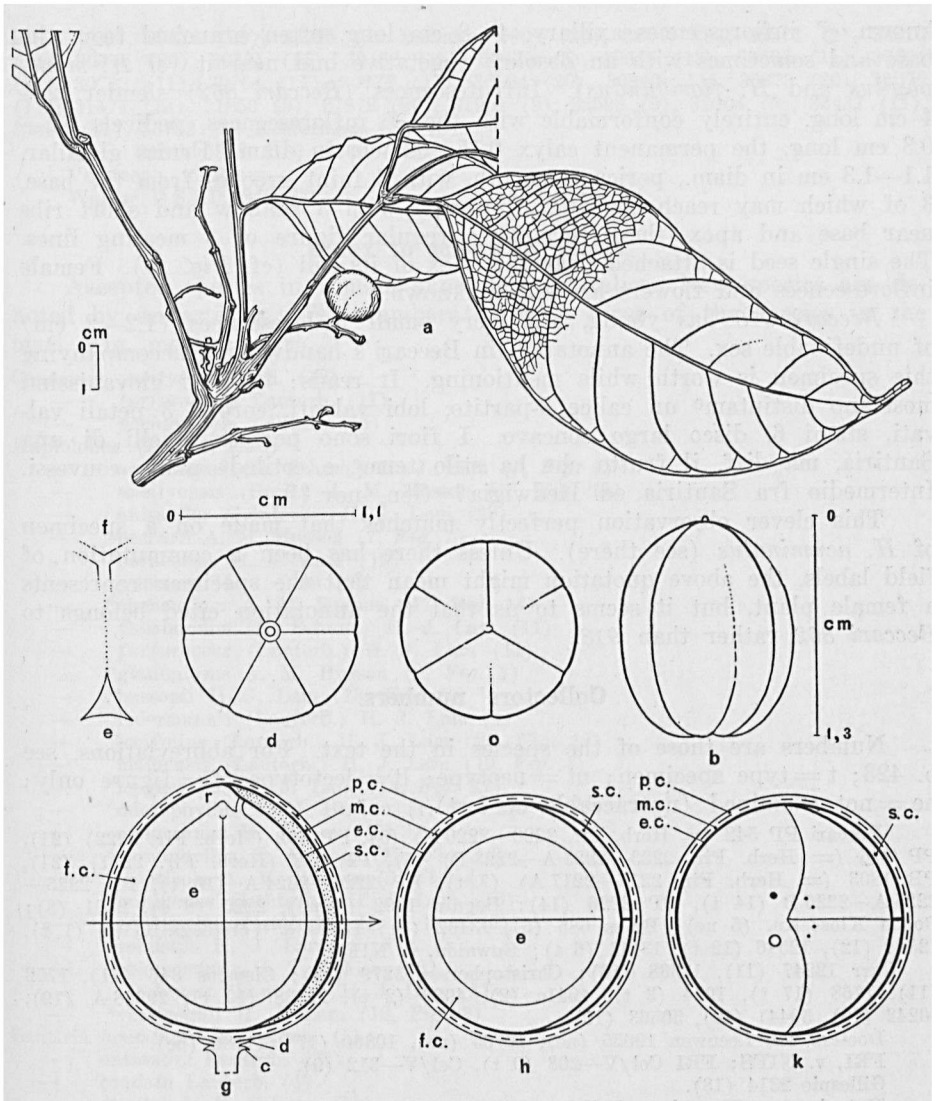

Fig. 15. — *H. leeifolius* (Lauterb.) H. J. Lam — a. branchlet with leaves, infrutescences and fruit; b. fruit, lateral view; c. ditto, from above; d. ditto, from below; e. basal configuration of putamen; f. apical ditto; g. longitudinal section of fruit and embryo; h. cross section of same; k. ditto, the embryo removed, showing the scars of the funicula on the endocarp (legenda to g—k: f. c. fertile cell, s. c. sterile cells, e. embryo, r. radicle, p. c. pericarp, m. c. mesocarp, e. c. endocarp, d. disk, c. calyx) — from *Beccari P.P. 862* (FI).

and bluntly acuminate-apex, 7—15.5 × 3.5—7 cm, petiolules 0.8—1.8 cm (lateral) and 3.5—4 cm (terminal), secondary nerves 8—12, little prominent below, hardly so above, tertiary nerves and reticulation faint and little conspicuous on either side. Female inflorescences and flowers un-

known, ♂ inflorescences axillary, 4—8 cm long, often branched from the base and sometimes with an obsolete vegetative bud near it (cf *H. monophyllus* and *H. floribundus*). Infrutescences (*Beccari 862*) slender, 2—4 cm long, entirely conformable with the ♂ inflorescences, pedicels 0.2—0.3 cm long, the permanent calyx 0.15—0.2 cm in diam. Fruits globular, 1.1—1.3 cm in diam., pericarp smooth, with 6 faint grooves from the base, 3 of which may reach the apex, putamen with 3 shallow and short ribs near base and apex, there forming a regular figure of 3 meeting lines. The single seed is attached near the apex of its cell (cf. *Fig. 15*). Female inflorescences and flowers are still unknown.

Beccari 918 has young, still very small inflorescences (1.2—2 cm) of undefinable sex. The annotation in Beccari's handwriting accompanying this specimen is worth while mentioning. It reads: "I fiori giovanissimi mostrano distintame un calice 3-partito, lobi valvati, corolla 3 petali valvati, stami 6, disco largo concavo. I fiori sono perfette quelli di una Santiria, ma diff. il frutto che ha stilo terme e cotiledo piano convessi. Intermedio fra Santiria ed Hedwigia? Gen. nov.?"

This clever observation perfectly matches that made on a specimen of *H. acuminatus* (see there). Unless there has been a commutation of field labels, the above quotation might mean that the specimen represents a female plant, but it seems to us that the annotation cited belongs to *Beccari 862* rather than *918*.

Collectors' numbers.

Numbers are those of the species in the text. For abbreviations, see p. 423; t = type specimen; nt = neotype; lt = lectotype; f = figure only; ne = not examined (untraceable or lost).

Beccari PP 542 (= Herb. Fir. 2220—2220 A) (5), PP 862 (Herb. Fir. 2222) (21), PP 876 (= Herb. Fir. 2223—2223 A—2223 B) (5), PP 918 (Herb. Fir. 2221) (21), PB 1803 (= Herb. Fir. 2217—2217 A) (7 t), PP 2224—2224 A (13 t), PP 2225—2225 A—2225 B (14 t), PP 2226 (14); Beguin 1902 (8 ne), 2225 (8 t), 2301 (8); Boden Kloss s.n. (5 ne); Brass 685 (5), 13152 (3); Brass & Versteegh 11198 (1 t), 12544 (12), 12546 (12 t), 13111 (6 t); Buwalda, v. NIFS.

Carr 12247 (11), 13338 (16); Christophersen 3279 (18); Clemens 846 (11), 1752 (11), 1768 (17 t), 1924 (3 t), 4941a (2), 4988 (2 t), 29338 (19 t), 29338 A (19), 50242 (19), 50441 (19), 50563 (19).

Docters van Leeuwen 10655 (ne), 10765 (ne), 10800 (17), 11186 (ne).

FRI, v. NIFS; FRI Cel/V—208 (9 t), Cel/V—312 (9).

Gillespie 2314 (18).

Hatusima, v. Kanehira; Hollrung 543 (11 lt), 737 (5 lt).

Kajewski 574 (18), 943 (18 t); Kanehira & Hatusima 11522 (10); Kostermans, v. NIFS, and Main & Aden.

Lam 705 (5), 3550 (8), 3583 (8), 3653 (8); Ledermann 6548 (10 f), 6605 (10 ne), 7397 (11 ne), 7483 (20), 7507 (11 ne), 7706 (11 ne), 7719 (20 nt), 7794 (10 ne), 7804 (10 f), 7806 (5 ne), 8041 (11 ne), 8082 (10 f), 8612 (10 ne), 9013 (4 lt), 9565 (16 ne), 9691 (10 f), 9703 (16), 9724 (5), 9760 (21 lt), 9796 (11), 9877 (4), 9915 (4), 9989 (16 nt), 10323 (16 ne), 10390 (5), 10393 (5 ne), 10396 (10 ne), 10398 (11 ne), 10455 (11), 10646 (11 ne), 10708 (10 ne), 11484 (4 ne), 11548 (5 ne), 12249 (11 ne), 12442a (4 ne), 12506a (4 ne).

Main & Aden (Exp. Kostermans) 1253 (20), 1316 (15 t), 1417 (9).

NGF 162 (20), 925 (11), 1312 (11), 1564 (11), 3754 (5); NIFS (bb. numbers) 14536 (11), 15892 (11 ne), 16456 (20), 22832 (20), 23153 (8), 23182 (9), 24500 (9), 24847 (8), 24852 (20), 24882 (20), 24939 (20), 25015 (11), 25088 (11), 25095 (11),

25841 (20), 25878 (20), 25925 (= Buwalda 580) (20), 28840 (9), 28871 (9), 28970 (11), 30306 (20), 30371 (15), 30462 (13), 30470 (5), 30515 (13), 30692 (11), 30694 (11), 30722 (11), 30764 (11), 30777 (11), 30824 (20), 30840 (11), 30973 (20), 31079 (11), 31471 (13), 31850 (9), 31878 (20), 31901 (9), 32598 (9), 32604 (9), 33437 (11), 33468 (11), 33782 (= Kostermans 88) (8).

A. C. Smith 5858 (18), 6160 (18).

Versteegh, v. Brass.

Walker B.S.I.P. 242 (18).

Index to scientific names.

Accepted species in roman, synonyms in italics. New species are denoted by an asterisk. The numbers refer to those of the species in the text. Fig. means figure.

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