

A REVISION OF BEAUMONTIA WALLICH, KIBATALIA G. DON AND
VALLARIOPSIS WOODSON (APOCYNACEAE)

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R U D J I M A N

A REVISION OF BEAUMONTIA WALLICH, KIBATALIA G. DON AND
VALLARIOPSIS WOODSON (APOCYNACEAE)

Proefschrift

ter verkrijging van de graad van
doctor in de landbouwwetenschappen,
op gezag van de rector magnificus,
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To my wife and children

ABSTRACT

This publication is a taxonomic revision on monographic basis of the three Apocynaceae genera Beaumontia Wallich, Kibatalia G. Don and Vallariopsis Woodson (tribe Nerieae of the Apocynoideae). For this revision material from 43 herbaria has been examined. Living material has been collected and studied in Indonesia (Java and Kalimantan). Two special field trips were carried out in Kalimantan and several trips were made in Java.

All species have been fully described, typified and illustrated, including one for the first time. Literature and synonymy have been treated. Keys to the species, genus descriptions and distribution maps have been prepared.

In Kalimantan the author discovered a species new to science, previously only represented in the herbaria among unnamed material collected in Sarawak and Johore: Kibatalia villosa Rudjiman.

The revision of the genera Beaumontia, Kibatalia and Vallariopsis was made, as these occur in Indonesia and were in need of revision. Most other genera of the Nerieae have recently been revised, mainly by other authors.

An introduction details the relationship with other genera of the Nerieae tribe in the Apocynoideae subfamily. The 18 genera presently understood as belonging in Nerieae can be classified in 5 species groups.

SAMENVATTING

Deze publicatie is een taxonomische revisie van de drie Apocynaceae genera Beaumontia Wallich, Kibatalia G. Don en Vallariopsis Woodson. Voor deze monografie werd materiaal uit 43 herbaria bestudeerd. Levende planten werden verzameld en onderzocht in Indonesië, op Java en Kalimantan (Borneo). Twee speciale verzamelreizen werden gemaakt op Kalimantan, en meerdere keren werd op Java verzameld.

Alle soorten zijn uitgebreid beschreven, getypificeerd en afgebeeld, waaronder een soort voor het eerst. Literatuur en synonymie zijn behandeld. Determinatiesleutels, genusbeschrijvingen en verspreidingskaarten completeren het geheel.

Op Kalimantan ontdekte de auteur een soort nieuw voor de wetenschap, tot nog toe alleen vertegenwoordigd door ongedetermineerd materiaal verzameld in Sarawak en Johore. Deze soort werd Kibatalia villosa Rudjiman genoemd.

De revisie van de genera Beaumontia, Kibatalia en Vallariopsis werd gemaakt, aangezien deze genera in Indonesië voorkomen en hun omschrijving en classificatie herziening behoeften. Veel andere genera in de Nerieae zijn onlangs gereviseerd, voornamelijk door andere auteurs.

Een inleidend hoofdstuk beschrijft de verwantschappen met andere genera van het tribus Nerieae in de onderfamilie Apocynoideae. De 18 genera die momenteel worden geacht thuis te horen in de Nerieae kunnen in 5 groepen worden gerangschikt.

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CONTENTS

ABSTRACT	i
SAMENVATTING	iii
I RELATIONSHIPS OF GENERA IN NERIEAE (APOCYNACEAE), an introductory chapter	vi
II TAXONOMIC REVISION, a revision of Beaumontia Wallich, Kibatalia G. Don and Vallariopsis Woodson, Agricultural University Wageningen Papers 86-5 (1987)	1
Introduction	1
History of the genera	1
Geographical distribution	3
Taxonomic part	3
Beaumontia	3
Kibatalia	36
Vallariopsis	89
Acknowledgements	92
Index of exsiccatae	94
Index of taxonomic names	99

I. RELATIONSHIPS OF GENERA IN NERIEAE (APOCYNACEAE)

an introductory chapter

The three genera Beaumontia, Kibatalia and Vallariopsis revised in this publication all belong to the tribe Nerieae of the subfamily Apocynoideae, according to Pichon (1950) who gave the most recent survey of the family. The tribe was founded by Reichenbach (1837) who published one of the first efforts to subdivide the family of Apocynaceae. He included Nerium, Strophanthus, Wrightia, Balfouria (= Wrightia) and some other genera at present housed elsewhere. Independently, in the same year G. Don founded the tribe Wrightieae on Wrightia and Kibatalia, leaving Nerium and Strophanthus in the Apocynoideae (as Echitoideae). De Candolle (1844) more or less followed G. Don. Bentham and Hooker (1876) and also Schumann (1895) subdivided the Apocynoideae in another fashion. Pichon gave a historic survey of the subdivision of the Apocynoideae showing the great differences in the opinions of the above-mentioned authors. He himself coined yet another completely different subdivision of the Apocynoideae. He recognized 4 tribes, each subdivided in several subtribes. Although he indicated that he was in favour of basing taxa on a combination of characters he presented an unworkable artificial arrangement based almost exclusively on the way how the anthers cohere with the pistil head. However, the Nerieae, as he made it, seems to be the best founded tribe of the Apocynoideae. The other three tribes appear very artificially circumscribed and several genera should change place (according to Leeuwenberg, pers.comm.). The present author could only compare data of the genera Pichon included in the Nerieae and a few genera of the other tribes. The Nerieae form a taxon quite reasonably based on a firm set of character states, and as it was not yet possible to compare the approximately 60 Apocynoideae genera placed by Pichon in the other three tribes, Nerieae are maintained here with a few alterations.

At least Pichon's Nerieae are a much better taxon than any of the suprageneric taxa recognized in the Apocynoideae by Bentham & Hooker (1876), Schumann (1895), and the three other tribes Pichon distinguished in this subfamily. The characters involved are the following.

Plants woody. Leaves usually opposite (not so in Adenium). Corolla frequently with a corona. Anthers narrowly triangular or nearly so, usually sterile at the apex and sagittate at the base, connivent into a cone and coherent with the pistil head. Pistil partly shed with the corolla (sometimes not in Nerium), in some genera the head or the upper part only, in other the whole part above the ovary. Fruits dry follicles, mostly apocarpous (syncarpous in Nerium, some Wrightia species and Alafia multiflora). Seeds with a terminal coma (not so in Malouetia and Allowoodsonia), sometimes also with a basal coma. Embryo with flat or folded cotyledons.

The recent revisions almost all on a monographic basis produced by several authors substantially contribute to our knowledge of almost all genera Pichon classified in the Nerieae. After comparative studies of the obtained information, almost all genera he placed there are retained in the tribe:

Adenium (Plaizier, 1980), Nerium (Leeuwenberg, 1984), Strophanthus (Beentje, 1982), Wrightia (Ngan, 1965), Pleioceras and Stephanostema (Barink, 1984), Beaumontia, Kibatalia and Vallariopsis (this publication), Vallaris (Rudjiman, 1982), Malouetia (van der Ploeg, 1984, 1985), Farquharia and Funtumia (Zwetsloot, 1981), Mascarenhasia (Markgraf, 1976), Alafia (Pichon, 1954), Isonema (van der Ploeg, 1983), Pottsia (Tsiang & P.T. Li, 1977).

Only two of the genera Pichon placed in the Nerieae (Dewevrella and Amphineurion) should not remain there. As for these the opinion of Van der Ploeg is followed. Dewevrella shows remarkable resemblances with Parsonsia in the flowers, especially by the well exerted stamens with long filaments and similar anthers. It is

placed in the Parsonsiinae of the tribe Echiteae. Amphineurion was founded as a section of Aganosma by De Candolle (1844) and raised to the rank of genus by Pichon. The present approach is to follow De Candolle in this respect.

Pichon's Nerieae are listed in Table 1 with the subtribes and genera he recognized and he placed here. Comments appear in the second column. Therefore only 16 genera of his list are maintained as such and at the same time kept in the Nerieae. The two genera Allowoodsonia and Vallariopsis not placed by Pichon could be placed in his Malouetiinae and Kibataliinae respectively. Allowoodsonia has flowers and seeds as Malouetia while the habit of the trees of both genera is also similar. These genera are the only two Apocynoideae genera lacking a coma on the seeds (Leeuwenberg, pers.comm.). Vallariopsis resembles Kibatalia especially by the flowers. Moreover, according to Ridley (1923) Vallariopsis produces long slender fruits resembling those of Kibatalia.

The authors cited before commented on the relationship of the genera they revised, and thus they created an arrangement in suprageneric taxa in the subfamily Apocynoideae. For the time being, also as the subfamily is too large to be easily overseen, they essentially maintained the Nerieae sensu Pichon. Beentje placed Strophanthus, Nerium, Adenium, Wrightia and Pleioceras together. Plaizier showed the close relationship of Adenium with Nerium and he based his opinion on the resemblance of their inflorescences, corolla, appendages of the stamens and the fruits. Barink observed that Wrightia, Pleioceras and Stephanostema are close relatives. Therefore she kept these 3 genera in the subtribe Wrightiinae. Van der Ploeg (1985) proposed to place together the genera Malouetia, Allowoodsonia, Mascarenhasia, Kibatalia and Funtumia in one group, and Strophanthus, Isonema and Adenium in another, basing his opinion mainly on the position and shape of flowers and the tree habit for the first group without proposing names for these groups.

The present author compared the different genera again, and concluded that the Nerieae can be subdivided into 5 groups, for most of which he uses names already used earlier by Pichon for some of his subtribes. All subdivisions made in the Nerieae are disputable. Moreover, the subdivision of the Apocynoideae is still a matter of concern and therefore it is considered better not to burden the present-day nomenclature with more names of ill-defined taxa at the level of subtribes. The Nerieae are a reasonably well defined tribe, but any subdivision leaves open ends. After long hesitation the 5 groups listed below, can be defended as natural units, thus putting some of Pichon's subtribes together and subdividing his Neriinae:

1. Adenium and Nerium. Both genera produce long twisted hairy appendages on the apices of the anthers. Their sepals are narrowly oblong or nearly so. Their showy corollas with mostly infundibuliform tube and rounded lobes are very similar. The aestivation of the corolla is to the right. Finally their stem anatomy cannot be greatly different, as Adenium can be grafted on a Nerium. Adenium has, however, minute scale-like corona lobes while the corona of Nerium consists of 5 large clearly lobed parts. The group could be named subtribe Neriinae as Nerium belongs here.

2. Wrightia, Pleioceras, Stephanostema, Beaumontia, Vallaris and Strophanthus. The first three genera share several character states: folded cotyledons, apex of the non-beaked seed (bearing the coma) directed towards the base of the follicle, the aestivation of the corolla to the left and the conspicuous corona. The corona is absent only in Wrightia religiosa. Strophanthus resembles these three genera by the mostly infundibuliform corolla, but the cotyledons are flat, the apex of the beaked seeds is directed towards the apex of the follicle and the aestivation is to the right. Moreover the seeds bear not only a terminal coma, but also a deciduous basal one. Beaumontia and Vallaris resemble Wrightia by the often more or less similar corolla, frequently

exserted stamens, non-beaked seeds with only an apical coma and flat cotyledons. However they lack the corona characteristic for almost all Wrightia species. The often very large infundibuliform white corolla of Beaumontia resembles the often colourful one of Strophanthus. Both genera have large usually more or less woody follicles and flat cotyledons. On the other hand Beaumontia lacks the corona characteristic for Strophanthus and has non-beaked seeds. The group could be called subtribe Wrightiinae.

3. Kibatalia, Funtumia, Mascarenhasia, Malouetia, Allowoodsonia and Vallariopsis. These 6 genera all have colleters on the inside of the sepals, coriaceous leaves and fleshy corollas the aestivation of which is to the right. The genera have no corona but possess long follicles. Furthermore the corolla tube is narrow and more or less cylindrical in most species. The five first genera have domatia on the leaves, the cotyledons are folded at least in Kibatalia, Funtumia and Malouetia, while at least both Funtumia species and some species of Kibatalia and Malouetia show the architectural model of Koriba. The group could be called subtribe Kibataliinae.

4. Alafia and Farquharia. The species in these two African genera are large lianas with coriaceous leaves, terminal inflorescences, fleshy corollas with a more or less cylindrical tube often inflated around the anthers with a usually flat limb, colleters in the calyx, and comate mostly non-beaked seeds. However, the seeds of Alafia have only an apical coma, but Farquharia seeds bear both an apical and a basal coma. The latter character was similar in Adenium of the first group. The comas of the seeds of both latter genera point away from the grain. The basal coma of the seeds of Strophanthus points towards the grain.

5. Isonema and Pottsia. These two genera are lianescent, bear terminal inflorescences and the flowers have corollas with a cylindrical tube. The stamens are well exserted, even the filaments are clearly visible above the corolla mouth and the non-beaked seeds have at least an apical coma. Isonema also has a

basal coma comparable with that of Strophanthus. These two genera were earlier classified in Pichon's Neriinae.

The following characters may support the propriety of the Nerieae as a good taxon, but subdivision nevertheless remains disputable. The follicles are syncarpous in Nerium and some Wrightia and Alafia species. The seeds of Nerium do not only bear a terminal coma, but also lateral hairs slightly resembling those of Strophanthus bullenianus. The seeds of Strophanthus are beaked as those of Funtumia and some Alafia species.

Conclusion

Taking into account the abovementioned considerations the Nerieae are maintained as a subtribe containing almost all genera assigned to it by Pichon, but for the time being its subdivision into subtribes remains disputable.

Table 1. Arrangement of genera in Nerieae

Pichon (1950)	is at present:	Rudjiman (1987)
Nerieae		
1. Neriinae (as Amphineuriinae)		1. Neriinae
Amphineurion	= Aganosma	Adenium
Pottsia		Nerium
Dewevrella	to Parsonsiinae	
Isonema		
Nerium		
2. Beaumontiinae		2. Wrightiinae
Vallaris		Wrightia
Parabeaumontia	= Vallaris	Pleioceras
Muantum	= Beaumontia	Stephanostema
Beaumontia		Beaumontia
3. Strophanthinae		Vallaris
Christya	= Strophanthus	Strophanthus
Roupellina	= Strophanthus	
Strophanthus		
4. Mascarenhasiinae		3. Kibataliinae
Mascarenhasia		Kibatalia
Echitella	= Mascarenhasia	Funtumia
5. Alafiinae		Mascarenhasia
Alafia		Malouetia
Aladenia	= Farquharia	Allowoodsonia
6. Kibataliinae		Vallariopsis
Funtumia		
Kibatalia		
7. Wrightiinae		4. Alafiinae
Wrightia		Alafia
Wallida	= Wrightia	Farquharia
Scleranthera	= Wrightia	
Pleioceras		
Stephanostema		
8. Malouetiinae		5.
Malouetia		Isonema
Malouetiella (Pichon 1954)	= Malouetia	Pottsia
9. Adeniinae		
Adenium		

Vallariopsis not included
 Allowoodsonia not mentioned

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KIBATALIA G. DON AND VALLARIOPSIS
WOODSON
(APOCYNACEAE)

(series of revisions of Apocynaceae XIX)

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STELLINGEN (THEOREMS)

I

In order to understand the delimitation of the tribe Nerieae, all genera belonging to it should be revised.

II

On Java and elsewhere the presence of kickxiin in Kibatalia arborea is very little known.

(K. Heyne, Nuttige Planten Ned. Indië 1-3: 1291. 1950).

III

Vallariopsis is only known from western continental Malaysia, the island Penang and from the islands Siberut and Pagai in the Province of West Sumatra. It will certainly be discovered in Sumatra itself.

IV

Intensive exploration in Kalimantan should determine the actual distribution of Kibatalia species.

V

Forestry students must take plant taxonomy as a basic course.

VI

A good silviculturist requires a good background in plant taxonomy.

VII

Many plant species unknown to science are vanishing from Kalimantan due to uncontrolled forest exploitation.

VIII

Governments have better opportunities than botanists to protect endangered species effectively.

IX

Agroforestry is a valuable plantation system to solve the critical socio-economic problems of people living near the forest.

X

Reforestation with exotic species may be recommended if species trials at the same site have been successful.

XI

The FONC-NUFFIC cooperation project contributes substantially to the research work capability of the staff members of the Faculty of Forestry, Gadjah Mada University, Indonesia.

XII

Plant taxonomy courses given to Indonesian students have not yet found a stable position; it was clearly indicated as one of the topics of the Eighth National Biology Congress in Purwokerto, C. Java, October 1987 as "Quo Vadis Taxonomy in Indonesia".

XIII

From an economic viewpoint, tropical foresters do not need to know the species names of forest plants, when species of the same genus have similar wood qualities.

XIV

To provide means of education, research and conservation, the Indonesian government should establish more Botanic Gardens outside Java.

Stellingen behorende bij het proefschrift van
Ir Rudjiman S.U.

A revision of *Beaumontia* Wallich, *Kibatalia* G. Don and
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INTRODUCTION

The present publication is a monographic revision of the Asian genera *Beaumontia*, *Kibatalia* and *Vallariopsis*. It is based on the study of living plants, herbarium material and spirit collections.

The author had the opportunity to study living plants in the field of *B. multiflora*, *K. arborea*, *K. maingayi*, *K. villosa* and *K. wigmanii*. The first and last were seen only in cultivation, the others in the wild. The cultivated plants of the mentioned species he studied in the Botanic Gardens of Yogyakarta and Bogor.

The genera *Beaumontia* and *Kibatalia* consist of 9 and 15 species respectively. *Vallariopsis* is considered to be monotypic. The three genera belong to the tribe *Nerieae*, of the subfamily *Apocynoideae*.

The distribution maps are the first ever made for these genera.

Almost all specimens studied are cited in the present paper.

HISTORY OF THE GENERA

BEAUMONTIA

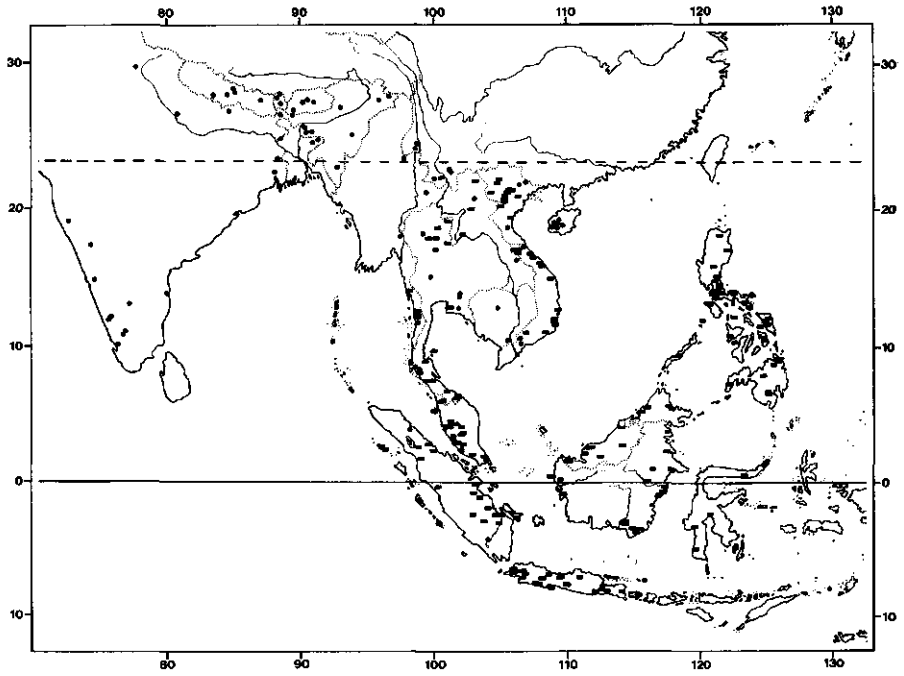
Beaumontia was described by WALLICH in 1824 with a single species *Beaumontia grandiflora*. He named it in honour of the late lady Diana Beaumont, a benevolent supporter of botanical science. Ten years earlier, ROXBURGH proposed the nomen nudum *Echites grandiflora* for the same taxon which he validated only in 1832, although it did not belong to the genus *Echites* as delimited today.

In 1850 WIGHT published a second species: *B. jerdoniana*. Several more followed, the last of which, *B. yunnanensis* Tsiang & W. C. Chen (1973), turned out to be conspecific with *B. khasiana*.

KIBATALIA

In 1826 BLUME proposed the Apocynaceous genus *Hasseltia* based on a single species *H. arborea*. He didn't know that 3 years earlier HUMBOLDT, BONPLAND and KUNTH published the Tiliaceous genus *Hasseltia*. When he discovered the latter, BLUME rebaptized his *Hasseltia Kickxia*. However, his *Kickxia* turned out to be a homonym of the Scrophulariaceous genus *Kickxia* Dumortier (1827). The latter fact was the reason why G. DON (1837) gave it its third name *Kibatalia* being used up to the present day.

The name of *Kibatalia* is derived from the *Sundanese*, *Ki Benteli*. *Ki* = wood; *Benteli* = spear. Presumably its wood was used by local people for shafts of spears (personal communication of M. RIVAI and HARINI, 1985).



MAP A. ● *Beaumontia*; ■ *Kibatalia*; ★ *Vallariopsis*.

VALLARIOPSIS

In 1882 HOOKER f. described the species *Vallaris lancifolia* based on material collected by MAINGAYI under Kew distribution number 1048. WOODSON (1936) proposed the genus *Vallariopsis* based on this species.

The present author maintains this genus.

GEOGRAPHICAL DISTRIBUTION

The distribution of the genera is shown on map A. *Beaumontia* occurs in tropical Asia from India to Bali in Indonesia. *B. grandiflora* is the only species reaching temperate regions in Nepal, Bhutan and Sikkim. The latter is widely cultivated in America, Europa and Africa.

Kibatalia is restricted to Southeast Asia, known from Thailand south to Indonesia and east to The Philippines. Its area nearly reaches 127° East. Several species occur in very limited areas: *K. elmeri* at Irosin (Luzon), *K. longifolia* at Southeast Mindanao, *K. macgregori* inhabit Sibuyan island and *K. wigmanii* Northeast Sulawesi. The most widely distributed species is *K. maingayi* covering a large part of the area of the genus.

Vallariopsis is only known from continental Malaysia and from the Islands of Siberut and Pagai, Province of West Sumatra. It is curious that the genus is not yet known from Sumatra.

TAXONOMIC PART

Beaumontia Wallich, Tent. Nap. 14. 1824; Ker, Bot. Reg. 911. 1825; Chittenden, Bot. Mag. 60: 3213. 1833; G. Don, Gen. Syst. 4: 77. 1837; De Candolle, Prod. 8: 403. 1844; Miquel, Fl. Ned. Ind. 2: 430. 1857; Bentham & Hooker, Gen. Pl. 2: 721. 1876; Kurz, Fl. Brit. Burma 2: 179. 1877; Hooker, Fl. Ind. 3: 660. 1882; Baillon, Hist. Pl. 213. 1889; Boerlage, Fl. Ned. Ind. 2: 389. 1899; Cooke, Fl. Bombay 2: 138. 1908; Koorders, Exk. Fl. Java 3: 77. 1912; Gamble, Fl. Madras 5: 817. 1923; Pitard in Fl. Indo-Chine 3: 1235. 1933; Craib, Fl. Siam. 2: 475. 1939; Pichon, Mém. Hist. Nat. 1: 61. 1950; Bor & Raizada, Some beautiful Indian climbers and shrubs 205. 1954; Backer & Bakhuizen v.d. Brink Jr., Fl. Java 2: 239. 1965; Tsiang & T'ao, Phyt. Sin. 11: 379. 1973; Stevens, Fl. Has. Dist. Karnataka 430. 1976; Herklots, Fl. Trop. Climbers 39. 1976; Tsiang & Li, Fl. Pop. Sin. 63: 129. 1977.

Type species: *Beaumontia grandiflora* Wallich

Woody climbers, producing white latex. *Trunk* terete; bark pale grey, rough and mostly corky. *Branches* terete, hollow when dry, pale grey or pale grey-brown, with longitudinally fissured bark, lenticellate, sometimes corky; branchlets terete, lenticellate, at the apex somewhat quadrangular or laterally compressed. *Leaves* opposite, those of a pair equal or subequal, less often unequal, petiolate; petioles connate at the base into a very short ocrea, with colleters in the axils. *Blade* coriaceous or papyraceous, entire, with costa impressed above and prominent beneath; secondary veins anastomizing; tertiary venation conspicuous, reticulate. *Inflorescences* axillary or terminal and then often seemingly axillary as in the axil of subtending leaf pair a branchlet is developing for the continuation of the branch, alternating when axillary, cymose, lax or less often congested. Peduncle and pedicels puberulent, sparsely to densely pubescent or less often tomentose; bracts sepal-like, mostly with colleters at the base of each bract (only in *B. macrantha*, colleters absent). *Flowers* 5-merous, mostly very large, actinomorphic, mostly fragrant. *Sepals* 5 (which may be 6 for *B. khasiana*), free, entire, with a single row of colleters at the base. *Corolla* consisting of a lower and an upper part; lower part cylindrical. *Stamens* connivent into a close cone around the pistil head (only in *B. khasiana* the anther cone less close), without dorsal swelling; filaments filiform; anthers narrowly triangular, acuminate at the apex, sagittate at the base, introrse, tails curved towards each other; cells 2, dehiscent throughout by a longitudinal slit. *Pistil*: disk ring- or cup-shaped, shallowly 5-lobed, or only in *B. longituba* 5-parted, surrounding the ovary; ovary bicarpellate; carpels broadly ovoid; style filiform; pistil head ellipsoid or ovoid, topped by a conical sterile apex. In each cell one semiglobose or ellipsoid placenta with many ovules. *Infructescences* as far as is known bearing 1-2(3) fruits, pendulous. *Mericarps* dark brown or dark grey, cylindrical or ellipsoid, rounded at the apex, somewhat cordate at the base, glabrous, lenticellate, dehiscent throughout by a longitudinal slit, many-seeded. *Seeds* (only known for *B. multiflora*, *B. murtonii* and *B. grandiflora*): with apex of the seeds directed towards the apex of the follicle, bearing an apical coma; grains fusiform, brown, glabrous, granulate; coma white, silky; hairs simple, recurved when the seed left the fruit; endosperm white, surrounding the embryo; embryo large, straight, white; cotyledons flat, elliptic; rootlet cylindrical, directed towards the apex of the seed, obtuse at the apex.

KEY TO THE SPECIES

1. Corolla tube 10–22.5(30) mm long, upper part 6–17.5(20) mm long; anthers inserted 4–6(10) mm from the corolla base, 8–9.5 × 1.5–2 mm; disk densely pubescent or tomentose 2
- Corolla tube (20)30–130 mm long, upper part (25)27.5–110 mm long; anthers inserted 10–40 mm from the corolla base, 10–17 × 2–4 mm; disk glabrous or puberulent 3

2. Corolla lobes (20)25–40 × 17.5–40 mm; mouth diameter 20–30 mm; filaments 20–25(30) mm long; stamens exerted for 10–20 mm; leaves sparsely puberulent or glabrescent above **5. B. khasiana**
- Corolla lobes 9–12 × 6–10 mm; mouth diameter 10–12.5 mm; filaments 10–10.5 mm long; stamens included for 0–1 mm; leaves (sparsely) tomentose above **7. B. macrantha**
3. Stamens exerted, less often included; filaments (10)15–25 mm long; pistil 25–50 mm long; disk glabrous, or sometimes with hirto-puberulence at the apex 4
- Stamens included; filaments 30–60 mm long; pistil 65–100 mm long; disk tomentulose, pubescent or densely hirto-puberulent 6
4. Peduncle 10 mm long; sepals very narrowly ovate, about 0.2 × as long as the corolla tube, 8–10 × 2 mm; mouth 12.5 mm in diameter; disk parted **6. B. longituba**
- Peduncle (25)30–100 mm long; sepals elliptic, obovate or narrowly ovate, 0.2–0.9 × as long as the corolla tube, 9–40(45) × 2–27 mm; mouth (25)32.5–70 mm in diameter; disk lobed 5
5. Sepals 27.5–40(45) × 18–27 mm; colleters of the sepals 50–70 in the whole flower; lower part of the tube (10)15–17.5 mm long; filaments inserted 20–25 mm from the corolla base **9. B. murtonii**
- Sepals 9–20(30) × 2–6(10) mm; colleters of the sepals 10–40 in the whole flower; lower part of the tube 5–10 mm long; filaments inserted 10–15(20) mm from the corolla base **8. B. multiflora**
6. Sepals (22.5)30–55(60) × (5) 10–25(40) mm, 1.3–6 × as long as wide, costa and secondary veins conspicuous; colleters at each bract 7–15; pistil head 10–12 × 2–3 mm, at the base hairy, furthermore glabrous; carpels tomentulose 7
- Sepals 13–27 × 3–6 mm, 4–5.6 × as long as wide, costa and secondary veins inconspicuous; colleters at each bract 1–3; pistil head 5–10 × 3 mm, glabrous, carpels pubescent or hirto-puberulent 8
7. Corolla tube 60–70(85) mm long, inside hairy; anthers hairy outside; pedicels puberulent or less often pubescent; bracts 1.1–1.8 × as long as wide, 17–25 × 9–20 mm **1. B. brevituba**
- Corolla tube (65)75–130 mm long, inside glabrous; anthers glabrous outside; pedicels tomentulose or densely pubescent; bracts about twice as long as wide, 10–21 × 5–11(15) mm **3. B. grandiflora**
8. Upper part of the corolla tube 6–9 × as long as the lower part, 60–90 mm long; anthers 15 × 4 mm; colleters at the sepals 60–70 in the whole flower; base of the corolla tube hairy inside; style hairy at the base **2. B. campanulata**
- Upper part of the corolla tube 2.25–3 × as long as the lower part, 45–55 mm long; anthers 10–12 × 2 mm; colleters at the sepals 6–10 in the whole flower; base of the corolla tube glabrous inside; style glabrous at the base **4. B. jerdoniana**

1. *Beaumontia breviflora* Oliver in Hooker, Icon. Pl. 16: t. 1582. 1887; Tsiang, Sunyatsenia 3: 153. 1936; Tsiang & Li, Fl. Pop. Sin. 63: 130. 1977.

Fig. 1; Map 1

Type: China: Kwangtung (Guangdong): Hainan, Henry 16 (K, holotype).

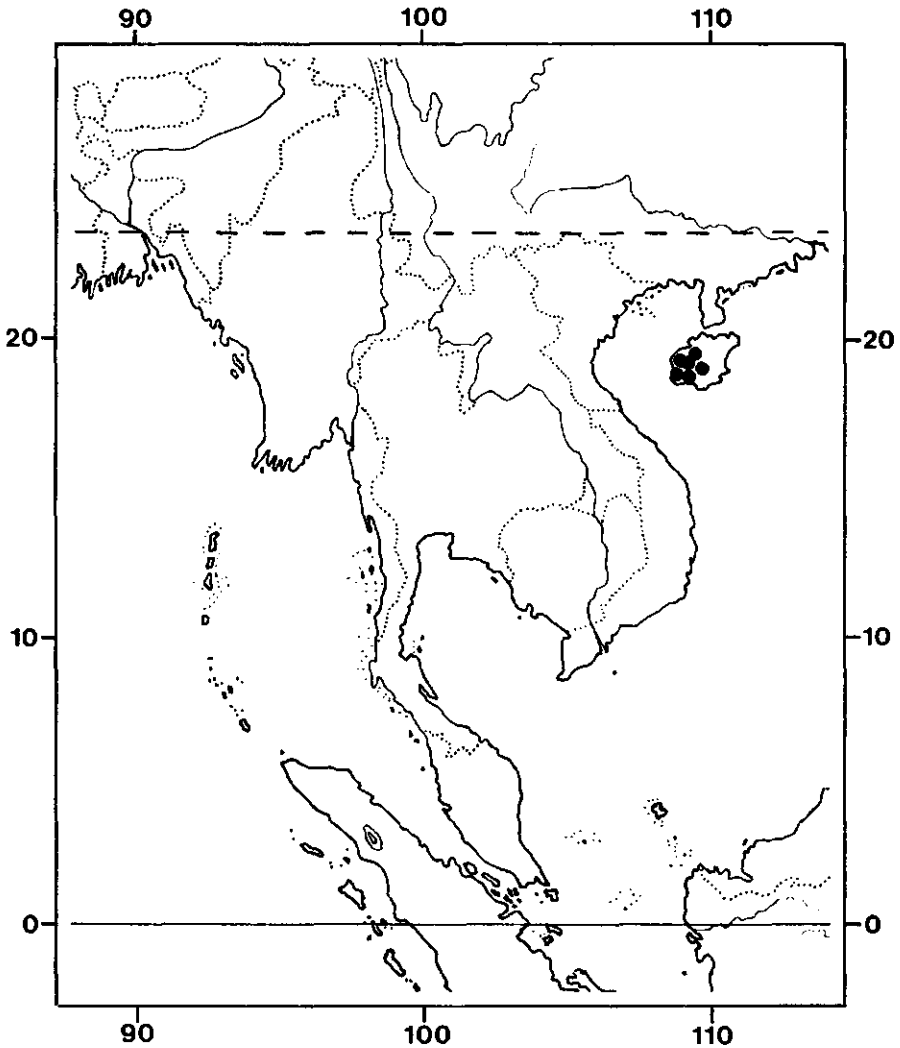
Woody climber, 3–5 m high. Trunk up to 2.5 cm in diameter. Branchlets pale yellow or grey, pubescent. Leaves: petiole 10–30 mm long, puberulent or sparsely pubescent, rarely glabrous, sometimes lenticellate, with 10–20 colleters in 1–3 rows in the axils; blade obovate or elliptic, 2–2.5 × as long as wide, (7)11.5–22.5 × (3)5–11 cm, acute or apiculate at the apex, at the base cuneate, sometimes almost rounded, above glabrous and sometimes pubescent only on the costa, beneath glabrous or sparsely to densely pubescent; with 9–15 secondary veins on each side. Inflorescences lax, 1–6-flowered, 0.6–1.3(1.8) × as long as the leaves, 13.5–21.5 cm long, once-branched. Peduncle 10–35(45) mm long, puberulent, less often pubescent; pedicels 35–60 mm long, puberulent, less often pubescent; bract elliptic or ovate, 1.1–1.8 × as long as wide, 17–25 × 9–20 mm, 0.3–0.4 × as long as the sepals, apiculate at the apex, sparsely pubescent on both sides, deciduous or persistent, with 7–10 colleters in a single row. Flowers fragrant or odourless. Sepals foliaceous, pale yellow, elliptic or obovate, 1.3–1.8(2.5) × as long as wide, 35–53 × 20–32 mm, outside puberulent, inside puberulent or often glabrous, acuminate at the apex, with 50–60 colleters in the whole flower, with conspicuous costa and veins; colleters slender, 1 mm long, acuminate at the apex. Corolla white or less often creamy; tube 1.3–2.3 × as long as the calyx, 1.5–1.6 × as long as the mouth diameter, 60–70(85) mm long, puberulent on both sides; lower part 12.5–20 mm long; upper part widely obconical or nearly rotate, 2.5–3.5 × as long as the lower part, 45–50(70) mm long, at the mouth 35–60 mm in diameter; lobes lingulate, 1–1.25 × as long as wide, 40–55 × 35–50 mm, acute at the apex, puberulent on both sides, with conspicuous parallel veins. Stamens included for 0–5 mm, rarely exserted; filament inserted at about 30–35 mm from the corolla base, 55–60 mm long, glabrous; anthers 13–17 × 3 mm, at the apex for about 2 mm sterile, outside with some pubescence, inside glabrous. Pistil about 85–90 mm long; disk cup-shaped, 1–3 × 4–5 mm, sparsely puberulent at the apex; ovary superior; carpels connate, 2.5–4 × 3–4 mm, tomentulose; style 55–70 mm long, glabrous; pistil head 10 × 3 mm, with some hirtio-pubescence near the base, furthermore glabrous. Infructescences: Mericarps obovoid, black when dry, 6 × 3 cm, glabrous, subtended by the persistent calyx; pedicels 4 cm long, glabrous, lenticellate; seed unknown.

Distribution: China: Hainan.

Ecology: Thickets or forests in the mountains, often on river banks. Altitude up to 1700 m.



FIG. 1. *Beaumontia breviflora*. 1, habit ($\times \frac{2}{3}$); part of flower opened ($\times \frac{2}{3}$); 3, anther, ventral view ($\times 2$); 4, anther, dorsal view ($\times 2$); 5, part of pistil ($\times \frac{4}{3}$); 6, flower base, partly dissected ($\times \frac{4}{3}$). 1-6 from Lau 1492.



MAP 1. *Beaumontia brevituba*

Specimens examined:

CHINA: Kwantung Prov., Hainan, Tam Distr., Hung Mo Shan (fl. May) Tsang & Fung 190 (A, G, K, NY, P, UC, US); Chang Kiang Distr., near Ka Chick Shan (fl. Apr.) Lau 1492 (A, NY, P); Kan-en Distr.: Chim Fung Ling near Sam Mo Watt (fl. March) Lau 3606 (P); near Fong Ngan Po (fl. Feb.) Lau 5520 (A); Five finger Mt. (fl. May) Woon Young Chun 1537 (UC); Bak Sa (fr. June) Lau 27536 (A); *ibid.* (fl. March) Lau 25732 (A); *sin. loc.* (fl. June) Katsumada 21955 (UC); *sin. loc.* (fl. March) Henry 16 (K, type) Liang 66317 (NY).



FIG. 2. *Beaumontia campanulata*. 1, habit ($\times \frac{2}{3}$); flower opened ($\times \frac{2}{3}$); 3-4, anther both sides ($\times 2$); 5, pistil head with anthers ($\times 2$); 6, basal part of flower ($\times 4$). 1-6 from Bon 3828.

2. *Beaumontia campanulata* Pitard in Fl. Indo-Chine 3: 1235. 1933.

Fig. 2; Map 2

Type: Vietnam (Tonkin): Kien Khe, Dong Ham, Bon 3828 (P, lectotype; isotype: P).

Homotypic synonym: *B. pitardii* Tsiang, Sunyatsenia 2: 160. 1934.

Woody climber. Branches smooth, with longitudinally fissured bark; branchlets dark brown, sparsely to densely pubescent. Leaves: petiole 10–20 mm long, puberulent or pubescent, sometimes glabrous, with 6–20 colleters in 1–2 rows in the axils; blade elliptic or obovate, 1.9–2.6 × as long as wide, 10.5–20 × 5.5–10 cm, often some basal smaller, apex apiculate, at the base cuneate or almost rounded, above glabrous or sometimes only on the costa and veins more densely so; with 11–14 secondary veins on each side. Inflorescences lax, about 1 × as long as the leaves, 14–17 cm long, 6–9-flowered, once branched. Peduncle 10–25 mm long, tomentulose; pedicels 22.5–30 mm long, tomentulose; bracts ovate, 2–5 × as long as wide, 10–15 × 3–5 mm, acute at the apex, tomentulose on both sides, mostly persistent, with 1–3 colleters. Flowers white, probably fragrant. Sepals narrowly elliptic, 4–5.6 × as long as wide, 15–25 × 3–6 mm, acute at the apex, tomentulose on both sides, with 60–70 colleters in the whole flower; costa and veins inconspicuous. Corolla: tube 2.8–6.6 × as long as the calyx, 70–100 mm long, 2–4 × as long as the mouth diameter, outside with some puberulence, inside glabrous but sparsely puberulent at the extreme base; lower part 10 mm long; upper part narrowly campanulate, 6–9 × as long as the lower part, 60–90 mm long, at the mouth 25–35 mm in diameter; lobes broadly ovate, 0.8–1 × as long as wide, 17.5–20 × 15–25 mm, acute or acuminate at the apex, outside sparsely puberulent, inside glabrate; veins parallel, conspicuous. Stamens included for 5–10 mm; filaments inserted 20–22.5 mm from the corolla base, 45–50 mm long, glabrous; anthers 15 × 4 mm, at the apex for 3–4 mm sterile, outside glabrous or often with some hirtio-puberulence, inside glabrous. Pistil 70–75 mm long; disk cup-shaped, 1–1.5 × 2–3 mm, shallowly 5-lobed, glabrous on both sides, puberulent at the apex, enveloping the ovary; ovary superior; carpels 1.5 × 2 mm, pubescent; style 60–70 mm long, near the base sparsely hirtio-puberulent, furthermore glabrous; pistil head 5–7.5 mm long, glabrous. Fruit unknown.

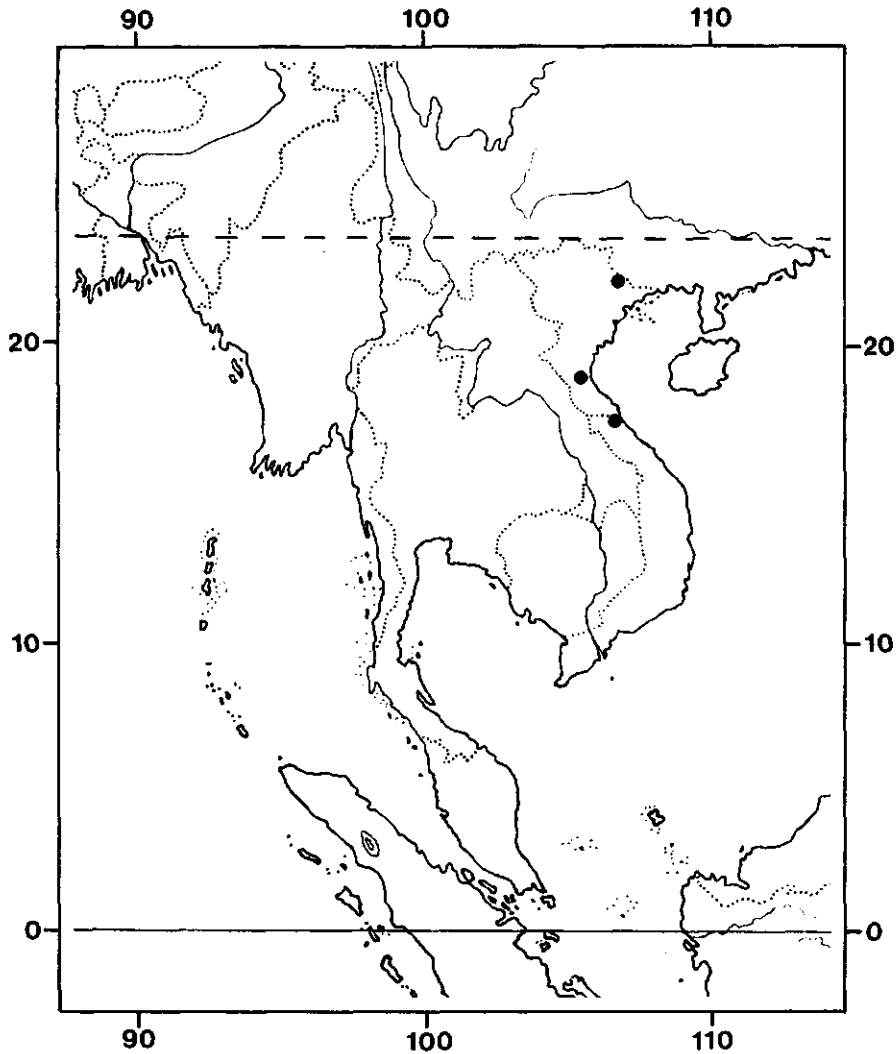
Distribution: Vietnam (Tonkin).

Ecology: In mountain area on rocky soil. Altitude unknown.

Vernacular names: Vietnam: Giai Hoang or Hung (Kien Khe) teste Bon 3828.

Specimens examined:

VIETNAM (TONKIN): Dong Dang (fl. Feb.) Balansa s.n. (P); Kien Khe: Dong Ham (fl. March) Bon 3828 (P, type); Dong Bau, Bon 2871 (P, paratype); sin. loc. (fl. Apr.) Bon 2056 (P, paratype).



MAP 2. *Beaumontia campanulata*

3. *Beaumontia grandiflora* Wallich, Tent. Nap. 15. 1824; Cat. 1629. 1828; Ker, Bot. Reg. 911. 1825; Geel, Sert. Bot. 1: 2. 1828; Chittenden, Bot. Mag. 60: 3213. 1833; G. Don, Gen. Syst. 4: 77. 1837; Miquel, Fl. Ned. Ind. 2: 430. 1857; Kurz, Fl. Burm. 2: 179. 1877; Brandis, Ind. Trees 463. 1906; Cooke, Fl. Bombay 2: 1083. 1908; Pitard in Fl. Indo-Chine 3: 1238. 1933; Bor & Raizada, Ind. Climbers and Shrubs 206. 1954; Maheshwari, Fl. Delhi 212. 1963; Herklots, Fl. Trop. Climbers 39. 1976.

Fig. 3; Map 3

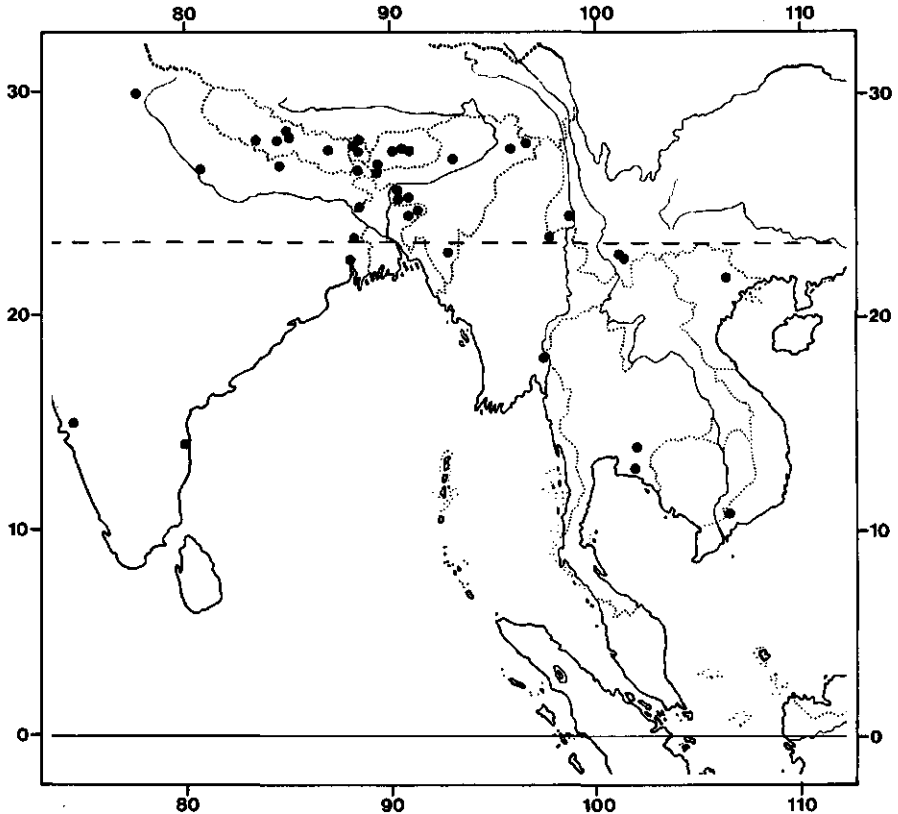
Type: Nepal: Noakote, Nawakot, Wallich 1629.1 (K – WALL, holotype).

Homotypic synonym: *Echites grandiflora* Roxburgh, Fl. Ind. 2: 14. 1832.



FIG. 3. *Beaumontia grandiflora*. 1, habit ($\times \frac{1}{2}$); 2, part of flower opened ($\times \frac{1}{2}$); 3, part of disk dissected ($\times \frac{10}{3}$); 4, anther, dorsal view ($\times \frac{4}{3}$); 5, anther, ventral view ($\frac{4}{3}$); 6, pistil head and anther dorsal view ($\times \frac{4}{3}$); 7, seed ($\times \frac{4}{3}$). 1-6 from Grierson & Long 3546; 7 from Wallich 1826.

Large woody *climber* or shrub 1–20 m high. *Trunk* up to 2 cm in diameter; bark corky, longitudinally fissured; branchlets sulcate when dry, dark brown, pubescent or tomentulose, less often glabrous. *Leaves*: petiole (5)10–30 mm long, channeled above, glabrous, less often sparsely to densely pubescent, sometimes lenticellate, with 10–20 colleters in 1–3 rows in the axils (occasionally colleters present on the ocrea); blade narrowly to broadly elliptic or obovate, 1.3–3.5 × as long as wide, (8.5)10.5–28 × (3.5) 5–15 cm, often some basal smaller, equal- or subequal-sided, acuminate, acute or apiculate at the apex, at the base cuneate or decurrent into the petiole, rarely rounded, less often slightly sinuate at the margin, above glabrous or sparsely puberulent, especially on the costa more densely so, beneath glabrous or sparsely to densely pubescent, usually with black dots; with 8–18(20) secondary veins on each side. *Inflorescences* lax, 3–19-flowered, 1–3 branched, (12)15–25 cm long, 1–1.4 × as long as the leaves. Peduncle (5–10)25–65(90) mm long, sparsely to densely pubescent or tomentulose, lenticellate; pedicels 25–45 mm long, tomentulose or densely pubescent; bracts elliptic, about twice as long as wide, 10–21 × 5–11(15) mm, 0.4–0.5 × as long as the sepals, obtuse or acuminate at the apex, densely pubescent on both sides, persistent or deciduous, with 10–15 colleters in a single row. *Sepals* foliaceous, pale green, less often purplish, obovate or elliptic, 1.75–5(6) × as long as wide, (22.5)30–55(60) × (5)10–25(40) mm, acuminate at the apex, sometimes acute, entire, sparsely to densely pubescent on both sides, with conspicuous costa and veins, with 40–60 colleters in the whole flower; colleters slender, about 1 mm long, acuminate at the apex. *Corolla* white, creamy or pale yellow, at the base pale green (testibus: Forrest 16248, Gierson & Lang 4309); tube 1.8–3.3 × as long as the calyx, (65)75–130 mm long, sparsely to densely pubescent outside, rarely puberulent, inside glabrous; lower part (10)15–25 mm long, upper part narrowly obconical or less often campanulate, (2.5)3.2–6(7) × as long as the lower part, (50)65–110 mm long, at the mouth 25–65 mm in diameter; lobes suborbicular or broadly ovate, sometimes lingulate, equal- or unequal-sided, 0.8–2 × as long as wide, 17.5–40 × 15–40 mm, acuminate at the apex, sparsely puberulent or less often glabrous on both sides, with conspicuous parallel veins. *Stamens* white, included for (0)5–25(30) mm, rarely exerted; filaments inserted at 25–40 mm from the corolla base, 32.5–60 mm long, sparsely hirtio-puberulent or glabrous; anthers 15–17 × 2 mm, at the apex for 1.5 mm sterile, glabrous on both sides. *Pistil* 70–100 mm long; disk ring-shaped, 1.5–2 × 3–4 mm, sparsely puberulent at the apex, superior; carpels connate, 3 × 9 mm, tomentulose; style 70–90 mm long, sparsely hirtio-puberulent or glabrous; pistil head 12 × 5 mm, glabrous. *Infructescences*: pedicels 5 × 1 cm, glabrous, lenticellate; peduncle 3 × 1 cm, glabrous, lenticellate. *Fruits*: mericarps dark grey, 22–31 × 5–6 cm, ellipsoid, obtuse at the apex, 200–300-seeded; wall 2–3 mm thick, pale brown inside. *Seeds*: grains 15–25 × 4–7 mm, obtuse at the both ends; coma (20)40–70 mm long; embryo: cotyledons 13–17 × 3–4 mm; rootlet 3 × 1 mm.



MAP 3. *Beaumontia grandiflora*

Distribution: Nepal, Bhutan, India, Bangladesh, Burma, China (Yunnan), Thailand, Vietnam.

Ecology: Humid montane forests, in valleys or on river banks. Altitude 25–1400 m.

Vernacular names: Tao Tum Yarn Chang (Thai), teste Put 3584.

Uses: Ornamental. The young branches are used for making coarse ropes (Bor & Raizada, 1954).

Most of the specimens examined:

NEPAL: EAST: Dingla, Udaipur (fl. Apr.) Banerji 1568 (A); Iripura (fl. Jan.) N.B. s.n. (E); Kali Gandaki, Totupani (fl. Apr.) Rice 1578 (US); Mayangdi Khola (fl. Apr.) Stainton et al. 2529 (E, UPS); Mayangdi Khola near Beni (fl. Apr.) Stainton et al. 106 (E, UPS); Kali Gandaki near Beni (fl. Apr.) Stainton et al. 86 (E); sin. loc., Carrey s.n. (K); Noakote, Nawakot, Wallich 1629.1 (K-WALL, type).

BHUTAN: Tongsa Distr., Wang de Khola below Shamgong, Grierson & Long 4309 (E); Samchi Distr., Phunsholing (fl. Feb.) Grierson & Long 2993 (E); Gaylephung Distr., Lodrai Khola (fl. March) Grierson & Long 3890 (E); Sarbhong Distr., 12 km E. of Sarbhong, near Lao Pani, Grierson

& Long 3546 (E); Byiti Sam, Mangde Chu (fl. March) Ludlow et al. 18553 (E); Mangde Chu (fl. May) Ludlow & Sherriff 3066 (E, UPS).

INDIA: Bettiah, Rastler 396 (K); Bombay: sin. loc., Herb. Dalzell s.n. (K). North West: Royle, Anonym. s.n. (K). Ichgaon (?) (fl. March) Biswas 3258 (CAL); Calcutta, CBO s.n. (E); sin. loc. (fl. Dec.) Herb. Graham s.n. (G); Saharanpur (fl. March) Golland 1294 (E); Sikkim: Pakanburi, Hooker s.n. (C, E, G, K, L, LD, M, MEL, NY, OXF, P, U, W); sin. loc. (fl. Feb.) Native collector 204 (CAL, M, Z); Serampore, Voigt s.n. (C). GARO HILLS: Dorokma (fl. March) Perry 1328 (K); sin. loc., Srinivasan s.n. (CAL); Mt. Tura (fr. March) Koelz 24798 a (MICH), Koelz 24688 (L, MICH); Ercha, near Kalimpong (fl., fr. March) Gamble 3225 (K); Thora, near Sivoke (fl. Apr.) Gamble 3224 A (K). ASSAM: Lusai Hills (fl. Apr.) Koelz 27578 (L, MICH); Abor Hills, Dihang (fl. Feb.) Kingdon-Ward 7856 (K). Chutia Nagpur, Palandu, Cooke 94 (K); Cochan, Keenan s.n. (K); Kanara, Yellapur (fl. Nov.) Bell 7522 (K); sin. loc. (fl. Oct.) Herb. Weber s.n. (HBG).

BANGLADESH: Chittagong, Sylhet, Anonym., s.n. (E); Sylhet, Wallich 1629.2 (K-WALL, M). Buxa Duars (fl. March) Biswar 1942 (NY).

BURMA: Nam Hka (fl. Apr.) Dickason 9770 (A); Thaton Distr., Tawokywa, Thauogyu valley (fl. March) Lace 4690 (E, K); sin. loc., Toppin 3043 (E).

CHINA: YÜNNAN: Salween valley (fl. Apr.) Forrest 16248 (A, E, K, W); ibid. (fl. Apr.) Forrest 13746 (E); sin. loc., Forrest 9922 (E); Szemao, Henry 11950 (A, E, K, L, MO, NY, W); Kauin Fang (fl. Aug.) Orleans s.n. (P).

THAILAND: sin. loc., Herb. Desvaux 398 (P); Lamphong, Me Laung (fl. March) Winit 1639 (BM, K, P); Korat Prov., Kao Lam Put 3384 (BM).

VIETNAM: Mt. Tay Ninh (fl., fr. Feb.) Muller 914 (K, P); between Dong Mo and Van Linh (fl. March) Pételot 2441 (A, MO).

CULTIVATED:

USA: Lake of Central Florida (fl. Nov.) Farlin 5229 (MICH); Los Angeles (fl. Apr.) Griffiths 4340 (K).

GUATEMALA: near Coban (fl. March, Apr.) Standley 90916 (F).

HONDURAS: Lancetilla valley near Tela (fl. March, Dec.) Standley 55187 (F, US).

EL SALVADOR: Pomincio, Calderon 484 (NY, US).

COSTA RICA: San Jose (fl. Dec.) Benez & Valerio 138 (F); National Park (fl. Jan.) Khan et al. 319 (BM).

CUBA: Santa Clara, Soledad, Cienfuegas (fl. Jan.) Brues s.n. (GH).

JAMAICA: Arntully, Orcutt 5639 (US).

MARTINIQUE: sin. loc., Belanger s.n. (P).

GUADELOUPE: sin. loc. (fl. March) Questel 2314 (US).

TRINIDAD: Port of Spain (fl. Nov.) B.E.D. s.n. (F).

BERMUDA Islands: Agricultural Station, Brown et al. 2010 (NY).

HAITI: Port au Prince (fl. Nov.) Ekman s.n. (K).

BRAZIL: São Paulo (fl. Aug.) Kuhlmann 4322 (K, US).

GREAT BRITAIN: Kew Bot. Gard. (fl. Apr.) Anonym. s.n. (K).

AFRICA: GHANA: Legon (fl. Feb.) Leeuwenberg 11070 (WAG).

NIGERIA: Bot. Gard. of Ibadan University (fl. Oct.) Emwiogbon 57962 (FHO, WAG).

ZAIRE: Kisantu (fl. Sept.) Callens 2869 (NY).

ZAMBIA: Livingstone (fl. July) Gilges 650 (K, M, SRGH).

KENYA: Nairobi Arboretum (fl. June) Williams 460 (FHO, K).

MALAWI: Zomba Bot. Gard. (fl. Aug.) Salubeni 816 (SRGH).

MOZAMBIQUE: Vasco da Gama Gard. (fl. Dec.) Balsinhas 1917 (K, LISC).

MADAGASCAR: sin. loc., Anonym. s.n. (MEL).

REUNION: sin. loc., Cadet s.n. (P).

MAURITIUS: Bot. Gard. (fl. Sept.) Gueho 10819 (MAU); Rose Hills (fl. Sept.) Rivaland 422 (MAU).

ASIA: INDIA: Calcutta Bot. Gard. (fl. Jan.) Wallich 1629.3 (G, K-WALL), 226 (C), s.n. (MEL), Hort. Neap., Wallich s.n. (L). New Delhi (fl. March) Rich 982 (K).

CHINA: Hongkong Bot. Gard., Chun 6169 (UC); Chung Chi campus (fl. Feb.) Hu 6582 (K, MICH, US); Fukien, Foochow (fl. Apr.) Chung 2695 (K, UC).

THAILAND: Kasetsart University (fl. Dec.) Watdamnangsamp 31 (L).
SINGAPORE: Palace of Sultan (fl. July) Anonym. s.n. (L).
INDONESIA: Bogor Bot. Gard., Merrill s.n. (NY).

Note: In 1814 ROXBURGH published a nomen nudum *Echites grandiflora* in Hort. Beng. 20. 1814, which he validated only in 1832. As meanwhile WALLICH had published *Beaumontia grandiflora* as a valid name for the same species in Tent. Nap. 15. 1824, he is the author.

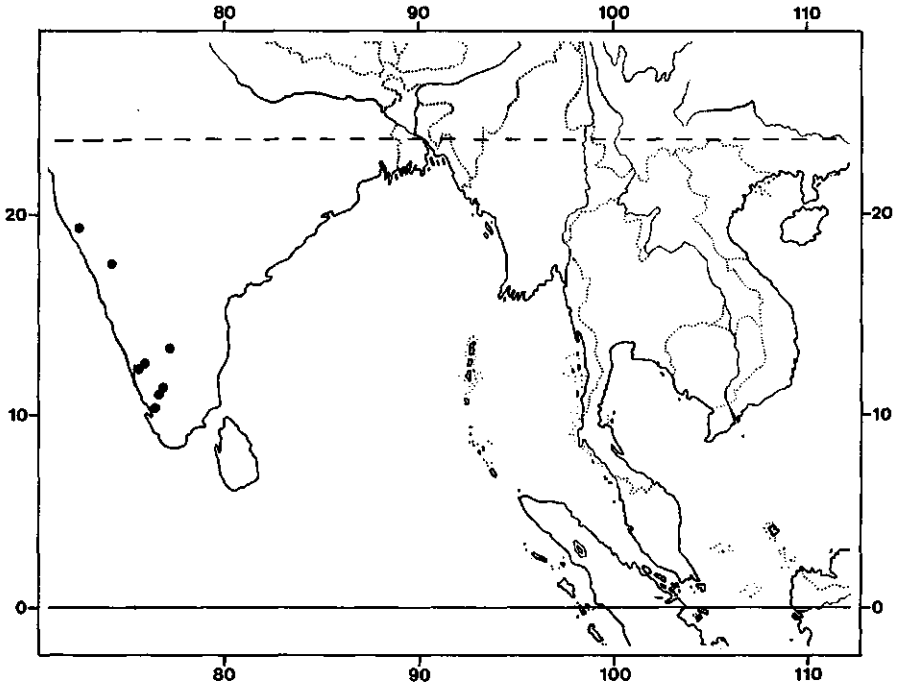
4. *Beaumontia jerdoniana* Wight, Icon. Pl. 4(2): 1314–15. 1850; Walpers, An. Bot. 3: 39. 1852; Hooker, Fl. Brit. Ind. 3: 661. 1882; Brandis, Ind. Trees 463. 1906; Cooke, Fl. Bomb. 2: 138, 1908; Gamble, Fl. Madras 5: 817. 1923; Stevens, Fl. Has. Dist. Karnataka 430. 1976. **Fig. 4; Map 4**

Type: India: sin. loc., Herb. Wight s.n. (K, holotype).

Woody climber. Branches glabrous, with longitudinally fissured bark; branchlets smooth and with dark brown sparse pubescence. Leaves: petiole 5–25 mm long, glabrous or rarely puberulent, with 2–8 colleters in a single row in the axils; blade obovate or often elliptic, 2–3.3 × as long as wide, (7)9.5–28 × 3–13.5 cm, equal-sided, long acuminate at the apex, at the base cuneate, glabrous above or sometimes sparsely pubescent on the costa, beneath glabrous or sparsely pubescent; with 12–18 secondary veins on each side. Inflorescences lax, 6–9-flowered, 0.4–1.6 × as long as the leaves, 12–16 cm long, cymose, once branched. Peduncle (15) 25–50 mm long, sparsely pubescent; pedicels 15–25 mm long, pubescent; bracts elliptic, 2.5–3.6 × as long as wide, 10–11 × 3–4 mm, acuminate at the apex, sparsely pubescent on both sides, with 1–3 colleters, deciduous. Flowers: Sepals pale green with light pink on the veins (teste Saldanha 16005), elliptic 4–5.6 × as long as wide, 13–27.5 × 3–6 mm, acuminate at the apex, pubescent on both sides, mostly with invisible veins, with 6–10 colleters in the whole flower; colleters slender, 1 mm long, acuminate at the apex. Corolla white (teste Saldanha 16005); tube 2.1–4.3 × as long as the calyx, 60–70 mm long, 1.5–2.8 × as long as the mouth diameter, outside sparsely puberulent, inside glabrous; lower part 15–20 mm long; upper part widely obconical, 2.25–3.3 × as long as the lower part, 45–50 mm long, at the mouth 30–40 mm in diameter; lobes ovate or hemi-orbicular, 0.5 × as long as the calyx, about 1 × as long as wide, 17.5–35 × 15–35 mm, acute or rounded at the apex, sparsely puberulent on both sides, with conspicuous parallel veins. Stamens included for 5–10 mm, inserted 20–30 mm from the corolla base, 30–45 mm long, glabrous; anthers 10–12 × 2 mm, acuminate, at the apex for 1 mm sterile, glabrous on both sides. Pistil about 65–70 mm long; disk 1.5–2 × 4 mm, sparsely hirtio-puberulent at the apex; ovary superior; carpels connate, 1–2 × 3 mm, densely hirtio-puberulent; style green, 55–75 mm long, glabrous; pistil head green, 8–10 × 3 mm, glabrous. Fruit unknown.



FIG. 4. *Beaumontia jerdoniana*. 1, flowering branch ($\times \frac{2}{3}$); 2, bud ($\times \frac{2}{3}$); 3, opened flower ($\times \frac{2}{3}$); 4, ovary with disk and colleters ($\times 3$); 5-6, stamen both sites ($\times 3$); 7, fruit ($\times \frac{2}{3}$); 8, seed ($\times \frac{2}{3}$). 1, 3-6 from Saldanha 16005; 2 from Thomson 3411; 7-8 from Wight s.n.



MAP 4. *Beaumontia jerdoniana*

Distribution: India, Burma.

Ecology: Monsoon forests in the mountains. Altitude: unknown.

Specimens examined:

INDIA: BOMBAY: between Maratha and Canara, Young s.n. (BM); Bhudargad, Young s.n. (L); sin. loc. (fl. Apr.) Dalzell s.n. (K); near Mercara (fl. Feb.) Hohenacker s.n. (K). HASSAN Distr.: Mysore (fl. Jan.) Saldanha 16005 (US). Mt. Nilgiri & Kurg, Gibson s.n. in Herb Hook. f. & Thomson (K, P). MALABAR: near Concan, Stocks et al. s.n. (GH, K, L, P, W). MADRAS: Nilgiri, Cleghorn s.n. (E). Nerear (?) (fl. Feb.) Anonym. 461 (U); sin. loc., Herb. Wight s.n. (K, type).

BURMA: Wa Distr.: Nan Pan Chaung (fl. Apr.) Khant 15332 (K).

CULTIVATED:

USA: S. California (fl. May) Griffith 5061 (K).

INDIA: Calcutta Bot. Gard. (fl. Feb.) Debbormann 11237 (CAL).

THAILAND: Bangkok, Collins s.n. (BM).

INDONESIA: Bogor Bot. Gard. (fl. Nov.) Merrill s.n. (NY, US); *ibid.*, Spire s.n. (P); *ibid.*, Leeuwenberg 13160, 13161, 13183, 13185 (WAG).

5. *B. khasiana* Hooker f., Fl. Brit. Ind. 3: 661. 1882; Brandis, Ind. Trees 463. 1906. Fig. 5; Map 5

Type: India, Meghalaya: Mt. Khasia, Nungklow, Lobb s.n. (K: holotype; isotype: W).

Heterotypic synonyms: *B. shanica* McGregor et Smith, Rec. Bot. Surv. Ind. 4: 278. 1911. Corrigenda to vol. 4, fasc. 6, p. 278 line 10 for *B. brevituba* and *B. shanica* nom. nov. The specific name of *brevituba* is preoccupied. Vol. 4, p. 278 is in fasc. 5, 1911. Type: Burma: S. Shan state, McGregor 1286 (K, holotype; isotype: E).

B. yunnanensis Tsiang et W.C. Chen, Act. Phyt. 11: 380. 1973; Tsiang, Icon. Sin. 3: 843. 1974. Type: China: Yünnan, Lung-Lang Hsien, Tsai 55535 (A, BO, isotypes).

Woody climber. Trunk stout. Branchlets smooth, densely dark brown-pubescent. Leaves: petiole 10–30(40) mm long, (sparsely) puberulent or less often pubescent, with 8–25 colleters in 1–2 rows in the axils; ocrea with 5–12 colleters; blade elliptic or obovate, 1.7–2.3 × as long as wide, 12–25 × 6–13.5 cm, long-acuminate or apiculate at the apex, at the base cuneate or almost rounded, above sparsely puberulent or glabrescent, only on the costa and secondary veins more densely hairy, beneath tomentose or velutinous; with (12)13–18 secondary veins on each side. Inflorescences lax, 16–20 cm long, 1–1.4 × as long as the leaves, 9–13-flowered, 1–2 × branched. Peduncle 65–120 mm long, densely pubescent; bracts 0.7–1 × as long as the sepals, 2.1–3.5 × as long as wide, 15–17 × 6–7 mm or sometimes smaller, narrowly elliptic, acuminate at the apex, densely pubescent on both sides, with 3–5 colleters in a single row, persistent. Flowers probably fragrant. Sepals narrowly elliptic or narrowly ovate, 2.6–4 × as long as wide (7)10–16 × 2–5(10) mm, acuminate at the apex, densely pubescent on both sides, with 5–30 colleters in the whole flower; costa and veins inconspicuous. Corolla white; tube 1–1.8 × as long as the calyx, 0.5–1 × as long as the mouth diameter, 10–20 mm long, outside pubescent, often near the base more densely so, inside glabrous or with several tufts of hairs, only near the base densely hirt-pubescent; lower part 4–5(7.5) mm long; upper part broadly campanulate, 1.1–3.75 × as long as the lower, 6–15(20) mm long, at the mouth 20–30 mm wide; lobes broadly ovate or broadly elliptic, 0.8–1.4 × as long as wide, 1.25–4 × as long as the corolla tube, 25–40 × 17.5–40 mm, rounded at the apex, (sparsely) puberulent or pubescent on both sides, equal-sided; parallel veins especially in the lobes conspicuous. Stamens exerted for about 10–20 mm; filaments inserted where the corolla tube widens, being 4–5(10) mm from the corolla base, 20–25(30) mm long, at the base twisted and with some hirt-puberulence, furthermore glabrous or with some puberulence; anthers 8–9.5 × 1.5–2 mm, at the apex for about 1–1.5 mm sterile, glabrous or with some puberulence outside, inside glabrous. Pistil 32.5–35(40) mm long; disk ring-shaped, shallowly 5-lobed, 1–2 × 3–5 mm, outside sparsely to densely pubescent, at the apex often more densely so; ovary superior; carpels connate, 2 ×

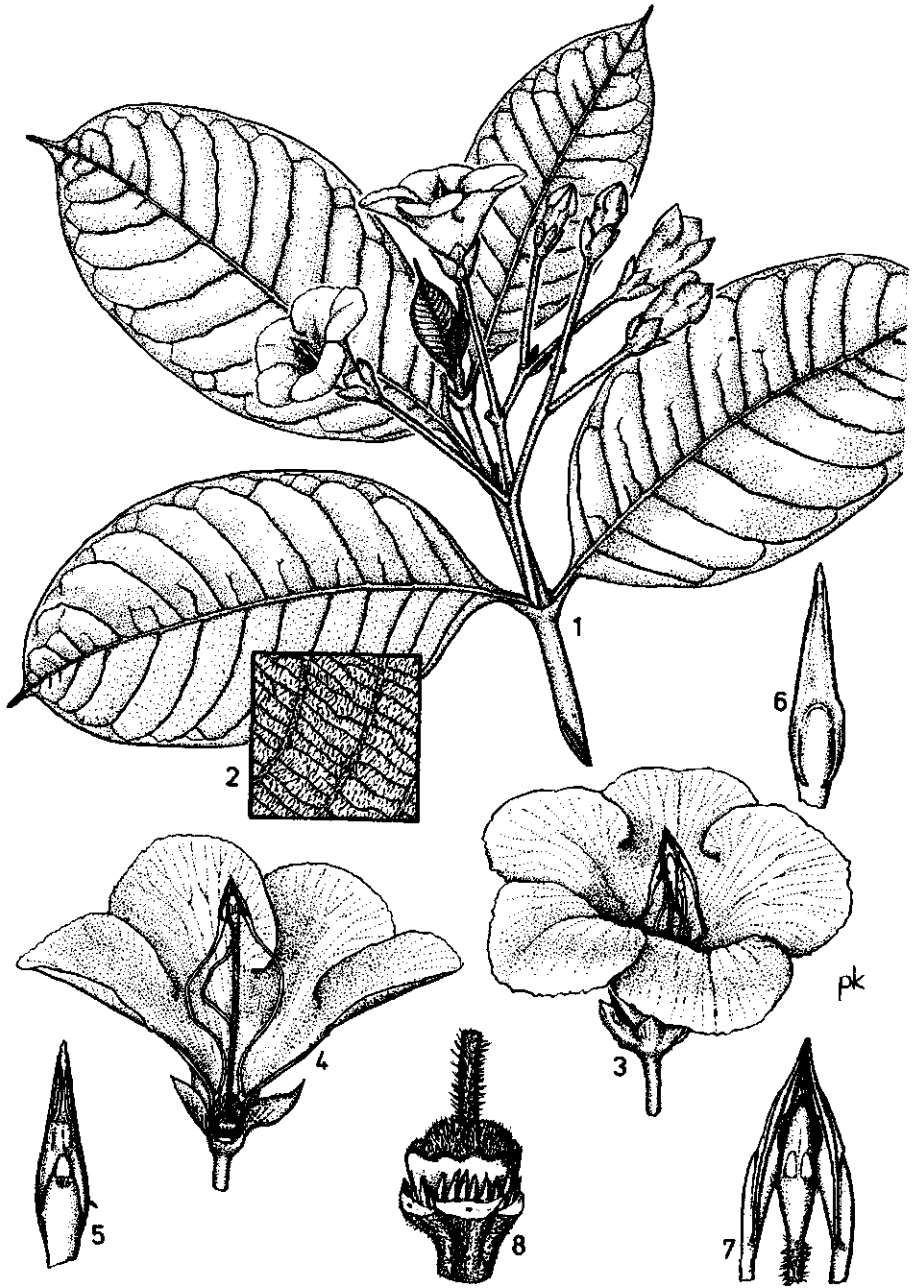


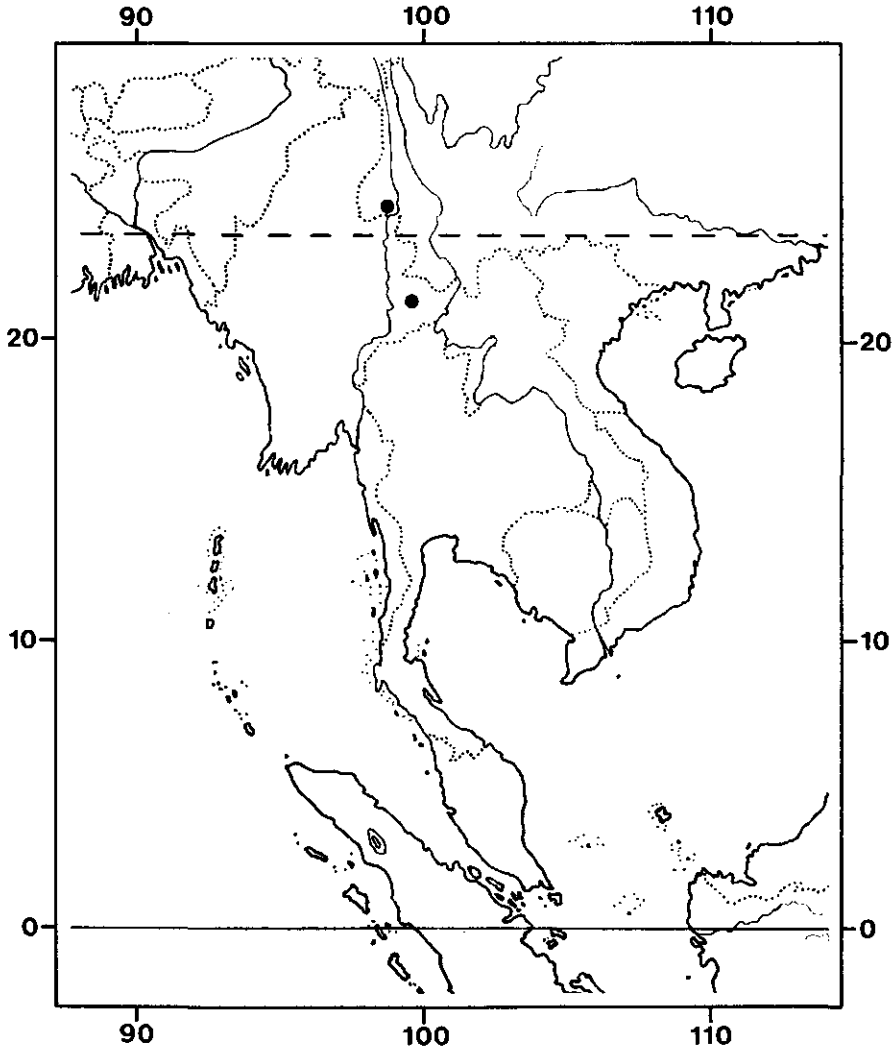
FIG. 5. *Beaumontia khasiana*. 1, flowering branch ($\times \frac{1}{3}$); 2, detail of leaf beneath ($\times 1$); 3, flower ($\times \frac{2}{3}$); 4, opened flower ($\times \frac{2}{3}$); 5-6, anther both sides ($\times 3$); 7, anthers with pistil head ($\times 3$); 8, ovary with disk and colleters ($\times 4$). 1-8 from Kingdon-Ward 20735.

3 mm, densely pubescent; style 20–30 mm long, hirsute; pistil head 4–5 × 1.5–2 mm, glabrous or often only at the extreme apex with some hirsuto-puberulence. *Fruit* unknown.

Distribution: India, Burma, China (Yunnan).

Ecology: Forests in the high mountains. Altitude 1500–1750 m.

Uses: Ornamental.



MAP 5. *Beaumontia khasiana*

Specimens examined:

INDIA: Mt. Khasia, Nungklow, Lobb s.n. (K, W, Type).

BURMA: S. Shan state, Kiu Long, W. of Keng Tung (fl. March) McGregor 1286 (K, E, type of *B. shanica*); Hkinlum, Kachin state (fl. Apr.) Kingdon-Ward 20735 (E).

CHINA: Yünnan, Lung Ling Hsien (fl. March) Tsai 55535 (A, BO, type of *B. yunnanensis*).

CULTIVATED: INDONESIA: Bogor Bot. Gard., Spire s.n. (L).

6. *Beaumontia longituba* Craib in Fedde, Repert. 393. 1913. Fig. 6; Map 6

Type: India: Naga Hills, Saithu near Manipur, (fl. Nov.) Meebold 6615 (K, holotype).

Climbing *shrub*. *Branches* glabrous, smooth, sulcate when dry, with many black dots; branchlets pale grey, with many black dots. *Leaves*: petiole 10–12 mm long, glabrous, with many black dots, with 5–10 colleters in 1 row in the axils; blade narrowly elliptic, 2.8–3.3 × as long as wide, 13–17 × 4.5–6 cm, often some basal smaller, acuminate at the apex, at the base cuneate, glabrous and with many black dots on both sides; with 11–14 secondary veins on each side. *Inflorescences* lax, once branched, 6–7-flowered, 10 cm long, 0.6–0.7 × as long as the leaves. Peduncle 10 mm long, with dark brown dense short pubescence; pedicels 3–4 mm long, with dark brown dense short pubescence; bracts narrowly ovate, 2–3.3 × as long as wide, 5–8 × 1.5–4 mm, acuminate at the apex, outside pubescent, inside sparsely pubescent, persistent, with 1–2 colleters at the edges. *Flowers*: *Sepals* very narrowly ovate, 4–5 × as long as wide, about 0.2 × as long as the corolla tube, 8–10 × 2 mm, acuminate or acute at the apex, with dense short pubescence on both sides, with inconspicuous costa and veins, with about 35 colleters in the whole flower; colleters slender, 1 mm long, acuminate at the apex. *Corolla* white(?); tube 4.5–5.6 × as long as the calyx, 3.5–3.6 × as long as the mouth diameter, about 45 mm long, outside at the lower part densely pubescent and at the upper part more densely so, inside glabrous; lower part 20 mm long; upper part obconical, 1.25 × as long as the lower part, 25 mm long, at the mouth 12.5 mm in diameter; lobes ovate, equal-sided, 1.5–1.8 × as long as wide, 15–18 × 10 mm, acute at the apex, sparsely pubescent on both sides, with inconspicuous parallel veins. *Stamens* included for 3–5 mm; filaments inserted at about 24–25 mm from the corolla base, 10–11 mm long; anthers 11 × 1.75 mm, at the apex for about 2 mm sterile, glabrous on both sides. *Pistil* 43 mm long; disk consisting of 5 parts, 2 × 1 mm; parts rounded and puberulous at the apex, glabrous elsewhere; ovary superior; carpels connate, 2 × 1 mm, densely pubescent; style 35 mm long, sparsely to densely pubescent; pistil head 8 × 2 mm, glabrous. *Fruits* unknown.

Distribution: India: Naga Hills, Saithu near Manipur.

Ecology: Forests on the mountains. Altitude: 1200 m.

Only known from the type.

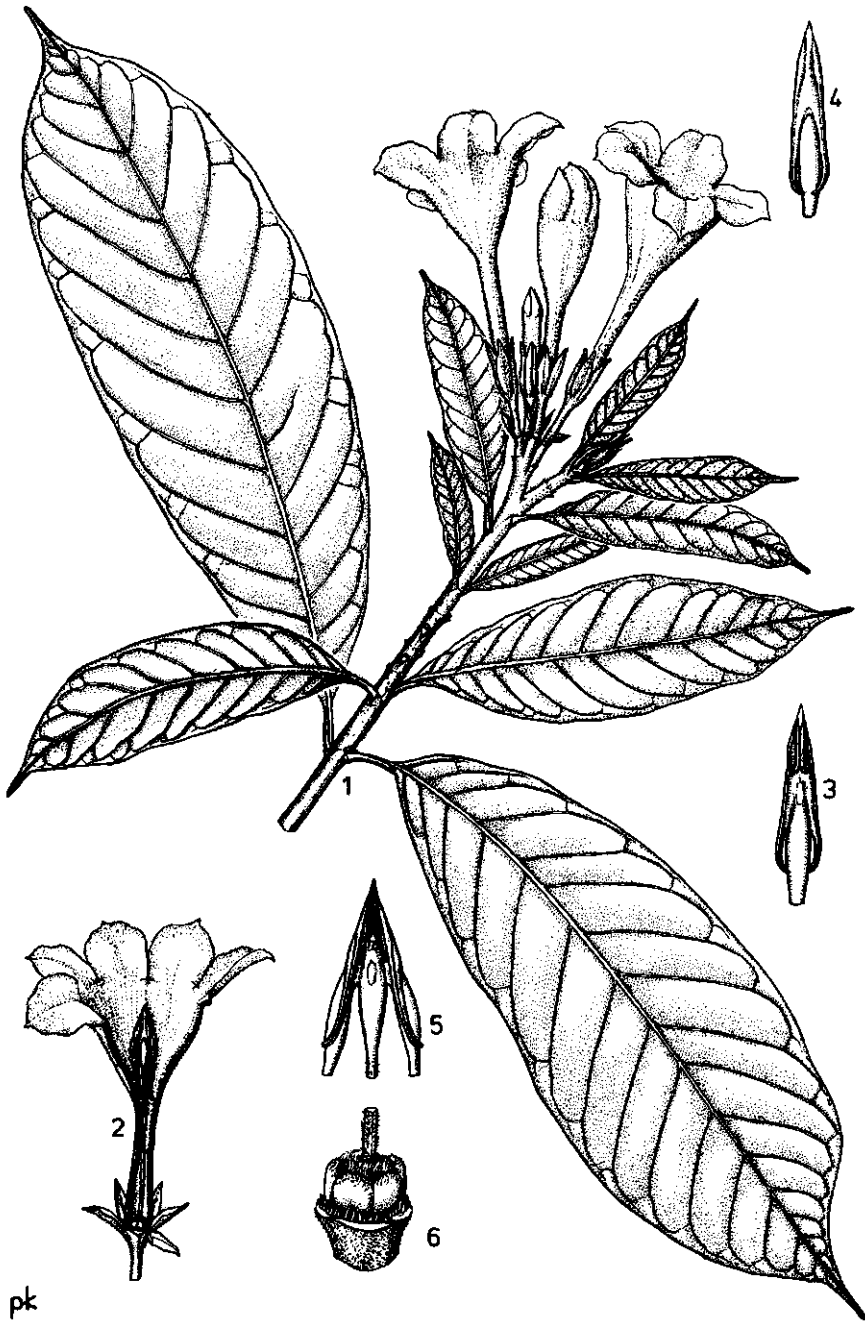
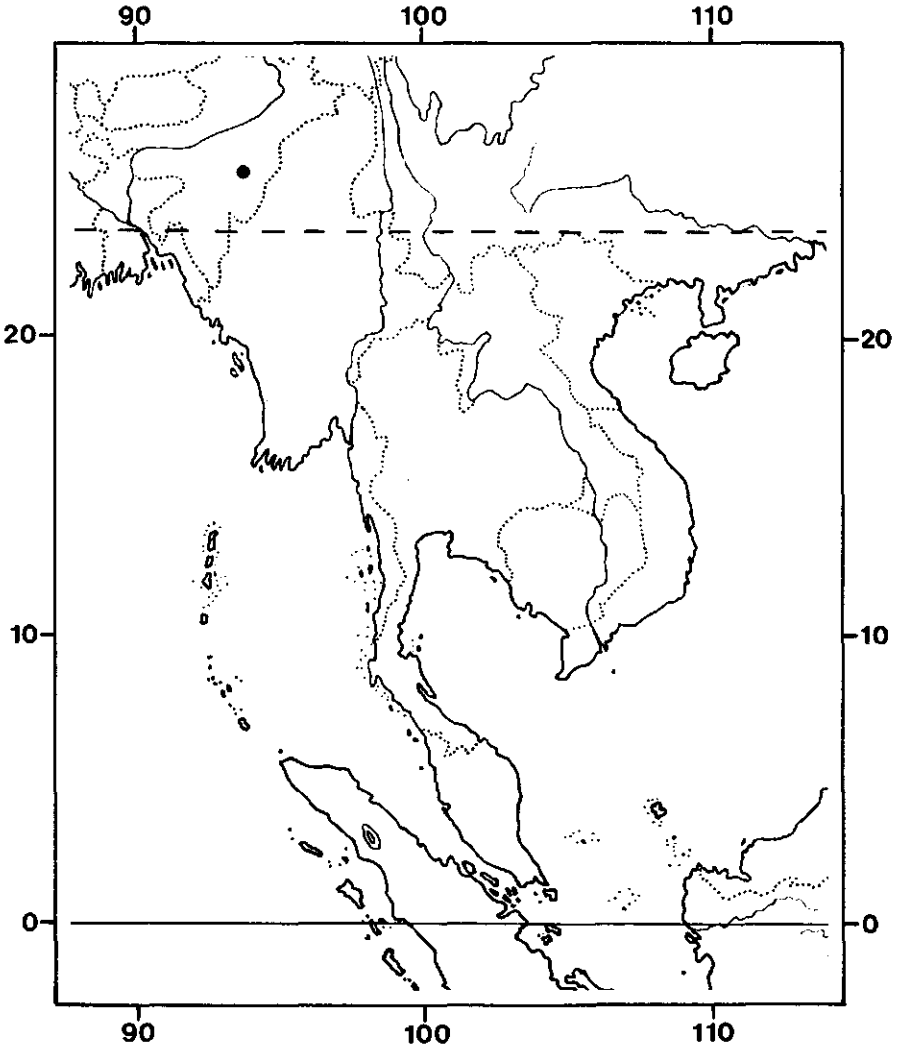


FIG. 6. *Beaumontia longituba*. 1, flowering branch ($\times \frac{2}{3}$); 2, opened flower ($\times \frac{2}{3}$); 3-4, anther both sides ($\times 2$); 5, anthers with pistil head ($\times 2$); 6, ovary ($\times 4$). 1-6 from Meebold 6615.



MAP 6. *Beaumontia longituba*

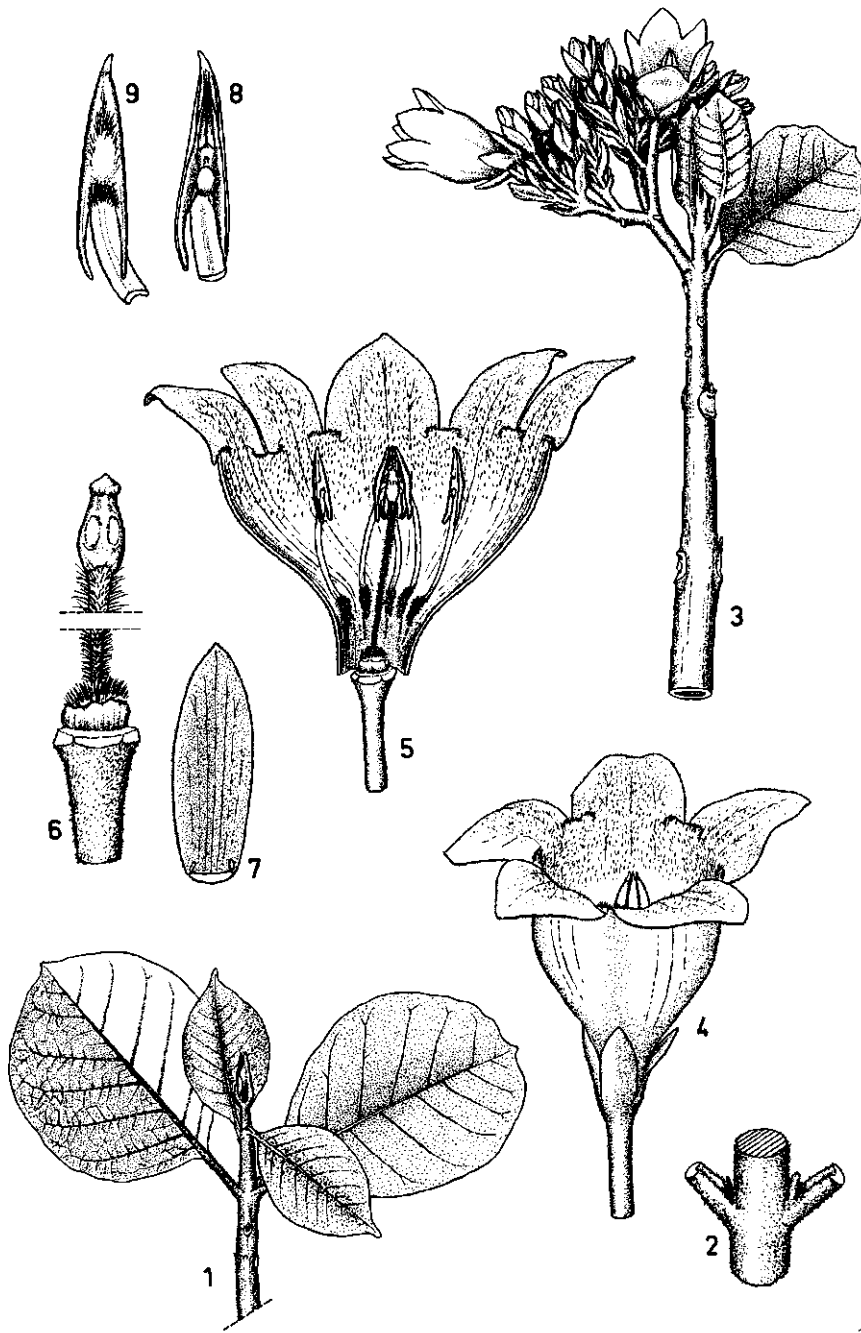
7. *Beaumontia macrantha* (Ridley) Rudjiman, Meded. Landb. Wag. 82-11: 15. 1982. Fig. 7; Map 7

Basionym: *Vallaris macrantha* Ridley, Journ. Fed. Mal. Stat. Mus. 10. 101. 1922.

Type: Thailand: Tapli, Kloss 6946 (K, holotype).

Heterotypic synonym: *B. rosea* Fischer, Kew Bull. 316. 1929.

Type: Burma: Bausanpan, Parkinson 7751 (K, holotype).



Ⓓ

FIG. 7. *Beaumontia macrantha*. 1, branchlet ($\times \frac{2}{3}$); 2, node with colleters ($\times 2$); 3, flowering branch ($\times \frac{2}{3}$); 4, flower ($\times 1\frac{1}{2}$); 5, opened flower ($\times 1\frac{1}{2}$); 6, pistil ($\times 4$); 7, sepal with colleters ($\times 4$); 8-9, stamen both sides ($\times 4$). 1-9 from Kerr 18653.

Climbing *shrub* up to 5 m high. *Stem* up to 1.25 cm in diameter (according to Ridley, 1922); bark fibrous. *Branches* smooth; branchlets pale grey, whitish-pubescent. *Leaves* probably only at the apex decussate; petiole 2.5–3.5 cm long (copied from Fischer (1929) and Ridley (1920)), tomentose, with 10–20 colleters in 1–3 rows in the axils; blade elliptic, 1.1–1.6 × as long as wide, 14–25 × 12–15 cm (copied from Fischer and Ridley), apiculate at the apex, cuneate or almost rounded at the base, above (sparsely) tomentose, beneath tomentose; with 6–8 secondary veins on each side. *Inflorescences* congested, 2–3 × as long as the leaves, 7–7.5 cm long, 17–34-flowered, 1–3 branched. Peduncle 35–40 mm long, tomentose; pedicels 15–17.5 mm long, tomentose; bracts elliptic, 2.1–3 × as long as wide, 6–8 × 2–3.5 mm, acuminate at the apex, tomentose on both sides, deciduous; colleters absent. *Flowers* probably fragrant. *Sepals* elliptic, 2.6–3.5 × as long as wide, 8–9 × 2–3 mm, acuminate at the apex, tomentose on both sides, with 8–10 colleters in the whole flower; costa and veins inconspicuous. *Corolla* pale yellow or light pink; tube 2.2–2.8 × as long as the calyx, 1.8–2.5 × as long as the mouth diameter, 20–22.5(25) mm long, tomentose outside, inside tomentose near the base and sparsely so at the apex, with a glabrous belt in the middle; lower part 5–6 mm long; upper part campanulate, 2.5–3.5 × as long as the lower, 15–17.5 mm long, with 10(5 × 2) appendages at the extreme apex alternating with the lobes, at the mouth 10–12.5 mm wide; lobes broadly ovate, 1.2–1.5 × as long as wide, 9–12 × 6–10 mm, acute at the apex, tomentose on both sides, with inconspicuous parallel veins. *Stamens* included for 0–1 mm; filaments inserted where the corolla tube widens, being 5–6 mm from the corolla base; about 10–10.5 mm long, tomentose at the base, and with hirto-pubescent at the apex, furthermore glabrous; anthers 8–10 × 1.5 mm, at the apex for about 1 mm sterile, outside hirto-pubescent, inside glabrous. *Pistil* about 20 mm long; disk cup-shaped, 1–1.25 × 3 mm, shallowly 5-lobed, glabrous outside, at the apex tomentose; ovary superior; carpels connate, 1 × 2.5 mm, tomentose; style 17–18 mm long, (sparsely) tomentose; pistil head 2 × 1 mm, glabrous. *Fruit* unknown.

Distribution: Burma, Thailand.

Ecology: Coastal area, lowland forests. Altitude 0–200 m.

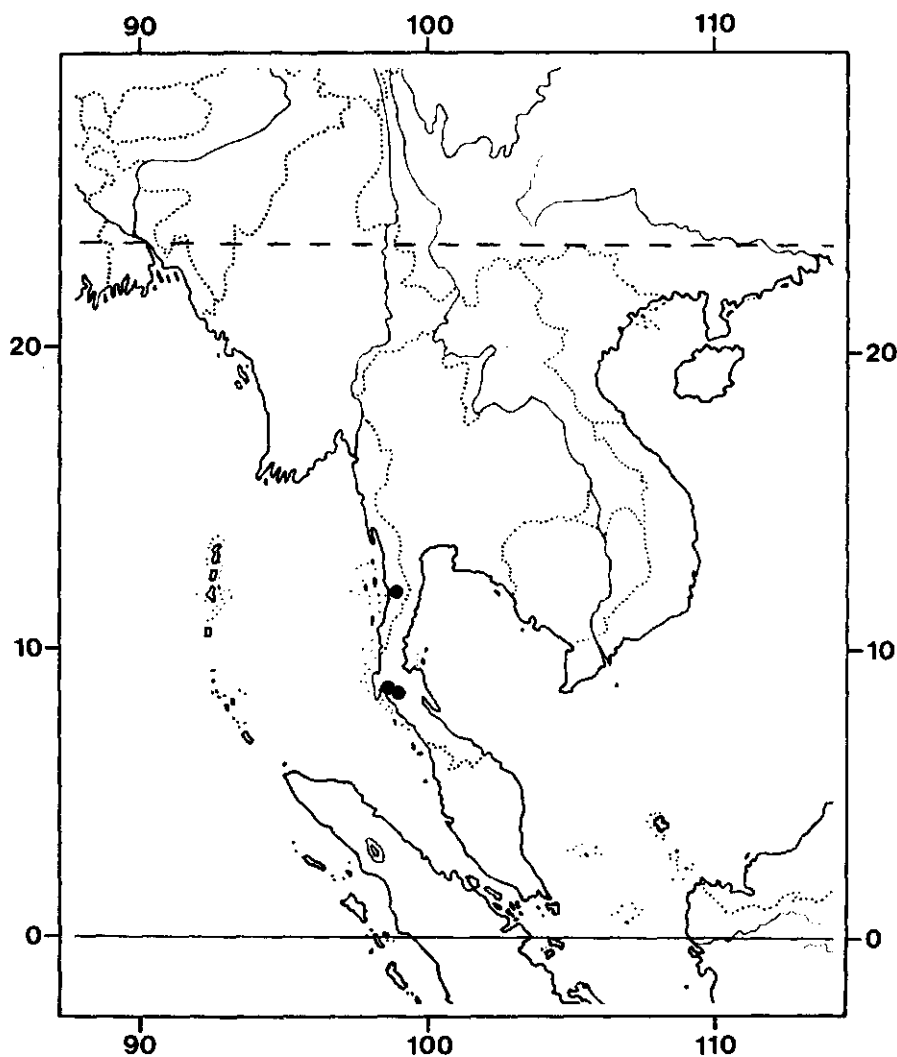
Vernacular name: Muantum (Thai).

Uses: probably useful as an ornamental.

Specimens examined:

BURMA: Bausanpan (fl. Apr.) Parkinson 7751 (K, type of *B. rosea*).

THAILAND: Tapli, Kloss 6946 (K, type); Tamben Kao, Panom Krabi (fl. March) Kerr 18653 (BM, E, K, L, P).



MAP 7. *Beaumontia macrantha*

8. *Beaumontia multiflora* Teijsm. et Binn., Nat. Tijds. Ned. Ind. 4: 395. 1853; Vriese & Dozy, Ned. Kruid. Arch. 3: 393. 1855; Boerlage, Fl. Ned. Ind. 2: 400. 1899; Koorders, Exk. Fl. Java 3: 77. 1912; Backer & Bakhuizen v.d. Brink Jr., Fl. Java 2: 239. 1965. **Fig. 8; Map 8**

Type: Indonesia: West Java: Banten, Teijsmann 14050 (BM, lectotype).

Woody evergreen *climber*, 4–20 m high. *Trunk* 3–15 cm in diameter; bark 2–3 mm thick, scabrous; sapwood straw-coloured, conspicuously porous.

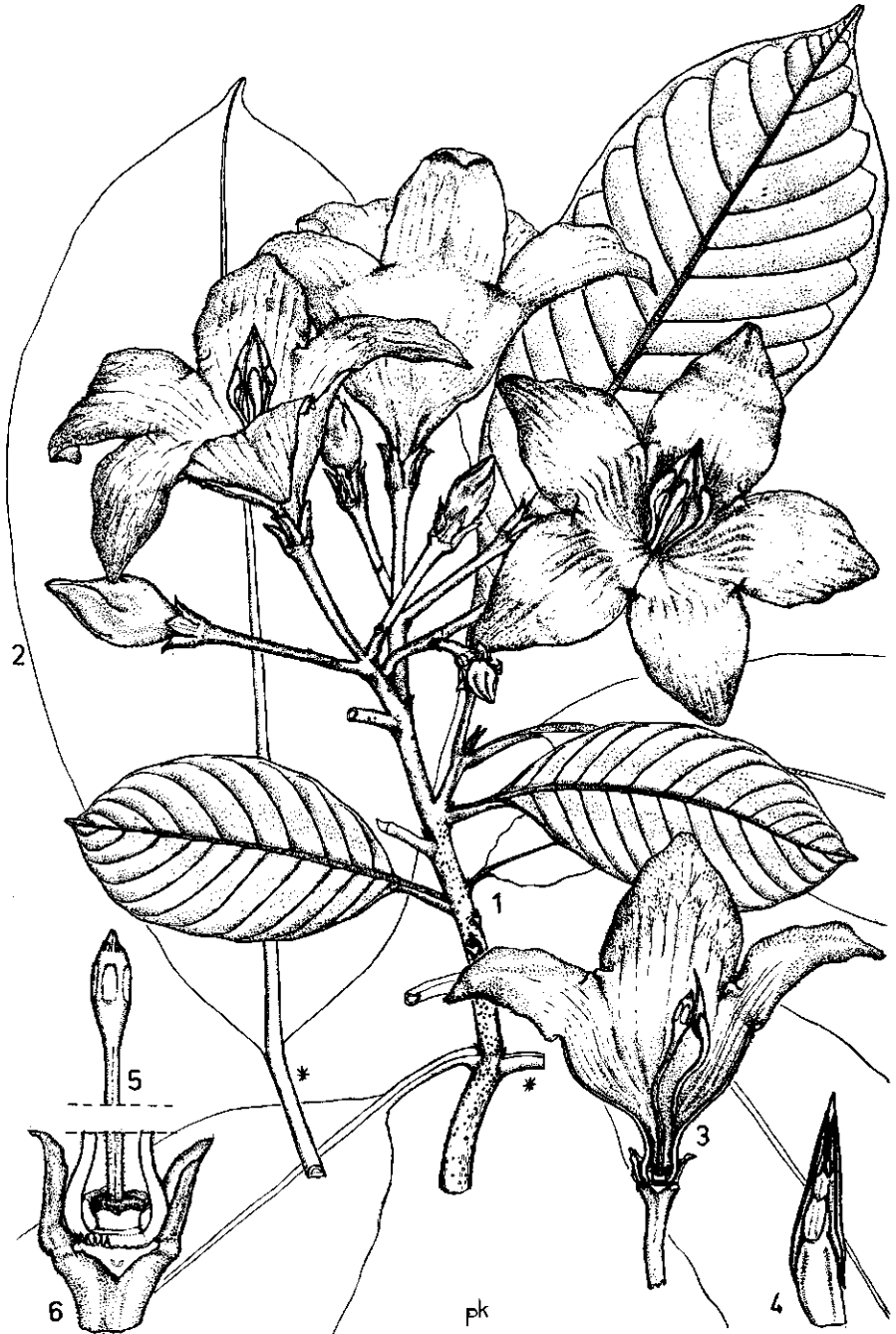
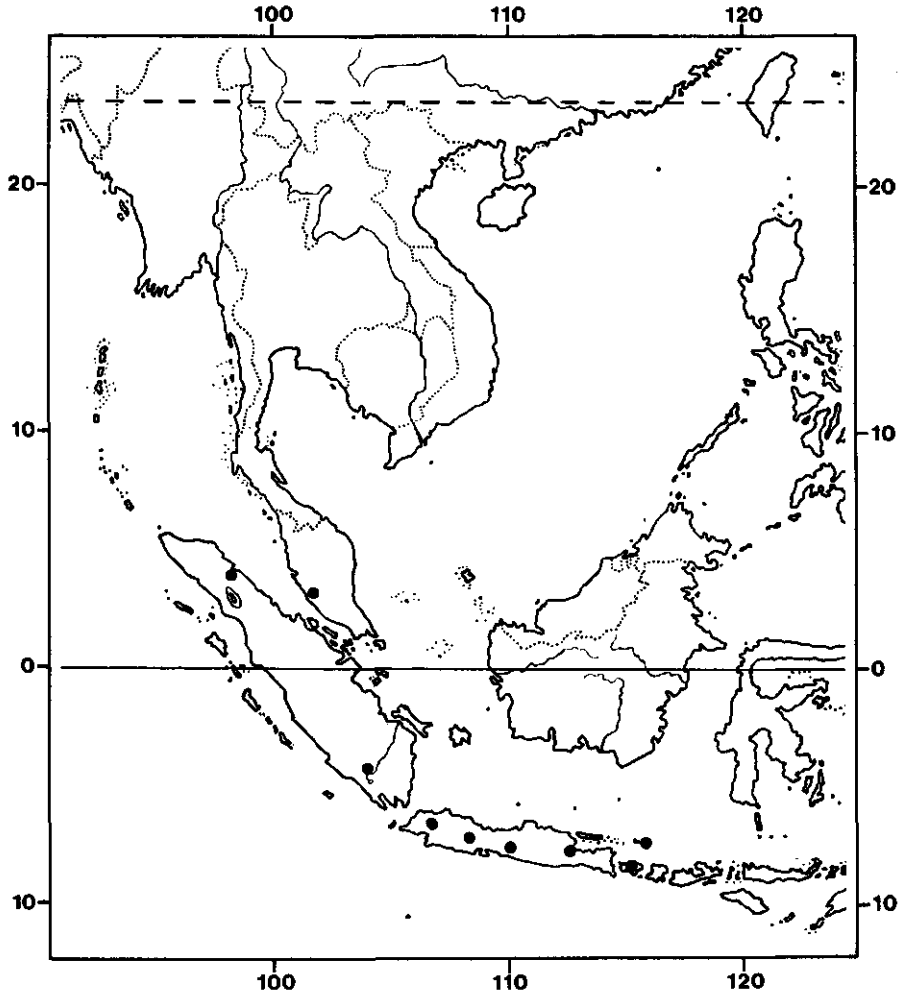


FIG. 8. *Beaumontia multiflora*. 1, habit ($\times \frac{2}{3}$); 2, outline of fully developed leaf ($\times \frac{2}{3}$); 3, section of flower ($\times \frac{2}{3}$); 4, anther, ventral view ($\times \frac{4}{3}$); 5, pistil head ($\times \frac{4}{3}$); 6, flower base, partly dissected ($\times \frac{4}{3}$). 1-6 from Leeuwenberg 11893.

Branches corky, with longitudinally fissured bark; branchlets pale grey-brown, smooth, sulcate when dry and with dark brown-pubescent. *Leaves*: petiole 10–20 mm long, glabrous or less often sparsely puberulent, with 10–20 colleters in a single row in the axils; blade dark green and shiny above, elliptic, less often obovate, 1.5–2.6 × as long as wide, 6–24.5 × 3–13 cm, apiculate or caudate at the apex, at the base cuneate or less often rounded, glabrous or sparsely puberulent above, beneath sparsely to densely pubescent, rarely glabrous; with costa sometimes white-spotted, with 12–17 secondary veins on each side. *Inflorescences* lax, 9–38-flowered, 10–17 cm long, 0.5–2 × as long as the leaves. *Peduncle* 30–100 mm long, sparsely puberulent, somewhat quadrangular or laterally compressed, often lenticellate; *pedicels* 15–40 mm long, sparsely dark brown-pubescent; *bracts* pale green, pink at the extreme apex, elliptic, 2.25–2.5 × as long as wide, 5–9 × 2–4 mm, acuminate at the apex, outside pubescent, inside pubescent except for the glabrous base, with 5–20 colleters in a single row. *Sepals* pale green or maroon, sometimes pinkish at both margins, elliptic or narrowly ovate, 2–4.5 × as long as wide, 0.2–0.48 × as long as the tube, 9–20(30) × 2–6(10) mm, acuminate at the apex, sparsely to densely pubescent on both sides, or glabrous inside, with conspicuous costa and veins, with 10–40 colleters in the whole flower; colleters about 1 mm long, acuminate or truncate at the apex. *Corolla* white, near the base pale yellow or light green; tube (1.75) 3–4.5(5) × as long as the calyx, (20)30–45(50) mm long, outside sparsely to densely pubescent, inside glabrous; lower part 5–10 mm long; upper part widely obconical, 3–4(5) × as long as the lower part, (25)27.5–35(40) mm long, at the mouth (25)32.5–50(70) mm in diameter; lobes broadly ovate, 0.8–1.7 × as long as wide, 17–30 × 12–30 mm, rounded or acute at the apex, rarely obtuse, unequal-sided, spreading, somewhat twisted at the right margin, outside sparsely pubescent, inside sparsely pubescent or less often glabrate, with conspicuous parallel veins. *Stamens* creamy or brown, exerted for 0–5 mm, less often included; filaments white, inserted 10–15(20) mm from the corolla base, 15–25 mm long, bending outward near the apex, widened at the apex, glabrous; anthers 10–12 × 2–3 mm, at the apex for 1–2 mm sterile, glabrous on both sides. *Pistil* light green, 25–40 mm long; disk cup-shaped, 1–2 × 3–5 mm, obscurely 5-lobed, glabrous or less often with some puberulence, enveloping the ovary; ovary semi-inferior; carpels connate, 0.5–2 × 2–4 mm, tomentulose or densely pubescent; style light green, 25–30(35) mm long, sparsely hirtio-puberulent near the base, furthermore glabrous; pistil head light green, 7.5 × 2 mm. *Infructescences*: *pedicels* 3–5 × 0.75 cm, pale grey, glabrous, with some lenticels; *peduncle* short, glabrous, lenticellate. *Mericarps* dark or dark brown, cylindrical, 10–25 × 4–7 cm, rounded at the apex, somewhat cordate at the base, glabrous, lenticellate, 100–250-seeded; wall 2–3 mm thick, pale yellow inside. *Seeds*: grains (10)14–18 × (2)4–7 mm, obtuse at the apex, acute or obtuse at the base; coma (15)20–50 mm long; embryo: cotyledons 12–13 × 4–4.5 mm; rootlet 3–4 × 1 mm.

Distribution: Indonesia: From Sumatra to Java and Bali. Malaysia: Continent: Selangor.



MAP 8. *Beaumontia multiflora*

Ecology: Lowland or mountain forests. Altitude 0–700 m.

Vernacular names: Susu Munding (Sundanese, according to Teijsmann & Binnendijk, 1853); Susu Kebo (Javanese, according to Koorders, 1912). Both mean milk of buffaloes.

Uses: Ornamental.

Specimens examined:

MALAYSIA: Selangor State, Batu caves (fl. Nov.) Sinclair 40057 (SING); *ibid.* (fl. Dec.) Ridley s.n. (K).

INDONESIA: SUMATRA: NORTH: near Medan (fl. Dec.) Lörzing 16458 (BO); South: N.W. of Ranau Lake, near Kampung Sukanegri (fl. Oct.) Van Steenis 3438 (BO). **JAVA:** sin. loc., Hasskarl s.n. (P);

sin. loc., Zollinger 3281 (A, BM, G, P); sin. loc., Teijsmann in Herb. Drake 77 (P); sin. loc., Anonym. s.n. (MEL). WEST: Bandung: sin. loc. (fl. May) Popta 1362 (L); Cikurai (fl. May) Van Steenis 1656 (BO). CENTRAL: Yogyakarta Prov., Sleman, Gunung Gamping (fl. Aug.) Junghuhn s.n. (L). EAST: Kangean Island, W. Paliat (fl. May) Backer 29619 (BO). BALI: sin. loc., Anonym. s.n. (L).

CULTIVATED:

USA: Hawai Islands: Honolulu, Nuuanu Valley (fl. Oct.) Meebold 10790 (NY); Honolulu, Manoa Valley (fl. Nov.) Degener 9842 (NY); Oahu (fl. Jan.) Inafuku s.n. (M); *ibid.* (fl. Oct.) Meebold 21306 (M); *ibid.* (fl. May) Fosberg 10387 (NY).

INDIA: Calcutta Bot. Gard., Anonym. s.n. (BO); Ballygunge (fl. March) Apar s.n. (CAL).

CHINA: YÜNNAN: Yunnan-Tou (fl. June) Anonym. s.n. (L); Hongkong, in the garden of Mr. Barretto (fl. March) Hu 13130 (K).

THAILAND: Bangkok (fl. Feb.) Marcan 1967 (BM, K, MO), (fr. Aug.) Marcan 1924 (K).

SINGAPORE: Singapore Bot. Gard. (fl. Dec.) Leeuwenberg 11893 (WAG); *ibid.* (fl. Sept.) Furtado s.n. (K).

INDONESIA: JAVA: Jakarta, Pal Merah (fl. May) Backer 34011 (BO); *ibid.* (fl. Oct.) Backer 34012 (BO). WEST: Bogor: Depok (fl. July) Bakhuizen v.d. Brink Jr. 1330 (BO, U), (fl. Apr.), 5913 (BO); Bogor Bot. Gard., Spire s.n. (K, L, NY, P); *ibid.*, Pulle s.n. (U); *ibid.*, Teijsmann s.n. (L); *ibid.* (fl. July) Hallier s.n. (G, L); *ibid.* (fl. July) Rudjiman 272 (BO, Herb. Fak. Kehutanan UGM Yogyakarta, WAG). CENTRAL: Yogyakarta: Arboretum Fac. Biology UGM (fr. Jan.) Rudjiman 202 (BO, Herb. Fak. Kehutanan UGM, WAG); front yard Fac. Biology UGM (fl. Feb.) Rudjiman 203 (BO, Herb. Fak. Kehutanan UGM, WAG); Bulaksumur, front yard of Prof. Kamarijani's home (fl. Jan.) Rudjiman 201 (BO, Herb. Fak. Kehutanan UGM, WAG). EAST: Purwodadi Bot. Gard. (fl. July) Van Kregter & Pleyte 89 (BO, L); Pasuruan (fl. Apr.) Backer 37168 (L); sin. loc. (fl. June) Koorders 41192B (BO); sin. loc. (fl. May) Teijsmann s.n. (K); sin. loc., De Vriese s.n. (K); sin. loc., Miquel s.n. (K).

9. *Beaumontia murtonii* Craib, Contrib. Fl. Siam. 7: 282. 1914. Fig. 9; Map 9

Type: Thailand: Kow Hoo Wen, Murton 113 (K, lectotype).

Heterotypic synonym: *B. fragrans* (Pierre ex Planchon, Prod. Apoc. 325. 1894, nomen) ex Pitard in Fl. Indo-Chine 3: 1236. 1933.

Type: Vietnam: Quang Tri Prov., Lang Vay, Poilane 1286 (P, lectotype; isotypes: A, BO, NY, SING).

Large woody climbing evergreen *shrub*, up to 20 m high. *Trunk* 1.5–2.5 cm in diameter; branchlets pale grey or dark brown, sparsely to densely pubescent or glabrous. *Leaves*: petiole 10–25(30) mm long, sparsely puberulent or glabrate, less often pubescent, with 6–30 colleters in 1–3 rows in the axils; blade broadly elliptic or obovate, 1.4–2.3 × as long as wide, 10–25(30) × 3.5–13(15) cm, apiculate or acute, rarely obtuse at the apex, at the base rounded or cuneate, above glabrous or sometimes sparsely pubescent on the costa, beneath glabrous or sparsely to densely pubescent but often more densely so on the costa and veins; with 11–18 secondary veins on each side. *Inflorescences* lax, 1–3 branched, 6–12-flowered, 12–19.5 cm long, 0.6–1.4 × as long as the leaves. Peduncle (25)30–60(90) mm long, puberulent or sparsely to densely pubescent; pedicels 30–50 mm long, sparsely pubescent; bracts 2 × as long as wide, 10–15 × 5–7.5 mm, deciduous or less often persistent, with (10)15–20 colleters. *Flowers* fragrant. *Sepals* pale green, broadly elliptic, rarely elliptic or obovate, 1–2.6(3) × as long as wide, 0.4–0.9 × as long as the corolla tube, 27.5–40(45) ×



FIG. 9. *Beaumontia murtonii*. 1, flowering branch ($\times \frac{2}{3}$); 2, opened flower ($\times \frac{2}{3}$); 3-4, anther both sides ($\times 2$); 5, ovary ($\times 4$); 6, seed ($\times \frac{2}{3}$); 7, embryo ($\times \frac{2}{3}$). 1-5 from Kerr 19837; 6-7 from Collins 1030.

(10)18–27 mm, apiculate or rounded, rarely acuminate at the apex, entire, sparsely pubescent on both sides, with conspicuous costa and veins, with 50–70 colleters in the whole flower; colleters slender, 1 mm long, acuminate at the apex. *Corolla* white or creamy; tube 0.8–2.75 × as long as the calyx, 0.7–1.4 × as long as the mouth diameter, outside sparsely to densely pubescent, inside glabrate or glabrous; lower part (10)15–17.5 mm long; upper part widely obconical, 1.8–3.1 × as long as the lower part, (30)32.5–47.5 mm long, at the mouth 32.5–65 mm in diameter; lobes ovate or lingulate, subequal- or equal-sided, 1.3–1.4 × as long as wide, 19–30 × 14–30 mm, acute at the apex, less often rounded, glabrate or less often sparsely pubescent on both sides, with conspicuous parallel veins. *Stamens* yellow or orange, exerted for about 0–5 mm, rarely included; filaments white, inserted at about 20–25 mm from the corolla base, 15–25 mm long, glabrous; anthers (10)13–15 × 2–3 mm, at the apex for about 2 mm sterile, glabrous or less often with some pubescence on both sides. *Pistil* about 45–50 mm long; disk cup- or rarely ring-shaped, (0.5)1.5 × 3–4 mm, glabrous, or sometimes only at the apex with hirto-puberulence; ovary superior; carpels connate, 1–1.25 × 3 mm, densely pubescent, often puberulent; style 40 mm long, glabrous or sparsely hirto-puberulent; pistil head 8–13 × 2 mm, glabrous. *Infructescences*: pedicels 4 × 0.75 cm, rigid, glabrous, lenticellate; peduncle 2.5 × 0.5 cm, glabrous, lenticellate. *Fruits*: mericarps dark brown, 18 × 5 cm, ellipsoid, obtuse at the apex, cordate at the base, glabrous, 200–300-seeded; wall 2–3 mm, pale brown inside. *Seeds*: grains 11–14(20) × 4–5 mm, sparsely pubescent or glabrous, obtuse at the both ends; coma 30–80 mm long; embryo pale brown; cotyledons 11 × 4 mm, obtuse at the base; rootlet 3 × 1 mm.

Distribution: Thailand, Laos, Cambodia, Vietnam, Continental Malaysia.

Ecology: Evergreen forests or thickets in the mountains, or on river banks, often along the coasts. Altitude 0–1500 m.

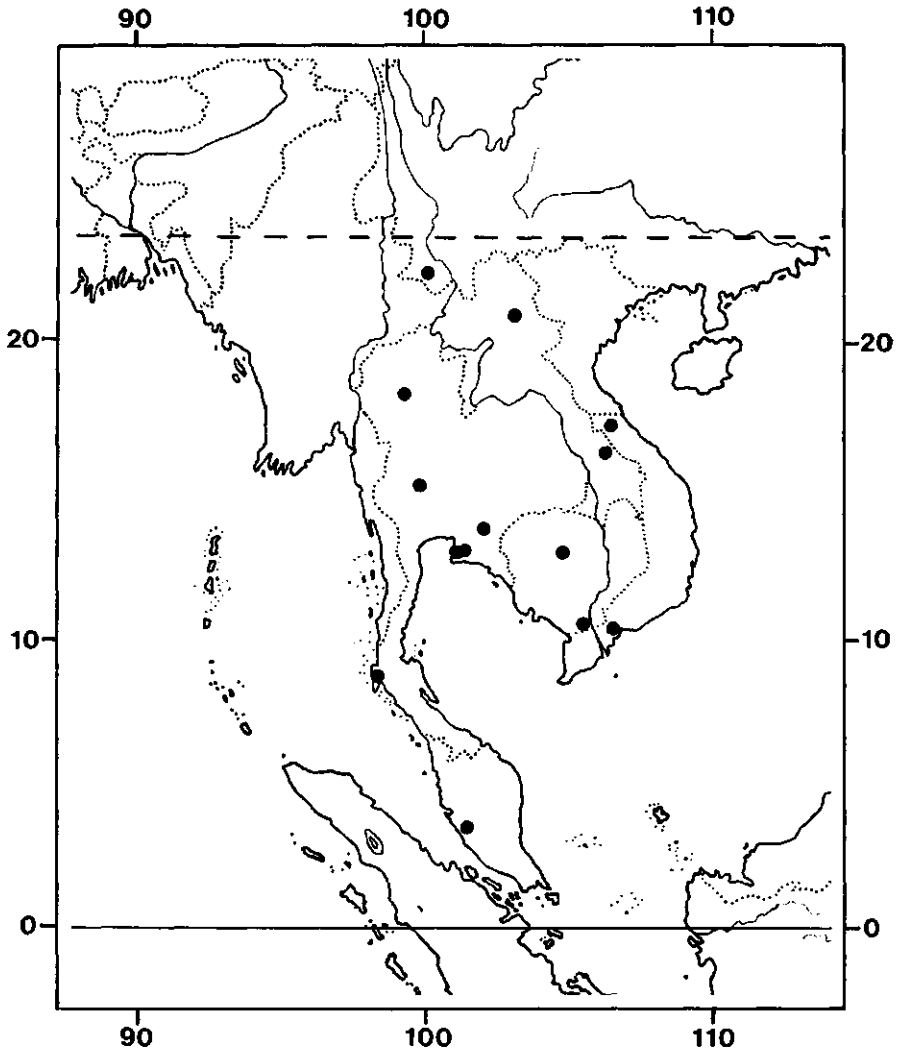
Vernacular names: Thailand: Kumlung Changsarn (near Bangtapan) teste Put 1426; Sai tan yai (near Krabi) teste Kerr 19837; Knua nguan hern or Sala naung, teste Phon Anuwat Wanasah 60. Cambodia: Chor Chhak (near Watphnom) teste Vidal 5100.

Uses: The latex is used as arrow poison (teste Vidal 5100); ornamental (teste Sulit 3555).

Specimens examined:

CHINA: YÜNNAN: Nan-Chiao (fr. June) Wang 75419 (A).

THAILAND: Chonburi Prov., Sriracha Distr.: Chundaten R. Falls (fl. Nov.) Maxwell 74–987 (AAU, L); Hoap Bon, Collins 535 (K, US); Ban Chark (fl. Nov.) Collins 1718 (BM, K, US); Pan Sadhet (fl., fr. Nov.) Collins 1365 (K, US); between Nong Kaw and Nong Khe Ploy (fl. Feb.) Collins 356 (K); Naung Yai Bu (fl. Sept.) Kerr 2676 (K, paratype); sin. loc., Collins 1030 (K); sin. loc. (fl. Nov.) Collins 1985 (K, US). Ban Keng near Krabin (fl. Nov.) Kerr 19837 (E, K); Kan Kradai, Prachap (fl. Jan.) Put 2309 (BM, K, P); Bangtapan (fl., fr. Dec.) Put 1426 (BM, K, L); sin. loc. (fl. Jan.) Phon Anuwat Wanasah 60 (K); Kow Hoo Wen (fl. Feb.) Murton 113 (K, type).



MAP 9. *Beaumontia murtonii*

LAOS: Savannaket Prov., between Lao Bo and Muong Nou (fl. Apr.) Poilane 13295 (P, WAG); near Luang Prabang, on Mt. Xuong (fl. March) Poilane 20519 (L, P).

CAMBODIA: Prek Sangke (fl. Nov.) Harmand 6 bis (A, BM, K, P, paratype of *B. fragrans*); sin. loc., Nguon Hahn s.n. (P).

VIETNAM: Mt. Dinh near Baria, Pierre 4477 (A, K, NY, P, paratype of *B. fragrans*); Chaudoc Prov., Mt. C'am (fl. Dec.) Pierre 484 (K, P, paratype of *B. fragrans*); Quang Tri Prov., Lang Vay (fl. Apr.) Poilane 1286 (A, BO, K, P, SING, type of *B. fragrans*).

MALAYSIA: Selangor State, Bt. 22½, Genting Sampah (fl. Oct.) Kasim & AR 00653 (L).

CULTIVATED:

GHANA: Achimota (fl. Dec.) Irvine 2576 (E).

NIGERIA: Ibadan (fl. Feb.) Assi 13782 (K).
SRI LANKA: Ceylon, Colombo (fl. Oct.) fosberg 57877 (E, GH, K, NY).
THAILAND: Bangkok (fl. Dec.) Vesterdal 241 (C).
CAMBODIA: Wat Phnom and Camp Le Rolland (fl. Feb.) Vidal 5100 (P).
VIETNAM: Saigon Bot. Gard. (fl. Aug.) Hiep 605 (P, WAG); Hanoi Bot. Gard. (fl. March) Anonym. s.n. (P); *ibid.* (fl. Apr.) Fleury in Chevalier 37757 (P, WAG).
INDONESIA: Bogor Bot. Gard., Rudjiman s.n. (Herb. Fak. Kehutanan UGM, Yogyakarta); *ibid.*, Leeuwenberg 13184 (WAG).
PHILIPPINES: Laguna Prov., on Mt. Makiling, at Forestry Camp (fl. Dec.) Sulit 3555 (PNH); Rizal, at Mandaluyong (fl. Nov.) Vergara 15 (L); Cebu (fl. Oct.) Lawrence s.n. (K).

NOMINA NUDA

B. longifolia Lodd. ex Loud., Hort. Brit. 67. 1830 = *B. grandiflora* Wallich.
B. speciosa Hort., Siebert & Doß, Dilm. Blumeng. 1:660. 1893 = *B. grandiflora* Wallich

EXCLUDED SPECIES

B. wallichii (A. DC.) Walpers, Ann. Bot. Syst. 3: 39. 1852 = *Wrightia wallichii* A. DC., Prod. 8: 405. 1844 = *W. arborea* (Dennst.) Maberley, Taxon 26: 523. 1977.

Kibatalia G. Don, Gen. Syst. Bot 4: 86. 1837; Blume, Rumphia 4. 25. 1849; Woodson, Phil. Journ. Sci. 60. 209. 1936; Pichon, Mém. Mus. Nat. sér. 2.1: 70. 1950; Bakhuizen v.d. Brink Jr. in Backer et al., Fl. Java 2: 238. 1965; Whitmore, Fl. Mal. 2: 16. 1973.

Basionym: *Hasseltia* Blume, Bijdr. Fl. Ned. Ind. 15: 1045. 1826 (non H.B.K. 1823).

Type species: *Hasseltia arborea* Blume (= *K. arborea* (Blume) G. Don).

Homotypic synonyms: *Kickxia* Blume, Fl. Java Ins. VII. 1828; Endlicher, Gen. Pl. 2: 586. 1836 (as *Kixia*); De Candolle, Prod. 8: 408. 1844 (as *Kixia*); Miquel, Fl. Ned. Ind. 2: 435. 1856; Bentham & Hooker, Gen. Pl. 2: 721. 1876; Miers, Apoc. S. Am. 9. 1878 (as *Kickcia*); Baillon, Hist. Pl. 214. 1889; Koorders & Valetton, Bijdr. Java 1: 109. 1894; K. Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2): 161. 1895; Boerlage, Fl. Ned. Ind. 2: 390. 1899; Hua, Bull. Soc. Bot. France sér. 4.4: 271. 1904; Stapf, Kew Bull. 3: 50. 1905 (non Dumortier 1827).

Kibatalia subgenus *Eukibatalia* Woodson, Phil. Journ. Sci. 60: 211. 1936.

Heterotypic synonym: *Paravallaris* Pierre, Bull. Mens. Soc. Linn. Paris sér. 2.4: 31. 1898; Hua, Bull. Soc. Bot. France sér. 4.4: 270, 271. 1904; Pitard in Fl. Indo-Chine 3: 1179. 1933; Craib, Fl. Siam. 2(5): 455. 1939; Wu & Wang, Acta Phyt. Sin. 6(2): 186, 293. 1957; Tsiang & Li, Acta Phyt. Sin. 11(4): 373. 1973; Tsiang, Icon. Cormoph. Sin. 3: 843. 1974; Tsiang & Li, Fl. Rep. Pop. Sin. 63: 133. 1977. Type species: *P. macrophylla* Pierre (= *K. anceps*).

Evergreen less often deciduous *tree* or *shrub*. Bark exuding white latex. *Branches* terete, brown or dark grey, lenticellate, glabrous; *branchlets* terete, sometimes laterally compressed and canaliculate at the apex, glabrous (only in *K. anceps* sometimes sparsely puberulent), lenticellate, brown or dark grey, with transversely fissured bark or not. *Leaves* opposite, those of a pair equal or subequal, petiolate; petiole of a pair connate into a very short ocrea, with colleters in the axils (not in *K. longifolia*); petiole glabrous, only in *K. anceps* sparsely puberulent; blade papyraceous to coriaceous, mostly narrowly to widely elliptic, unequal to equal-sided, entire, glabrous on both sides or more or less pubescent beneath; costa impressed above, rarely not, prominent beneath; secondary veins anastomizing or slightly curved towards the margins; tertiary venation more or less reticulate; domatia mostly present. *Inflorescences* terminal or axillary and then in alternating axils, once-branched. *Peduncle* short, glabrous; pedicels mostly glabrous; bracts sepal-like, shorter than the sepals, persistent, rarely deciduous. *Flowers* 5-merous, actinomorphic. *Sepals* ovate, less often hemi-orbicular or elliptic, the inner narrower than the outer, imbricate quincuncial in bud, entire, mostly with colleters inside at the base. *Corolla* white, creamy or pale green, subdivided in a lower and an upper part (not known for *K. longifolia*), or not in *K. maingayi* and some specimens of *K. anceps*, lower part cylindrical or nearly so, often with a subglobose lower one- or two-thirds; slightly widened into an upper part; lobes elliptic, narrowly elliptic or sometimes obovate or ovate, entire, overlapping to the right in bud. *Stamens* exerted or included, connivent into

a close cone around the pistil head, rarely free, with or without dorsal swellings (not known for *K. longifolia*), inserted at the level where corolla tube (lower part) is widening, or only in *K. maingayi* at the apex of the corolla tube; anthers narrowly triangular, adhering to the pistil head, acuminate at the partially sterile apex, sagittate at the base, introrse; cells 2, dehiscent throughout by a longitudinal slit. *Pistil*: disk ring- to cup-shaped, sometimes enveloping the ovary, 5-lobed or nearly so; ovary bicarpellate, superior; carpels 2, free, ovoid; style mostly cylindrical, consisting of two connate strands; pistil head conical. In each cell one semi-globose or rarely ovoid placenta with many ovules. *Infructescences* bearing 1-4(8) fruits, with glabrous pedicels and peduncle. *Mericarps* very narrowly ellipsoid or cylindrical, less often clavate, subtended by the persistent calyx. *Seeds*: grains brown, fusiform, tapering into a coma bearing beak, with apex directed towards the base of the follicle; coma whitish or brown; hairs simple, straight; rootlet cylindrical, obtuse at the apex, rarely very short; cotyledons folded.

KEY TO THE SPECIES

- 1. Stamens exerted for 0.5-4 mm 2
- Stamens included for (1)3-30 mm 8
- 2. Corolla tube 5-14 mm long; upper part absent or up to 2 mm long 3
- Corolla tube 23-37 mm long; upper part 5-9(10) mm long 7
- 3. Leaves 15-34.5 cm long; costa hairy beneath, manifestly prominent; petiole 6-15 mm long, sparsely puberulent, less often glabrous **1. K. anceps**
- Leaves 3.5-19 cm long; costa glabrous beneath, moderately prominent; petiole 2-10 mm long, glabrous 4
- 4. Leaves 8-19 × 2-7.5 cm; secondary veins (6)7-14 on each side; corolla tube (9)11-14 mm long; domatia (if present) consisting of pits 5
- Leaves 3.5-13.5(14) × 0.8-5.5(6) cm; secondary veins 4-8 on each side; corolla tube 5-8(10) mm long; domatia (if present) without pit 6
- 5. Corolla mouth glabrous or glabrate; inflorescences 1-6-flowered; axis with many bracts; petiole 2-6 mm long **7. K. laurifolia**
- Corolla mouth densely hairy; inflorescences 8-25-flowered; axis without bract; petiole 5-15 mm long **14. K. villosa**
- 6. Corolla lobes glabrous at the apex; colleters in the calyx 2-4; leaves 3-8.1 × as long as wide, 4-10 × 0.8-4 cm; corolla tube 2.8-7 × as long as the calyx **6. K. gitingensis**
- Corolla lobes hairy at the apex; colleters in the calyx 4-15; leaves 2.1-4.75 × as long as wide, 3.5-13.5(14) × (1)2-5.5(6) cm; corolla tube 2-3(4.5) × as long as the calyx. **10. K. maingayi**
- 7. Corolla tube 23-26 mm long; lobes 15-20 mm long; leaves obtuse or acute at the apex; ovary glabrous **5. K. elmeri**
- Corolla tube 34-37 mm long; lobes 25-33 mm long; leaves acuminate with obtuse point at the apex; ovary hairy **11. K. merrilliana**

8. Corolla lobes $25-33 \times 3-4$ mm, $7.5-10 \times$ as long as wide; mouth 2-2.5 mm in diameter; lower part of the tube 4-5 mm long; calyx without colleters **13. *K. stenopetala***
 - Corolla lobes (19) $27-60 \times (5)7-22$ mm, $0.9-5 \times$ as long as wide ⁺⁺); mouth 4-10 mm in diameter; lower part of the tube 5-16(18) mm long; calyx with colleters 9
9. Anthers inserted 6-8 mm from the corolla base; lower part of the tube 5-6.5 mm long; sepals ciliolate, rarely not; inflorescences one-flowered 10
 - Anthers inserted 15-19 mm from the corolla base ⁺); lower part of the tube 7-17(18) mm long ⁺); sepals not ciliolate; inflorescences 1-12-flowered 11
10. Leaves $1.5-2.2 \times$ as long as wide; domatia several; corolla tube 18-23 mm long; colleters in the calyx 5-15 **12. *K. puberula***
 - Leaves $2.7-4.2 \times$ as long as wide; domatia many, almost all over; corolla tube (25) $28-33$ mm long; colleters in the calyx 50-60 **15. *K. wigmanii***
11. Stamens included for 1-1.5 mm; anthers inserted 15 mm from the corolla base; leaves narrowly ovate; upper part of the tube pubescent or velutinous inside **9. *K. macgregori***
 - Stamens included for 3-30 mm; anthers inserted 17-19 mm from the corolla base; leaves elliptic to narrowly elliptic or obovate; upper part of the tube glabrous or sparsely (hirt-) pubescent inside 12
12. Leaves $1.7-2.5 \times$ as long as wide, $16-26(35) \times 8-13$ cm; colleters in the leaf axils 15-60; corolla tube glabrous inside; colleters in the calyx 70-100 **2. *K. arborea***
 - Leaves $2.6-5.7 \times$ as long as wide, $(5)6-20 \times 1-6.5$ cm; colleters in the leaf axils 0-3; corolla tube hairy inside; colleters in the calyx 4-15 13
13. Leaves $(5)6-11 \times 1-4$ cm; corolla tube 11-25(27) mm long; lobes (1.1) $1.3-4 \times$ as long as the tube; stamens included for 4-6 mm **3. *K. blancoi***
 - Leaves $13-17.5 \times 3-6.5$ cm; corolla tube (20) $33-37$ mm long ⁺⁺); lobes (0.5) $0.8-0.9 \times$ as long as the tube; stamens included for (3) $9-11$ mm ⁺⁺) 14
14. Leaves $3-4.8 \times$ as long as wide, acuminate or caudate at the apex; leaf axils with colleters; sepals $2-3.75 \times$ as long as wide; pedicels 5 mm long. **4. *K. borneensis***
 - Leaves $2.6-2.8 \times$ as long as wide, acute at the apex; leaf axils without colleters; sepals $0.8-1.7 \times$ as long as wide; pedicels 30 mm long **8. *K. longifolia***
⁺) for *K. longifolia*, after Merrill (1920).
⁺⁺) not yet known for *K. longifolia*.

1. *Kibatalia anceps* (Dunn et R. Williams) Woodson, *Sunyatsenia* 3 (2,3): 101. 1936; *Phil. Journ. Sc.* 60: 215. 1936; Pichon, *Mém. Mus. Nat. sér.* 2.1: 71. 1950.

Fig. 10; Map 10

Basionym: *Trachelospermum anceps* Dunn et R. Williams, *Kew Bull.* 10: 343. 1920; Woodson, *Sunyatsenia* 3 (2,3): 101. 1936.



FIG. 10. *Kibatalia anceps*. 1, habit ($\times \frac{1}{2}$); 2, part of corolla lobes dissected ($\times 3$); 3, part of calyx with pistil ($\times 3$); 4, anther, dorsal view ($\times 11$); 5, fruit ($\times \frac{1}{2}$); 6, seed ($\times \frac{1}{2}$); 7, embryo ($\times 2$). 1 from Pételot Oct. 1935; 2-4 from Pételot 1866; 5 from Pételot 6001; 6 from Fleury in Chevalier 32197; 7 from Poilane 13629.

Type: Burma: Letpanthaung, Mergui: Meebold 14654 (K, lectotype); Tenasserim, Bosvachaung and Kyauktalan: Meebold 15408 (K, paratype); Meebold no. 14966 not traced.

Heterotypic synonyms: *Vallis ? anceps* Wallich, Cat. 1622. 1828 (nomen nudum). Type: Burma: Tavoy, Kelong: Wallich 1622. (K-WALL., paratype).

Vallis arborea Fischer, Kew Bull. 2: 92. 1927. Type: Burma: S. Tenasserim, Ngawun Chaung: Parkinson 1632 (K, holo and isotype of *V. arborea* Fischer). *Vallis anceps* (Dunn et R. Williams) Fischer, Kew Bull. 1: 28. 1931, where cited as *V. anceps* (Wallich) Fischer.

Paravallis macrophylla Pierre (Prod. Medic. 325. 1894, nomen nudum) ex Hua, Bull. Soc. Bot. 2: 273. 1904; Type: Vietnam: From Mekong to Hue: Harmand in Herb. Pierre 1869 (P, lectotype; isotype: K).

Homotypic synonym: *Kibatalia macrophylla* (Pierre) Woodson, Philipp. Journ. Sc. 60: 214. 1936.

Paravallis yunnanensis Tsiang et P.T. Li, Acta Phyt. Sin. 11(4): 373. 1973. Type: China: Yunnan: Hsi-Shuang Pan-Na: Feng 20361 (PE, holotype).

Deciduous *shrub* or *tree* 3–15 m high. *Trunk* 10–23 cm in diameter. *Branches* hollow when dry, slightly compressed, with longitudinally fissured bark; branchlets hollow when dry, terete, laterally compressed and canaliculate at the extreme apex, sparsely puberulent or glabrous, longitudinally fissured. *Leaves*: petiole 5–15 mm long, sparsely puberulent or less often glabrous; colleters many, long, in a single row, persistent when the leaves are shed; blade coriaceous, glossy above, narrowly elliptic, 2.2–4 × as long as wide, 15–38 × 5–13 cm, equal- or subequal-sided, acuminate, obtuse or sometimes subcaudate at the apex, at the base cuneate or rounded, sinuate at the margins, glabrous above, beneath glabrous or often sparsely pubescent and sometimes minutely granulate, especially on the costa and secondary veins more densely so, less often hirsute; with 13–19(21) secondary veins on each side; tertiary venation obscure; domatia mostly absent, rarely present. *Inflorescences* lax, 0.1–0.4 × as long as the leaves, 2.5–6 cm long, (2)4–12-flowered. *Peduncle* 3–7.5 mm long, less often obsolete; inflorescence axis with deciduous bracts close together, 5–25 mm long; pedicels 15–30 mm long, sparsely to densely pubescent; bracts mostly erect. *Flowers* fragrant. *Sepals* pale green, free or connate for about 2 mm, ovate, 1.3–2.5 × as long as wide, 4–5 × 2–3 mm, acute or acuminate at the apex, sparsely puberulent outside, inside sparsely puberulent or glabrous; with 3–7 colleters in the whole flower in a single row at the base of the inner sepals near the edges, slender, about 1 mm long, obtuse rarely retuse at the apex. *Corolla* white or pale green; tube 2.2–2.75 × as long as the calyx, 11–12.5 mm long, glabrous outside, inside sparsely puberulent or pubescent in upper-half, furthermore glabrous; at the mouth 3.5–4 mm wide, sparsely pubescent; lobes narrowly elliptic, 1.2–1.8 × as long as the tube, 2.1–4 × as long as wide, 13.5–20 × 4–7 mm, acute or obtuse at the apex, sparsely puberulent outside, inside at the extreme base sparsely pubescent, furthermore sparsely to densely puberulent. *Stamens* exerted for 3–4 mm; anthers sessile, 3–3.5 × 0.75–1 mm, with apex for about 0.25–0.5

mm sterile, outside glabrous or sparsely hirt-pubescent, with a narrowly longitudinal dorsal groove, inside near the base pubescent and furthermore glabrous; tails curved inwards. *Pistil* 12.5–14 mm long; disk cup- or ring-shaped, 1–1.5 × 2–3 mm, obscurely 5-lobed; carpels ovoid, 1.25–2.5 × 1.75–2 mm, puberulent or with several stiff hairs outside; style 9–12 mm long, pubescent at the extreme apex, furthermore glabrous; pistil head 1–1.5 mm, with a bifid or obscurely lobed apex. *Infructescences*: pedicels 1.5–3 cm long, rigid, often sparsely puberulent, sparsely or not lenticellate; puduncle 2–10 mm long, often sparsely puberulent; bracts persistent. *Mericarps* narrowly ellipsoid, green (?) when mature, slightly pubescent at the extreme base, 7–24 × 0.5–0.8 cm, with a raised line at each side, acute or obtuse at the apex, many-seeded, divergent at an angle of about 60–180°, with exocarp rather thick and hard, not lenticellate; wall 0.5–1 mm thick, pale brown inside. *Seeds*: grains 15–20 × 2–3 mm, glabrous, granulate, acute at the base, beak glabrous for about 15 mm, bearing an apical coma about 10–22 mm; coma white or pale brown; hairs 15–45 mm long, shorter than the grain (and beak); embryo whitish; cotyledons 17 × 4 mm; rootlet 3 × 1 mm.

Distribution: Burma, China (Yünnan), Thailand, Laos, Cambodia and Vietnam.

Ecology: Forests, Savannas, often on stream banks, valleys or road sides. **Altitude:** 50–700 m.

Vernacular name: Burma: Nan Kai Tong (Shan); Thailand: Mook Yai (Loei); Laos: Khao Khouay (B. Sapham Meuk); Vietnam: Suoi-nai, Cay dui do'i, Cay toi voi (Phu Tho).

Most of the specimens examined:

BURMA: Tenasserim: sin. loc. (fl. June) Kerr 21672 (BM, K, L); Ngawun Chaun (fl., fr. Jan.) Parkinson 1632 (K, type of *Vallis arborea*); Bosvachaung and Kyauktalan (fl. March, Apr.) Meebold 15408 (K, paratype). Tavoy: Kelang, *Wallich 1622* (K-WALL, paratype); Kalamunsi Chaung, Mergui (fl. May) Meebold 14654 (K, lectotype).

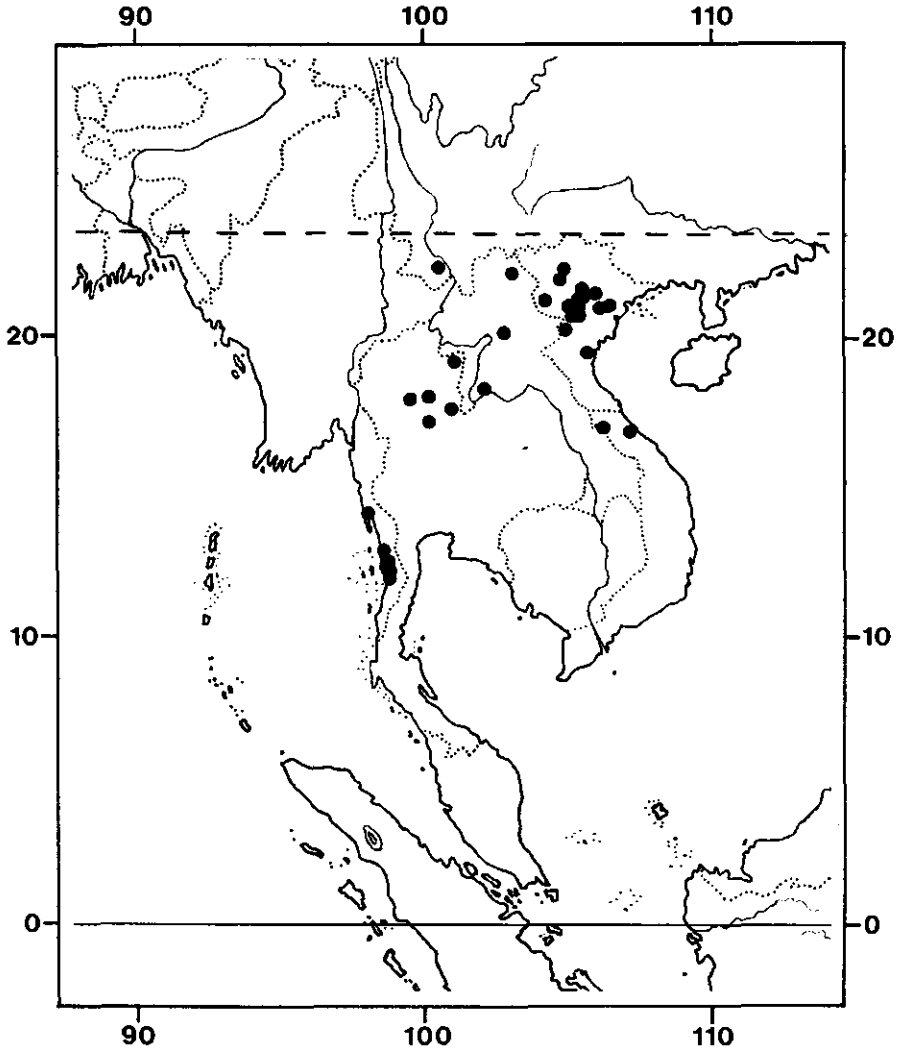
China: Yünnan: Hsi-Shuang Pan-Na (fr. Apr.) Feng 20361 (PE, type of *Paravallis yunnanensis*).

Thailand: Loei, Num Khan (fr. Nov.) Dee 1029 (K); N Phrae (fr. Jan.) Smitinand 10779 (L); N Phrae, between Muang Khan and Nam Krai (fl., fr. Apr.) Smitinand & Cheke 10794 (C, K, L, P); Doi Duan, Muang Pan (fr. March) Kerr 5108 (BM, K, L, P); Pra Ruang Waterfalls, Suhotai (bud, June) Maxwell 72–272 (AAU); Lampang: Muang Trang (fl. June) Winit 1420 (K); Me Salop (fl., fr.) Winit 1246 (K); Me Jom, Me Chawk (fl. May) Winit 1825 (K).

Cambodia: De Ninh Prov., Bang Tre Lat, Poilane 16449 (P); De Vinh Prov., Song Ca valley, km 102, road 7 (fr. Jan.) Poilane 19962 (P, WAG).

Laos: Lai Chau (fr. Jan.) Poilane 27147 (P, WAG); Lai Chau, near Pong Saly (fr. Apr.) Poilane 25844 (P, WAG); B. Sapaham Meuk (fr. March) Vidal 1182 B (P); Central, near Mekong R., Harmand s.n. (P).

Vietnam: Tu-Phap (fr. Sept.) Balansa 2103 (G, K, P, paratype of *Paravallis macrophylla*); *ibid.* (fl. June) Anonym. s.n. (L); Cay Sen, Thien Thon (fr. Jan.) Bon 5057 (P, WAG); Tuyen Quang Prov.: Phu Ho (fl., fr. June) Pételot 1866 (A, UC); *ibid.*, Parquier 3052 (P, UC); sin. loc. (fl. June) Pételot 1934 (NY, P); Cho Ganh, Phu Ho (fr. Sept.) Pételot 698 (P); Muong Si, near Lac Tho (fr. March) Bon s.n. (P); Sontay Prov.: between Sontay and Da Chang (fl., fr. Oct.) Pételot s.n. (A, P, US); Mt. Basi (fr. Feb.) Pételot 6001 (A); Vinh Yen Prov.: Vinh Yen, Herb. Eberhardt 3801 (NY, P); Lang Lue, Herb. Eberhardt 4904 (A, P); Phu Tho Prov.: La Pho, Herb. Eberhardt 4349



MAP 10. *Kibatalia anceps*

(P); Dao Gia, near Phu Tho (fr. Apr.) Chevalier 37478 (P); Chan Mong F.R. (fr. Apr.) Fleury in Chevalier 32197 (P, WAG); Trung Giap For. (fl. May) Fleury 37531 (P, WAG); Hoa Binh Prov.: near Muang Than, road from Hanoi to Hoa Binh (fr. Jan.) Pételot 4921 (AAU, NY, P); Sui Yut, Herb. Eberhardt 422 (P, WAG); Mai Chau, Herb. Eberhardt 4245 (P); Thanh Hoa Prov.: Thien Hou (fl. June) Bon 5404 (A, P); between La Han and Lung Van (fr. Jan.) Poilane 18876 (P, WAG); Hoi Xuan (fl., fr. Aug.) Poilane 1752 (A, NY, P); Quang Tri Prov.: Ailao Pass (fl. May) Poilane 24872 (WAG); ibid. (fl. May) Poilane 24837 (P, WAG); sin. loc. (fr. March) Poilane 13629 (P, WAG); Hue, Harmand s.n. (P); Hue, (fl. Sept.) Harmand in Herb. Pierre 1869 (K, P, lectotype of *Paravallaris macrophylla*).

2. *Kibatalia arborea* (Blume) G. Don, Gen. Syst. Bot. 4: 86. 1837; Blume, Rumphia 4: 26. 1849; Woodson, Phil. Journ. Sc. 60: 226. 1936; Craib, Fl. Siam. 2(5): 456. 1939; Pichon, Mém. Mus. Nat. sér. 2(1): 1950; Whitmore, Fl. Mal. 2: 18. 1973. **Fig. 11; Map 11**

Basionym: *Hasseltia arborea* Blume, Bijdr. Ned. Ind. 1046. 1826; Steudel, Nom. Bot. 1(2): 846. 1840.

Type: Indonesia: West Java: Bogor, Cihampea (Tjampian). Lectotype: Blume s.n. (L 925.250–255). Paratypes: Blume s.n. (L 898.110–294; L 898.110–296; L 898.110–298, M, W).

Homotypic synonyms: *Kickxia arborea* (Blume) Blume, Fl. Jav. Ins VII. 1828; Miquel, Fl. Ned. Ind. 2: 435. 1845; Walpers, Ann. Bot. 3: 39. 1852; Villar, Novis. Phil. 132. 1880; Koorders & Valetton, Bijdr. Java 1: 110. 1894; Planchon, Prod. Med. 298. 1894; Schumann in Engler & Prantl, Nat. Pflanzenfam. 4(2): 167, 174. 1895; Koorders, Meded. Lands Plant. 19: 529. 1898; Boerlage, Fl. Ned. Ind. 2(2): 400. 1899; Hua, Bull. Soc. Bot. France 44: 270, 271. 1904; Koorders, Exk. Java 3: 77. 1912; Koorders & Schumacher, Syst. Verz. 1: 181. 1913; Koorders, Atlas Baum. Java fig. 639, 640. 1918; Craib, Fl. Siam. 2(5): 456. 1939; Heyne, Nut. Ind. 1(3): 291. 1950; Stapf, Kew Bull. 3: 50. 1950. *Kickxia arborea* (Blume) A.DC., Prod. 8: 408. 1844 (as *Kixia arborea*); Hasskarl, Fl. Bot. Zeit. 299 ('267'). 1845 (as *Kixia arborea*).

Heterotypic synonym: *Tabernaemontana ovalis* Miq., Fl. Ind. Bat. Suppl. 229, 554. 1862. Type: Indonesia: Sumatra, H.B. 2213 (L, holotype; isotypes: BO, U).

Evergreen big tree 7.5–45(65) m high; crown small, light, rounded or cylindrical, up to 5 m in diameter. *Trunk* straight, 15–100 cm in diameter, often with short buttresses about 1.5 m high, clear bole 5–40 m high; outer bark smooth, finely fissured, about 2–4 mm thick, grey, grey-brown or black, lenticellate; inner bark white, light orange or greenish, often spotted, 0.8–2 cm thick; sapwood white or pale yellow, with faint rings. *Branches* hollow (when dry), often fissured, smooth; branchlets hollow (when dry), laterally compressed and slightly canaliculate at the extreme apex, sulcate when dry, bark sometimes transverse-ly fissured, less often slightly peeling off. *Leaves*: petiole 5–14(30) mm long; colleters 15–60, long, slender, in 1–3 rows (colleters persistent when the leaves are shed); blade coriaceous or papyraceous, elliptic, less often obovate, 1.7–2.5 × as long as wide, 16–26(35) × 8–13 cm, equal- or subequal-sided, acute, acuminate or rarely obtuse at the apex, rounded or cuneate at the base, dark green above, beneath pale green, often granulate, sparsely pubescent, on the midrib and secondary veins more densely so, rarely with black dots all over; with 11–18 secondary veins on each side; tertiary venation conspicuous; domatia absent. *Inflorescences* lax, 0.5–0.6 × as long as the leaves, 8–10 cm long, 1–2-flowered. *Peduncle* 2–5 mm long; pedicels 30–50 mm long. *Flowers* fragrant, and with about the same odour as Kenanga (*Cananga sp.*) *Sepals* pale green or white, connate for 0.5–1 mm, ovate or narrowly ovate, 1.3–3.5 × as long as wide, 4–7 × 2–3 mm, obtuse, acute or acuminate at the apex, glabrous

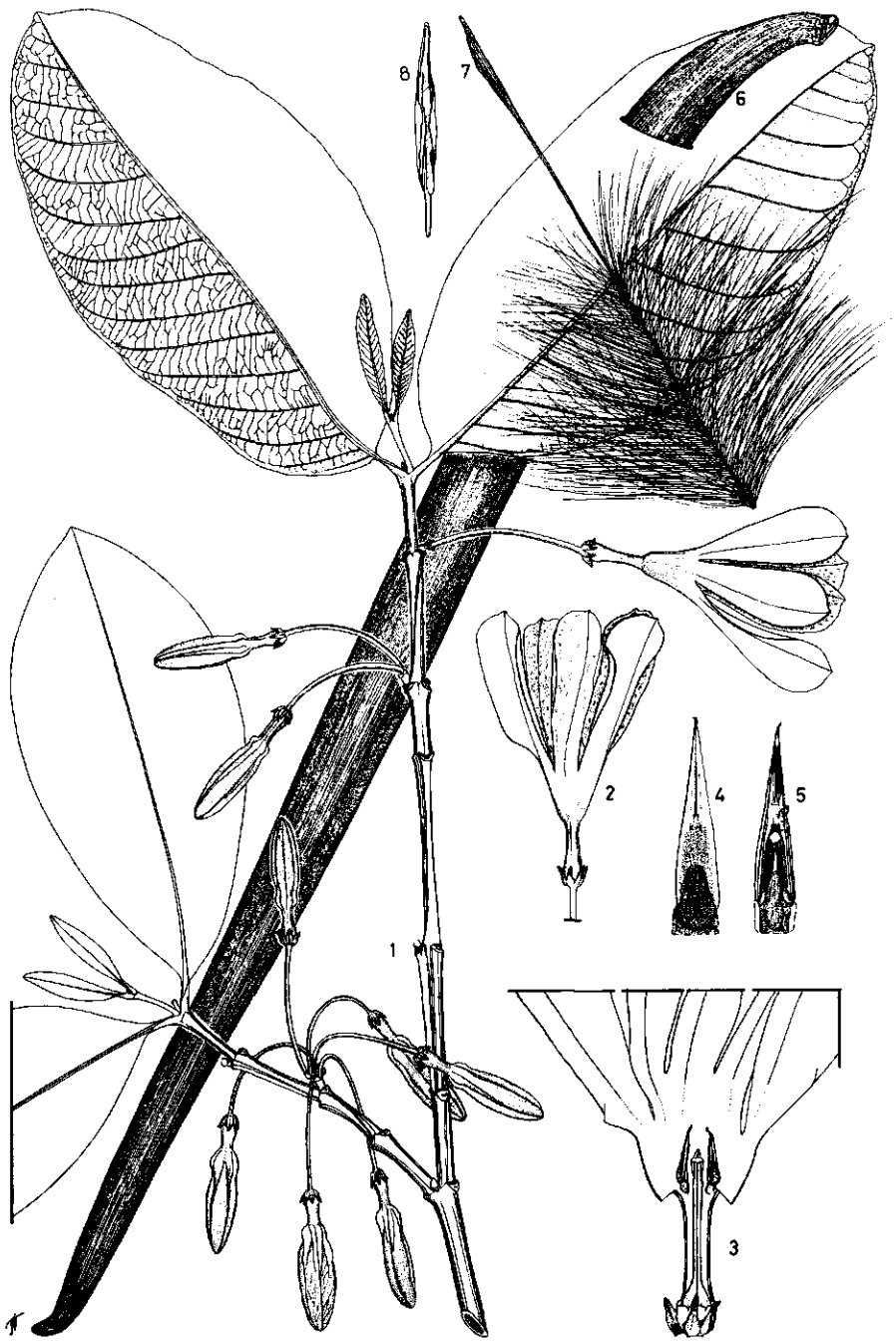


FIG. 11. *Kibatalia arborea*. 1, habit ($\times \frac{1}{2}$); 2, flower ($\times \frac{1}{2}$); 3, part of flower opened out ($\times 1$); 4, anther, dorsal view ($\times 3$); 5, anther, ventral view ($\times 3$); 6, fruit ($\times \frac{1}{2}$); 7, seed ($\times \frac{1}{2}$); 8, embryo ($\times 1$). 1 from Sargent 20-10-1903; 2-5 from Blume s.n., L 898.110-294; 6-7 from Koorders 202B; 8 from Whitmore FRI 13406.

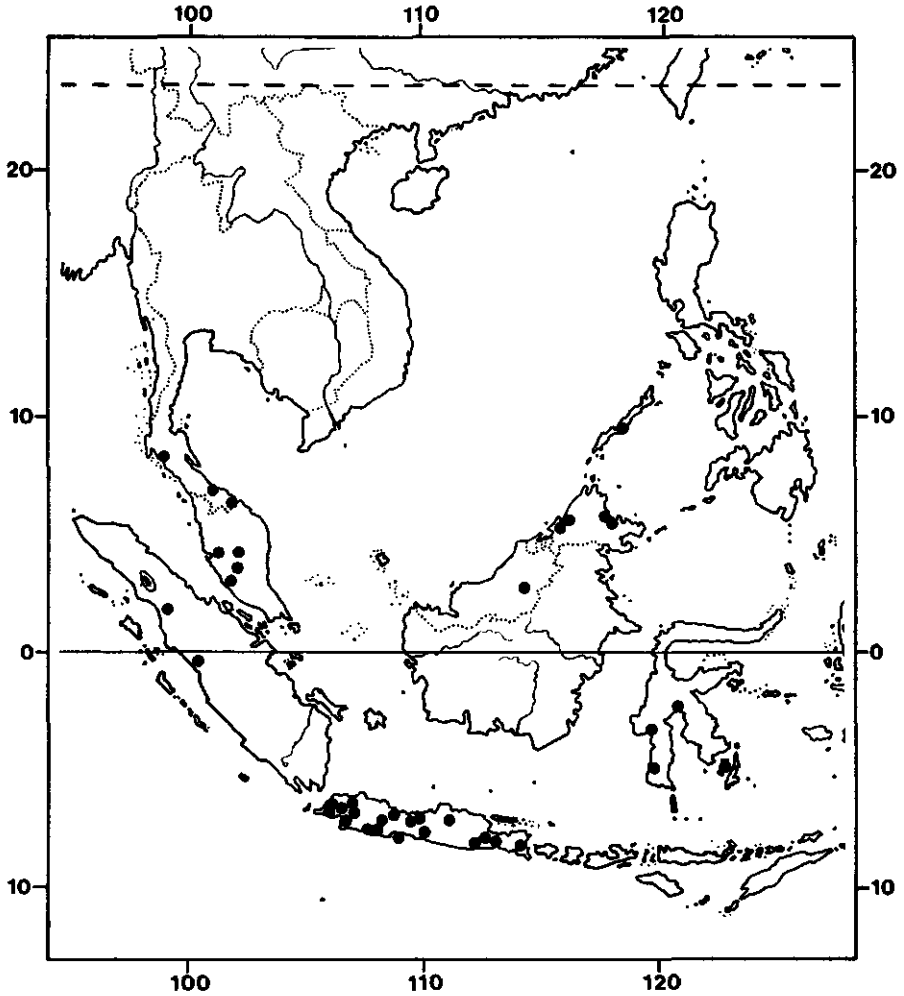
outside, inside glabrous or less often sparsely to densely pubescent; with about 70–100 colleters in the whole flower in a single row at the base of the sepals, simple, rarely lobed, about 1 mm long, obtuse at the apex. *Corolla* white or creamy, often tinged with green outside; tube 1.8–11.2 × as long as the calyx, 24–45 mm long, glabrous on both sides; lower part 10–15 mm long; upper part obconical or narrowly campanulate, 1–2.2 (3.7) × as long as the lower (part), (9)12–25(40) mm long, at the mouth 5–10 mm wide; lobes elliptic or narrowly obovate, 2.3–3.2 × as long as wide, 30–40 × 10–18 mm, (0.2)0.8–2.2 × as long the tube, acute, acuminate or rounded at the apex, glabrous or sparsely to densely pubescent on both sides, unequal-sided. *Stamens* included for 3–30 mm, inserted 7–19 mm from the corolla base; filaments 0–1 mm long, rarely obsolete; anthers 6–7 × 1–2 mm, with apex about 1–1.5 mm sterile, outside glabrous or sparsely hirtic-pubescent, inside hirtic-pubescent or tomentose below the connectives, and furthermore glabrous; tails straight. *Pistil* 12–22 mm long; disk cup-shaped, 2–3 × 2–3 mm, obscurely 5-lobed; carpels ovoid, 2.5–4 × 1.5–2.5 mm, glabrous; style 10–19 mm long, widening towards the apex, glabrous; pistil head 1–3 × 1–2 mm, with a lateral receptive zone and topped by an obscurely lobed apex. *Infructescences* pendulous; pedicels 4–6 cm long, rigid, stout, with large lenticels, less often with faint transversely fissured bark; peduncle 2–6 mm long. *Mericarps* very narrowly ellipsoid or very narrowly clavate, 25–85 × 1–2.5 cm, tapering into an acuminate or acute apex, with or without large lenticels, hard, many-seeded, parallel or divergent; wall 3–5 mm thick, yellow inside; calyx mostly persistent under the ripe fruits. *Seeds*: grains 28–35 × 2–3.5 mm, glabrous, acuminate or acute at the base; beak glabrous for about 50 mm, bearing an apical coma for about 30–40 (80) mm; coma white; hairs 20–100 mm long, shorter than the grain (and beak); embryo whitish or creamy; cotyledons 22–25 × 3 mm; rootlet 4–7 × 1 mm.

Distribution: Thailand, Malaysia, Indonesia (Sumatra, Java, Sulawesi), Philippines (Island of Palawan).

Ecology: Lowland tropical forest, often on stream banks and steep slopes. Altitude: 0–500 m.

Uses: According to Heyne (1950), the latex is used as medicine against stomach disorder or worm diseases. In Southeast Sulawesi the wood is used as sabre sheath.

Vernacular names: Malaysia: Jelutung (Sandakan); Jelutung pipit, Jelutung Beruang or Tamadak (Kepong). Indonesia: Sumatra: Balam batik, Balam dadi or Kayu gede (Tapanuli). Java: West: Kitumbali (Bogor); Kibunteli (Bogor, Bandung); Kibenteli (Banten); Hambulu (Cirebon). Central and East: Kayu Santen (Pekalongan, Subah, Cilacap, Yogyakarta, Kediri, Malang, Banyuwangi); Balung (Subah). Sulawesi: Lingorumbolia (Malibi); Atesahah (Mamuju); Soliti, Kasimbolili (Muna).



MAP 11. *Kibatalia arborea*

Most of the specimens examined:

THAILAND: Ban Tu Gor, Tan Young Mas (fl. Apr.) Laksnakara 840 (BM, E, K, L, P); Naung Chick, Krabi (fl. March) Kerr 18623 (BM, K, MO).

PHILIPPINES: Palawan: Puerto Princessa, Irawan River valley, Mt. Beaufort (fl. May) Podzorski SMHI-2170 (L).

MALAYSIA: Continent: Kepong: sin. loc. (fl. March) Hashim 16499 (SING); *ibid.* (fr. Nov.) Kochummen 94049 (K, KEP, L), (fl. Apr.), 80947 (A, BO, K, KEP, L, SING); *ibid.*, Symington 20144 (KEP); *ibid.* (fl. Nov.) Kochummen 93486 (K, KEP); near Kerah R. (fl., fr. Nov.) Saw 32298 (KEP, SING); Pahang Taman Negara, Tembiling R., at Pasir Beluas (fr. March) Whitmore FRI 8620 (K, KEP, L, WAG). Pahang, Mt. Benom (fr. March) Whitmore FRI 3406 (K, KEP, L, SING); near Kraw R. (fr. Oct.) Ja'amat 44938 (KEP). Selangor: Pansom R., Bukit Tangkol at Ulu Langat

(fr. Aug.) Gadoh anak Umbai 2159 (KEP). North Borneo: Beaufort Distr., km 40, along the railway line, Cuadra A 1322 (KEP, SING); Papar Distr., Kawang (fl. May) Mikil 30296 (K, L, SING); Sandakan, Sepilok F. R., Nicholson SAN 17287 (L, SING); Mt. Dulit, near Long Kapa (fl. Aug.) Richard R 1307 (A, K, L); Beluran Distr., Pamol (fl. May) Meijer SAN 25131 (L).

INDONESIA: SUMATRA: Priaman, H.B. 2213 (BO, L, U, type of *Tabernaemontana ovalis*); Res. Tapanuli, near Kp. Sajaermatinggi, Gerdeng 11 (BO, BZF); sin. loc., Koorders 10272 β (BO). JAVA: WEST: Banten Distr., Cibaliung (fr. July) Koorders 202 β (BO, L); Banten Distr., Kampung Cigorondong, Cimanggu, along the stream Ciherang (fr. Nov.) Bisset 766 (BO); Bogor Distr., Pelabuhan Ratu, Koorders 203 β (BO, L); Bogor Distr., Depok, Koorders 30935 β (BO, L); Bogor Distr., Dungus Iwul, 10 km W. of Jasinga, Kartapraja 440 (BO); *ibid.*, (imm. fr. Feb.) Hartono & Wasiyat 1 (BZF); Cirebon Distr., Kuningan, Houter 124 (BO); Bandung Distr.: Ciamis, Desa Cisaga, Wasiyat 1023 (BZF); Leuweng Sancang, Pemeungpeuk, Rudjiman 206 (BO, Herb. Fak. Kehutanan UGM Yogyakarta, WAG). Ciamis Distr., Rejadesa Sub Distr., Desa Tanjungsukun, Rudjiman 204 (BO, Herb. Fak. Kehutanan UGM Yogyakarta, WAG); *ibid.*, Rudjiman 205 (Herb. Fak. Kehutanan UGM Yogyakarta); sin. loc. (fl. June) Blume s.n. (BO, C, K, L, M, P, S, U, type); Hasskarl s.n. (P); sin. loc., Kollmann s.n. (NY); sin. loc., Martokusumo in Herb. Koordersianum 13407 β (BO); sin. loc., Reichenbach f. s.n. (W); sin. loc., Zollinger 3085 (A, BM, G, MEL, P). CENTRAL: Cilacap, Nusakambangan, Koorders 205 β (BO, L, P), (fr. June) 13443 β (BO, L, UC), (fr. June) 13453 β (BO, L), 37017 β (BO, L); Lebakbarang, Pekalongan (fl. Jan.) Backer 23503 (BO); Kulon Progo Distr., Kokap Sub Distr., Teganing I, Rudjiman 268 (BO, Herb. Fak. Kehutanan UGM, Yogyakarta, WAG); Blora, Anonym. no. Ja. 1464 (BZF). EAST: Kediri Distr., Pare, near Jambean (fr. June) Koorders 23519 β (BO, L, P); Sumbermanjing, near Kalipare, Koorders 23450 β (BO); Malang Distr., at Sumbertangkil, Koorders 23983 β (BO, L); Rogojampi, Banyuwangi (fr. Aug.) Koorders 28859 β (BO). SULAWESI: CENTRAL: Kampung Mesu, Malili (fl. Oct.) Reppi 113 (BO, BZF); Kampung Malili, Reppi 155 (BO, L); *ibid.*, Waturandang 34 (A, BO); Tapalang, Mamuju, Nurkas 436 (BO); Maros, Teijsmann 12698 (BO); Kampung Kawata, Malili (fl. Nov.) Waturandang 163 (BO, BZF). SOUTH EAST: Muna Isl. (fl. Dec.) Waturandang 201 (BO); *ibid.* (imm. fr., Aug.) Burghardt 96 (BO, BZF, L); Muna Isl., at Lahario, Neth. Ind. For. Serv. bb 21722 (BZF, L).

CULTIVATED:

VIETNAM: Saigon Bot. Gard. (fl. June) Anonym. 4697 (L).

MALAYSIA: Kepong, Selangor (fl. Feb.) Sahak bin Said 45825 (KEP); *ibid.* (fl. Sept.) Hamid 18245 (KEP).

INDONESIA: Bogor Bot. Gard. (fl., fr. Apr.) Anonym. s.n. (BO, UC, US).

3. *Kibatalia blancoi* (Rolfe ex Stapf) Merrill, Philipp. Journ. Sc. 17: 309. 1920 as *K. blancoi* (Rolfe) Merrill; Merrill, Enum. Philipp. 3: 334. 1923 as *K. blancoi* (Rolfe) Merrill; Pichon, Mém. Mus. Nat. sér 2.1: 71. 1950 as *K. blancoi* (Rolfe) Merrill; Woodson, Philipp. Journ. Sc. 60: 221. 1936 as *K. blancoi* (Rolfe) Merrill.

Fig. 12; Map 12

Basionym: *Kickxia blancoi* Rolfe (Journ. Linn. Soc. 21: 313. 1886, nomen nudum), ex Stapf., Kew Bull. 3: 52. 1905. Type: Philippines: Luzon: Herb. Lobb s.n. (K, holotype).

Heterotypic synonyms: *Kickxia merrittii* Merrill, Phillip. Journ. Sc. 4: 315. 1909.

Type: Philippines: Mindoro Isl., (fl. Apr., May) Merritt 11488 (K, holotype; WAG, photograph of US isotype). Homotypic synonym: *Kibatalia merrittii* (Merrill) Woodson, Philipp. Journ. Sc. 60: 220. 1936.

Missapplied name: *Kickxia arborea* Villar (non Blume) in Naves & Villar, Nov. App. Fl. Philipp. 132, t. 428 bis, 1880 (nomen nudum).

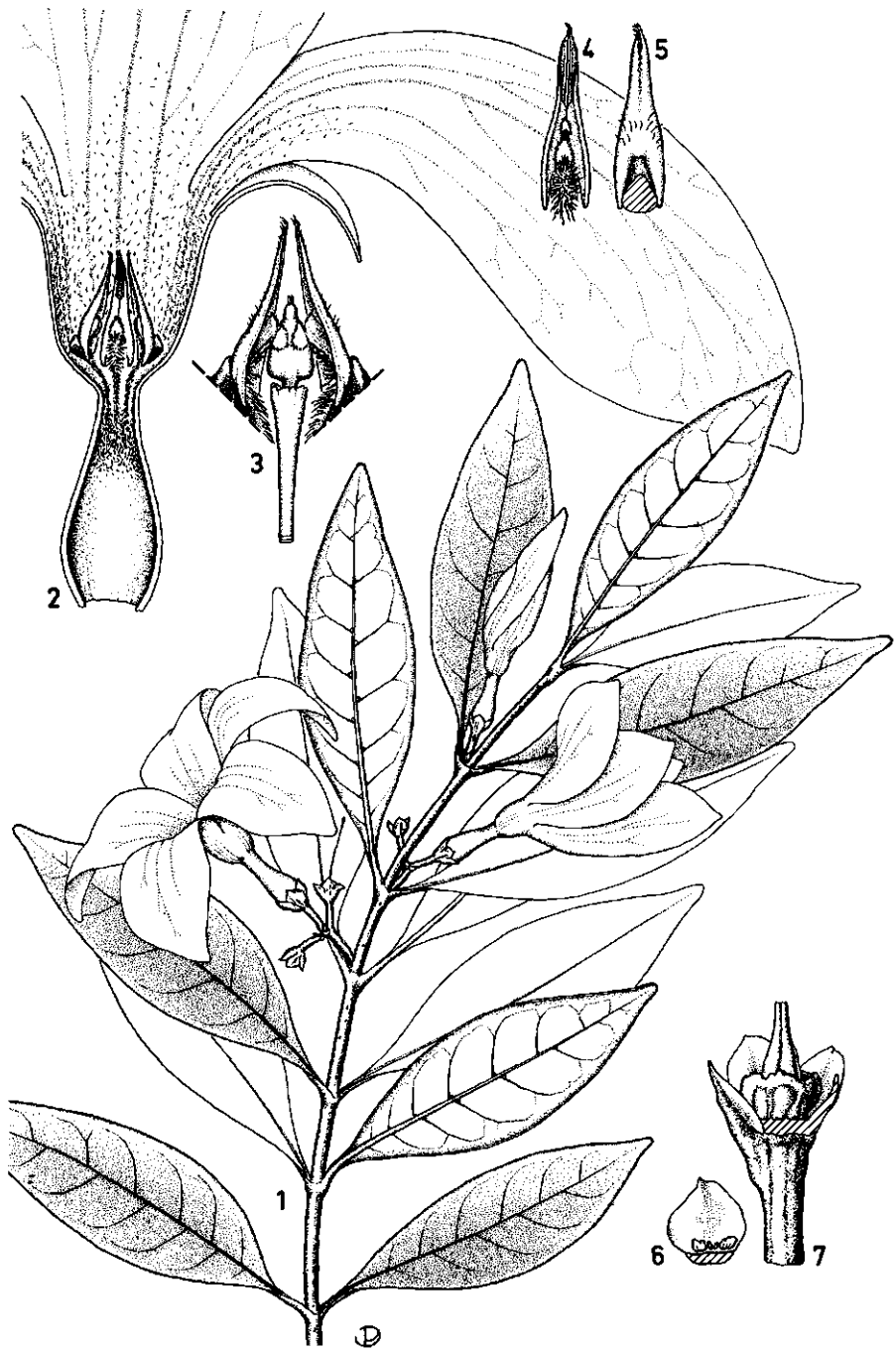


FIG. 12. *Kibatalia blancoi*. 1, habit ($\times \frac{2}{3}$); 2, section of flower ($\times \frac{2}{3}$); 3, apex of gynoecium and anthers lateral view ($\times 3$); 4, anther ventral view ($\times 3$); 5, anther dorsal view ($\times 3$); 6, sepal inside with colleters ($\times 3$); 7, part of calyx with disk and ovary ($\times 3$). 1, 6-7 from Sulit PNH 6876; 2-5 from Mabesa FB 25726.

Tree 10–20 m high; trunk terete, 13–40 cm in diameter; branchlets sulcate when dry, finely longitudinally fissured, bark sometimes transversely fissured. *Leaves*: petiole channeled above, (2)4–10 mm long; colleters several, short; blade coriaceous, sometimes subcoriaceous when dry, narrowly elliptic, 2.6–5.7 × as long as wide, (5)6–11 × 1–4 cm, acute or acuminate with an obtuse point at the apex, rarely shortly caudate, cuneate at the base, glabrous on both sides; with 5–10(12) secondary veins on each side; tertiary venation conspicuously or obscurely reticulate; domatia with or without tufts of hairs. *Inflorescences* lax, 0.5–2 × as long as the leaves, 4.5–8.5(10) cm long, 1–4-flowered. Peduncle (0)2–5 mm long; pedicels 8–17(25) mm long, glabrous; bracts erect or spreading. *Flowers* fragrant, less often odourless. *Sepals* pale-green (?), free, ovate, (0.5)1–1.6 × as long as wide, 2–5 × 2–4 mm, acute or obtuse at the apex, glabrous on both sides, with 4–15 colleters in the whole flower in a single row at the base of the sepals, slender, flat, obtuse at the apex. *Corolla* white; tube 3.5–8 × as long as the calyx, 11–25(27) mm long, glabrous outside, inside glabrous or sometimes sparsely hirt-pubescent; lower part 6–16(18) mm long; upper part campanulate, 0.3–0.8 × as long as the lower, 5–10(15) mm long, at the mouth about 6–8(15) mm wide; lobes narrowly elliptic, (1.1)1.3–4 × as long as the tube, 1.5–4 × as long as wide, 30–45 × (6)10–22 mm, acute at the apex, sparsely pubescent or glabrous outside, glabrous or often sparsely puberulent at the base inside. *Stamens* included for about 4–6 mm; anthers sessile, about 6 × 2 mm, at the apex sterile for about 0.5 mm, outside sparsely to densely hirt-pubescent except for the glabrous tails, inside sparsely hirt-pubescent below the connectives; tails straight. *Pistil* about 19–22 mm long; disk cup-shaped, 1.5–3 × 2–4 mm, shorter than the ovary, retuse at the apex; carpels 2–4 × 1.5–3 mm, glabrous; style 12–22 mm long, glabrous, widened at the apex; pistil head 3 × 1 mm. *Fruit* unknown.

Distribution: Philippines: Islands of Luzon, Guimaras, Catanduanes, Zambales, Mindoro, and Panay.

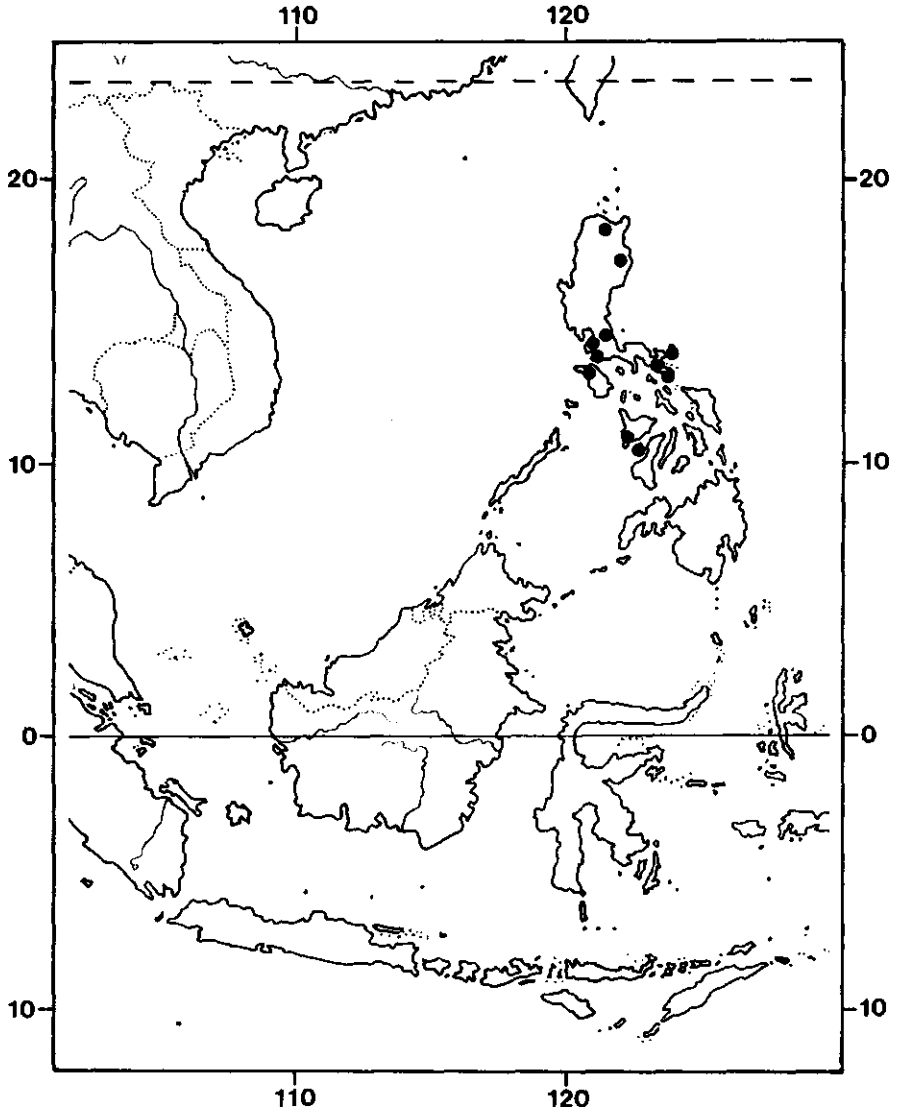
Ecology: Mountains or volcanic area.

Vernacular names: Laniti Itim, Pandakaki Itim (Rizal); Lanete (Luzon); Baguibonlas (Panay).

Uses: For making wooden shoes.

Specimens examined:

PHILIPPINES: LUZON: Ilocos Prov. (fl. Apr., May) Adduru FB 25863 (A, K, P, US, paratype of *K. elmeri*); *ibid.* (fl. March) Paraiso FB 25465 (BO, P); Laguna Prov., Mt. Maguiling (fl. June) Mabesa FB 25726 (A, P, PNH, US, paratype of *K. elmeri*); *ibid.*, Colamba Estate, Mt. Makiling (fl. May) Sulit 1592 in PNH 6876 (A); *sin. loc.*, Herb. Lobb s.n. (K, type); Zambales Prov., San Antonio (fl. Apr.) Madarang s.n. (MICH); Albay Prov., Mayon Vulcano (fl. June) Mendoza 1380 (K, L); Batangas Prov. (fl. May) Tamesis FB 21545 (BO, L, paratype of *K. elmeri*); Sorsogon Prov., Irosin (fl. Nov., Dec.) Vidal 3277 (A, K). CATANDUANES: *sin. loc.* (fl. Aug.) Mabbayag FB 28110 (A, P, paratype of *K. elmeri*). MINDORO: Paluan (fl. Apr.) Ramos BS 39812 (A, BO, K, L, P, paratype of *K. elmeri*); *sin. loc.* (fl. Apr., May) Merritt FB 11488 (K, holotype of *Kickxia merrittii*, WAG, photograph of US isotype). GUIMARAS: *sin. loc.* (fl. June) Gammill FB 862 (NY, US). PANAY: Ilo-ilo Prov., San Yosquin, Anonym. 3289 (K).



MAP 12. *Kibatalia blancoi*

4. *Kibatalia borneensis* (Stapf) Merrill, Philipp. Journ. Sc. 17: 309. 1920; Pichon, Mém. Mus. Nat. sér. 2.1: 71. 1950. Fig. 13; Map 13

Type: Sarawak: *Lobb s.n.* (K, holotype; MO, holotype photograph).

Basionym: *Kickxia borneensis* Stapf, in Hooker's Icones Plantarum 27: t. 2693. 1901; Stapf, Kew Bull. 3: 53. 1905; Merrill, Journ. As. Soc. 501. 1921.

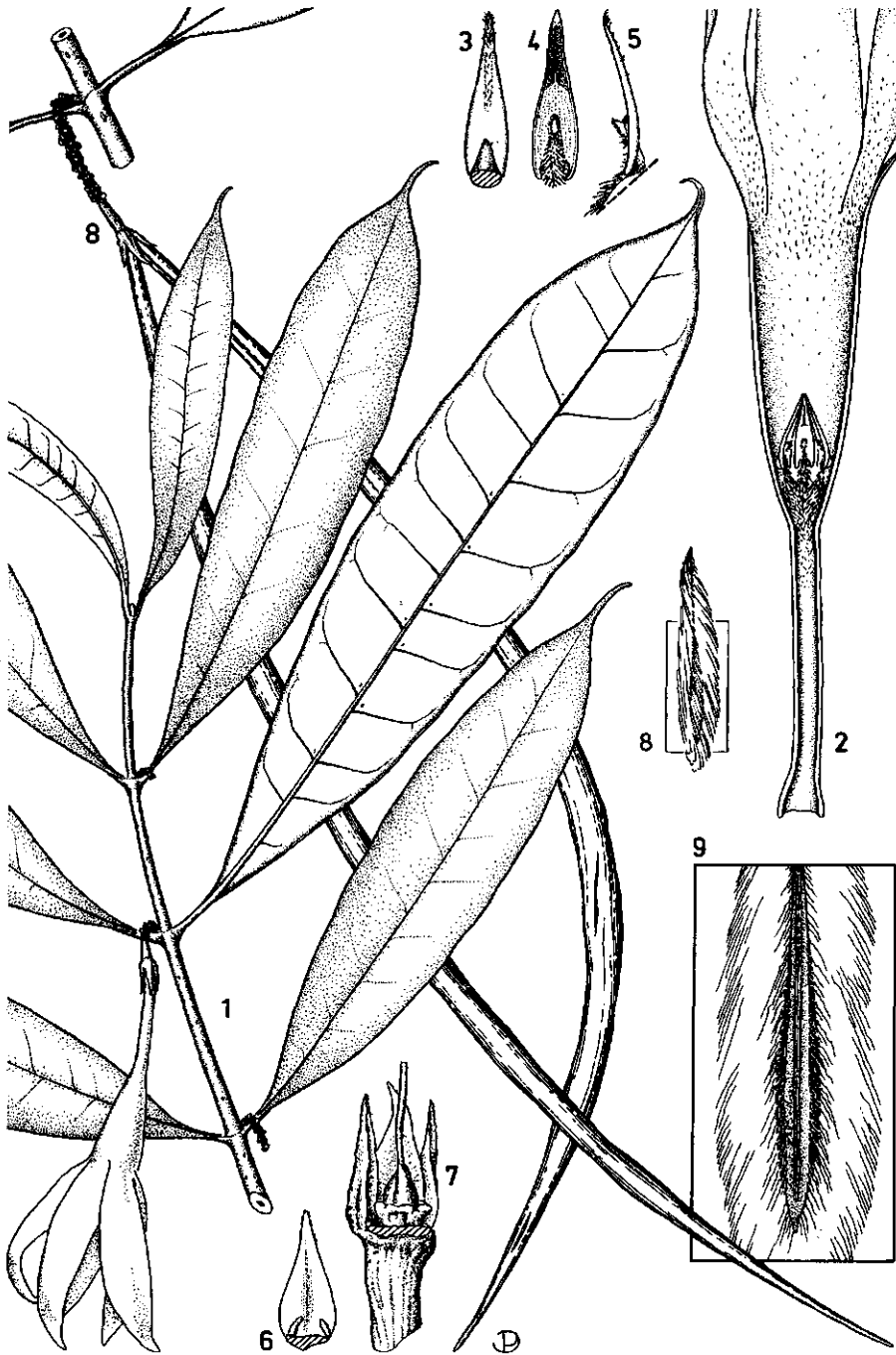


FIG. 13. *Kibatatia borneensis*. 1, habit ($\times \frac{2}{3}$); 2, section of flower ($\times 2$); 3, anther, dorsal view ($\times 4$); 4, anther, ventral view ($\times 4$); 5, anther, lateral view ($\times 4$); 6, sepal inside with colleters ($\times 4$); 7, part of calyx with disk and ovary ($\times 4$); 8, seed ($\times \frac{2}{3}$); 9, enlarged part of seed ($\times 2$). 1 from Bujang S 20865; 2-7 from Native collector 46; 8-9 from Tahir 12251.

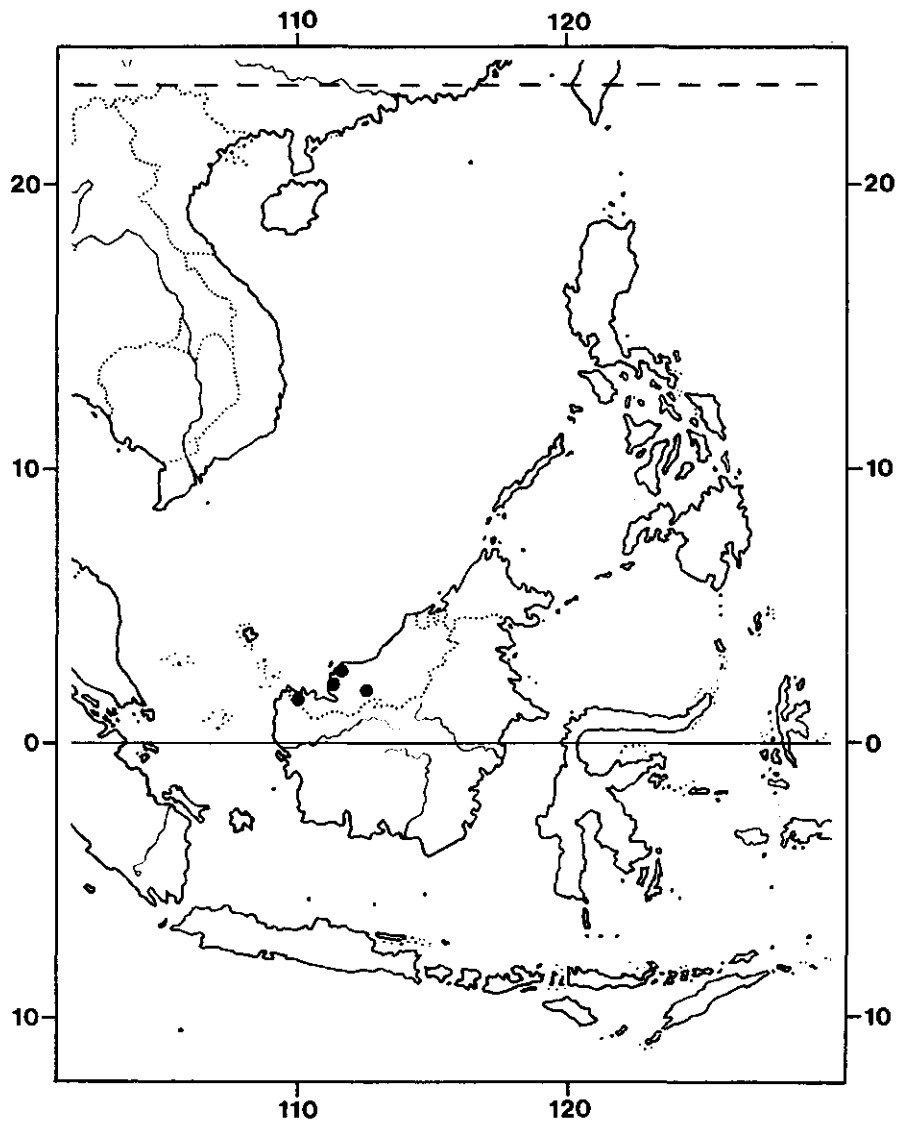
Treelet or shrub 1.5–4 m high. *Trunk* 2.5–5 cm in diameter; bark dark brown. *Branches* hollow (when dry), smooth; brachlets sulcate when dry. *Leaves*: petiole 5–20 mm long, often shorter, with 1–3 short colleters; blade coriaceous when dry, narrowly elliptic, 3–4.8 × as long as wide, 9.5–20 × 3–6 cm, equal- or subequal-sided, acuminate (acumen 7–15 mm long) or caudate at the apex, glabrous on both sides; with 8–11(15) secondary veins on each side; tertiary venation mostly invisible or obscure; domatia present, rarely absent. *Inflorescences* 0.2–0.6 × as long as the leaves, 5–8 cm long, lax, 1–2-flowered. Peduncle about 2 mm long; pedicels about 5 mm long, glabrous. *Flowers* probably fragrant. *Sepals* pale green, connate for about 1 mm, narrowly ovate, 2–3.75 × as long as wide, 4–7.5 × 2–2.5 mm (the inner narrower than the outer), acuminate at the apex, glabrous outside, sparsely puberulent inside; with 5–15 colleters in the whole flower in a single row mostly situated at the base near the edges of the sepals; colleters simple, slender, 0.5–1 mm long, obtuse at the apex. *Corolla* white; tube 4.9–8 × as long as the calyx, (20)30–37 mm long, glabrous outside, inside sparsely pubescent or tomentose; lower part (11)15–17 mm long; upper part campanulate, 1–1.1 × as long as the lower, about (8)15–20 mm long, at the mouth about 5–6 mm wide; lobes narrowly elliptic, 3.75–4.2 × as long as wide, (15–19)30–36 × (5)8–9 mm, (0.5)0.8–0.9 × as long as the tube, acute at the apex, glabrous on both sides or with some stiff hairs at the extreme base inside. *Stamens* included for (3)9–11 mm, inserted 19–22 mm from the corolla base; anthers sessile, 5–5.5 × 1–1.5 mm, with apex for about 0.5 mm sterile, outside with some stiff hairs, especially near the apex more densely so, tomentose or with some stiff hairs below the connectives inside; tails slightly curved inwards or not. *Pistil* about 22–25 mm long; disk ring-shaped, 0.5 × 1–2 mm, shorter than the ovary, obscurely 5-lobed; carpels narrowly ovoid, 2–4 × 2 mm, glabrous, abruptly narrowing into the style; style 18 mm long, glabrous; pistil head about 1–2 mm long, with a lateral receptive zone, topped by an obscurely lobed apex, adhering to the anthers. *Infructescences*: pedicels 7–10 mm long, with small lenticels; inflorescence axis with many deciduous bracts closely together, about 12–23 mm long. *Mericarps* black, very narrowly cylindrical, 10–30 × 0.4–0.6 cm, tapering into an acuminate apex, lenticellate or not, many-seeded; wall 1–2 mm thick, whitish or pale yellow. *Seeds* bearing a coma all over; grains 18–20 × 2–3 mm, minutely granulate; acuminate at the base; beak 3–11 mm long; coma white, hairs 15–30 mm long, longer than the grains (and beak); embryo whitish; cotyledons 6–10 × 1.5 mm; rootlet very short.

Distribution: Malaysia: Sarawak (Kuching).

Ecology: Swamp or heath forests. **Altitude:** Low.

Specimens examined:

MALAYSIA: SARAWAK: Benatang Distr., Matu Daro (fr. Nov.) Sanusi bin Tahir 12251 (K, L); near Kampung Samarian, 5 km W. of Kuching (fr. Jan.) Anderson & Williams S 27076 (L); Naman F.R. (fr. June) Anderson 7945 (K); *ibid.* (fl., fr. Nov.) Anderson 9300 (K); Sg. Mas, Loba Kabong P.F. (fr. Sept.) Hj. Bujang S 20865 (BO, L); *sin. loc.*, *Lobb s.n.* (K, type; MO, type photograph); *ibid.* (fr. May) Native collector 46 (A), 1241 (A, K).



MAP 13. *Kibatalia borneensis*

5. *Kibatalia elmeri* Woodson, Philipp. Journ. Sci. 60: 223. 1936, partly, excl. Mabesa FB 25726, Tamesis FB 21545, Adduru FB 25863, Ramos BS 39812

Fig. 14; Map 14

Type: Philippines: Luzon: Irosin, Elmer 15934 (MO, holotype; isotypes: A, BM, BO, BP, C, F, G, K, L, NY, P, U, UC, W, Z; WAG, photograph of US isotype); Elmer 15270 (A, BO, BP, C, F, G, K, L, MICH, MO, NY, P, U, UC, US, W, Z, paratype).

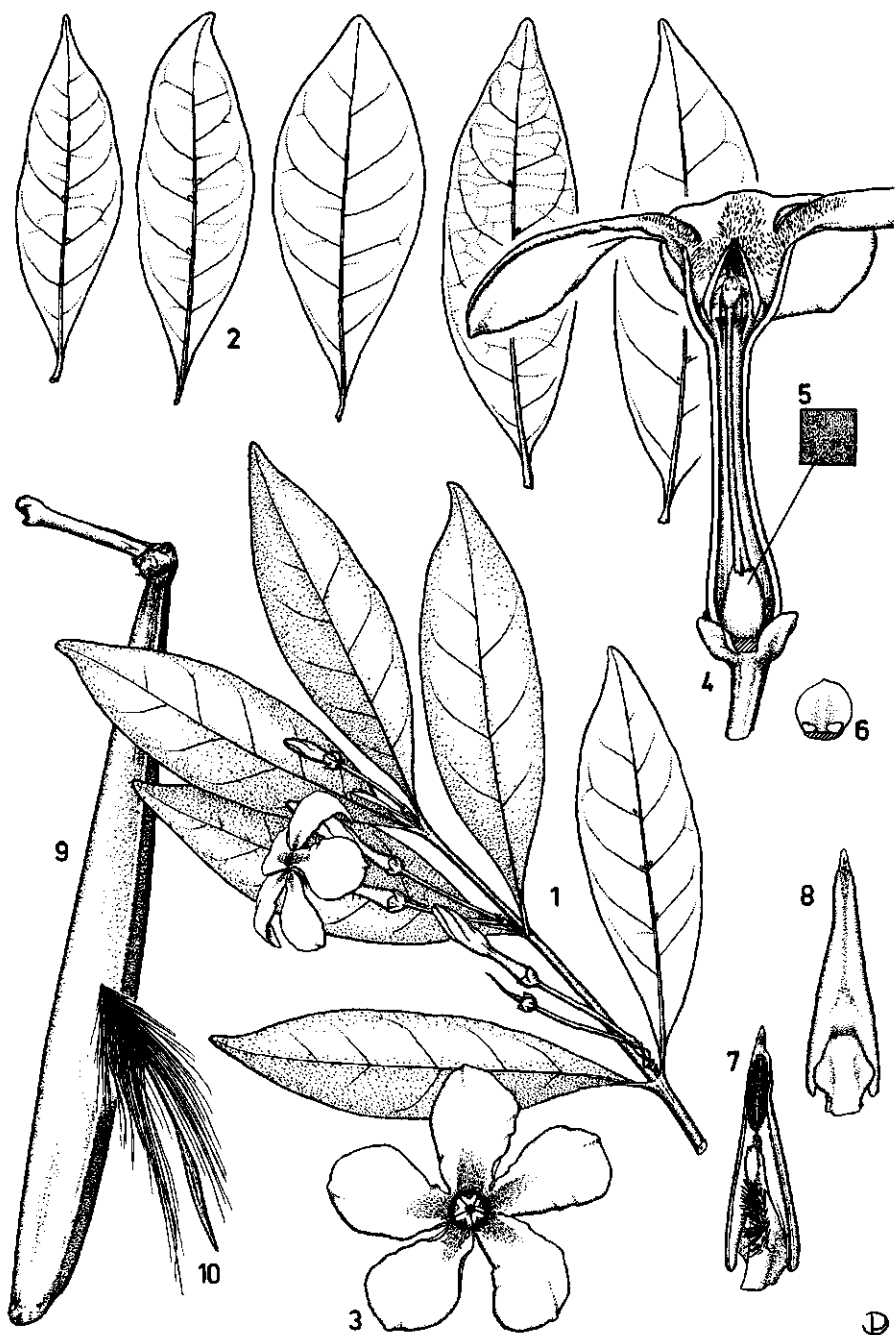


FIG. 14. *Kibatalia elmeri*. 1, flowering branch ($\times \frac{2}{3}$); 2, leaves beneath ($\times \frac{2}{3}$); 3, flower from above ($\times 1$); 4, opened flower ($\times 2$); 5, part of disk ($\times 6$); 6, sepal with colleters ($\times 2$); 7-8, stamen both sides ($\times 6$); 9, fruit ($\times \frac{2}{3}$); 10, seed ($\times \frac{2}{3}$). 1-8 from Elmer 15934; 9-10 from Elmer 15270.

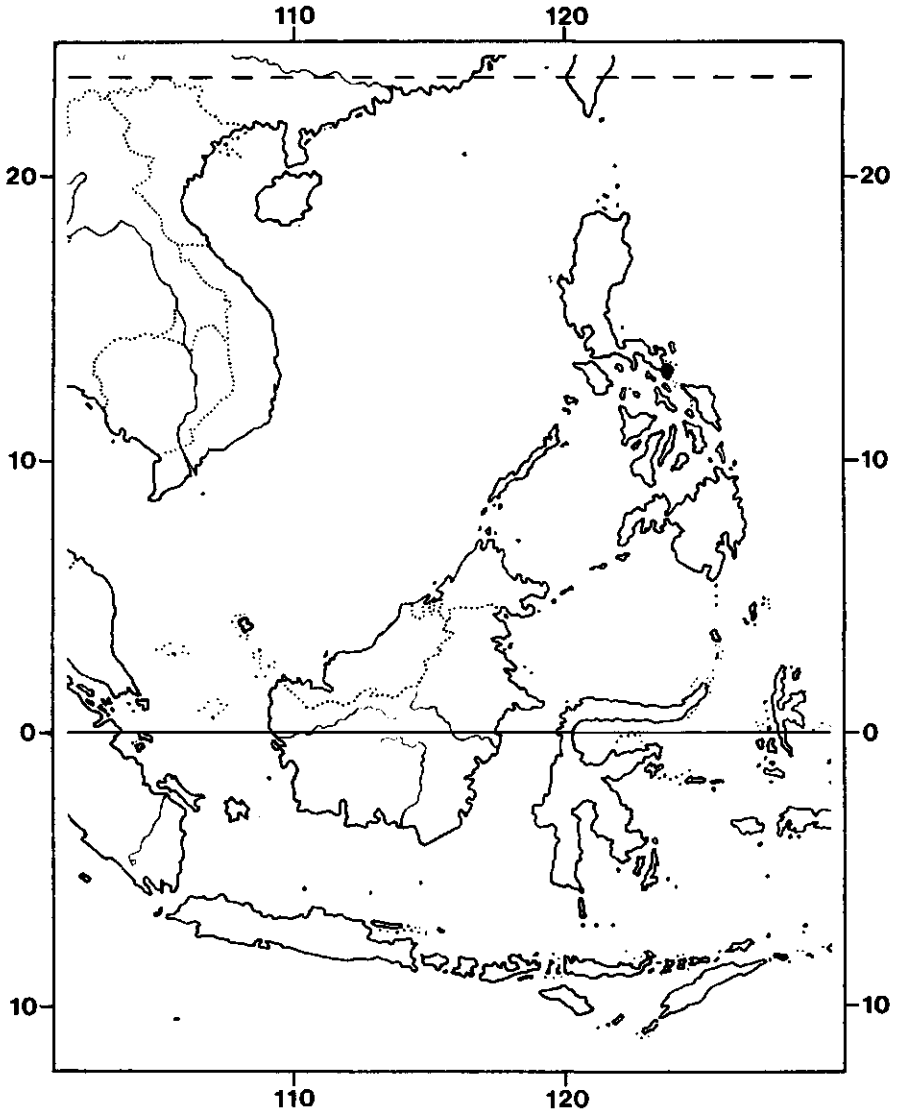
Homotypic synonym: *Kibatalia fragrans* Elmer, Leaflet Philipp. Bot. 10: 3694. 1939.

Tree 5–15 m high (according to Woodson, 1936); branches finely fissured; branchlets sulcate when dry, bark sometimes transversely fissured. *Leaves*: petiole channelled above, 4–6 mm long; colleters several, long, in a single row, persistent or less often deciduous when the leaves are shed; blade elliptic, 2.7–3.8 × as long as wide, 6–10.5 × 2–3.5 cm, equal- or subequal-sided, obtuse or sometimes acute at the apex, glabrous on both sides; with 5–7 secondary veins on each side; tertiary venation obscure; domatia present, without tufts of hairs. *Inflorescences* lax, 0.6–1.2 × as long as the leaves, 6.5–7.5 cm long, 1–6-flowered. Peduncle 4–5 mm long; pedicels 20–25 mm long, glabrous; bracts about 0.5 mm long, erect. *Flowers*: *Sepals* probably pale green, connate for about 1 mm, ovate to broadly ovate, 1–1.5 × as long as wide, 2–4.5 × 2–3.5 mm, acute or obtuse at the apex, outside glabrous or glabrate, sometimes sparsely hirt-puberulent near the apex outside, inside glabrous, with 4–8 colleters in the whole flower in a single row, flat, about 1 mm long, obtuse at the apex. *Corolla*: tube 5.7–8.3 × as long as the calyx, 23–26 mm long, glabrous outside, inside glabrous or sometimes near the apex sparsely pubescent; lower part 17–20 mm long; upper part obconical, 0.2–0.3 × as long as the lower, 5–6 mm long, at the mouth 7.5–9.5 mm wide; lobes 1.2–1.7 × as long as wide, 15–20 × 10–14 mm, 0.5–0.8 × as long as the tube, obtuse at the apex, glabrate or often glabrous outside, inside sparsely to densely hirt-pubescent near the base, furthermore glabrous. *Stamens* exerted for 0.5–3 mm, inserted 19–22 mm from the corolla base; anthers sessile, 5–6.5 × 1.5–2 mm, apex sterile for about 0.5 mm, outside glabrous or sparsely puberulent, inside glabrous or sometimes velutinous or less often sparsely pubescent near the base; tails straight. *Pistil* 21–26 mm long; disk cup-shaped, as long as or longer than the ovary, 4–5 × 2–3 mm, glabrate or sparsely puberulent outside, inside glabrous; carpels ovoid, 3–4 × 3–4 mm, glabrous; style 14–19 mm long, glabrous, persistent when the corolla is shed; pistil head 2 × 1 mm. *Infructescences*: pedicels 2.5–3.5 × 0.5–0.75 cm, dark brown, with many lenticels; peduncle 1.5–2.5 × 0.5 cm, dark brown; bracts deciduous. *Mericarps* dark grey or grey-brown, very narrowly ellipsoid or very narrowly ovoid, 10–15.5 × 1–1.5 cm, tapering into an obtuse apex; wall light brown, 2 mm thick. *Seeds*: grains minutely granulate, 20–27 × 2 mm; beak 35–45 mm long, bearing coma all over; coma pale brown; hairs 10–50 m long, longer than the grain and beak; embryo unknown.

Distribution: Philippines: Island of Luzon, Irosin, Mt. Bulusan.

Ecology: Forest in the mountains. Altitude unknown.

Vernacular names: Lanetenggubat (Tag.) or Cagpaayan (Il.), according to Woodson (1936).



MAP 14. *Kibatalia elmeri*

Specimens examined:

PHILIPPINES: LUZON: Sorsogon Prov., Irosin, Mt. Bulusan (fl. May) Elmer 15934 (A, BM, BO, BP, C, F, G, K, L, MO, NY, P, U, UC, W, Z, type), (fr. Nov.) 15270 (A, BO, BP, C, F, G, K, L, MICH, MO, NY, P, U, UC, US, W, Z, paratype).

6. *Kibatalia gitingensis* (Elmer) Woodson, Philipp. Journ. Sci. 60: 216. 1936.

Fig. 15; Map 15

Basionym: *Kickxia gitingensis* Elmer, Leafl. Philipp. Bot. 4: 1455. 1912 (as *K. gitingense*); Woodson, Philipp. Journ. Sci. 60: 216. 1936.

Type: Philippines: Island of Sibuyan, Mt. Giting-giting, Elmer 12203 (K, holotype; isotypes: BM, BO, BP, E, F, G, K, L, MO, NY, W, Z; WAG photograph of US isotype).

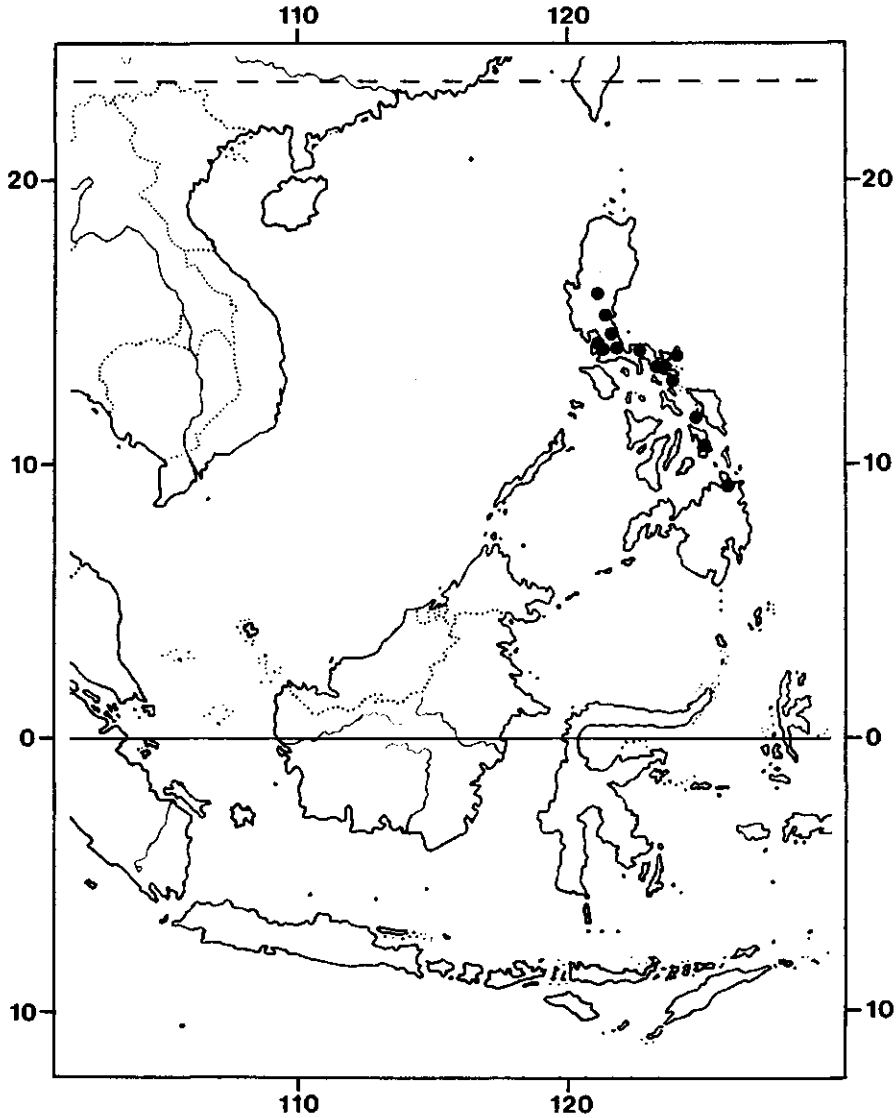
Homotypic synonym: *Vallaris gitingensis* (Elmer) Merrill, Philipp. Journ. Sci. 10(1): 70. 1915.

Heterotypic synonym: *Vallaris angustifolia* Merrill, Philipp. Journ. Sci. 7(5): 335. 1912. Lectotype: Philippines: Luzon: Sorsogon Prov.: sin. loc., Curran *FB 10507* (K).

Evergreen big tree, 4–30 m high. Trunk 5–55 cm in diameter, with short spreading buttresses; outer bark brittle, fissured, blackish, inconspicuously lenticellate; inner bark white; sapwood pale yellow, white or creamy. Branches finely longitudinally fissured, often lenticellate; branchlets slightly sulcate when dry, bark dark brown or blackish, with small lenticels. Leaves: petiole 3–7(10) mm long; colleters slender, 2–8, in 1–3 rows; blade papyraceous, often subcoriaceous when dry, narrowly elliptic, less often narrowly ovate, 3–8.1 × as long as wide, 4–10 × 0.8–4 cm, unequal-, less often equal-sided, acuminate or subcaudate with an obtuse point at the apex, cuneate at the base or decurrent into the petiole, entire or less often slightly sinuate, glabrous on both sides; costa not channeled above; with 5–8 obscure secondary veins on each side; tertiary venation invisible or obscure; with or without domatia, if present, domatia obscure. Inflorescences 0.2–0.6 × as long as the leaves, 2.5–3 cm long, congested, 4–24-flowered. Peduncle about 1–2 mm long; pedicels 8–12 mm long. Flowers fragrant. Sepals green, connate for 0.2–1 mm, ovate, 0.8–2.5 × as long as wide, 1–2.5 × 1–1.5 mm, acute at the apex, entire, glabrous outside, inside glabrous or often sparsely puberulent, ciliate at the margins, with 2–4 colleters in the whole flower at the base of the sepals, simple, slender, obtuse at the apex, rarely absent. Corolla white; tube 2.8–7 × as long as the calyx, 6–8 mm long, glabrous on both sides, except for the sparsely hirt-pubescent apex outside; lower part 4–6.5 mm long; upper part 0.1–0.25 × as long as the lower part, 1–1.5 mm long, at the mouth about 3–4 mm wide; lobes narrowly elliptic, 1–2 × as long as the tube, 1.3–3 × as long as wide, 8–12 × 3–7 mm, acute at the apex, less often obtuse, outside sparsely puberulent or glabrous, less often pubescent, inside sparsely to densely pubescent, only near the base more densely so, less often glabrous. Stamens exserted for 2–2.25 mm, inserted 5–7 mm from the corolla base; filaments about 0.3–0.5 mm long, glabrous outside, inside velutinous; anthers 2–2.25 × 0.5–0.75 mm, with apex for about 0.25 mm sterile, outside sparsely puberulent, especially along the grooves and at the apex more densely so, less often glabrous (sometimes without grooves), inside glabrous or sparsely to densely velutinous below the connectives; tails curved inwards. Pistil 7–9 mm long; disk often cup-shaped, 0.5–1 × 1 mm, 5-lobed, glabrous on both



FIG. 15. *Kibatalia gitingensis*. 1, habit ($\times \frac{1}{2}$); 2, part of flower opened out ($\times 2$); 3, part of pistil and anther lateral view ($\times 10$); 4, anther, ventral view ($\times 10$); 5, fruit ($\times \frac{1}{2}$); 6, seed ($\times \frac{1}{2}$); 7, embryo ($\times 1$). 1 from Wenzel 652; 2-4 from Dulduiao 25565; 5-6 from Ramos BS 19537; 7 from Elmer 15391.



MAP 15. *Kibatalia gitingensis*

sides; carpels ovoid, $1-1.5 \times 0.75-1$ mm, puberulent outside; style 5.5-7 mm long, glabrous; pistil head about 0.75-1 mm long. *Infructescences*: pedicels 10-15(20) mm long, with or without lenticels, bark sometimes transversely fissured; peduncle about 2 mm long; bracts persistent. *Mericarps* very narrowly ellipsoid, one fruit normally developed and the others galled, $8-25 \times 0.3-0.4$

cm, tapering into an acuminate apex, several-seeded, divergent; wall 1 mm thick, pale yellow inside. *Seeds*: grains 22–25 × 2–3 mm, glabrous, minutely granulate, acute at the base; beak glabrous for 5–10 mm, bearing an apical coma for 20–30 mm; coma brownish or whitish; hairs 10–60 mm long, longer than the grain and beak; embryo creamy; cotyledons 17–18 × 3 mm; rootlet 4–5 × 1 mm.

Distribution: Philippines: Islands of Catanduanes, Luzon (Tayabas, Sibuyan, Quézon, Biliran), Leyte and Surigao.

Ecology: Forest in the hills. Altitude: 150–525 m.

Uses: Timber production, wooden crafts, wooden shoes (bakia), tooth picks.

Vernacular names: Laniti (dialect Bis, Biliran); Laniting gubat (Laguna Prov., Luzon).

Specimens examined:

PHILIPPINES: LUZON: Laguna Prov.: Mt. Makiling (fl. May) Sulit PNH 8514 (BO); *ibid.* (fl. Apr.) Canicosa PNH 09638 (L); Makiling Nat. Park (fr. Apr.) Sulit PNH 81943 (L, PNH); Payete (fl. Apr.) Holmann 8 (GH); Famy at Bakong (fl. Apr.) Lagrimas PNH 39284 (SING). Sorsogon Prov.: *sin. loc.* (fr. July, Aug.) Ramos BS 23434 (A, BM, BO, F, GH, K, L, MO, NY, P, SING, US); *sin. loc.* (fl. June) Curran FB 10507 (K, Lectotype of *Vallis angustifolia* Merrill); Irosin, Mt. Bulusan (fr. Nov.) Elmer 15275 (A, BM, BO, C, F, K, L, MO, NY, PNH, S, U, UC, US, W, Z), (fr. Nov.) 15391 (A, BM, BO, C, F, K, L, MO, NY, U, Z), (fl., fr. Apr.) 15910 (A, BM, BO, C, F, K, L, MO, NY, S, U, UC, US, Z); *ibid.* (fr. July, Aug.) Sulit PNH 2702 (BO, L, MO, PNH, SING, UC); Irosin, Vidal 3278 (A). Camarines Sur, Agusais (fr. Oct.) Edaño 102 in BS 76127 (A, MICH, NY). Tayabas Prov.: *sin. loc.* (fr. Oct., Nov.) Manuel FB 24755 (K, US); Mt. Banajao (fr. Jan.) Ramos BS 19537 (BM, K, L, P, US); Bia-an, San Jose, at Mauban (fl. May) Duldulao 37 (A, US). Camarines Prov.: Paracele (fr. Nov., Dec.) Ramos & Edaño 33515 (A, K, P, US); Guinobatan, Palma FB 27241 (K). Quézon Prov.: Real, Llavao, at Kakabod (fl., fr. July) Lagrimas et al. 620 (L, MO), (fr. Dec.) 584 (PNH); *ibid.* (bud Apr.) Leano PAL s.n. (L, MO); at Real (fl. May) Roso 134 (L). Mindanao: Surigao Prov., *sin. loc.*, Wenzel 3504 (A, BO, C, G, K, M, MO, NY, UC, Z), (imm. fr. June) 2554 (A, BO, G, K, M, MO, NY, Z). **LEYTE:** *sin. loc.*, Wenzel 678 (US), (fl. May) 652 (A, C, F, L, MO, US). Catanduanes: *sin. loc.* (fr. March) Borja FB 28829 (A, P). Sibuyan: Capiz Prov., Magallanes, Mt. Giting-giting (fl., fr. Apr.) Elmer 12203 (BM, BO, BP, E, F, G, K, L, MO, NY, W, Z, type; WAG, photograph of US isotype). **BILIRAN:** Mt. Suiro (fl. May) Sulit PNH 21653 (L).

7. *Kibatalia laurifolia* (Ridley) Woodson, Philipp. Journ. Sci. 60: 212. 1936.

Fig. 16; Map 16

Basionym: *Trachelospermum laurifolium* Ridley, Journ. Fed. Mus. 5(3): 163. 1915. Type: Thailand: Koh Pennan, Robinson 5764 (K, holo- and isotype; P, isotype).

Homotypic synonym: *Paravallis laurifolia* (Ridley) Kerr, Fl. Siam. Enum. 2(5): 455. 1939.

Heterotypic synonym: *Paravallis microphylla* Pitard, Fl. Indo-Chine 3: 1181. 1933. Type: Vietnam (Annam), Poilane 47 (P, lectotype; isotypes: A, NY).



FIG. 16. *Kibatalia laurifolia*. 1, flowering branch ($\times \frac{2}{3}$); 2, flower ($\times 2$); 3, opened flower ($\times 2$); 4-5, anther both sides ($\times 6$); 6, opened fruit ($\times \frac{2}{3}$); 7, seed ($\times \frac{2}{3}$); 8, detail of seed ($\times \frac{12}{5}$); 9, embryo ($\times \frac{12}{5}$). 1, 6-7 from Clemens 4344; 2-5 from Leeuwenberg 12166; 8-9 from Kerr 18229.

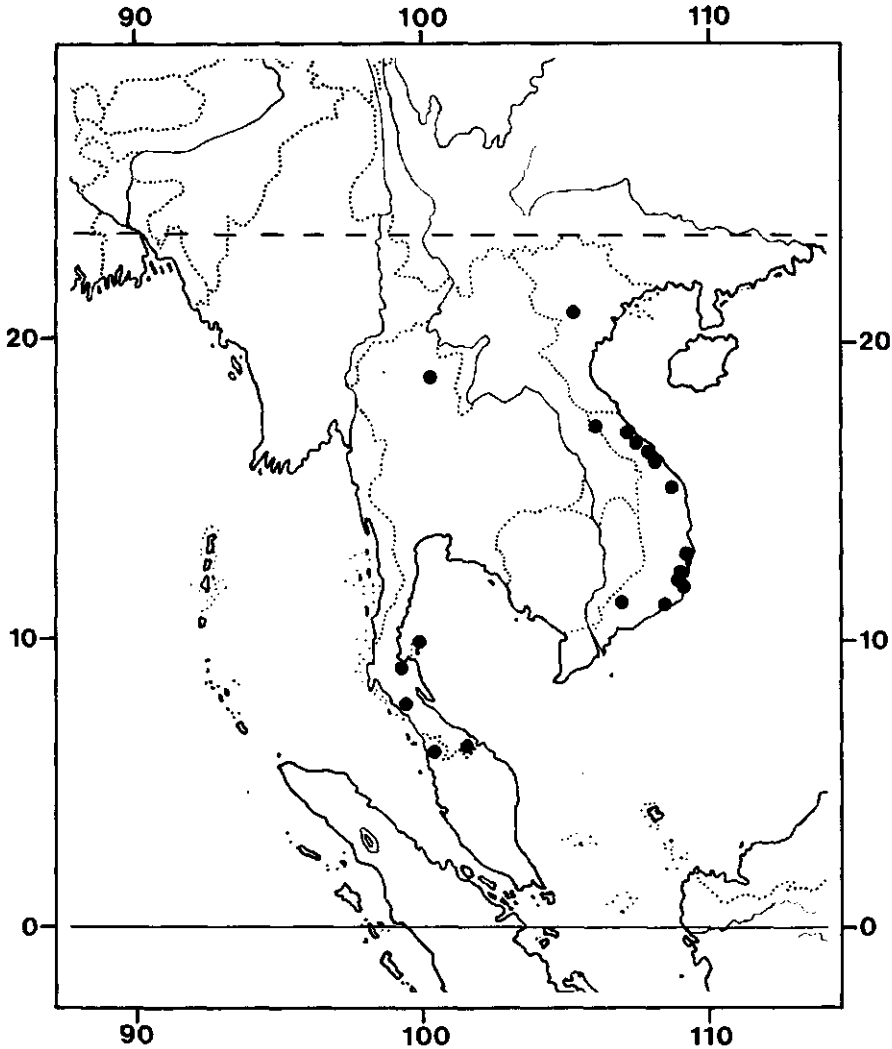
Evergreen shrub or tree 1–20 m high. *Trunk* 4–19 cm in diameter; bark rather smooth. *Branches* hollow when dry, appear from low down; branchlets slightly compressed and canaliculate at the extreme apex or not; bark sometimes transversely fissured. *Leaves*: petiole 2–6 mm long, colleters 2–15, in 1–3 rows; blade coriaceous or papyraceous when dry, narrowly elliptic or narrowly ovate, sometimes elliptic, (1.8)2.5–5.7 × as long as wide, 8–19 × 2–6 cm, unequal- or equal-sided, tapering into an acuminate or subcaudate apex with obtuse point, less often acute at the apex, glabrous on both sides, much paler beneath or not; with (6)7–14 secondary veins on each side; tertiary venation obscure; with or less often without domatia, if present, domatia consisting of pits. *Inflorescences* lax, 0.2–0.4 × as long as the leaves, 2.5–3 cm long, 1–6-flowered. Peduncle 0–5 mm long, lenticellate or not, inflorescence axis with deciduous bracts closely together and 2–5 mm long; pedicels 5–20 mm long, glabrous, less often with puberulent base; bracts erect, sometimes with ciliolate margin. *Flowers* fragrant. *Sepals* pale green, connate for 0.5–2 mm, ovate, elliptic or hemi-orbicular, 1–2.5 × as long as wide, 1.5–3 × 1–3 mm, obtuse, acute or rounded at the apex, ciliolate at the margin, outside glabrous or glabrate, inside glabrous, sometimes with glandular dots; with 4–8 colleters in the whole flower in a single row at the base of the sepals near the edges, simple, slender or flat, 0.75–1 × 0.5 mm, acute or obtuse at the apex. *Corolla* white or pale yellow; tube 11–12 mm long, 3.3–7 × as long as the calyx, mostly glabrous on both sides, sometimes only near the apex sparsely hirtio-pubescent outside and tomentose inside; lower part 8.5–11 mm long, slightly widening into a very short obconical upper part; upper part 0.09–0.2 × as long as the lower part, 1–2 mm long, at the mouth 2.5–4.5 mm wide; lobes narrowly elliptic, 0.8–1.3 × as long as the tube, 1.6–3 × as long as wide, 9–16 × 3–8 mm, acute at the apex, at the base auriculate, at the margin often sparsely ciliolate, sparsely to densely pubescent on both sides, less often puberulent outside. *Stamens* exerted for 2–2.5 mm, adnate to the mouth or not, inserted 10–12 mm from the corolla base; anthers sessile, 2.75–3.5 × 0.5–1 mm, acuminate at the for about 0.25–0.5 mm sterile apex, outside hirtio-pubescent, inside glabrous or sometimes near the base sparsely hirtio-pubescent; tails curved inwards or straight. *Pistil* 12–14 mm long, persistent when the corolla is shed; disk ring-shaped, 0.75–1 × 1–2 mm, obscurely 5-lobed; carpels ovoid, 2 × 1–2 mm, sparsely hirtio-puberulent outside, less often retuse at the apex, abruptly narrowing into the style; style filiform, 9–11 mm long, glabrous; pistil head 1–2 × 0.75 mm, glabrous or with some hirtio-pubescent. *Infructescences*: pedicels 1.5–2.5 × 0.3 cm, lenticellate, bark sometimes transversely fissured; peduncle short or obsolete, 0–0.2 cm long; bracts persistent. *Mericarps* dark grey or dark brown, cylindrical or ellipsoid, woody, 6.5–17 × 0.5–1 cm, tapering into an obtuse apex, with a raised line at each side or not, not lenticellate, many-seeded; wall 0.75–1 mm thick, pale brown or pale yellow inside. *Seeds*: grains 15–23 × 1.5–3 mm, glabrous, minutely granulate and shallowly canaliculate, acute at the base; beak glabrous for 5–10 mm, bearing an apical coma for 10–20 mm; coma whitish; hairs 30–50 mm

long, longer than the grain and beak; embryo whitish; cotyledons 16×2 mm; rootlet cylindrical, 4.5×1 mm.

Distribution: Thailand, Vietnam, and Malaysia (Continent).

Ecology: Forests, thickets, or limestone hill. Altitude: 25–500 m.

Vernacular names: Thailand: Nga Chang (Surat). Vietnam: Cay danh (Hoa Tan), Cay Banh Loi (Ile Tre), Cay Moc (Dong Che), Bhao (Nhattrang).



MAP 16. *Kibatalia laurifolia*

Specimens examined:

THAILAND: Bangao, Surat (fr. Feb.) Kerr 18229 (BM, E, K, L, MO, P, SING); Kaw Lepong, Trang (fl. Apr.) Kerr 19073 (BM, E, K, L, P); Ban Son (fl. May) Hanif & Nur 4238 (K, SING); S.W. of Koh Pennan (fl. May) Robinson 5764 (K, P, type).

VIETNAM: Tu-Phap (fl. May) Anonym. s.n. (L); Trang Bon (fl. May) Hoi s.n. (MO); Quang Tri Prov.: Ailao Pass (fl. Aug.) Poilane 24895 (P, WAG); Dong Che (fl. May) Poilane 10504 (A, K, MICH, P, paratype of *Paravallaris microphylla*). Nhatrang Prov.: Hoa Tan (fl., fr. June) Poilane 47 (A, NY, P, Lectotype of *P. microphylla*); Ile Tre, Moi village (bud, Apr.) 3066 (P, UC, paratype of *P. microphylla*); Mère et l'Enfant Mts. (fl., fr. May) 6620 (A, P, paratype of *P. microphylla*); Phu Hu (fr. Jan.) 5423 (A, F, NY, P). Hoi, north Tourane (fl., fr. Aug.) Clements 4344 (A, BM, C, G, K, MO, U, UC, Z); Mut-tin, Tourane (fl. May) Forestier 38314 (P, WAG).

MALAYSIA: Perak (fr. March) Samsuri Ahmad & Mahmud Sidek SA 649 (SING).

CULTIVATED: IVORY COAST: near Abobo (fl. Dec.) Leeuwenberg 10712 (WAG); Adiopodoumé, 17 km W. of Abidjan (fl. May) Leeuwenberg 12166 (WAG).

8. *Kibatalia longifolia* Merrill, Philipp. Journ. Sci. 17: 307. 1920; Merrill, Enum. Philipp. 3: 335. 1923 (as *K. oblongifolia*). **Fig. 17; Map 17**

Type: Philippines: Mindanao: Davao Prov., Balutakay, Santa Cruz (fl., fr. Apr.) A. de Mesa 118 in FB 27534 (A, lectotype, was isotype).

Tree up to 16 m high; trunk up to 34 cm in diameter, with white latex (?). *Branches*: branchlets dark brown, sulcate when dry. *Leaves*: petiole 6–7 mm long, channeled above; without colleters in the axils; blade elliptic or subobovate, 2.6–2.8 × as long as wide, 16–17.5 × 6–6.5 cm, acute at the apex; with 8–9 secondary veins on each side; tertiary venation obscure; domatia obsolete. *Inflorescences* about 10 cm (?) long, probably 0.5–0.6 × as long as the leaves, 1–3-flowered, lax. Peduncle short, 3–5 mm long; pedicels 30 mm long; bracts persistent. *Flowers* white, bell-shaped (teste: A de Mesa 27534). *Sepals* 0.8–1.7 × as long as wide, 4–7 × 4–5 mm, glabrous on both sides, acute or rounded at the apex, entire; colleters more or less than 7 in the whole flower, flat, retuse or obtuse at the apex. *Corolla* unknown: tube (according to Merrill, 1920): lower part 16 mm long; upper part 10 mm long, inflated, outside glabrous or sparsely puberulent, inside pubescent; lobes 40 × 4–5 mm, outside sparsely puberulent, inside puberulent. *Stamens* probably included; anthers sessile, outside glabrous, at the apex hirto-pubescent, inside hirto-pubescent below the connectives, furthermore glabrous. *Pistil*: disk 5 × 4 mm, hirto-puberulent at the apex, furthermore glabrous; ovary 6 × 4 mm, glabrous; style and pistil head unknown. *Infructescences*: pedicels 3 × 0.5 cm, rigid, glabrous. *Mericarps* dark brown, narrowly ellipsoid, 17–21.5 × 1.5–1.75 cm, tapering into an acute apex, with a raised line at each side, divergent at an angle of about 225–250°, many-seeded. *Seeds* with several tufts of hairs on suture side; grains 20–30 × 2–3 mm, glabrate, minutely granulate, acuminate at the base; beak glabrous for about 10–15 mm, bearing an apical coma for 40–50 mm; coma white; hairs 20–50 mm long, shorter than the grain (and beak); embryo pale yellow; cotyledons 20 × 3 mm; rootlet 3 × 1 mm.

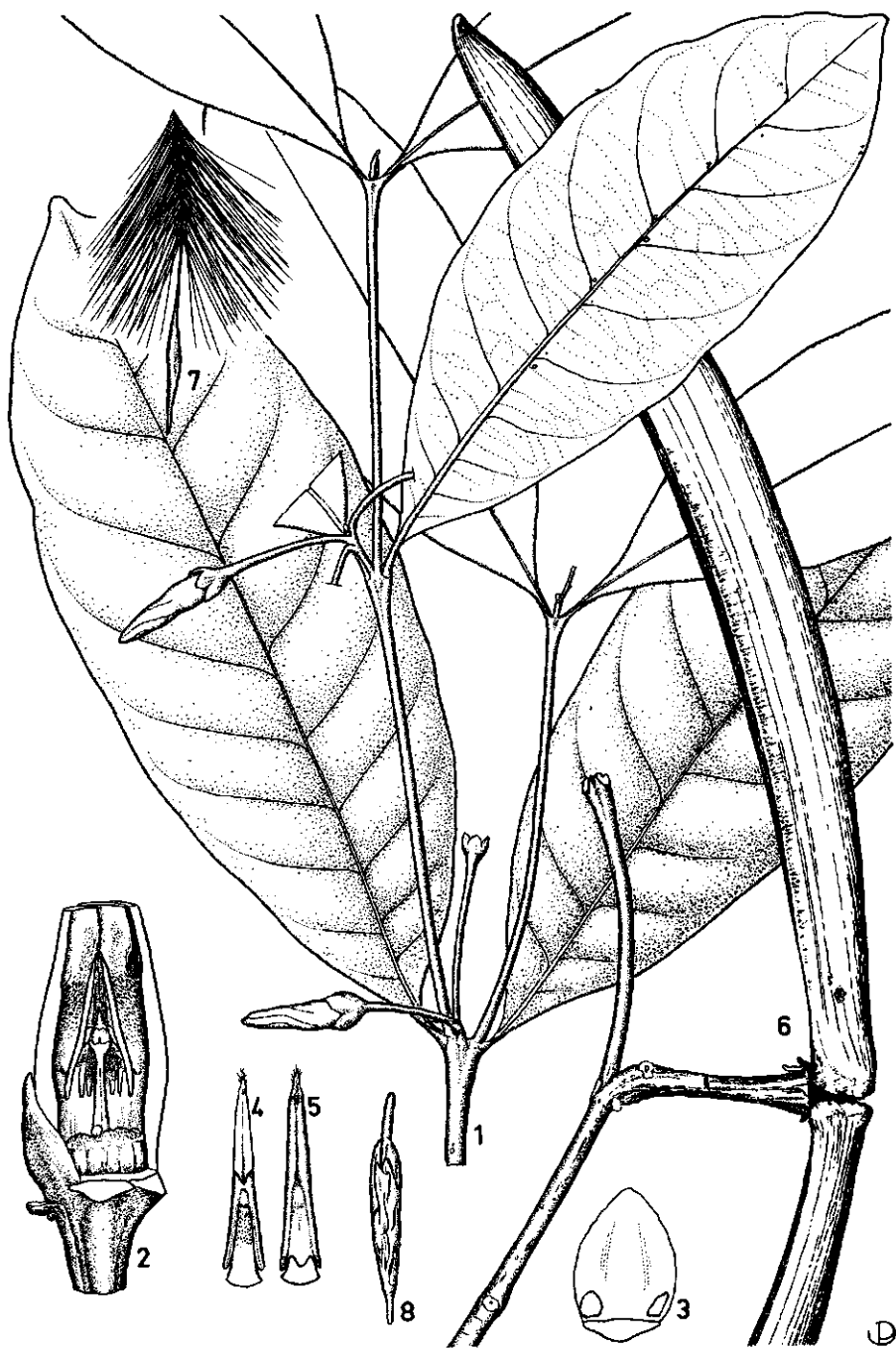
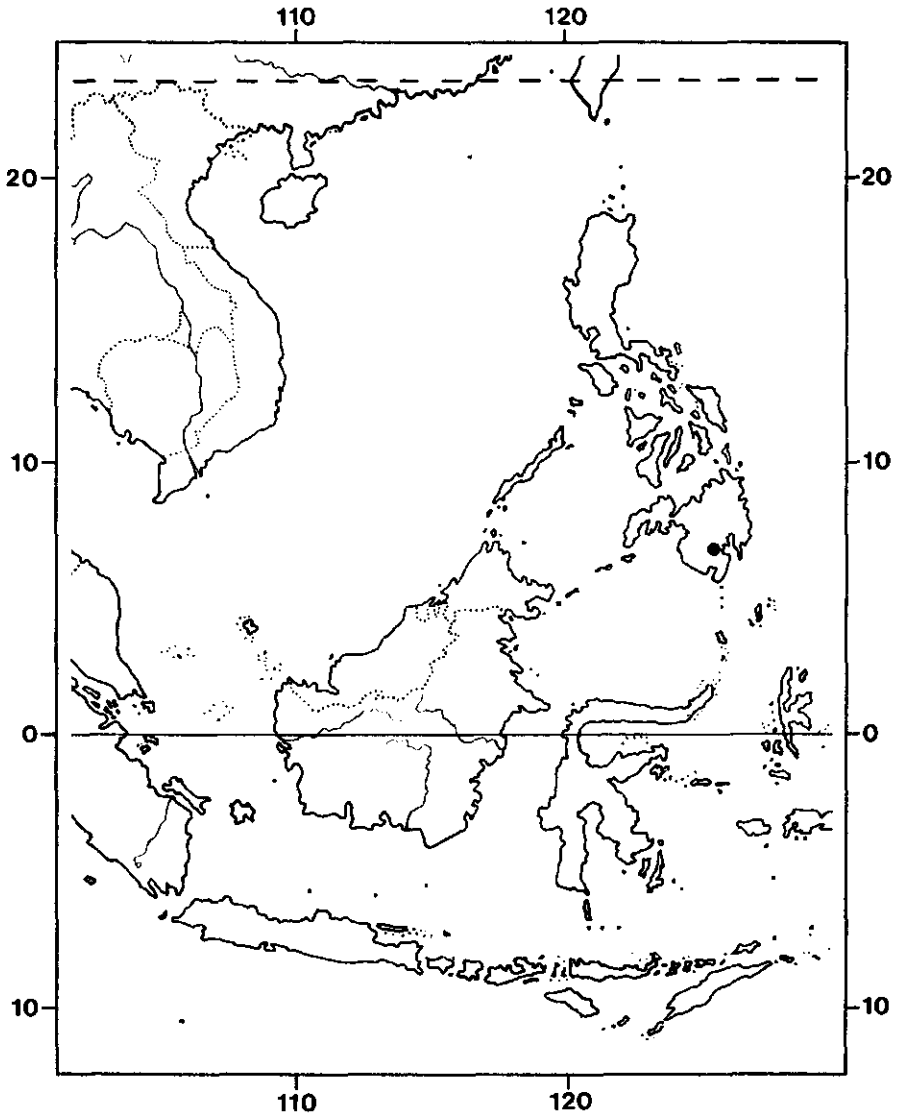


FIG. 17. *Kibatalia longifolia*. 1, flowering branch ($\times 3$); 2, part of bud ($\times 3$); 3, sepal with colleters ($\times 3$); 4, immature stamen both sides ($\times 4$); 5, immature stamen both sides ($\times 4$); 6, branchlet with fruit ($\times 3$); 7, seed ($\times 3$); 8, embryo ($\times 1\frac{1}{2}$). 1-8 from de Mesa 118.



MAP 17. *Kibatalia longifolia*

Distribution: Philippines, Mindanao Isl., Province of Davao.

Ecology: Forests (?), on deep rich soil. Altitude: 40 m.

Vernacular name: Klangnita (dialect Tagakaolo).

Only known from the type.

9. *Kibatalia macgregori* (Elmer) Woodson, Philipp. Journ. Sci. 60: 224. 1936.

Fig. 18; Map 18

Basionym: *Kickxia macgregori* Elmer, Leaf. Philipp. Bot. 4: 1457. 1912.

Type: Philippines: Island of Sibuyan, Magallanes, Elmer 12373 (K, holotype; isotypes: A, BM, BO, BP, E, F, G, L, MICH, MO, NY, W, Z; WAG, photograph of US isotype).

A rather small or middle sized *tree*; stem 20 cm thick, 8 m high or higher, branched above the middle; wood yellowish-white, very soft, bitter, odourless; bark roughened, brown when old, greyish-mottled towards the top; branches with numerous lax secondary branches, the shining portion slender and more or less drooping (copied from Elmer, 1912); branchlets sulcate when dry. *Leaves*: petiole 5–7 mm long; colleters several, in a single row, persistent when the leaves are shed; blade papyraceous or subcoriaceous when dry, narrowly ovate, 3.5–4 × as long as wide, 8–12.5 × 2–3.5 cm, equal- or less often subequal-sided, acuminate or acute, sometimes shortly caudate at the apex, cuneate at the base, glabrous on both sides; with 10–13 secondary veins on each side; tertiary venation obscure; domatia with or without several tufts of hairs. *Inflorescences* lax, 0.4–0.8 × as long as the leaves, 5.5–6.5 cm long, 1–3-flowered. Peduncle 2–3 mm long; pedicels 10–15(20) mm long; bracts 0.5–1 mm long, erect. *Flowers* odourless (Elmer, 1912). *Sepals* green, free, ovate, 1–1.5 × as long as wide, 2–3 × 2 mm, acute or acuminate at the apex, glabrous on both sides; with 3–5 colleters in the whole flower in a single row at the base of the sepals, mostly situated on the inner sepals, flat, about 1 mm long, acute at the apex. *Corolla* white (Elmer, 1912); tube 6.5–11 × as long as the calyx, (17)19–22 mm long, glabrous outside, inside densely pubescent or velutinous except for the glabrous base, lower part 13–15 mm long; upper part obconical, 0.3–0.53 × as long as the lower, 5–7 mm long, at the mouth about 4.5(8.5) mm wide; lobes narrowly elliptic, 1.2–2.1 × as long as the tube, 2–3.8 × as long as wide, 27–40 × 7–15 mm, acute at the apex, folded near the base, glabrous outside, inside glabrate or sparsely puberulent, often near the base more densely so. *Stamens* included for 1–1.5 mm, inserted 18–20 mm from the corolla base; anthers sessile, 4–4.5 × 1 mm, at apex sterile for about 0.5 mm, outside sparsely puberulent, only near the apex more densely so, inside sparsely pubescent, especially below the connectives hirt-pubescent or velutinous; tails straight. *Pistil* 17–20 mm long; disk cup-shaped, 2–2.5 × 2–3 mm; carpels ovoid, 2–3 × 1.5–3 mm, glabrous; style 12–15 mm long, glabrous, persistent when the corolla is shed; pistil head about 2 × 0.5 mm. *Fruits* unknown.

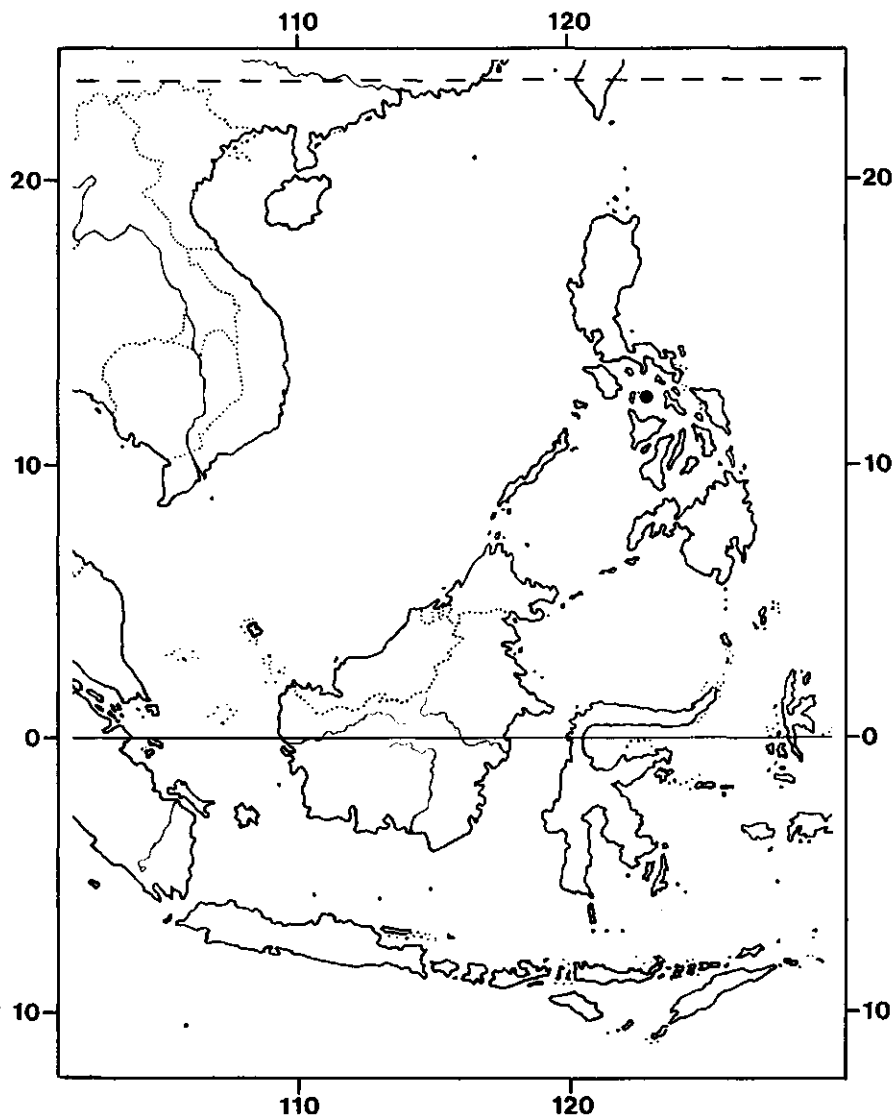
Distribution: Philippines: Island of Sibuyan.

Ecology: Forest in the mountains. Altitude: Highland.

Only known from the type.



FIG. 18. *Kibatalia macgregori*. 1, flowering branch ($\times \frac{2}{3}$); 2, leaf beneath ($\times \frac{2}{3}$); 3, opening bud ($\times \frac{2}{3}$); 4, longitudinal section of flower ($\times 3$); 5, sepal with colleters ($\times 3$); 6-7, stamen both sides ($\times 6$). 1-7 from Elmer 12373.



MAP 18. *Kibatalia macgregori*

10. *Kibatalia maingayi* (Hooker f.) Woodson, Philipp. Journ. Sci. 60: 213. 1936; Whitmore, Fl. Mal. 2: 18. 1973. **Fig. 19; Map 19**

Basionym: *Vallisneria maingayi* Hooker f., Fl. Brit. Ind. 3: 651. 1882; Gamble, Journ. As. Beng. 74(2): 461. 1907; Ridley, Fl. Mal. Pen. 3: 351. 1923.

Type: Malaysia: Malacca, Maingayi 2948, under Kew distribution number 1084 (K, holotype; isotypes: K, L); *ibid.*, Maingayi 2628 under Kew distribution number 1084 (A, GH, K, paratype).

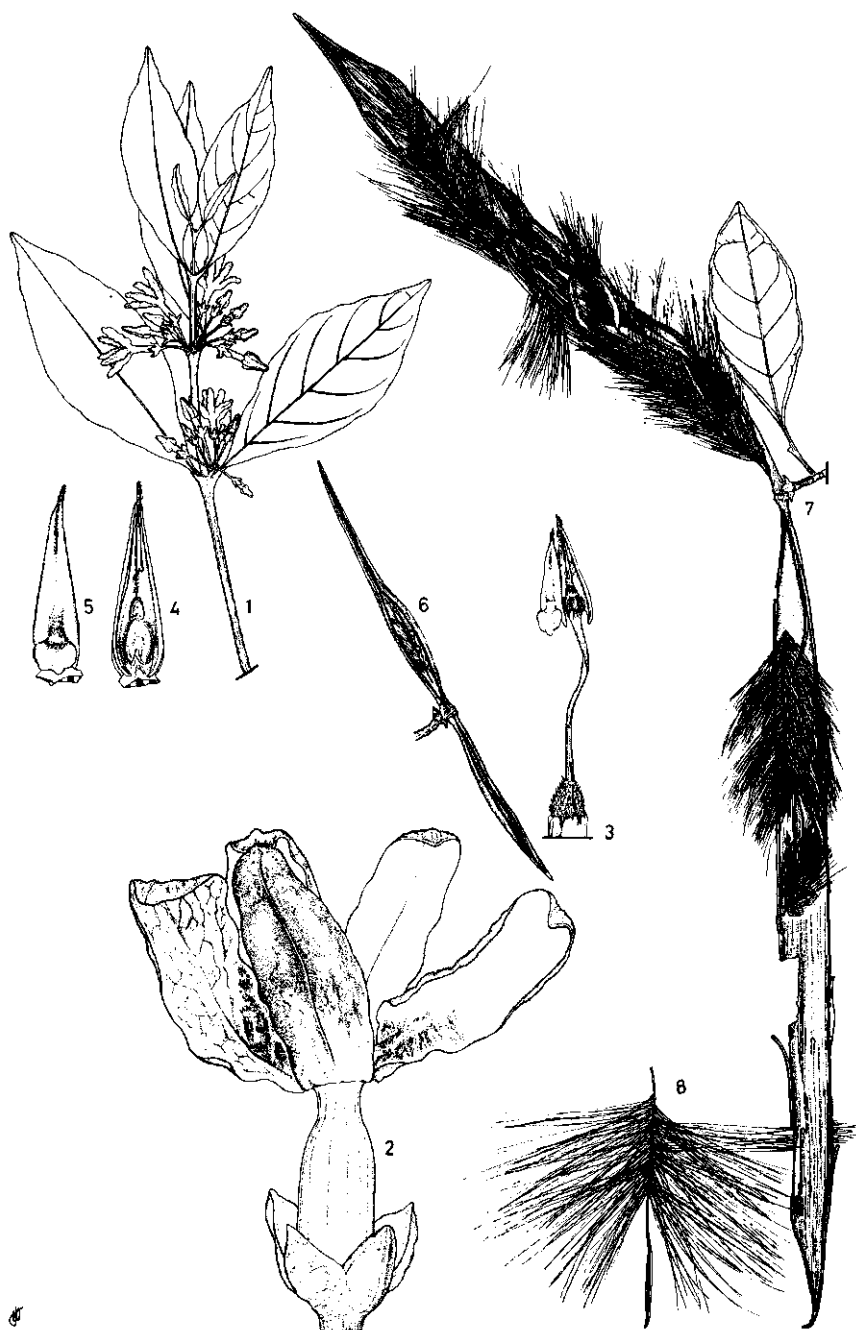


FIG. 19. *Kibatalia maingayi*. 1, habit ($\times \frac{1}{2}$); 2, flower ($\times 5$); 3, gynoecium and stamens inside and dorsal view ($\times 5$); 4, stamen, ventral view ($\times 10$); 5, stamen, dorsal view ($\times 10$); 6, fruit, small size ($\times 1$); 7, mature fruit ($\times \frac{1}{2}$); 8, seed ($\times \frac{1}{2}$). 1 from Kostermans & Anta 1096; 2-5 from Kostermans 7167; 6-7 from Dachlan 2 in bb 9898; 8 from Kostermans 6698.

Homotypic synonym: *Paravallaris maingayi* (Hooker f.) Kerr, Fl. Siam. Enum. 2(5): 456. 1939.

Heterotypic synonym: *Holarrhena daronensis* Elmer, Leaflet Philipp. Bot. 4: 1455. 1912 (as *Halorrhena daronensis*). Type: Philippines: Mindanao Isl., Davao Distr., (fr. Sept.) Elmer 11912 (K, Lectotype, was isotype; isotype: A, BM, BO, BP, E, L, MO, P, US, W). Homotypic synonyms: *Vallaris daronensis* (Elmer) Merrill, Philipp. Journ. Sci. Bot. 10(1): 70. 1915. *Kibatalia daronensis* (Elmer) Woodson, Philipp. Journ. Sci. 60: 218. 1936.

Evergreen big tree 5–40 m high; crown small, about 2 m across, light, rarely dense. *Trunk* straight, slender, 7–120 cm in diameter, sometimes with buttresses; when big buttress about 1 m high; clear bole 10–30 m high, 30–50 cm in diameter at the first branch; outer bark rough or smooth, 1–4 mm thick, often fissured or cracked, pale brown, dark grey or whitish mottled; fissures in bark 10 mm long, 5–10 mm wide; inner bark pale yellow, less often brown outside, mottled, granulate, often with sweet taste, 3–10 mm thick, inside white; sapwood moderately soft, white, straw-coloured or pale yellow, odourless, with a distinct sweetish taste (teste: Elmer 11912). *Branches* smooth, with often longitudinally and transversely fissured bark; branchlets smooth, sulcate when dry, with or without lenticels. *Leaves*: petiole 2–10 mm long, with or without colleters; if present, colleters slender, persistent or deciduous when the leaves are shed; blade coriaceous, narrowly to widely elliptic, $2.1\text{--}4.75 \times$ as long as wide, $3.5\text{--}14 \times (1)2\text{--}6$ cm, acuminate with an obtuse point, less often acute or shortly caudate at the apex, with sometimes slightly sinuate margins, cuneate at the base or decurrent into the petiole, above dark green, shiny, with or without domatia; domatia with tufts of hairs or not; with 4–7 secondary veins on each side; tertiary venation obscure. *Inflorescences* congested, $0.2\text{--}0.3 \times$ as long as the leaves, 1.5–2.5 cm long, 4–25-flowered. Peduncle 1–3 mm long, not lenticellate; pedicels 7–12(15) mm long, lenticellate; bracts very small. *Flowers* fragrant and with about the same odour as peanut (*Arachis hypogaea*) teste Dorst in bb. 1T.2P.191), less often odourless. *Sepals* green, spreading or recurved, free or connate for 0.5–1 mm, ovate, $(1)1.2\text{--}3 \times$ as long as wide, $1.5\text{--}3 \times 1\text{--}2$ mm, acute or acuminate at the apex, less often obtuse, ciliate at the margin, outside glabrous or less often pubescent, only near the apex puberulent, inside glabrous; colleters 4–15 in the whole flower in a single row at the base of the sepals, short, about 0.5 mm long, flat, retuse or rarely obtuse at the apex. *Corolla* white, pale yellow or light green; tube $2\text{--}3(4.5) \times$ as long as the calyx, 5–8(10) mm long, glabrous outside, inside sparsely to densely hirtio-puberulent except for the glabrous part near the apex; mouth about 3–4 mm wide, sparsely to densely hirtio-puberulent; lobes obovate or ovate, rarely elliptic, $(0.6)0.75\text{--}2.4 \times$ as long as the tube, $1.4\text{--}2.3 \times$ as long as wide, $6\text{--}12 \times 3\text{--}7$ mm, obtuse or acute at the apex, less often rounded, equal- or unequal-sided, slightly ciliolate at the apex, sparsely to densely pubescent on both sides, less often glabrous inside. *Stamens* exerted for 2–2.5(3) mm, inserted 5–8(10) mm from the corolla base; anthers sessile, $2\text{--}2.5(3) \times 0.75\text{--}1$ mm, with apex for about 0.25–0.5 mm sterile, outside glabrous, only along the

grooves and at the apex hirto-puberulent, inside glabrous, only below the connective hirto-puberulent; tails curved inward. *Pistil* 6–9(12) mm long; disk ring-to cup-shaped, 0.5–1.5 × 1–1.5(2) mm, 5-lobed; carpels ovoid, 1–2 × 0.75–1.5 mm, sparsely hirto-puberulent (especially near the apex outside); style 4.5–6.5(9) mm long, sparsely puberulent or glabrous, only at the extreme apex more densely hirto-puberulent; pistil head about 1 mm long, partly hirto-pubescent at the extreme base. *Infructescences*: pedicels 10–25 mm long, with or without lenticels and sometimes with transversely fissured bark; peduncle about 10–20 mm long, with lenticels or not. *Mericarps* dark brown or pale grey, bitter (teste Dorst 1T.2P 191), very narrowly cylindrical, 8–50 × 0.4–0.6 cm, tapering into an acuminate apex, glabrous, many-seeded; wall 1 mm thick, light brown inside. *Seeds*: grains glabrous, granulate, 20–35 × 1.5–3 mm, acute at the base; beak glabrous for about 5–10 mm, bearing an apical coma for 0–65 mm; coma light brown or whitish; hairs 10–80 mm long, longer than the grain (and beak); embryo creamy; cotyledons 15–20 × 1.5–3 mm; rootlet 5 × 0.5–1 mm.

Distribution: Thailand, Malaysia, Indonesia: Sumatra and Kalimantan. Philippines: Mindanao Isl.

Ecology: Evergreen lowland or montane forests, often on dry, sandy soil.

Uses: The latex is for sale (teste: Kostermans 211), the wood is used for axes shaft or knife sheath (teste: Rudjiman 242, 263, 265), the leaves are applied for spleenomegaly in the Philippines (teste: Frake 707).

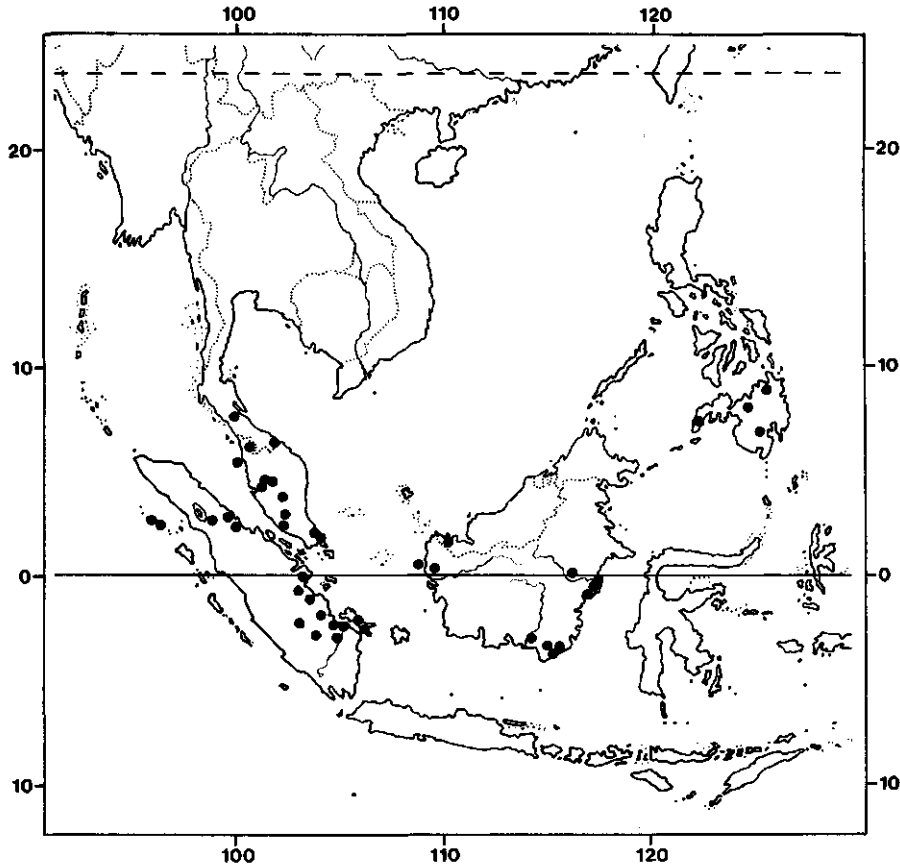
Vernacular names: Malaysia: Jelutung (Perak), Jelutung Pipit (Selangor), Jelutung Beruang (Selangor), Polai (Malacca). Indonesia: Sumatra: Bentaos susah (Palembang), Mayang Parbue (Simalungun), Mengkelai (Bangka), Pulai (Bangka), Rubi Bunga (Simalur), Rubi Item Silai (Simalur), Rubi Item (Simalur), Kayu Tambus Purun (Asahan), Kayu Nasi (Palembang), Pulai (Riau), Mentaos (Riau). Kalimantan: West: Pelai Liling (Sambas). South: Mentaos (Kintap, Barito Kuala), Bintuas (Pleiharai). The Philippines: Mindanao: Melegates (Zamboanga).

Specimens examined:

THAILAND: Kao Soi Dao, Patalung (fl. Apr.) Kerr 19237 (BM, E, L, P, SING); Bam Kaluti, Toh Moh (fl. Apr.) Herb. Kerr 787 (BM, K).

PHILIPPINES: MINDANAO Island: Davao Distr., Todaya, Mt. Apo (fr. Sept.) *Elmer 11912* (A, BM, BO, BP, E, K, L, MO, P, US, W, type of *Holarrhena daronensis* Elmer); Lake Lanao, Camp Keithley (bud. May) Clemens s.n. (F); Zamboanga, Dikus (fr. Jan.) Frake 707 (L); Agusan Prov., along vitus creek (fr. Aug.) Genova FB 30451 (NY, UC, W).

MALAYSIA: PENANG: Government Hills (fl. March) Curtis 1767 (K, SING); Batu Feringgi (fr. Sept.) Guard 12569 (BM, K, SING); (fl. March) Curtis 2748 (BM, K, SING). PERAK: Chickees F.R. (fr. Oct.) Watson 32675 (A, K, L, SING); Ulu Geroh R., E. of Gopeng, Bertam, NG 1554 (L, SING); Koh Mai F.R. (fl. Apr.) Kiah 35217 (A, K, SING). SELANGOR: Low Hills (fl. Apr.) Cubutti C. 7. 964 (SING); Ulu Langat (fl. May) Gadoh anak Umbai 2132 (K). PAHANG: Betong, Raka Hills F.R., Kochummen 16130 (K, L); Road State (fl. Apr.) Watson 1862 (SING). NEGRI SEMBILAN: Gunung Angsi (fl. Apr.) Watson 1885 (SING). MALACCA (fl. Apr.) Maingayi 2948 (under Kew distribution number 1084, small leaved specimens) (K, holotype; isotype: K, L); *ibid.*, Maingayi 2628 (under Kew distribution number 1084, large leaved specimens) (A, GH, K, paratype); *sin. loc.*, Maingayi 1069 (K). JOHORE: Sungai Segun, Gunung Panti (fl. Apr.) Corner s.n. (SING); Penya-



MAP 19. *Kibatalia maingayi*

bong (fl. May) Foxworthy C.7. 1174 (K, SING). SARAWAK: Kuching, Semengoh F.R. (fl. May) Galau S 15637 (BO, K, L, SING); *ibid.*, (fl. May) Banying anak Nyudong S 13953 (BO, L); *ibid.*, (fl. June) Asah 12725 (A, BO, K, L); *ibid.*, Penrissen Road (fl. Apr.) Othman et al. S 37185 (K, L, MO).

INDONESIA: SUMATRA: NORTH: Kuala near Kampung Lundet (fl. March) Bartlett 7124 (F, G, L, MICH, NY); Tor Matutung, Asahan (fr. July) Rahmat si Boeea 9509 (A, F, G, K, L, MICH, NY, UC); Simalungun, Gaja 15 in bb 3077 (BO, BZF, L). SIMALUR Isl.: (fr. June) Ahmad 1182 (BO, BZF, L, U), (fr. Oct.) 719 in bb 3355 (BO, BZF, L), (fl. Dec.) 771 in bb 3395 (A, BO, BZF, L); Tapah, Ahmad 1651 in bb 4751 (BO, BZF, L). RIAU: Muara Pejangki (fl. Apr.) Buwalda 62 in bb 27481 (A, BO, L) (fl. Apr.) 6493 (A, BO, L, NY); Kw. Keritang, Buwalda 479 in bb 28702 (A, BO, L). SOUTH: BANGKA: Lobak besar (fl. Oct.) Kostermans & Anta 1096 (A, BO, L, SING); *ibid.* (bud Sept.) Kostermans 118 in bb 34055 (A, AAU, BO, BZF, G, L); (fl. Oct.) 1074 (A, BO, BM, L, SING); Mangkol Mt. (fl. Sept.) Kostermans 784 (A, BO, L); Bakung village (fl. Oct.) Kostermans 211 in bb 34145 (BZF, K, L). Palembang Distr.: Rawas, Anonym. 990 (BO); *ibid.* (fl. May) Dumas 1553 (BO, K, L, U); *ibid.*, Grashoff 990 (BO); near Bayung Lincir and Banyuasin (imm. fr. Oct, mature fr. Dec.) Dorst IT.191 (BO, BZF); Lematang Ilir, Gunung Magang village, Dorst T.3P.963 (A, BO, BZF); Musi Ilir, Ipil village (fl. Apr.) Lunel 18 in TB 1082 (BO, BZF). KALIMAN-

TAN: WEST: Lemukutan Isl., Hallier 360 (BO, L, U); Mt. Senjunjuh, Sambas, Perigi Limus village, De Jong 181 in bb 7051 (BO, BZF). SOUTH: Kintap village, Tanah Laut Distr. (fl. Oct.) Busri 31 in bb 5532 (BO); *ibid.*, Rudjiman 242 (Herb. Fak. Kehutanan UGM, Yogyakarta); N. of Pandansari village, Subdistr. Kintap, Distr. Tanah Laut (imm. fr. Apr.) Rudjiman 265 (Herb. Fak. Kehutanan UGM Yogyakarta); near Salaman village, Subdistr. Kintap (fr. Apr.) Rudjiman 263 (Herb. Fak. Kehutanan UGM Yogyakarta); Jilatan village, Tanah Laut Distr. (fr. May) Dachlan 2 (BO, BZF); Terusan village (fl. May) Abar bin Adau 74 (BO, BZF). EAST: Loa Janan, W. of Samarinda (fr. Apr.) Kostermans 6698 (L, SING); Tanjung Bangko, near mouth of Mahakan R. (fl. fr. June) Kostermans 7167 (A, BO, L, SING, WAG); Central Kutei, Belayan R., near Kembang Janggut (fl. May) Kostermans 10689 (A, BM, BO, L, WAG); Balikpapan (fr. Feb.) Kostermans 10051 (BM, BO, L, SING); *ibid.*, near Mentawir village (fr. March) Kostermans 10159 (BO, L, SING).

CULTIVATED: SINGAPORE: Bot. Gard. (fl. Apr.) Hassan 36262 (BM, K, PNH, SING); *ibid.* (fl. Apr.) Nur 35849 (A, BM, K, PNH, SING); *ibid.*, Ridley 4917 (BM, K, L).

11. *Kibatalia merrilliana* Woodson, Philipp. Journ. Sci. 60: 225. 1936.

Fig. 20; Map 20

Type: Philippines: Leyte, Wenzel 330 (BM, holotype; isotypes: A, F, G, GH, L; WAG, photograph of US isotype)

Tree 6–7 m high. *Trunk* 10–12 cm in diameter. *Leaves*: petiole 2–5 mm long; colleters several, long; blade coriaceous, elliptic, 2.5–3.4 × as long as wide, 7.5–13.5 × 2.5–4.5 cm, acuminate with obtuse point at the apex, glabrous on both sides; with 6–8 conspicuous secondary veins on each side; tertiary venation obscure; domatia present. *Inflorescences* lax, 0.6–1.2 × as long as the leaves, 9–9.5 cm long, 1–2-flowered. Peduncle about 4–5 mm long; pedicels about 20–25 mm long, glabrous; bracts about 1 × 1 mm, ovate, acute at the apex, glabrous on both sides. *Flowers* fragrant. *Sepals* probably pale green, free, ovate, 0.7–1.5 × as long as wide, 3–5 × 2–5 mm, acute, obtuse or rounded at the apex, glabrous on both sides; with 4–10 colleters in the whole flower, at the base of the sepals, being flat, simple, about 1 mm long and acute at the apex. *Corolla* white; tube 7–9 × as long as the calyx, 34–37 mm long, glabrous outside, inside glabrous, except for the pubescence near the apex; lower part 27–28 mm long; upper part campanulate, 0.25–0.3 × as long as the lower part, 7–9 mm long, at the mouth about 10–12 mm wide; lobes obovate, 0.6–0.9 × as long as the tube, 1.3–1.7 × as long as wide, 25–33 × (12)17–23 mm, obtuse at the apex, folded at the base or not, outside glabrous, inside sparsely hirtopubescent near the base, furthermore glabrous. *Stamens* exerted for 1–3 mm, inserted about 29–30 mm from the corolla base; filaments 0.5–1 mm long, glabrous; anthers 6–7 × 1.5–2 mm, with apex for about 0.5 mm sterile, outside glabrous, only along the grooves with some puberulence, inside sparsely hirtopubescent; tails straight. *Pistil* 30 mm long; disk urceolate, 8 × 5 mm, longer than the ovary, 5-lobed, minutely puberulent outside; carpels ovoid, about 7 × 4.5 mm, glabrous; style filiform, 20 mm long, glabrous; pistil head about 3 mm long. *Fruits* immature; peduncle 7.5 mm; pedicels 35–45 × 4 mm, glabrous.

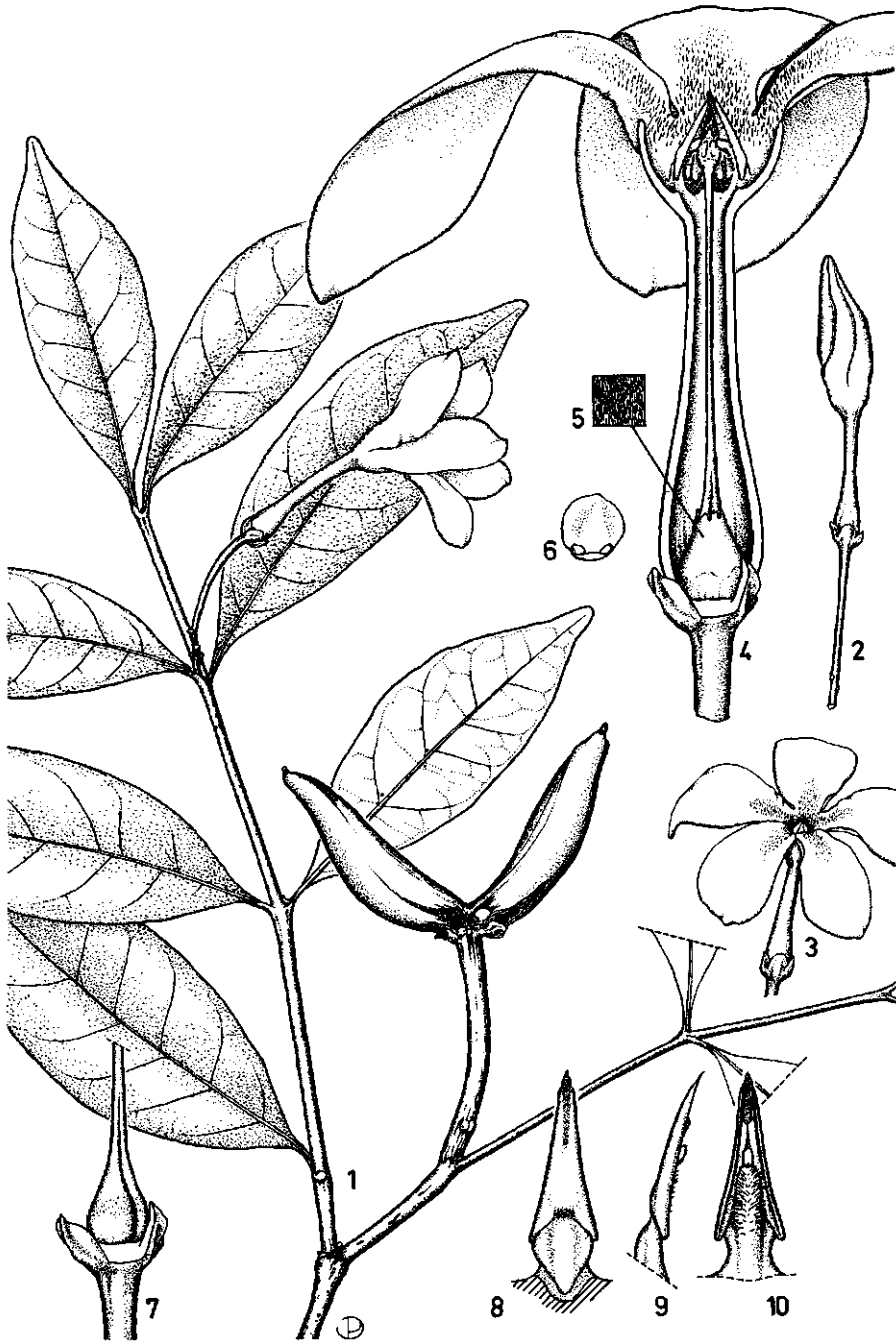
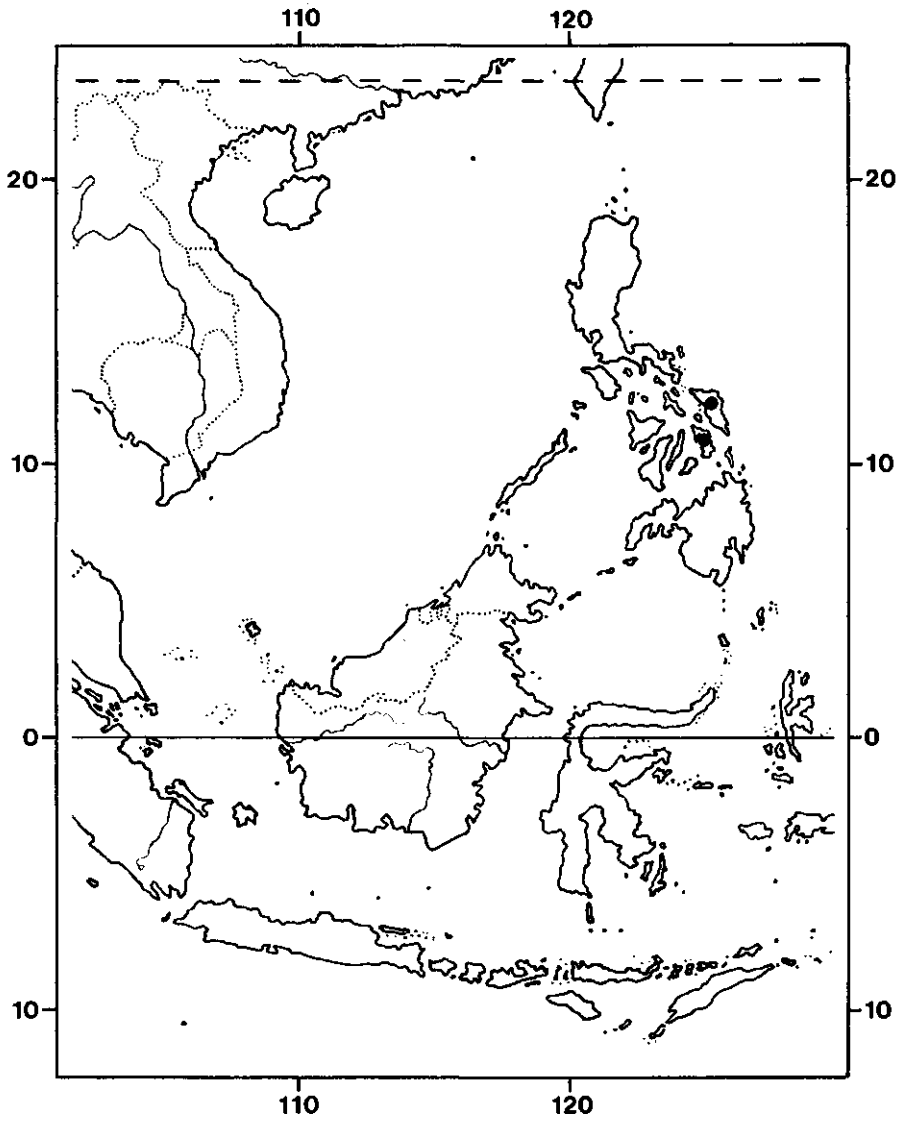


FIG. 20. *Kibatalia merrilliana*. 1, branch with flower and young fruit ($\times \frac{2}{3}$); 2, flower bud ($\times \frac{2}{3}$); 3, flower ($\times \frac{2}{3}$); 4, opened flower ($\times 2$); 5, part of disk ($\times 6$); 6, sepal with colleters ($\times 2$); 7, part of calyx with ovary (disk removed) ($\times 2$); 8-10, stamen three sides ($\times 4$). 1-3 from Sulit & Conese PNH 6241; 4-10 from Wenzel 330.



MAP 20. *Kibatalia merilliana*

Specimens examined:

PHILIPPINES: SAMAR Isl.: Tabokan, Liquilocon, Wright (fl., imm. fr. May) Sulit & Conese 2855 in PNH 6241 (A, L, PNH, SING). LEYTE: sin. loc. (fl. July) Wenzel 330 (A, BM, F, G, GH, L, type; WAG, photograph of US isotype).

12. *Kibatalia puberula* Merrill, Philipp. Journ. Sci. 30: 423. 1926; Woodson, Philipp. Journ. Sci. 60: 223. 1936. **Fig. 21; Map 21**

Type: The Philippines: Samar Isl., McGregor BS 43767 (UC, lectotype, was isotype; isotype: NY).

Evergreen tree 6–10 m high. *Trunk* 15–20 cm in diameter. *Branches:* branchlets sulcate when dry, pale grey or pale brown. *Leaves:* petiole 3–5 mm long; colleters about 5–6, short; blade papyraceous or coriaceous when dry, elliptic, less often ovate or obovate, 1.5–2.2 × as long as wide, 11–17.5 × 5.5–9.5 cm, mostly equal-sided, obtuse, acuminate or acute at the apex, at the base rounded or cuneate, glabrous above, beneath sparsely puberulent, especially on the midrib and secondary veins more densely so, glabrescent; costa with several lenticels beneath, with 8–12 secondary veins on each side; tertiary venation obscure, seemingly parallel; several domatia. *Inflorescences* mostly solitary, 0.5–0.9 × as long as the leaves, 9.5–10 cm long. *Peduncle* about 2–5 mm long; *pedicels* about 20–30 mm long, glabrous or sparsely puberulent. *Flowers* fragrant. *Sepals* probably pale green, free, ovate, 0.6–2 × as long as wide, 2–4 × 2–4 mm, acute or acuminate at the apex, ciliate at the margin, outside sparsely puberulent or pubescent, near the base more densely so, inside glabrous; with 5–15 colleters in the whole flower in a single row at the base of the sepals, slender or flat, simple, obtuse or retuse at the apex. *Corolla* white; tube 5.6–11.5 × as long as the calyx, 18–23 mm long, outside glabrous, inside sparsely hirto-pubescent or puberulent; lower part about 6–6.5 mm long; upper part (2)2.4–2.8 × as long as the lower, (12)16–17 mm long; at the mouth about 4–5 mm wide; lobes narrowly elliptic, 1.7–2.6 × as long as the tube, 3.5–5 × as long as wide, (33)40–48.5 × 9–13 mm, acute or acuminate at the apex, outside glabrous or sparsely puberulent, except for the sparsely to densely hirto-pubescent base, inside glabrous, only near the base sparsely hirto-pubescent or puberulent. *Stamens* included for (5)8–9.5 mm, inserted (6)7.5–8 mm from the corolla base; anthers sessile, 6.5 × 1.5–2 mm, apex for about 0.5 mm sterile, outside glabrous, only sparsely to densely hirto-pubescent along the grooves, inside glabrous; tails straight. *Pistil* 10–15 mm long; disk ring- or cup-shaped, 2 × 2–3 mm, shorter than the ovary, glabrous on both sides, except for the hirto-pubescent apex; carpels ovoid, 3–3.5 × 2–2.5 mm, glabrous or with several stiff hairs at the apex; style 5.5–9.5 mm long; pistil head 1.5–2 mm long. *Fruits* unknown.

Distribution: Philippines: Island of Samar.

Ecology: Dipterocarp forests or river banks, sometimes on rocky hills. Altitude: 100–250 m.

Vernacular name: Lanete (dialect Bis).

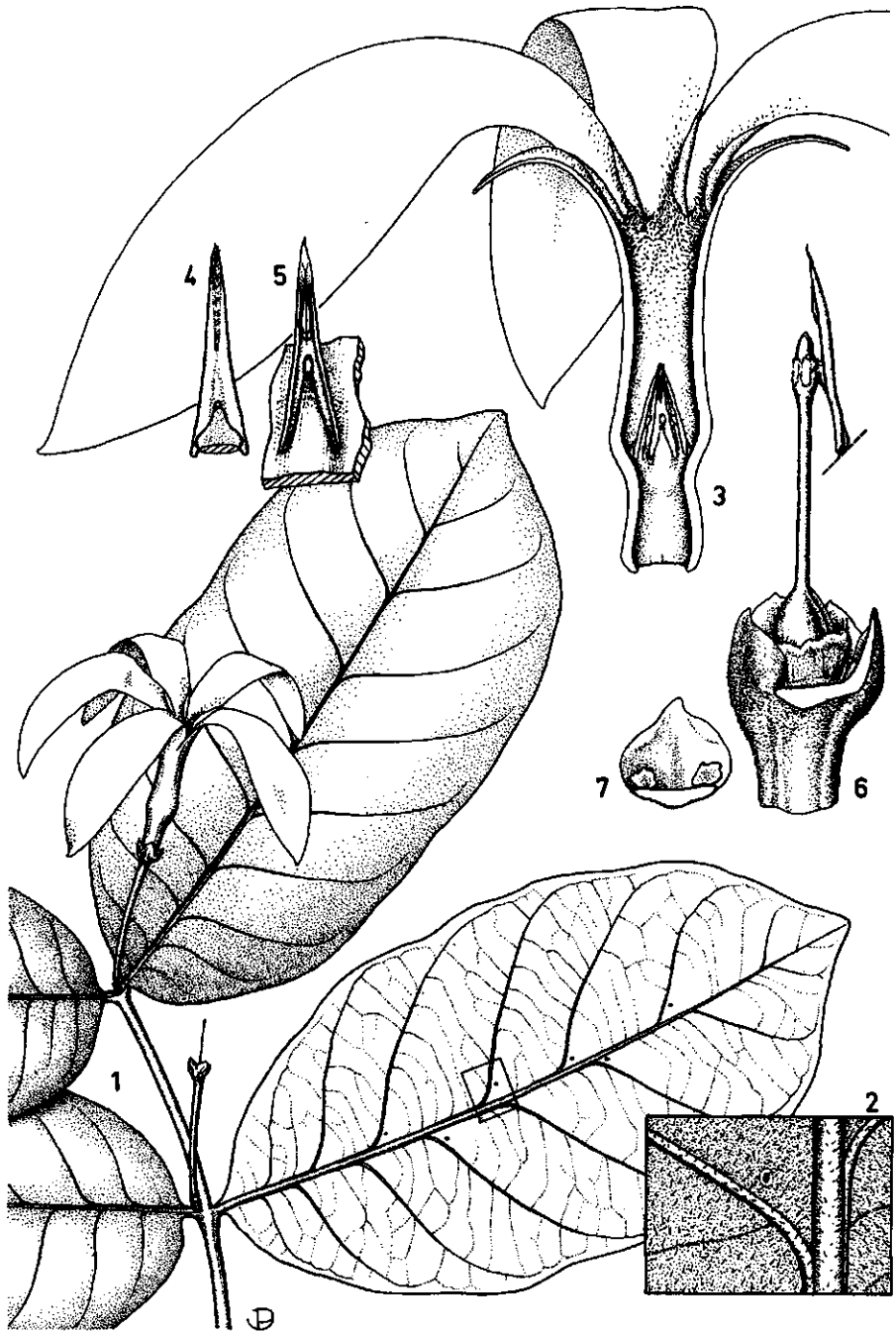
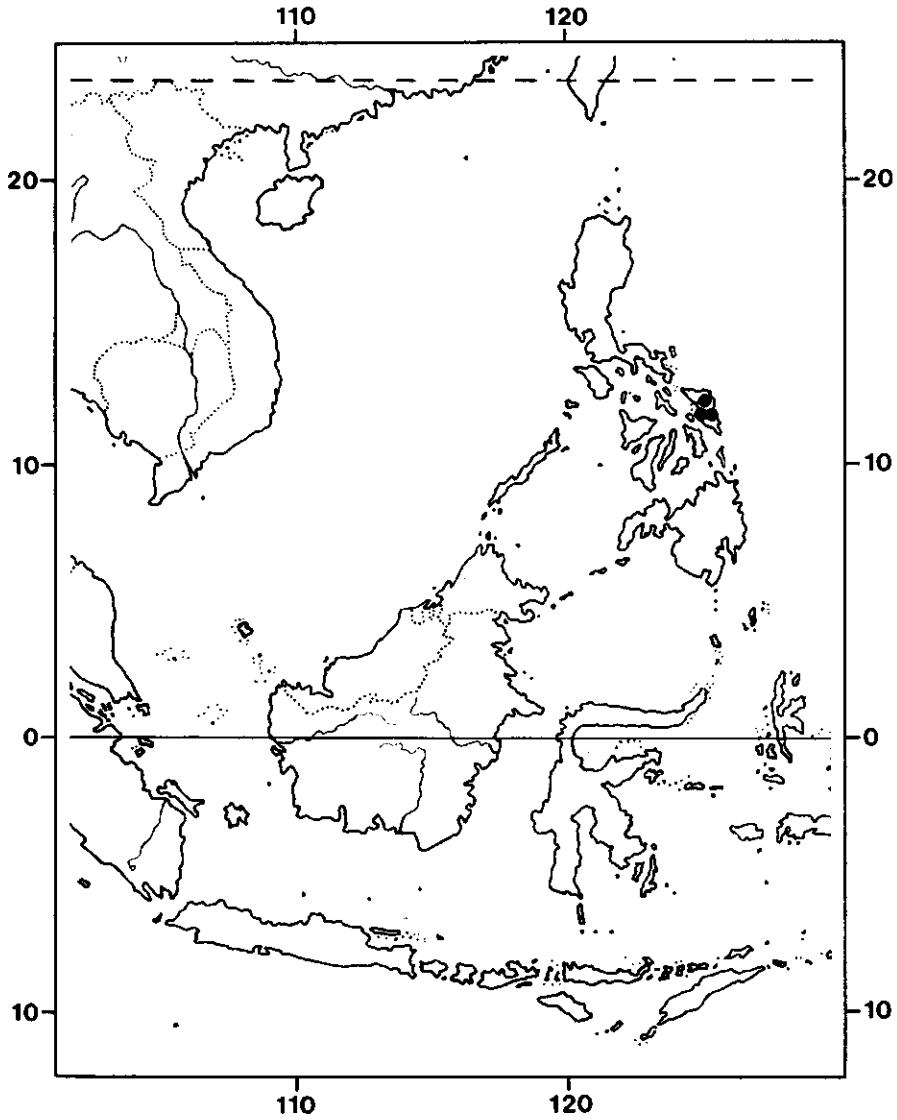


FIG. 21. *Kibatalia puberula*. 1, flowering branch ($\times \frac{2}{3}$); 2, leaf beneath (detail with domatium) ($\times 4$); 3, longitudinal section of corolla ($\times 2$); 4-5, stamen both sides ($\times 4$); 6, calyx with pistil and one stamen ($\times 4$); 7, sepal with colleters ($\times 4$). 1-7 from Sulit PNH 6293.



MAP 21. *Kibatalia puberula*

Specimens examined:

PHILIPPINES: SAMAR Isl.: Wright, Mt. Malingon (fl. Apr., May) Sulit PNH 6180 (BO, L, PNH, SING); Bagacay, Concord (fl. Apr., May) Sulit 2766 in PNH 6293 (A, L); Loquilocon (fl. June) McGregor BS 43767 (NY, UC, type).

13. *Kibatalia stenopetala* Merrill, Philipp. Journ. Sci. 17: 308. 1920; Woodson, Philipp. Journ. Sci. 60: 219. 1936. **Fig. 22; Map 22**

Type: Philippines: Mindanao Isl., Ramos & Pascasio 34691 (A, lectotype, was isotype; isotypes: BM, BO, K, L, P; WAG, photograph of US isotype).

Heterotypic synonym: *K. luzonensis* Woodson, Philipp. Journ. Sci. 60: 218. 1936. Type: Philippines: Luzon Isl., (fl. June) Rivera & Duyag 75041 (holotype not seen, probably destroyed in PNH; isotype: UC).

Tree, about 5–10 m high; branches nearly black when dry, glabrous, obscurely lenticellate (copied from MERRILL (1920) and WOODSON (1936)); branchlets sulcate when dry, bark sometimes transversely fissured. *Leaves*: petiole 2–5 mm long; colleters several, persistent when the leaves are shed; blade coriaceous or less often papyraceous when dry, elliptic to narrowly elliptic, often subobovate, 2–4.7 × as long as wide, 5–10 × 1.75–4.25 cm, obtuse or acuminate with an obtuse point at the apex, less often acute, at the base cuneate or decurrent into the petiole, glabrous on both sides; with 5–8 secondary veins on each side; tertiary venation obscure; domatia present or not. *Inflorescences* 4.5–7 cm long, 0.5–1 × as long as the leaves, 1–4-flowered. Peduncle 0–3 mm long; pedicels 9–22(25) mm long. *Flowers*: *Sepals* broadly ovate, free, 1–1.3 × as long as wide, 1.5–2 × 1.5 mm, acute at the apex, entire, glabrous on both sides; colleters absent. *Corolla* white (according to Merrill in Woodson (1936)); tube cylindrical, 10–16 mm long, 5–10.6 × as long as the calyx, glabrous outside, inside glabrous, except for the sparsely hirtopubescent upper part; lower part 4–5 mm long; upper part 5–12 mm long, 1–3 × as long as the lower part, mouth about 2–2.5 mm wide; lobes narrowly elliptic 1.5–3.3 × as long as the tube, 7.5–10 × as long as wide, 25–33 × 3–4 mm, acuminate at the apex, glabrous outside, inside glabrous, only sparsely puberulent near the base. *Stamens* included for 7–8 mm, not connivent into a close cone, inserted 4–5 mm from the corolla base; anthers sessile, 5–6 × 1 mm, with apex about 1 mm sterile, glabrous on both sides, except for the few stiff hairs along the grooves outside and below the connectives inside; tails curved towards each other. *Pistil* 7 mm long; disk ring-shaped, about 1 × 2 mm, shallowly 5-lobed; carpels ovoid, about 2 × 2 mm, glabrous; style 3 mm long, glabrous; pistil head about 2 × 1 mm. Mature *fruits* unknown.

Distribution: Philippines: Islands of Mindanao and Luzon.

Ecology: Forest in the mountains. Altitude: Low (MERRILL, 1920).

Specimens examined:

PHILIPPINES: Luzon Isl.: Cagayan Prov., Mt. Babatingin (fl. May) Edaño FB 79430 (A); Laguna Prov., Majayjay (fl. June) Rivera & Duyag BS 75041 (UC, type of *K. luzonensis*). MINDANAO Isl.: Surigao Prov., (fl. fr. June) Ramos & Pascasio BS 34691 (A, BM, BO, K, L, P, type; WAG, photograph of US isotype).

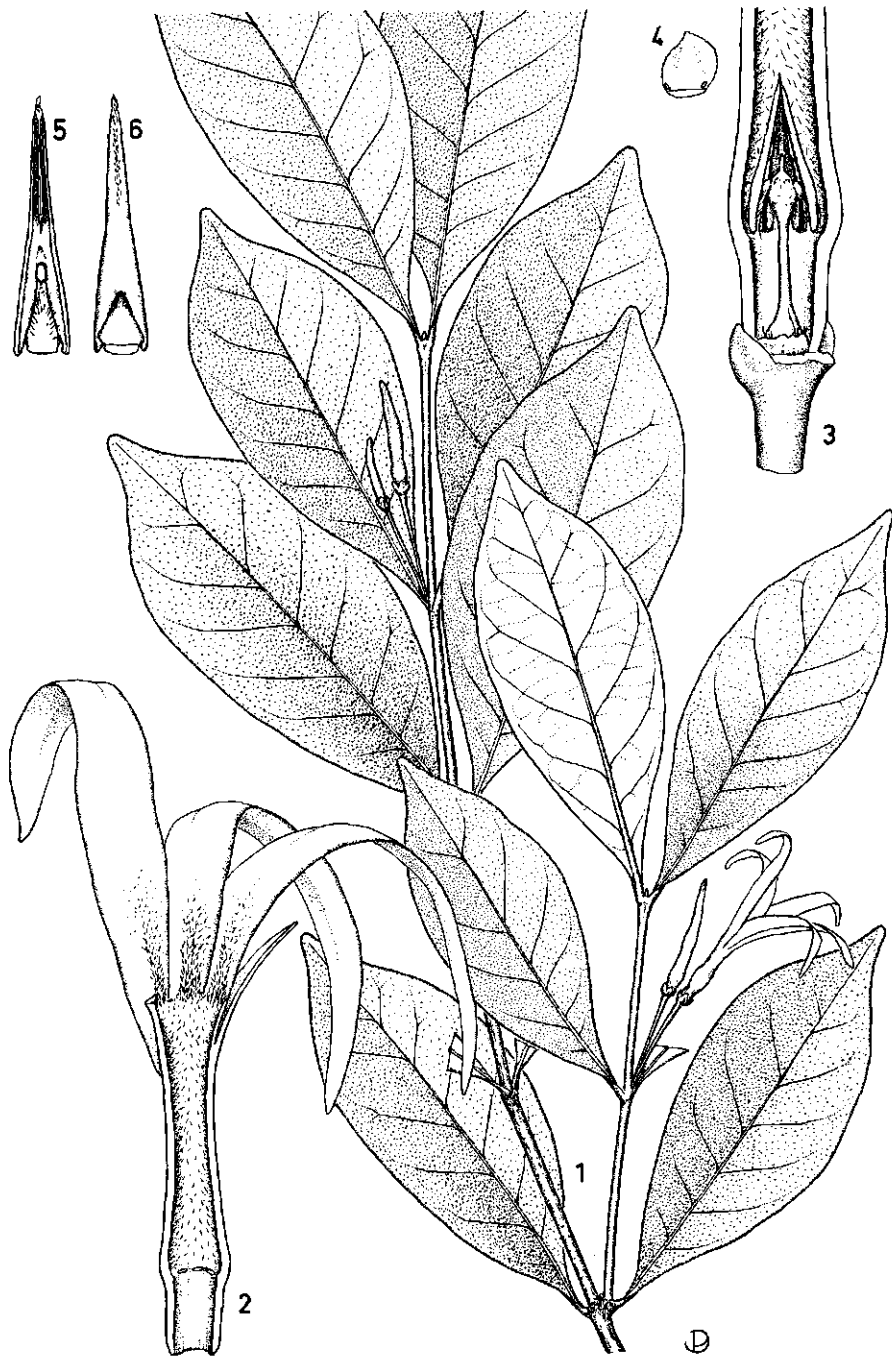
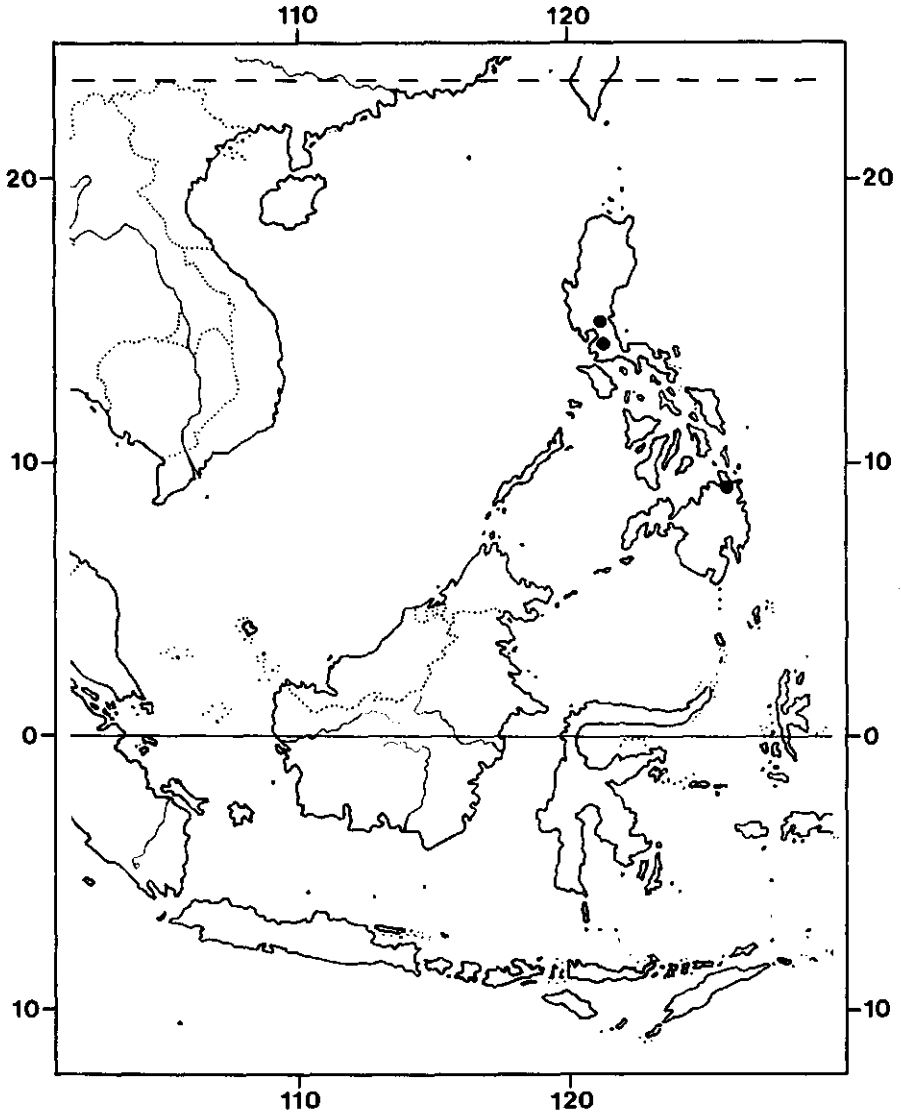


FIG. 22. *Kibatalia stenosepala*. 1, flowering branch ($\times \frac{2}{3}$); 2, part of corolla without stamens ($\times 2$); 3, flower base dissected ($\times 4$); 4, sepal with colleters ($\times 4$); 5-6, stamen both sides ($\times 6$). 1-6 from Ramos & Pascasio BS 34691.



MAP 22. *Kibatalia stenopetala*

14. *Kibatalia villosa* Rudjiman, sp. nov.

Arbor sempervirens. Folia petiolata laminis coriaceis ellipticis vel anguste ellipticis, apice acutis, acuminatis vel rare obtusis vel caudatis, basi cuneatis, utraque latere glabris. Inflorescentia congesta, pedunculo brevissimo vel obscuro. Flores pedicellati odorantes. Sepala pallide viridia, ovata, apice acuta, glabra vel subglabra. Corolla alba vel viridi-flava tubo calyce multo longiore, lobis

Fig. 23; Map 23

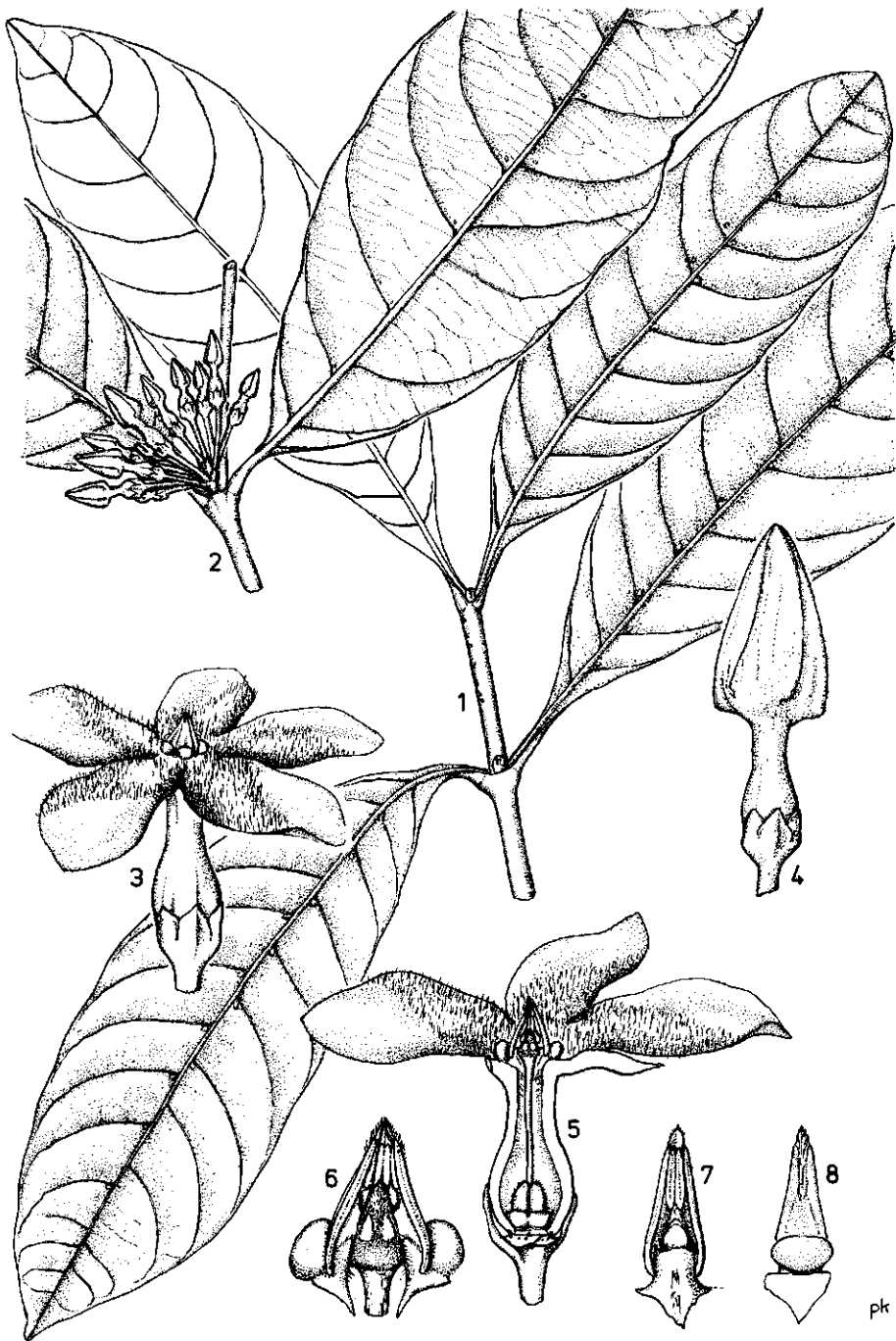
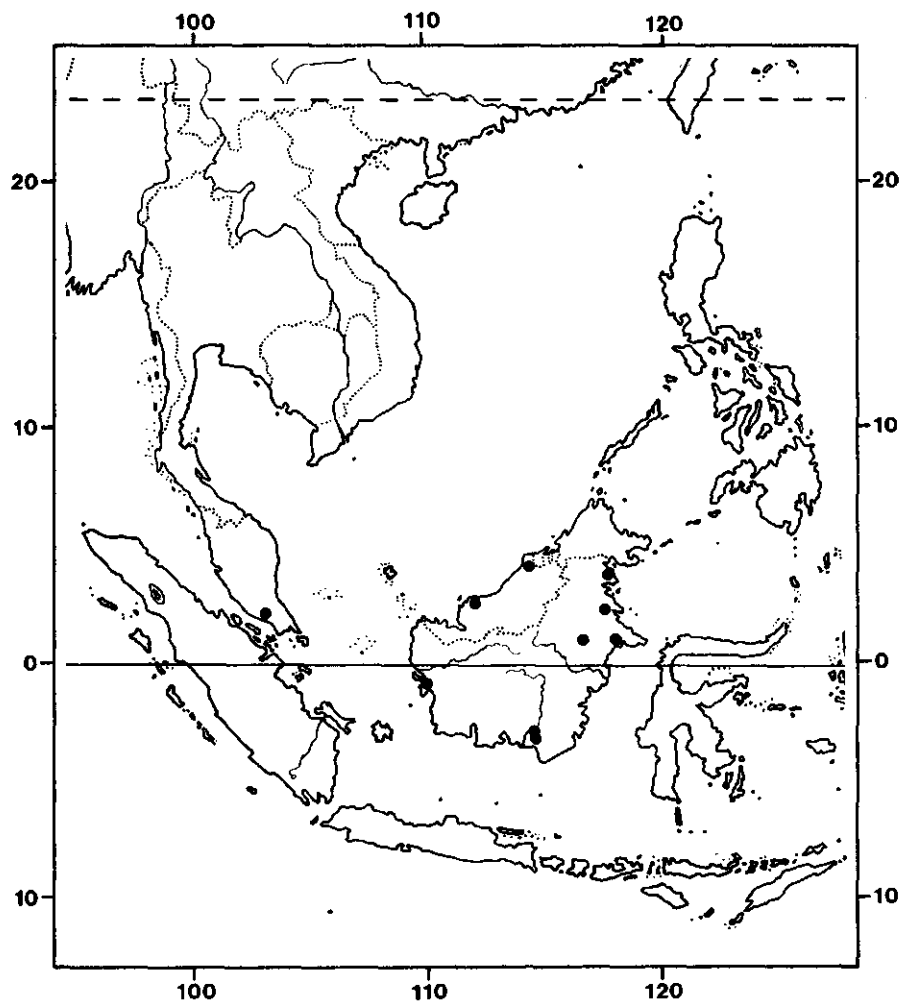


FIG. 23. *Kibatalia villosa*. 1, branchlet ($\times \frac{2}{3}$); 2, flowering branchlet ($\times \frac{2}{3}$); 3, flower ($\times 2$); 4, flower bud ($\times 2$); 5, section of flower ($\times 2$); 6, apex of gynoecium and anther lateral view ($\times 6$); 7, anther, ventral view ($\times 6$); 8, anther, dorsal view ($\times 6$). 1, 3-8 from Rudjiman 266; 2 from Haviland 3050.

ellipticis vel anguste ellipticis. Stamina exserta antheribus sessilibus. Ovarium disco annulari vel cupuliformi circumdatum. Fructus immaturus anguste follicularis.

Type: Indonesia: Kalimantan: South: Barito Kuala Distr., Bambang, Rudjiman 266 (BO, holotype; isotypes: BO, Herb. Fak. Kehutanan UGM Yogyakarta, L, WAG).

Evergreen tree 15–30 m high. Trunk 20–70 cm in diameter, clear bole 10–22 m high; crown small; bark rather smooth, finely fissured, often slightly cracked in small quadrangular pieces; inner bark brown; sapwood yellow, creamy or white. Branches and branchlets with transversely fissured bark, less often not. Leaves: petiole 5–15 mm long; colleters several, short, persistent when the leaves are shed; blade coriaceous, elliptic or narrowly elliptic, $1.2-3.8(7.2) \times$ as long as wide, $9.5-18 \times (2.5)5-7.5$ cm, acute, acuminate, less often obtuse or slightly caudate at the apex, cuneate at the base, glabrous on both sides, dark green and shiny above, light green beneath; with (8)9–12 secondary veins on each side; tertiary venation obscure; domatia consisting of pits. Inflorescences $0.13-0.26 \times$ as long as the leaves, 2.5–2.75 cm long, congested, 8–25-flowered. Peduncle (0)1–5 mm long; pedicels about 10–12 mm long, glabrous, sometimes near the base sparsely puberulent; bracts 0.5 mm long. Flowers rather fragrant. Sepals pale green, connate for about 1 mm, sometimes free, ovate $0.8-3 \times$ as long as wide, $1.75-4.5 \times 1.5-2$ mm, acute at the apex, glabrous or sparsely puberulent on both sides; with 2–6 colleters in the whole flower at the base of the sepals near the edges, being about 0.5–1 mm long and obtuse at the apex. Corolla white or greenish-yellow; tube 2–8 \times as long as the calyx, (9)11–14 mm long, cylindrical with or without a subglobose lower half, glabrous outside, inside glabrous, often sparsely puberulent, and sparsely tomentose near the apex; lower part 8–12 mm long; upper part $0.1-0.16 \times$ as long as the lower part, 0–2 mm long; at the mouth sparsely hirtopubescent, villose or often tomentose, about 6–8 mm wide; lobes elliptic or narrowly elliptic, $0.6-1.8 \times$ as long as the tube, $0.9-3.7 \times$ as long as wide, $9-7 \times 4.5-7.5(10)$ mm, obtuse, acute or truncate at the apex, subequal-sided, sometimes ciliolate, near the base with recurved margins, outside glabrous or glabrate, inside pubescent, less often glabrate near the apex, and at the base sparsely hirtopubescent or villous. Stamens exserted for 3–3.5 mm, inserted 10–12 mm from the corolla base; anthers sessile, $3 \times 1-1.5$ mm, apex for about 0.25–0.5 mm sterile, glabrous outside, only sparsely to densely hirtopubescent near the apex, inside with several stiff hairs below the connectives, furthermore glabrous; tails straight or curved inward. Pistil 12–14.5 mm long, persistent when the corolla is shed; disk ring-to cup-shaped, $1-2 \times 1-2$ mm, shallowly 5-lobed, glabrous on both sides; carpels ovoid or narrowly ovoid, $2-3 \times 1-2$ mm, sparsely puberulent or glabrous; style 8–11 mm long, glabrous; pistil head $1.5-2 \times 0.75$ mm. Infructescences: Immature fruits narrowly follicular, mature fruits unknown.



MAP 23. *Kibatalia villosa*

Distribution: Malaysia: Continent: Johore. Sarawak: Kalong, Marudi. Indonesia: Kalimantan: West, East, South.

Ecology: Swamp or montane forest, often on limestone, sandy or loam soil. Altitude: 0–1200 m.

Uses: In Indonesia the wood is used for dagger sheaths.

Vernacular names: Malaysia: Uchong (Marudi); Jelutun pipit (Johore). Indonesia: Empaga (Simpang, W. Kalimantan); Nyatu (Berauw, E. Kalimantan); Mantaos (Kintap, Barito Kuala, S. Kalimantan).

Specimens examined:

MALAYSIA: JOHORE: Rengam F. R. (fl. Apr.) Kochummen FRI 16379 (A, L, paratype). SARAWAK: Oya, Kalong (fl. Apr.) Haviland 3050 (BM, BO, CAL, K, L, P, SING, paratype); Bukit Mentagai, Bok Tisam, Marudi (fl. Apr.) Asah ak. Bubong S 23014 (A, L, SING, paratype).

INDONESIA: KALIMANTAN: WEST: Simpang, near Pene Contong village, Fryd 7 in bb 13524 (BO, paratype). EAST: N. part of Nunukan Isl., Kostermans 18 f (BO, L, paratype); Berauw, near Long Lanuh village (fl. Apr.) Zwaan 743 in bb 18491 (A, BO, BZF, L, paratype); East Kutai, Susuk R. Region (fr. June) Kostermans 5585 (A, BO, L, SING, paratype); Peak of Balikpapan, Be-oul (fl. June) Kostermans 7559 (K, L, NY, paratype). SOUTH: Bambang village, Subdistr. Belawang, Distr. Barito Kuala (fl. Apr.) Rudjiman 266 (BO, L, Herb. Fak. Kehutanan UGM Yogyakarta, WAG, type); about 5 km W. of Sidomulyo transmigration area, Subdistr. Belawang, Distr. Barito Kuala, Rudjiman 267 (BO, Herb. Fak. Kehutanan UGM, L, WAG, paratype), near Bambang, Subdistr. Belawang, Distr. Barito Kuala (fl. Apr.) Native collector s.n. (Herb. Fak. Kehutanan UGM, Yogyakarta, paratype).

15. *Kibatalia wigmanii* (Koorders) Merrill, Philipp. Journ. Sci. 17: 310. 1920; Woodson, Philipp. Journ. Sci. 60: 226. 1936. **Fig. 24; Map 24**

Basionym: *Kickxia wigmanii* Koorders, Meded. Lands Plant. 19: 528. 1898.

Type: Indonesia: North Sulawesi, Koorders 16045 β (L, lectotype; isotypes: BO, K, P).

Homotypic synonym: *Kickxia valetonii* Koorders, loc. cit., p. 67 & 169 (nomen nudum), p. 647 (citing *Kickxia wigmanii*, as the correct name).

Evergreen tree, 7–25 m high; crown small. Trunk straight, 20–45 cm in diameter, often slightly fluted at the base, with horizontal branches; outer bark smooth, dark brown, blackish or grey, 5–8 mm thick; inner bark whitish or light brown; sapwood straw-coloured or white. **Branches:** branchlets dark grey, with a laterally compressed apex, elliptic on section. **Leaves:** petiole 5–10 mm long; colleters 2–13, short, in a single row, persistent when the leaves are shed; blade coriaceous, narrowly obovate or narrowly elliptic, 2.7–4.2 \times as long as wide, 12.5–33.5 \times 4.5–8 cm, subequal- or rarely equal-sided, acute, acuminate or less often shortly caudate with sharp point at the apex, at the base cuneate, less often slightly sinuate at the margin; with 10–16 secondary veins on each side; tertiary venation conspicuous; domatia many, rarely few. **Inflorescences** pendulous, 0.2–0.7 \times as long as the leaves, 7.5–9 cm long, 1–2-flowered. **Peduncle** 5–10 mm long, dark grey; **pedicels** 15–20 mm long, light green. **Flowers** fleshy, fragrant. **Sepals** pale green, connate for about 1 mm, ovate, 1.3–2 \times as long as wide, 5.5–8 \times 4–5 mm, acute at the apex, sometimes ciliate at the margin, glabrous on both sides; **colleters** about 50–60 in the whole flower in a single row at the base of the sepals, simple, slender, shallowly lobed, about 1 mm long, obtuse at the apex. **Corolla** yellow or creamy; tube thick, 4.6–5.4 \times as long as the calyx, (25)28–33 mm long, glabrous except for the sparsely puberulent apex outside, inside sparsely pubescent, near the apex more densely so; lower part 5–5.5 mm long; upper part cylindrical (but wider), 4.6–5 \times as long as the lower part, (20)23–25 mm long, at the mouth about 5–7.5 mm wide; lobes narrowly elliptic, (1.2)1.6–2.1 \times as long as the tube, 3.2–3.6 \times as long as wide, (30)55–60 \times (7)15–20 mm, unequal-sided, with a thick midrib,

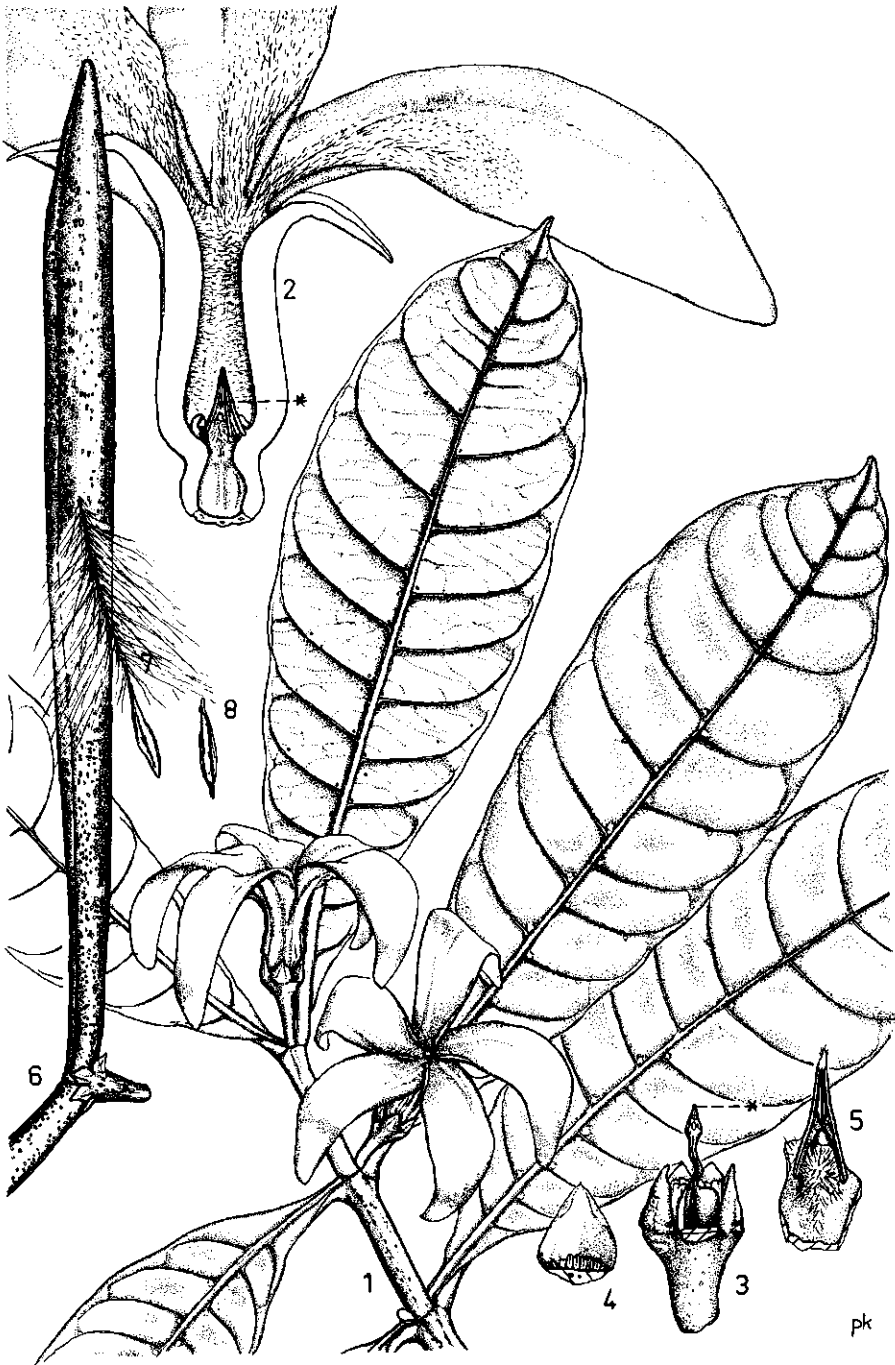
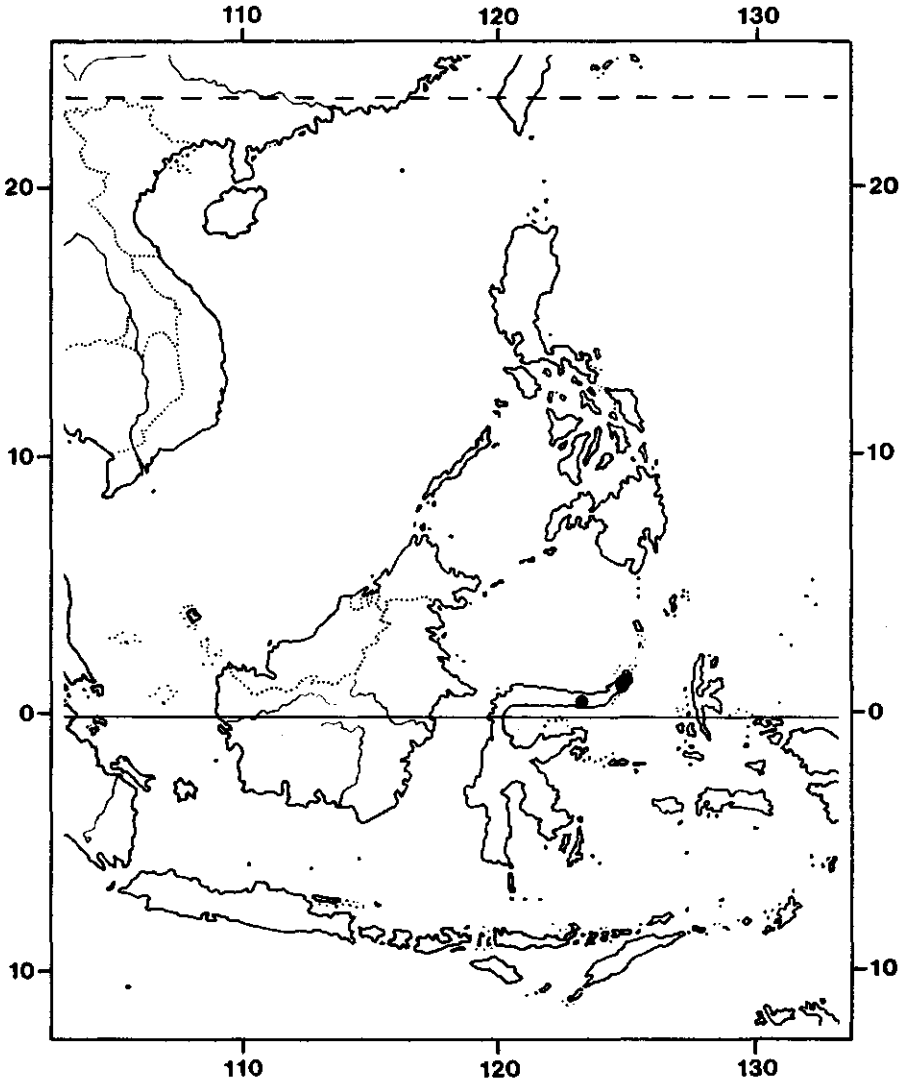


FIG. 24. *Kibatalia wigmanii*. 1, habit ($\times \frac{2}{3}$); 2, section of flower ($\times \frac{2}{3}$); 3, part of calyx opened out and pistil ($\times \frac{4}{3}$); 4, a single sepal inside ($\times \frac{4}{3}$); 5, anther, ventral view ($\times \frac{2}{3}$); 6, fruit ($\times \frac{2}{3}$); 7, seed ($\times \frac{4}{3}$); 8, embryo ($\times \frac{2}{3}$). 1-5 from Leeuwenberg 11864; 6-8 from Koorders 16045B.



MAP 24. *Kibatalia wigmanii*

rounded or obtuse at the apex, glabrous outside, inside sparsely puberulent or pubescent near the base, furthermore glabrous. *Stamens* included for 15–17 mm, inserted 6–7 mm from the corolla base; anthers sessile, 5–6 × 1.5–2 mm, apex about 0.5 mm sterile, glabrous on both sides, only sparsely hirtio-pubescent inside at the base; tails straight. *Pistil* 11–11.75 mm long; disk cup-shaped, 3–3.25 × 3 mm, about as long as the ovary, shallowly 5-lobed, glabrous on both sides; carpels 3–3.25 × 2.25 mm, glabrous on both sides; style 8–8.5 mm

long, glabrous; pistil head 2–3.5 mm long. *Infructescences*: pedicels 3–4 cm long, rigid, with large lenticels; peduncle 0.4–0.5 cm long; bracts deciduous. *Mericarps* narrowly ellipsoid or narrowly cylindrical, (11)23–31.5 × 1–2 cm, tapering into an acute or obtuse apex, with large lenticels, many-seeded, divergent, light brown or dark brown inside; wall 3 mm thick. *Seeds*: grains 17–30 × 3–4 mm, glabrous, minutely granulate, acute at the base; beak glabrous for 5–20 mm, bearing an apical coma for 25–70 mm; coma yellowish or creamy; hairs 25–70 mm long, shorter than the grains (and beak); embryo whitish or creamy; cotyledons 15–19 × 3–4 mm; rootlet 4–5.5 × 1 mm.

Distribution: Indonesia: North Sulawesi.

Ecology: Forest in the mountains, on volcanic soil. Altitude: 50–500 m.

Vernacular names: Kayu Santi (Pinamorongan), Mawarotan (Mt. Klabat), Lila (Lolumbulan), Lenas Lalaina (Papo Pompasso).

Specimens examined:

INDONESIA: SULAWESI: NORTH: Lolumbulan near Paku ure (fl., fr. Apr.) Koorders 16045 β (BO, K, L, P, type); Karowa or Papo Pompasso near Menado (fr. Apr.) Koorders 16046 β (BO, L, paratype); Kayawatu, Koorders 16067 β (BO, L, UC, paratype); Pinamorongan, Kakas Distr. (fr. Feb.) Koorders 16049 β (BO, L, paratype); Ratahan, Koorders 16047 β (BO, L, paratype); Mt. Klabat, Koorders 16048 β (BO, K, L, paratype); Bonedoa, Kampung Gunung Bone (fr. Feb.) Steur 118 in bb 18417 (BO, L); Bolaan Mongondo, between Pinagaluman and Pindol (fl. Oct.) De Vogel 2560 (L); Minahasa (fl. Apr.) Alston 15385 (BM).

CULT: INDONESIA: Bogor Bot. Gard., Nasution 7 (L); *ibid.* (fl. Now.) Leeuwenberg 11864 (WAG); *ibid.* (fl., fr. May) Rudjiman 270 (BO, Herb. Fak. Kehutanan UGM Yogyakarta, WAG).

Vallariopsis Woodson, Philipp. Journ. Sci. 60: 228. 1936.

Vallariopsis lancifolia (Hooker f.) Woodson, Philipp. Journ. Sci. 60: 228. 1936.

Fig. 25; Map 25

Basionym: *Vallis lancifolia* Hooker f., Fl. Brit. Ind. 3: 651. 182; Gamble, Journ. As. Beng. 74(2): 461. 1907; Ridley, Fl. Mal. Pen. 2: 352. 1923.

Type: Malaysia: Malacca, Maingayi 1846, under Kew distribution number 1102 (K, holotype; isotypes: A, K, L; MO, photograph of K isotype).

Climber or *creeper* 1–12 m high. *Branches* terete, dark brown or grey, lenticellate, glabrous; *branchlets* terete, sometimes slightly angled, dark brown or grey, with warty lenticels. *Leaves* opposite, those of a pair mostly equal, less often unequal, petiolate; *petiole* 2–10 mm long, channeled above, glabrous or less often sparsely pubescent, those of a pair connate at the base into a very short ocrea, sometimes with 1–2 short colleters in the axils; *blade* papyraceous, narrowly elliptic or ovate, 2.6–4.5 × as long as wide, 1.75–8 × 0.4–3 cm, tapering into an acuminate or obtuse apex, at the base attenuate or less often acute, entire, glabrous on both sides; with costa slightly impressed above and prominent beneath; with 8–19 inconspicuous, fine, anastomizing secondary

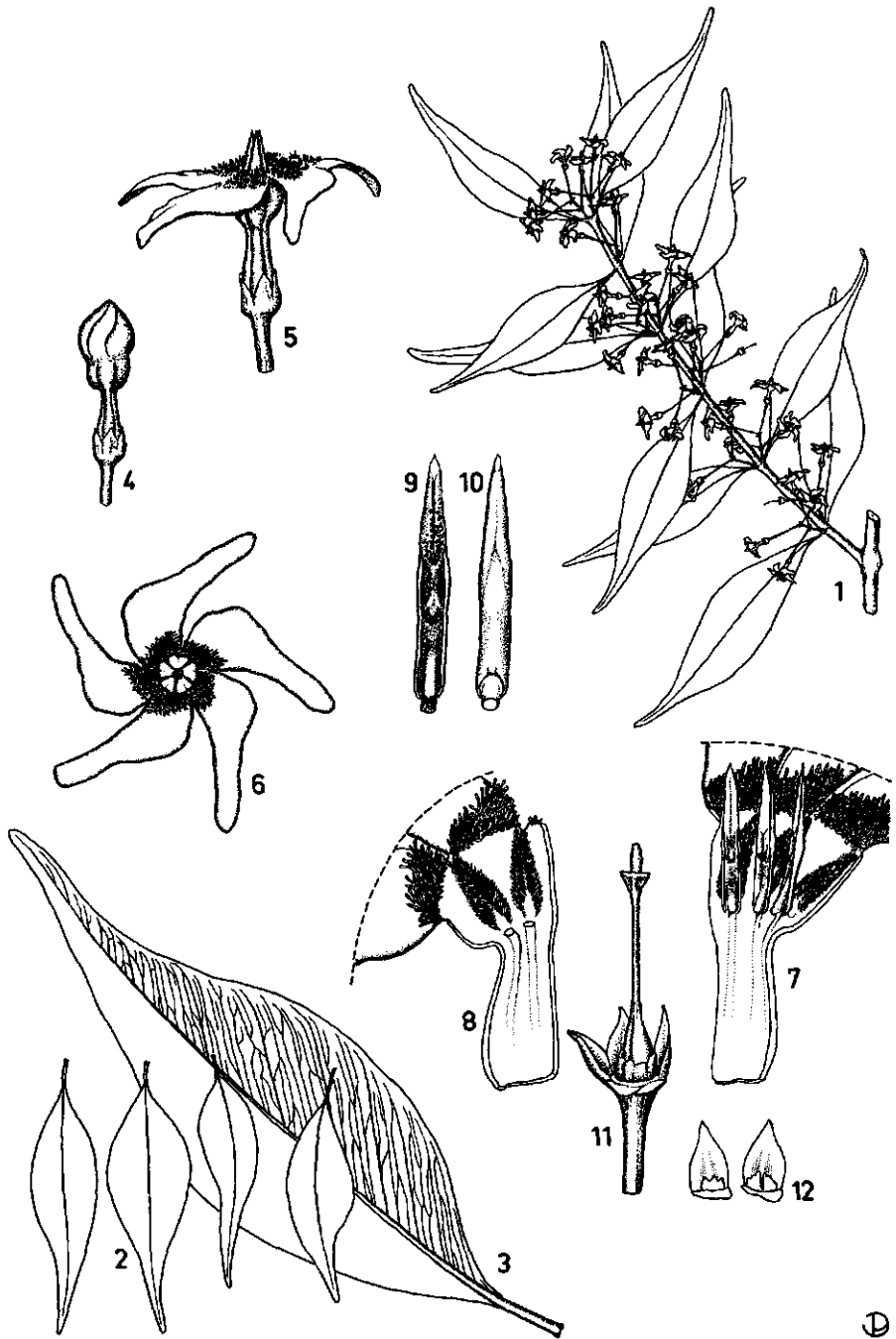
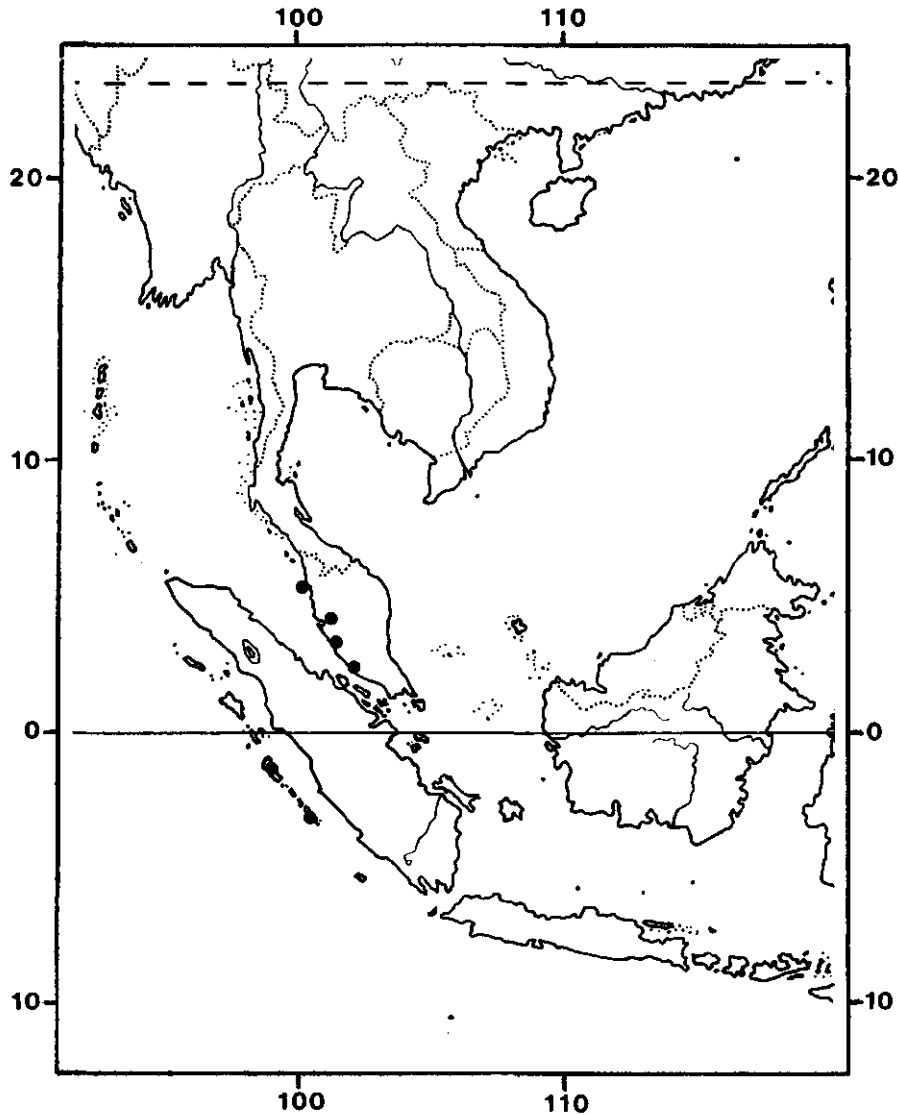


FIG. 25. *Vallariopsis lancifolia*. 1, flowering branch ($\times \frac{2}{3}$); 2, leaves ($\times \frac{2}{3}$); 3, leaf ($\times 2$); 4, flower bud ($\times 4$); 5, flower ($\times 4$); 6, flower from above ($\times 4$); 7, part of corolla with stamens ($\times 8$); 8, part of corolla without stamens ($\times 8$); 9-10, stamen both sides ($\times 12$); 11, calyx with pistil ($\times 8$); 12, two sepals with colleters ($\times 8$). 1-12 from Fox 33.



MAP 25. *Vallariopsis lancifolia*

veins; tertiary venation obscurely reticulate. *Inflorescences* terminal or axillary, opposite, cymose, almost dichasial, 0.3–0.4 × as long as the leaves, 1–2 cm long, 3–11-flowered once branched. Peduncle short, 1–8 mm long, or obsolete, dark brown, glabrous, rarely sparsely pubescent; pedicels 4–9 mm long, dark brown, glabrous, less often sparsely pubescent; bracts sepal-like, erect or recurved, sparsely ciliate at the margin, persistent. *Flowers* 5-merous, actino-

morphic. *Sepals* probably pale green, connate for about 0.5 mm, ovate, about $2 \times$ as long as wide, $1-1.5 \times 0.5-0.75$ mm, acute, often ciliate at the apex, entire, glabrous outside, inside glabrous or less often sparsely pubescent, with about 20 colleters in a single row in the whole flower at the base of the sepals. *Corolla* white; tube $2.6-4 \times$ as long as the calyx, 4-4.5 mm long, glabrous on both sides, except for the tomentose apex inside, consisting of a lower and an upper part; lower part cylindrical, 2.5-3 mm long; upper part campanulate, $0.3-0.6 \times$ as long as the lower, about 1.5 mm long, at the mouth about 2 mm wide; lobes oblique, $1.4-3.3 \times$ as long as wide, $3.5-5 \times 1.5-2.5$ mm, obtuse or acute at the apex, entire, glabrous outside, inside glabrous, except for the pubescent base. *Stamens* exerted for 1.5-2 mm, with small ellipsoid ventral swellings at the base, adhering to the style apex; filaments inserted where the corolla tube widens, 4-4.5 mm from the corolla base; anthers sessile, narrowly triangular, 2.5×0.3 mm, acuminate at the for about 0.2 mm sterile apex, sagittate at the base, glabrous on both sides, introrse; cells 2, dehiscent throughout by a longitudinal slit. *Pistil* 3-3.5 mm long; disk cup-shaped, 0.5×0.75 mm, shorter than the ovary, 5-lobed, glabrous on both sides; ovary bicarpellate, superior; carpels connate at the base, ovoid, abruptly narrowing into the style, 1×0.75 mm, glabrous; style cylindrical, somewhat widened at the apex, 2-3 mm long, glabrous; pistil head subellipsoid, about 0.75 mm long, with a short tip at the apex, adhering to the anthers. In each cell one semiglobose placenta with about 200 ovules. *Infructescences* unknown.

Distribution: Malaysia. Indonesia: Sumatera: Islands of Siberut and Pagai.
Ecology: Open area or swamp forest. Altitude: 0-700 m.

Specimens examined:

MALAYSIA: PENANG: Nursery Government Hill (fl. Aug.) Fox 10451 (SING); *ibid.* (fl. Aug.) Fox 33 (SING); *ibid.* (bud Oct.) Curtis 2146 (K, SING). PERAK: Goping near Larut (fl. June) King 4273 (K, SING). SELANGOR: Telok For. Res., near Klang (fl. Feb.) Kochummen 98567 (SING). MALACCA: (fl. May) Maingayi 1846, under Kew distribution number 1102 (A, K, L, type; MO, photograph of K isotype).

INDONESIA: SUMATRA: WEST: Pagai Isl. (fl. Feb.) Hagerup s.n. (C); Siberut Isl. (fl. Sept.) Booden-Kloss 14612 (K, SING).

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INDEX OF EXSICATAE

The letters in parentheses are the first letters of the species epithet. Only numbered collections with a named collector have been listed. If a collector gathered (a part of) his collection together with others, only his name is cited in this list: e.g. Kasin, M. & A.R. is cited as Kasin, M. The index is divided in three parts: part I: *Beaumontia*; part II: *Kibatalia*; part III: *Vallariopsis lancifolia*.

PART I BEAUMONTIA

- | | |
|---|--|
| <p>Aké Assi, L. 13782 (mur)
 Backer, C. A. 29619, 34011, 34012 and 37168 (gra)
 Bakhuijzen van den Brink jr. 1330 and 5913 (mul)
 Balsinhas, A. 1917 (gra)
 Banerjee, 1568 (gra)
 Bell, T. R. D. 7522 (gra)
 Beguni, 799 (mul)
 Biswas, K. 1942 and 3258 (gra)
 Bon, H. 2056, 2871 and 3828 (cam)
 Brenez, A. M. et al. 138 (gra)
 Brown, S. et al. 2010 (gra)</p> <p>Calderon, S. 585 (gra)
 Callens, H. 2869 (gra)
 Calvo, M. Z. 615 (gra)
 Chun, W. Y. 1537 (bre), 6169 (gra), 6742 (bre)
 Chun, W. Y. 1537 (bre), 6169 (gra), 6742 (bre)
 Chung, H. H. 1322 and 2695 (gra)
 Collins, D. J. 356, 535, 1030, 1365, 1718 and 1985 (mur)
 Cooke, 494 (gra)
 Croat, T. B. 252 (gra)</p> <p>Dama, N. V. 4027 (gra)
 Debberman, P. M. 11237 (jer)
 Degener, O. 9842 (mul)
 Desvaux, A. N. 398 (gra)
 Dickason, F. G. 9770 (gra)
 Duss, 54 (gra)</p> <p>Emwiogbon, J. A. 57962 (gra)</p> <p>Fleury, F. 37757 (mur)
 Forrest, G. 9922, 13746 and 16248 (gra)
 Fosberg, F. R. 10387 (mul), 57877 (mur)</p> <p>Gamble, J. S. 3224A and 3225A (gra)
 Gilges, W. 650 (gra)
 Gollau, 1294 (gra)
 Grierson, et al. 2993, 3546, 3890 and 4309 (gra)</p> | <p>Griffith, A. 4340 (gra), 5061 (jer)
 Griffith, W. 1843 (gra)
 Guého, J. 10819 (gra)</p> <p>Hallier, H. C49 (mul)
 Henry, A. 11950 (gra)
 Henry, B. C. 16 (bre)
 Herman, 6bis (mur)
 Hiep, 605 (mur)
 Hu, Shiu Ying 6582, 9675 and 13129 (gra), 13130 (mul)
 Hullet, R. W. 544 (mul)</p> <p>Irvine, 2576 (mur)</p> <p>Jack, J. G. 4027 and 4095 (gra)</p> <p>Kasin, M. et al. 00653 (mur)
 Katsumada, Z. 21955 (bre)
 Kerr, A. F. G. 2676 and 19837 (mur), 18653 (mac)
 Khan, Y. et al. 319 (gra)
 Khant, Maung Po 15332 (jer)
 Kingdon-Ward, F. 7856 and 18404 (gra), 20735 (kha)
 Kloss, C. B. 6946 (mac)
 Koelz, W. N. 24688, 24798A and 27578 (gra)
 Koorders, S. H. 41192B (mul)
 Krechten et al. 89 (mul)
 Kuhlmann, M. 4232 and 4322 (gra)</p> <p>Lace, J. H. 4690 (gra)
 Lasser, T. 1027 (gra)
 Lau, S. K. 3606 and 5820 (bre), 14921, 25732 and 27536 (bre)
 Leeuwenberg, A. J. M. 11070 (gra), 11893 (mul), 13160, 13161 and 13183 (jer), 13184 (mur), 13185 (jer)
 Liang, Y. H. 66317 (bre)
 Lörzing, J. A. 16458 (mul)
 Ludlow, F. et al. 3006 and 18553 (gra)</p> <p>McFarlin, J. B. 5229 (gra)
 McGregor, R. W. 1286 (kha)</p> |
|---|--|

Macuacua, L. 944 (gra)
Marcan, A. 1967 and 1803A (mul)
Maxwell, J. F. 74-987 (mul)
Meebold, A. E. 4368 (gra), 6615 (lon), 10790 and
21306 (mul)
Meyer, F. G. 10028 (gra)
Muller, T. 618 and 914 (gra)
Murton, 113 (gra)

Orcutt, C. R. 5639 (gra)

Pierre, 484 and 4477 (mur)

Parkinson, C. E. 7751 (mac)
Parry, N. E. 1117 and 1328 (gra)
Pételot, A. 2441 (gra)
Pierre, 4484 and 4477 (mur)
Poilane, 1286, 13295 and 20519 (mur)
Popta, S. N. 1362 (gra)
Put, 1426 and 2309 (mur), 3584 (gra)

Questel, A. 2314 (gra)

Raizada, N. B. 65 (gra)
Rastler, H. 396 (gra)
Rice, G. G. 15-78 (gra)
Rich, 982 (gra)
Rinzi 625 (gra)
Rivalland, G. 422 (gra)
Rudjiman, 200, 201, 202, 203 and 272 (mul)

Saldanha, C. J. 16005 (jer)
Salubeni, A. J. 816 (gra)
Schaijes, M. 2332 (gra)
Sinclair, J. 40057 (mul)
Stainton et al. 86, 106 and 2529 (gra)
Standley, P. C. 19244, 55187, 63358 and 90916
(gra)
Stekle, M. et al. 5740 (gra)
Steyermark, J. A. 52138 (gra)
Sulit, M. D. 3555 (mur)
Teijsmann, 77 and 14050 (mul)
Toppin, S. 3043 (gra)
Toro, R. A. 1 (gra)
Tsai, H. T. 55535 (kha)
Tsang, T. et al. 190 (bre)

Umaña, E. 48 (gra)

Van Krechten, et al. 89 (mul)
Van Steenis, 1650, 1656 and 3438 (mul)
Vergara, B. S. 15 (mur)
Vesterdal, A. 241 (mur)
Vidal, F. E. 5100 (mur)

Wallich, N. 226 and 1629 (gra)
Wanasah, P. A. 60 (mur)
Wang, C. W. 75419 (mur)
Watdamnahsomp, B. 31 (gra)
White, F. 3042 (gra)
Williams, 460 (gra)
Winit, P. 1639 (gra)

Zollinger, 3281 (mul)

PART II KIBATALIA

Achmad, 719, 771, 1182 and 1651 (mai)
Adu, Abar bin 74 (mai)
Adduru, M. FB 25863 (bla)
Alston, A. H. G. 15385 (wig)
Anderson, J. A. R. 7945 (bor), 9300 and S27076
(bor)
Asah, 12725 (mai)

Backer, C. A. 23503 (arb)
Balansa, B. 2103 (anc)
Baying anak Nyudong S13953 (mai)
Bartlett, H. H. 7124 (mai)
Bisset, N. G. 776 (arb)
Boesri 31 (mai)
Bon, H. 3398, 5057 and 5404 (anc)
Borja, A. 28829 (git)
Bubong, Asah Aka S 23014 (vil)
Bujang, H. J. S 20865 (vil)
Burghardt, C. P. 96 (arb)
Buwalda, P. 62, 479 and 6493 (mai)
Canicosa, E. PNH 09638 (git)
Chevalier, A. 37478 (anc), 38314 (lau), 40965
and 41035 (anc)
Clemens, J. et al. 4344 (lau)
Cuadra, A. A 1332 (arb)
Cubitti, G. E. S. C 7964 (mai)
Curran, H. M. FB 10507 (git)
Curtis, C. 1767 and 2748 (mai)

Dachlan, M. 2 (mai)
Dee 1029 (anc)
Dorst, L. J. W. IT.2P.191 (mai)
Duldulao, E. FB 25565 (git)
Dumas 1553 (mai)

Eberhardt 3801, 4122, 4245, 4349 and 4904 (anc)
Edaño, G. BS 76127 (git), FB 79430 (ste)
Elmer, A. D. E. 11912 (mai), 12203 (git), 12373
(mac), 15270 (elm), 15275, 15391 and 15910
(git), 15934 (elm), 16901 (git)

- Feng, K. M. 20361 (anc)
 Fleury, F. 32197 and 37531 (anc)
 Foxworthy, F. W. 4943 and C.7.1174 (mai)
 Frake, C. O. 707 (mai)
 Fryd, A. A. 7 (vil)
- Gadoh anak Umbai 2132 (mai), 2159 (arb)
 Gaja 15 (mai)
 Galau S 15637 (mai)
 Gammill, J. A. FB 862 (bla)
 Genove, M. FB 30451 (mai)
 Gerdeng 11 (arb)
 Grasshof, W. 990 (mai)
 Guard, J. 12569 (mai)
- Hallier, H. N.C. 66 (arb), 360 (mai)
 Hamid, A. 36021 (mai)
 Hamid, R. 18245 (arb)
 Hanif, M. et al. 4238 (lau)
 Hartono, et al. 1 (arb)
 Harmand in Herb. Pierre 1869 (anc)
 Hashim, M. 16499 (arb)
 Hassan, SF 36262 (mai)
 Haviland, 3050 (vil)
 Holmann, R. M. 8 (git)
 Houter, 124 (arb)
- Ja'amat, F. G. 37597 (mai) and 44938 (arb)
 Jong, B. de 181/W.B. (mai)
- Kartapraya, 440 (arb)
 Kassim, A. 283 (mai)
 Kerr, Herb. A. F. G. 5108 (anc), 18229 (lau),
 18623 (arb), 19237 (mai), 21672 (anc)
 Kiah, SF 35217 (mai)
 Kochummen, H. M. 96 (arb), 16130 (mai), FRI
 16374 (vil), 80947, 93486 and 94049 (arb)
 Koorders, S. H. 77 (arb), 202b, 203b, 204b,
 205b, 10272b, 13407b, 13443b, 13453b and
 13454b (arb), 16045b, 16046b, 16047b,
 16048b, 16049b and 16067b (wig), 23519b,
 23450b, 23983b, 28859b, 30935b and 37017b
 (arb)
 Kostermans, A. J. G. 18f (vil), 118, 211, 784,
 1074 and 1096 (mai), 5587 (vil), 6689 and 7167
 (mai), 7559 (vil), 10051, 10159 and 10689
 (mai)
 Lagrimas, M. 620 and PNH 39284 (git)
 Lakshnakara, M. C. 787 (mai), 840 (arb)
 Leano, P. A. CLP-PAL-31 (git)
 Leeuwenberg, A. J. M. 10712 (lau), 11864 (wig),
 11885 (mai), 12166 (lau), 13142 (wig)
 Loher, A. 6329 (bla)
- Mabbayag, F. FB 28110 (bla)
- Mabesa, C. 25726 (bla)
 Maingayi, A. C. 1069, 1084, 2628 and 2948 (mai)
 Manuel, F. FB 24755 (git)
 Maxwell, J. F. 72-272 (anc)
 McGregor, R. C. BS 43767 (pub)
 Meebold, A. 14654 and 15408 (anc)
 Mendoza, D. R. 1380 (bla)
 Merrit, M. L. 11488 (bla)
 Mesa, A. de FB 27634 (lon)
 Meijer, W. SAN 25131 (arb)
 Mikil, G. 30296 (arb)
- Nasution, R. E. 7 (wig)
 Ng 1554 (mai)
 Nicholson, D. I. SAN17287 (arb)
 Noerkas 436 (arb)
 Nur 35849 (mai)
- Othman, I. S 37185 (mai)
- Palme, V. FB 27241 (git)
 Paraiso, E. 25465 (bla)
 Parker, R. N. 2440 (anc)
 Parkinson, C. E. 1632 (anc)
 Pasquier, du 3052 (anc)
 Pételot, A. 698, 1866, 1934, 4921 and 6001 (anc)
 Podzorski, A. C. SMHI-2170 (arb)
 Poilanc, M. 47 (lau), 1752 (anc), 3066, 5423,
 6620 and 10504 (lau), 13629, 16449, 18876,
 19962, 24837 and 24872 (anc), 24895 (lau),
 25844 and 27147 (anc)
- Rahmat di Boeea 9509 (mai)
 Ramos, M. BS 19537, BS 23434 and 33515 (git),
 BS 34691 (ste), BS 39812 (bla)
 Reppie, H. N. 113 and 155 (arb)
 Richards, P. W. R 1307 (arb)
 Ridley, H. N. 4917 (mai)
 Rivera, F. BS 75041 (ste)
 Robinson, H. C. 5764 (lau)
 Roso, 134 (git)
 Rudjiman 204, 205 and 206 (arb), 242, 263 and
 265 (mai), 266 and 267 (vil), 268 (arb), 270
 (wig), 271 (arb)
- Sahak bin Said 45825 (arb)
 Samsuri, A. SA649 (lau), 12251 (bor)
 Saw, F. G. 32298, 33733 and 71988 (arb)
 Smitinand, T. 10779 and 10794 (anc)
 Steup, F. 118 (wig)
 Sulit, M. D. PNH 2588 (pub), PNH 2702 (git),
 PNH 2766 (pub), 2855 (mer), PNH 6876 (bla),
 PNH 8514, PNH 21653 and PNH 81943 (git)
 Symington, C. F. 10779 and 10794 (anc)

Tamesis, F. FB 21545 (bla)
Teijsmann, J. E. 1867 and 12698 (arb)

Verduyn Lunel, 18 (mai)
Vidal, J. 1182B (anc), 3277 (bla), 3278 (git)
Vogel, E. F. de 2560 (wig)

Wallich, N. 1622 (anc)
Walton, A. B. 28382 (arb)
Watson, J. G. 1862, 1885 and 32675 (mai)
Waturandang, A. G. 34 and 163 (arb)
Wenzel, C. A. 330 (mer), 652, 678, 2554 and
3504 (git)
Whitmore, T. C. FRI 3406 and FRI 8620 (arb)
Winit 1246, 1420 and 1825 (anc)

Zollinger 3085 (arb)
Zwaan, C. J. van der 743 (vil)

PART III VALLARIOPSIS LANCIFOLIA

Booden-Kloss, C. 14612
Curtis, C. 2146
Fox, W. 33, 10451
Hagerup, O. Feb. 1917
King, 4273
Kochummen, K. M. 98567
Maingayi, A. C. 1846

INDEX OF TAXONOMIC NAMES

(New names are in **bold face**, synonyms in *italics*. Page number of principal entries are in **bold face**, those of figures in *italics*.)

Apocynoideae 1

Arachis hypogaea L. 71

Beaumontia Wallich 1, 2

brevituba Oliver 4, 5, 6, 7, 8, 19

campanulata Pitard 5, 9, 10, 11

fragrans Pierre ex Pitard 31, 34

grandiflora Wallich 1, 2, 3, 4, 5, 11, 12, 14, 16

jerdoniana Wight 1, 5, 16, 17, 18

khasiana Hooker f. 1, 3, 5, 19, 20, 21

longifolia Lodd, ex Loud. 35

longituba Craib 3, 5, 22, 23, 24

macrantha (Ridley) Rudjiman 3, 5, 24, 25

multiflora Teijsm. & Binn. 1, 3, 5, 27, 28, 30

murtonii Craib 3, 5, 31, 32, 34

pitardii Tsiang 10

rosea Fischer 24, 26

shanica McGregor & Smith 19

speciosa Hort. 35

wallichii (A. DC.) Walpers 35

yunnanensis Tsiang & W. C. Chen 1, 19

Canangia Rumph. ex Hook. f. & Thoms. 43

Echites Jacq. 1

grandiflora Roxburgh 1, 11, 16

Halorrhena daronensis Elmer 71

Hasseltia H.B.K. 1

Hasseltia Blume 1, 36

arborea Blume 1, 36, 43

Holarrhena daronensis Elmer 71

merrittii (Merrill) Woodson 47, 49

valetonii Koorders 86

wigmanii Koorders 86

Kickxia Dumortier 1

Kixia A.DC. 36

Nerieae Reichenbach 1

Paravallaris Pierre 36

laurifolia (Ridley) Kerr 60

macrophylla Pierre 36, 40, 41, 42

maingayi (Hooker f.) Kerr 71

microphylla Pitard 60, 64

yunnanensis Tsiang & P.T. Li 40, 41

Scrophulariaceae A. L. de Jussieu 1

Tabernaemontana ovalis Miq. 43, 47

Trachelospermum anceps Dunn & R. Williams 38

Trachelospermum laurifolium Ridley 60

Valleriopsis Woodson 1, 2, 89

lancifolia (Hooker f.) Woodson 2, 89, 90, 91

Vallaris? anceps Wallich 40

anceps (Wallich) Fischer 40

angustifolia Merrill 57, 60

arborea Fischer 40, 41

daronensis (Elmer) Merrill 71

gitingensis (Elmer) Merrill 57

lancifolia Hooker f. 89

macrantha Ridley 24

maingayi Hooker f. 69

Wrightia arborea (Dennst.) Maberley 35

wallichii A.DC. 35

Kibatalia G. Don 1, 2, 36

subgenus *Eukibatalia* Woodson 36

anceps (Dunn & Williams) Woodson 36, 38, 39, 42

arborea (Blume) G. Don 1, 36, 38, 43, 44, 46

blancoi (Rolfe ex Stapf) Merrill 38, 47, 48, 50

borneensis (Stapf) Merrill 38, 50, 51, 53

daronensis (Elmer) Woodson 71

elmeri Woodson 2, 37, 49, 53, 54, 56

fragrans Elmer 54

gitingensis (Elmer) Woodson 37, 57, 58, 59

laurifolia (Ridley) Woodson 37, 60, 61, 63

longifolia Merrill 2, 36, 37, 38, 64, 65, 66

luzonensis Woodson 80

macgregori (Elmer) Woodson 2, 38, 67, 68, 69

macrophylla (Pierre) Woodson 40

maingayi (Hooker f.) Woodson 1, 2, 36, 37, 69, 70, 73

merrilliana Woodson 37, 74, 75, 76

merrittii (Merrill) Woodson 47

oblongifolia Merrill 64

puberula Merrill 38, 77, 78, 79

stenopetala Merrill 38, 80, 81, 82

villosa Rudjiman 1, 37, 82, 83, 85

wigmanii (Koorders) Merrill 1, 2, 38, 86, 87, 88

Kickxia Blume 1, 36

arborea (Blume) Blume 43

arborea (Blume) A.DC. 43

arborea Villar (non Blume) 47

blancoi Rolfe 47

borneensis Stapf 50

gitingensis Elmer 57

macgregori Elmer 67