BLUMEA 53: 345–383
Published on 29 October 2008 http://dx.doi.org/10.3767/000651908X608007

TAXONOMIC REVISION OF BEILSCHMIEDIA (LAURACEAE) IN BORNEO

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SUMMARY

A revision of *Beilschmiedia* Nees (Lauraceae) in Borneo is given. Descriptions, distribution maps, illustrations of leaves, terminal buds, and flowers, and a key to the species are provided. Twenty-six species were recognized, including one newly described species. The new species is distinguished from the other *Beilschmiedia* species of Borneo in having pubescent anther apices. *Beilschmiedia reticulata* was excluded from the revision as an imperfectly known species because of a lack of flowering specimens. *Beilschmiedia eusideroxylocarpa* was also excluded because it had only six stamens representing the second and third whorls, which is characteristic for the genus *Endiandra*.

Key words: *Beilschmiedia*, Lauraceae, Borneo, taxonomy.

INTRODUCTION

Beilschmiedia Nees is one of the larger genera of the Lauraceae with approximately 250 species (Nishida 2001), and is best represented in tropical Asia and Africa (Van der Werff 2003). The genus comprises trees and rarely shrubs and is usually distinguished from other genera of the Lauraceae by the following characteristics: paniculate or racemose inflorescences that are not strictly cymose at the terminal division, bisexual and trimerous flowers with six equal to subequal tepals, six to nine fertile stamens representing the outer two or three whorls, two-celled anthers, and fruits lacking cupules. It is placed in the tribe Cryptocaryeae Nees together with other core genera such as *Cryptocarya* R.Br., *Endiandra* R.Br., and *Potameia* Thouars based on wood and bark anatomy and inflorescence structure (Van der Werff & Richter 1996). This classification is also supported by a molecular study (Chanderbali et al. 2001).

The genus *Beilschmiedia* was originally established by Nees to accommodate two Indian species: *B. roxburghiana* Nees and *B. fagifolia* Nees. Since then approximately 350 names have been published in the genus (Nishida 2001). Revisional studies of the genus have been made in several regions, such as China, Madagascar, Australia, and the Neotropics, but never in the Malesian regions except for the treatment by Kochummen (1989) in the Tree Flora of Peninsular Malaya. Borneo is famous for its high plant diversity and endemism, and I have focused on the species of this island as a precursor to a treatment of the genus in Malesia.

MATERIAL AND METHODS

Herbarium collections from A, BO, K, KEP, L, SAN, and SAR were examined. All dimensions given are for dried material except for the floral characters. Flowers were soaked in boiling water before observation and measurement.

BEILSCHMIEDIA

Beilschmiedia Nees (1831) 61, 69. — Type: *Beilschmiedia roxburghiana* Nees.

Trees or rarely shrubs. *Leaves* alternate, subopposite, or opposite, rarely clustered, pinnately veined. *Inflorescences* axillary, racemose or paniculate with terminal branches of panicles not strictly cymose. *Flowers* bisexual. *Tepals* 6, equal or subequal. *Stamens* 9 or 6, representing outer two or three whorls; anthers 2-celled, introrse or latrorse in first and second whorls and latrorse or extrorse in third whorl. *Staminodia* 3, 6 (when stamens 9 or 6, respectively), or absent. *Pistil* stylocarpellous; ovary superior, with single ovule. *Fruits* ellipsoid, pyriform, spherical, or spindle-shaped, lacking cupule.

Distribution — About 250 species, pantropical, with the centre of diversity in Southeast Asia or Africa.

MORPHOLOGY OF BEILSCHMIEDIA IN BORNEO

Habit

All the *Beilschmiedia* species of Borneo are trees, ranging in height from 8–40 m.

Indument

The indument types and pubescence observed among the *Beilschmiedia* species of Borneo show a great deal of variation, which can be used to delimit species.

For example, the vegetative parts of the plants vary from completely glabrous to densely pubescent, whereas pubescence is consistently observed on at least some portion of the inflorescences, such as on the rachis, tepals, or filaments. Those species with opposite leaves lack pubescence on most of their vegetative parts, except for *B. dictyoneura* Kosterm. and *B. montanoides* Kosterm. Subopposite- or alternate-leaved species, however, usually have some hairs on at least their terminal buds. The only exception to this is *B. glauca* S.K.Lee & L.F.Lau, which has alternate leaves but is glabrous on all of its vegetative parts. Pubescence on the lower leaf surface is usually a stable character, but in some species, such as *B. tawaensis* Merr., the density of hairs can vary.

The hairs of the *Beilschmiedia* species of Borneo can be divided into three types based on their orientation (appressed, ascending, or erect), into two types based on their length (long or short), and into three types based on their straightness (straight, wavy, or curly). The minutely tomentulose species sometimes appear dusty to the unaided eye. The indument can vary on different parts of the same plant, while different indument types occur on the same part of a single plant in some species. However, the indument type or combination of types present on certain parts of a plant, particularly on the terminal buds, is usually consistent within a species, and can be used as a means of identification.

Leaves

The leaves are opposite, subopposite, or alternate. Phyllotaxis is usually consistent within a species; however, two species with alternate leaves, *B. crassa* Sach.Nishida and *B. maingayi* Hook.f., have subopposite leaves near the tip of each twig.

Leaf shape ranges from ovate to obovate, while leaf size often varies within a given species.

All the *Beilschmiedia* species of Borneo have penninerved leaves. Certain leaf venation characteristics are stable within a species and can be used to delimit species, including the appearance of the leaf surfaces (raised, immersed, or impressed), the number of secondary veins, the tertiary venation pattern (percurrent, i.e., tertiaries from the opposite secondaries joining, or not), and the minor venation pattern (coarse or fine). An extreme phenotype can be seen on the upper leaf surface of *B. crassa*, which has conspicuously raised thick minor veins, or in *B. phoebeopsis* Kosterm., which has completely immersed or sometimes impressed minor veins. The tertiary veins are percurrent in several large-leaved species (e.g., *B. kunstleri* Gamble), while the minor venation pattern varies from coarse (e.g., *B. crassa*) to extremely fine (e.g., *B. glauca*).

The leaves of the *Beilschmiedia* species of Borneo tend to coarser venation pattern than those of *Endiandra*, a genus often misidentified as *Beilschmiedia*. However, there are many exceptions, such as *B. glauca* having a very fine venation pattern and *E. clavigera* Kosterm. having a very coarse venation pattern.

Inflorescences

The inflorescences of the *Beilschmiedia* species of Borneo are mostly axillary and paniculate. The ultimate divisions are not strictly cymose in *Beilschmiedia*, which distinguishes it from *Dehaasia* Blume, a Bornean genus sometimes misidentified as *Beilschmiedia*. The inflorescences vary from very short (1–3 cm) with a small number of flowers (up to 10) in *B. gemmiflora* (Blume) Kosterm. to very long (8–18 cm) with a large number of flowers (around 200) in *B. micrantha* Merr. Only one species, *B. gemmiflora*, envelops its young inflorescences in an involucre.

The bracts are early deciduous in many species, but persist until anthesis in some species. Among the species with persistent bracts, *B. brachystachys* Kosterm., *B. dictyoneura*, *B. murutensis* Kosterm., *B. phoebeopsis*, and *B. telupidensis* Sach.Nishida have a single small bract; *B. hartonoana* Sach.Nishida, *B. micrantha*, *B. phoebeopsis*, and *B. tawaensis* have a pair of small bracts; and *B. maingayi*, *B. oligantha* Sach.Nishida, and *B. wieringae* Kosterm. have a single, relatively large bract.

Flowers

The flowers are bisexual, small, and almost subspherical, and range in size from roughly 1.5 mm long in *B. dictyoneura* to 5 mm long in *B. maingayi*. Six nearly erect tepals are present and they are usually equal in size, except in *B. dictyoneura* and *B. rivularis*, which have three slightly smaller inner tepals. The number of stamens is nearly always nine, except in *B. dictyoneura*, which has six, and in *B. crassa* and *B. glauca*, which can have six to nine. *Beilschmiedia kinabaluensis* Kosterm. also has six stamens, but it is not certain if this number is consistent because the only available specimen had young flowers. The six stamens in these species always represent the

first and second whorls, not the second and third whorls as seen in *Endiandra*. In small-flowered species, the filaments in the first and second whorls are usually shorter than or as long as the anthers. Some, but not all, of the large-flowered species, however, have longer filaments even in the first and second whorls (e.g., *B. gemmiflora*, *B. glabra*, *B. lucidula* (Miq.) Kosterm., *B. madang* (Blume) Blume, *B. oblonga* Kosterm., and *B. wieringae*). The filaments in the third whorls are longer than or as long as the anthers in many of the species. The anthers are glabrous at the apex except for in a new species, *B. telupidensis*. The relative filament length in the first and second whorls and the pubescence on the anther apices can be used to delineate species.

Fruits

The fruits are often ellipsoid and around 3 cm long, but are sometimes spherical or spindle-shaped, and conspicuously large. Spherical fruits occur in *B. crassa*, *B. kinabaluensis*, *B. lucidula*, *B. micrantha*, *B. phoebeopsis*, and *B. tawaensis*, whereas club-shaped (or sometimes ellipsoid) fruits occur in *B. glauciphylla* Kosterm., and spindle-shaped fruit is found in *B. gynotrochioides* Kosterm. The fruits of *B. kinabaluensis*, *B. glauciphylla*, and *B. gynotrochioides* are large (longer than 5 cm). The fruit pedicels are not usually thickened, but the thickened pedicels in such species as *B. glabra* and *B. gynotrochioides* obscure the border between the pedicel and fruit.

Sometimes specimens with relatively long oblong fruits of *Endiandra* are misidentified to *Beilschmiedia* in Borneo. Long oblong fruits with obtuse base and apex are rather rare for *Beilschmiedia*, but more common for *Endiandra* in Borneo and the Malay Peninsula. However, there are some exceptions in this tendency because both genera have a wide variation in fruit shape. As mentioned by Van der Werff (2001), fruiting specimens can often not be assigned to either genus with certainty because of their similarity in fruit and vegetative characters.

TAXONOMY OF BEILSCHMIEDIA IN BORNEO

I previously reported 28 species and one variety name on the *Beilschmiedia* specimens collected in Borneo (Nishida 2001). After a careful re-examination of the specimens, however, five species, i.e., *B. curtisii* Gamble, *B. lumutensis* Gamble, *B. malaccensis* (Meisn.). Hook.f., *B. perakensis* Gamble, and *B. wallichiana* (G.Don) Kosterm., were excluded from the Bornean flora; one species, i.e., *B. eusideroxylocarpa* Kosterm., was excluded from the genus; one species, i.e., *B. reticulata* Kosterm., was left as an imperfectly known species because of the lack of flowering specimens; and one species and one variety, i.e., *B. oligocarpa* Kosterm. and *B. micrantha* var. *latifolia* Merr., were transferred as synonyms of other taxa. Thus, three species have been described after the report and two species have been retained as independent species from the synonym list. As a result, 26 species are recognized in Borneo, including a new species.

The *Beilschmiedia* species of Borneo show a wide variation, which makes it difficult to adequately divide all the species into groups based solely on the morphology. However, at least for some of the species, several groups can be recognized, mainly by phyllotaxes, indument types, inflorescence or flower structure:

1. *B. glabra* group – Distinguished by opposite leaves and large flowers with long filaments in the first and second whorls; includes *B. glabra* and *B. lucidula*.

2. *B. glauciphylla* group – Distinguished by glabrous terminal buds, opposite elliptic leaves with coarse venation, and medium-sized flowers with filaments in the first and second whorls shorter than anthers; includes *B. glauciphylla*, *B. gynotrochioides*, and *B. microcarpa*.
3. *B. kunstleri* group – Distinguished by curly hairs on the terminal buds, alternate leaves, and large flowers with long tepals; includes *B. kunstleri* and *B. madang*, and *B. oblonga*.
4. *B. maingayi* group – Distinguished by alternate leaves, relatively short inflorescences with medium sized flowers and relatively large bracts; includes *B. maingayi*, *B. oligantha*, and *B. wieringae*.
5. *B. micrantha* group – Distinguished by curly hairs on the terminal buds and twigs, alternate leaves, long inflorescences with small flowers and small bracts; includes *B. micrantha*, *B. hartonoana*, *B. phoebeopsis*, and *B. tawaensis*.

These groupings are partly supported by cuticular characters (Nishida unpublished). The relationships among the groups and with the other species are unknown. These groupings should remain informal until a comprehensive classification is available for the genus.

KEY TO THE SPECIES

The key to the species is mainly based on flowering material, because flowers are necessary to identify the genus. Fruit characters are added if they are useful, but are always accompanied by vegetative characters. A few species appear twice in the key because of variability in their characters.

1a. Leaves opposite or subopposite 2
b. Leaves alternate 12
2a. Terminal buds covered with hairs 3
b. Terminal buds glabrous or pubescent only on edges or inside buds 7
3a. Hairs on terminal buds erect and wavy to curly. Fruits spherical 4
b. Hairs on terminal buds appressed and straight. Fruits ellipsoid or oblong 5
4a. Leaves strongly coriaceous. Minor leaf veins conspicuously raised on both surfaces. Flowers red. Fruit surface warty . . . . . **2. B. crassa**
b. Leaves firmly chartaceous. Minor leaf veins only slightly raised on both surfaces. Flowers greenish yellow. Fruit surface smooth or powdery . . . . **23. B. rivularis**
5a. Fertile stamens 6 . . . . . **3. B. dictyoneura**
b. Fertile stamens 9 6
6a. Leaves narrower than 3 cm. Flowers c. 2.5 mm long . . . . . **17. B. montanoides**
b. Leaves wider than 6 cm. Flowers c. 5 mm long . . . . . **14. B. maingayi**
7a. Minor veins raised on upper leaf surface 8
b. Minor veins immersed on upper leaf surface 10
8a. All filaments longer than anthers. Terminal buds conspicuously rounded with acuminate tip, wider than the twig except at flowering time (Fig. 12b) . . . . . **12. B. lucidula**
b. Filaments in the first and second whorls shorter than anthers. Terminal buds ovoid, almost as narrow as the twig 9
9a. Tree up to 30 m. Leaves coriaceous. Fruits longer than 6.5 cm . . . . . **7. B. glauciphylla**

b. Small tree up to 9 m. Leaves chartaceous. Fruits small, shorter than 3.5 cm . . . . . **16. B. microcarpa**

10a. Leaf base cuneate. Flowers longer than 4 mm, with all the filaments longer than anthers . . . . . **5. B. glabra**

b. Leaf base obtuse to rounded. Flowers shorter than 3 mm, with filaments in the first and second whorls shorter than anthers 11

11a. Leaves ovate. Fruit spherical, shorter than 5 cm, with smooth surface. Montane forest around 1500 m altitude . . . . . **10. B. kinabaluensis**

b. Leaves elliptic. Fruit spindle-shaped, longer than 8 cm, with rough surface. Forest up to 700 m altitude . . . . . **8. B. gynotrochioides**

12a. Terminal buds completely glabrous. Leaf venation pattern extremely fine . . . . . **6. B. glauca**

b. Terminal buds sparsely to densely pubescent. Leaf venation pattern fine to coarse 13

13a. Terminal buds pubescent with long straight hairs 14

b. Terminal buds pubescent with dusty, curly, or wavy hairs 17

14a. Terminal buds pubescent with appressed hairs. Twigs almost glabrous. Lower leaf surface glabrous . . . . . **14. B. maingayi**

b. Terminal buds pubescent with erect hairs. Twigs pubescent. Lower leaf surface pubescent on the tissues or along the major veins 15

15a. Leaves lanceolate, longer than 26 cm. Secondary veins more than 13 pairs . . . . . **22. B. pilosa**

b. Leaves obovate to elliptic, shorter than 24 cm. Secondary veins less than 12 pairs 16

16a. Tree, up to 30 m. Flowers white. Filaments longer than anthers **26. B. wieringae**

b. Small tree, up to 10 m. Flowers pale red. Filaments in the first and second whorls shorter than anthers . . . . . **20. B. oligantha**

17a. Leaves usually longer than 33 cm. Leaf base usually cordate (rarely obtuse). Young twigs thicker than 10 mm . . . . . **11. B. kunstleri**

b. Leaves usually shorter than 27 cm. Leaf base cuneate or obtuse, rarely rounded. Young twigs narrower than 7 mm 18

18a. Flower buds enveloped by involucre (the trace of clustered involucre can be seen even in infructescences) . . . . . **4. B. gemmiflora**

b. Flower buds not enveloped by involucre 19

19a. Inflorescences longer than 8 cm, usually bearing more than 100 flowers per inflorescence 20

b. Inflorescences shorter than 6 cm, usually bearing less than 60 flowers per inflorescence 23

20a. Minor leaf veins immersed and hardly visible on upper leaf surface 21

b. Minor leaf veins slightly raised and visible on upper leaf surface 22

21a. Leaf apex acute to acuminate. Leaf margin flat. Tertiary veins usually not percurrent. Petioles 1–2.5 cm long, without lignified base . . . . . **15. B. micrantha**

b. Leaf apex obtuse. Leaf margin slightly revolute. Tertiary veins strongly percurrent. Petioles 2.5–3.5 cm long, with lignified base . . . . . **21. B. phoebeopsis**

22a. Lower leaf surface almost glabrous. Midrib slightly raised on upper leaf surface. Flowers red . . . . . **9. B. hartonoana**

b. Lower leaf surface usually pubescent. Midrib slightly impressed on upper leaf surface. Flowers yellow to white . . . . . **24. B. tawaensis**
23a. Twigs and lower leaf surface glabrous 24
b. Twigs and lower leaf surface (at least on midribs) pubescent 25
24a. Leaves firmly chartaceous. Minor venation pattern fine. Flower receptacle not thick . . . . . **19. B. oblonga**
b. Leaves strongly coriaceous. Minor venation pattern coarse. Flower receptacle thick . . . . . **2. B. crassa**
25a. Flowers longer than 4 mm. All the filaments longer than anthers **13. B. madang**
b. Flowers shorter than 2.5 mm. Filaments in the first and second whorls shorter than anthers 26
26a. Leaves coriaceous, with revolute margin. Minor leaf venation pattern coarse . . . . . **18. B. murutensis**
b. Leaves chartaceous, with flat margin. Minor leaf venation pattern fine 27
27a. Lower leaf surface usually pubescent not only on the major veins but also on the tissue. Anther apices glabrous. Fruit pedicels not apically constricted . . . . . **1. B. brachystachys**
b. Lower leaf surface usually pubescent only on the midrib. Anther apices pubescent. Fruit pedicels apically constricted . . . . . **25. B. telupidensis**

1. Beilschmiedia brachystachys Kosterm. — Fig. 1; Map 1

Beilschmiedia brachystachys Kosterm. (1969) 453. — *Cryptocarya brachybotrys* Merr. (1929) 88, not *Beilschmiedia brachybotrys* Merr. — Type: *Elmer 21851* (holo PNH†; iso A, BO, K, L, UC), Malaysia, Borneo, Sabah, Tawao.

Small tree up to 15 m tall. *Terminal buds* narrowly ovoid, densely pubescent with long, erect, wavy, reddish brown hairs, and short, erect, curly, reddish brown hairs. *Twigs* terete, slightly angular when young, c. 2 mm diam., dark brown, pubescent with same type of hairs as on the terminal buds. *Petioles* 0.5–1 cm long, flat to slightly canaliculate above, drying dark brown, pubescent. *Leaves* alternate, evenly distributed, blade chartaceous, matt, elliptic or obovate, 7–11 by 3–5 cm, base cuneate, apex acute to slightly acuminate, margin flat, upper surface pubescent along the midrib with long wavy hairs, lower surface sparsely pubescent with erect hairs, slightly glaucous, midrib almost immersed above, raised below, secondary veins 7–9(–10) pairs, almost immersed above, raised below, tertiary veins not percurrent, minor venation fine, almost immersed above, slightly raised below. *Inflorescences* axillary, paniculate to racemose, 2–5 cm long, pubescent with long erect hairs, each bearing 5–30 flowers; floral pedicels of lateral divisions 1.5–2.5 mm long, pedicels of central flowers c. 3 mm long. *Flowers* greenish white, c. 2 mm long, c. 2 mm diameter. *Tepals* 6, ovate, c. 1.5 by 1 mm, densely pubescent on both sides. *Stamens* 9, c. 1 mm long, filaments shorter than anthers in the first and second whorls, longer than anthers in the third whorl, filaments pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.5 mm long; style terete, c. 0.6 mm long. *Infructescences* c. 10 cm long; pedicels c. 1 mm diam., thickened to c. 2 mm diam. below fruits, not constricted at apex. *Fruits* ellipsoid, c. 2 by 1 cm (immature), drying dark brown, surface smooth.

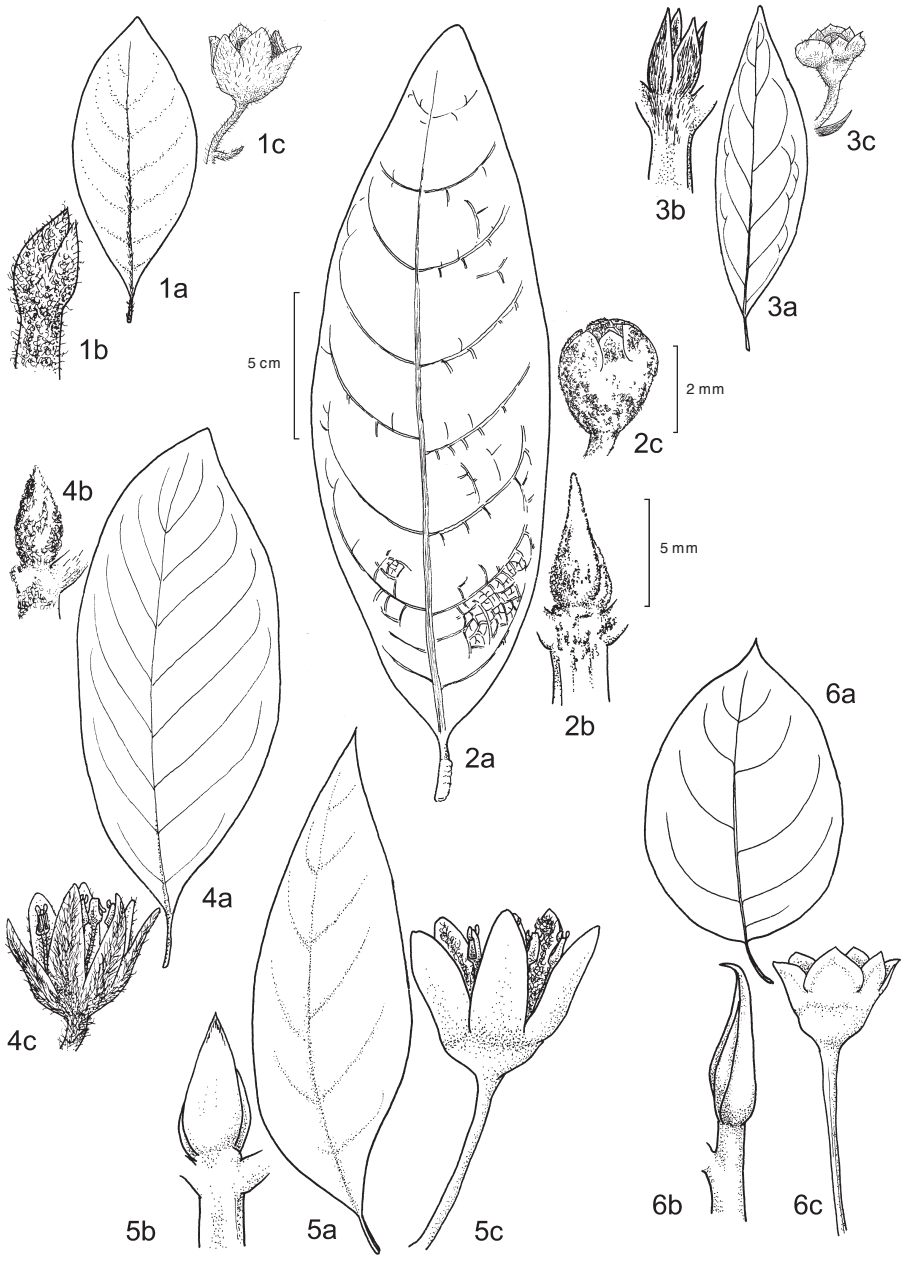


Fig. 1–6. Species of *Beilschmiedia* Nees in Borneo: 1. *B. brachystachys* Kosterm.; 2. *B. crassa* Sach. Nishida; 3. *B. dictyoneura* Kosterm.; 4. *B. gemmiflora* (Blume) Kosterm.; 5. *B. glabra* Kosterm.; 6. *B. glauca* S.K.Lee & L.F.Lau. a. Leaf; b. terminal bud; c. flower. Scales are the same for the same parts of the plants.

Distribution — Endemic to Borneo, known from E Sabah (Malaysia) and E Kalimantan (Indonesia).

Habitat & Ecology — Humid forest, on sandstone. Altitude 200–640 m. Flowering and fruiting: July.

Note — This species has sometimes been misidentified as *B. rivularis*, apparently because they share relatively similar indument type, leaf shape, and inflorescence shape. However, *B. brachystachys* differs from *B. rivularis* in the phyllotaxis (alternate vs subopposite) and fruit shape (ellipsoid vs spherical). Another species similar to *B. brachystachys* is *B. telupidensis* (see notes on *B. telupidensis* for the differences).

2. Beilschmiedia crassa Sach.Nishida — Fig. 2; Map 1

Beilschmiedia crassa Sach.Nishida (2006) 90. — Type: *Nooteboom & Chai 1661* (holo L; iso SAR), Malaysia, Borneo, Sarawak, Kalabit Highlands.

Tree to 20 m tall. All parts glabrous except for terminal buds and inflorescences. *Terminal buds* ovoid, reddish brown, pubescent with short and curly or dusty hairs. *Twigs* terete, slightly compressed when young, 3–5 mm diam., light to dark brown. *Petioles* 1.3–1.7 cm long, flat to canaliculate above, drying almost black. *Leaves* alternate or subopposite, evenly distributed, blade thick, strongly coriaceous, narrowly ovate, 13–23 by 3–9.5 cm, base obtuse, margin flat, apex acute, upper surface slightly glossy, lower surface matt, unknown whether glaucous or not, midrib impressed or slightly raised above, raised below, secondary veins 7–10 pairs, raised on both sides, tertiaries not percurrent, minor venation coarse, conspicuously raised on both sides, minor veins thick. *Inflorescences* axillary, paniculate, 4–6 cm long, sparsely pubescent, each bearing 20–30 flowers; pedicels c. 1 mm long. *Flowers* red, c. 3 mm long, c. 2 mm diameter. *Tepals* 6, almost equal, c. 1 by 0.8 mm, pubescent on both sides. *Stamens* 6–9, c. 0.8 mm long, all filaments shorter than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse to truncate at apex. *Staminodes* 3 (when stamens are 9) to 6 (when stamens are 6); staminodes (3 or less) in third whorl narrowly sagittate,

Map 1. Distribution of *Beilschmiedia brachystachys* Kosterm. (●), *B. crassa* Sach.Nishida (▲), *B. dictyoneura* Kosterm. (○), and *B. gemmiflora* (Blume) Kosterm. (△) in Borneo.

c. 0.9 mm long, with a pair of glands; 3 staminodes in fourth whorl subulate, c. 0.7 mm long. *Pistil* sparsely pubescent; ovary ovoid, c. 1 mm long; style terete, glabrous, c. 0.5 mm long. *Infructescences* 6–7 cm long; pedicels c. 5 mm diam., not apically constricted. *Fruits* spherical, c. 3 by 3.3 cm, drying brown, surface warty.

Distribution — Endemic to Sarawak (Malaysia).

Habitat & Ecology — Mossy montane forest on sandstone. Altitude 880–1000 m. Flowering: March; fruiting: August.

Note — This species is distinguished from the other *Beilschmiedia* species of Borneo by its thick flower receptacle and thick, strongly coriaceous, narrowly ovate leaves. Flowers of *B. crassa* have a variation in stamen number from six to nine because stamens in the third whorl are often sterile.

3. **Beilschmiedia dictyoneura** Kosterm. — Fig. 3; Map 1

Beilschmiedia dictyoneura Kosterm. (1965) 24. — Type: *Kostermans 4464* (holo BO; iso A, BISH, BM, BRI, CANB, K, KEP, L, LE, NY, P, PNH, SAN, SING), Indonesia, Kalimantan, N Balikpapan, Sungai Wain region.

Trees to 30 m tall. All parts glabrous except for terminal buds, young twigs, and inflorescences. *Terminal buds* ovoid, pubescent with brown, short, appressed hairs. *Twigs* terete, slightly angular when young, c. 1.5 mm diam., dark brown, usually glabrous or sparsely pubescent with short appressed hairs when young. *Petioles* 1.5–1.7 cm long, canaliculate above, drying dark brown. *Leaves* opposite, rarely subopposite, evenly distributed, blade firmly chartaceous, narrowly elliptic, 8–16 by (2.5–)3–4.5(–6.5) cm; base cuneate to obtuse, apex acute, margin flat; upper surface often slightly glossy, lower surface glaucous; midrib impressed or slightly raised above, raised below; secondary veins 6–10 pairs, sometimes arching to the next vein and ending in a loop, slightly raised above, raised below; tertiaries not percurrent; minor venation relatively coarse, very slightly raised above, almost immersed below. *Inflorescences* axillary, paniculate, 3–4 cm long, sparsely pubescent with short erect hairs, each bearing 10–20 flowers; floral pedicels c. 2 mm long. *Flowers* greenish white, c. 1.5 mm long, c. 2.5 mm diameter. *Tepals* 6, almost equal or inner three tepals slightly smaller, broadly ovate, 0.5–1 by 1–1.7 mm. *Stamens* 6, representing first and second whorls, c. 0.7 mm long, filaments shorter than anthers, almost glabrous or pubescent only around the base; anthers glabrous, acute at apex. *Staminodes* 3–6 (3 in third whorl, 0–3 in fourth whorl), c. 0.5 mm long, narrowly deltoid, a pair of glands rarely present in third whorl, lacking in fourth whorl. *Pistil* glabrous; ovary roundish ellipsoid, c. 0.6 mm long; style terete, c. 0.5 mm long. *Infructescences* up to 7 cm long; fruit pedicels c. 1.5 mm diam., slightly thicker to c. 2 mm diam. below fruits, not constricted at apex. *Fruits* ellipsoid, c. 1.5 by 1 cm, drying dark brown, slightly warty.

Distribution — Sabah (Malaysia), E, C and W Kalimantan (Indonesia). The species has also been collected from the Malay Peninsula and Sumatra.

Habitat & Ecology — Lowland to montane forest, on sandy soils. Altitude up to 900 m. Flowering: October, January; fruiting: December, April, June.

Vernacular name — Mensungow.

Note — This is one of the rare *Beilschmiedia* species that have only six stamens. This characteristic sometimes occurs also in *B. crassa*, *B. glauca*, and *B. kinabaluensis*,

but *B. dictyoneura* is easily distinguished from these three species by the terminal buds pubescent with appressed hairs and the opposite, chartaceous, narrowly elliptic leaves.

4. Beilschmiedia gemmiflora (Blume) Kosterm. — Fig. 4; Map 1

Beilschmiedia gemmiflora (Blume) Kosterm. (1952) 115. — *Laurus gemmiflora* Blume (1826) 555. — *Polyadenia gemmiflora* (Blume) Nees (1836) 576. — *Daphnidium gemmiflorum* (Blume) Blume (1851) 352. — *Lindera gemmiflora* (Blume) Boerl. (1900) 147. — Type: *Blume 1325* (holo L; iso BO), Indonesia, Java, Parang.

Tree to c. 35 m tall. *Terminal buds* ovoid, light brown, pubescent with short, curly hairs. *Twigs* terete, angular when young, c. 3 mm diam., light brown, pubescent with light brown, short, curly hairs. *Petioles* 1.5–2 cm long, canaliculate or flat above, drying brown. *Leaves* alternate, relatively crowded around the terminal buds, blade chartaceous, elliptic, (7–)9–15(–17) by (3.5–)4–8 cm, base obtuse to cuneate, apex acute, margin slightly revolute, upper surface slightly glossy or sometimes matt, lower surface matt, glabrous, not glaucous, midrib slightly impressed or almost immersed above, raised below, secondary veins 8–10 pairs, slightly raised above, raised below; tertiary veins not percurrent; minor venation relatively fine, almost immersed or slightly raised above, slightly raised below. *Inflorescences* axillary, enveloped by an involucre when young, racemose to paniculate with little branching, 1–3 cm long, each bearing a few to 20 flowers; floral pedicels c. 1 mm long. *Flowers* greenish, c. 3 mm long, c. 3 mm diameter. *Tepals* 6, equal, oblong, c. 2.5 by 1 mm, outside pubescent, inside almost glabrous. *Stamens* 9, first and second whorls c. 1.3 mm long, third whorl c. 1.5 mm long, all filaments longer than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* almost glabrous; ovary ovoid, c. 0.5 mm long; style terete, c. 1.2 mm long. *Infructescences* 5–8 cm long; fruit pedicels c. 3 mm diam., not constricted at apex. *Fruits* ellipsoid, c. 3 by 1.7 cm, drying blackish brown, surface smooth.

Distribution — W Sabah (Malaysia), E and C Kalimantan (Indonesia). This species is also distributed in Sumatra, Java, Celebes, and New Guinea.

Habitat & Ecology — Primary forest on sandy soils or brownish soils. Altitude 10–600 m. Flowering and fruiting in August.

Note — *Beilschmiedia gemmiflora* is distinguished from the other species of Borneo by its inflorescences enveloped by involucres. This character can be recognized even in fruiting specimens because there are traces of involucral segments at the base of infructescences.

5. Beilschmiedia glabra Kosterm. — Fig. 5; Map 2

Beilschmiedia glabra Kosterm. (1965) 22. — Type: *Kostermans 7313* (holo BO; iso A, BRI, K, L, LAE, NY, P, PNH, SING), Indonesia, Kalimantan, Balikpapan, Mt Beratus.

Tree to 35 m tall. *Terminal buds* ovoid, dark brown, as thick as the twigs, glabrous or rarely sparsely pubescent only on the edge of buds or inside buds. *Twigs* terete, angular when young, c. 4 mm diam., greenish brown, glabrous. *Petioles* 1.5–2 cm long, canaliculate above, drying dark brown, glabrous. *Leaves* opposite, evenly distributed, blade

relatively coriaceous, ovate to elliptic, 12–18(–26) by 5.5–7(–8) cm; base cuneate, apex acute, margin usually flat, both surfaces matt, glabrous, lower leaf surface not glaucous, midrib almost immersed above, raised below; secondary veins 6–9 pairs, almost immersed above, slightly raised below; tertiary veins not percurrent; minor venation relatively coarse, immersed above, very slightly raised below. *Inflorescences* axillary, racemose or paniculate with little branching, 2.5–4 cm long, each bearing a few to 30 flowers; floral pedicels of lateral divisions 3–8 mm long, pedicels of central flowers 5–10 mm long. *Flowers* yellowish or pale green, c. 5 mm long, c. 5 mm diameter. *Tepals* 6, equal, oblong, c. 3.5 by 1.5 mm, only inside pubescent. *Stamens* 9, c. 2.5 mm long, all filaments longer than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, truncate at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.7 mm long; style terete, c. 1.5 mm long. *Infructescences* c. 10 cm long; fruit pedicels c. 15 mm diam., not constricted at the apex. *Fruits* ellipsoid with a pointed apex, 3–4.5 by c. 2.5 cm, drying brown, surface smooth or slightly rough.

Distribution — In Sabah, E Sarawak (Malaysia), and E Kalimantan (Indonesia). This species has also been collected from the Malay Peninsula.

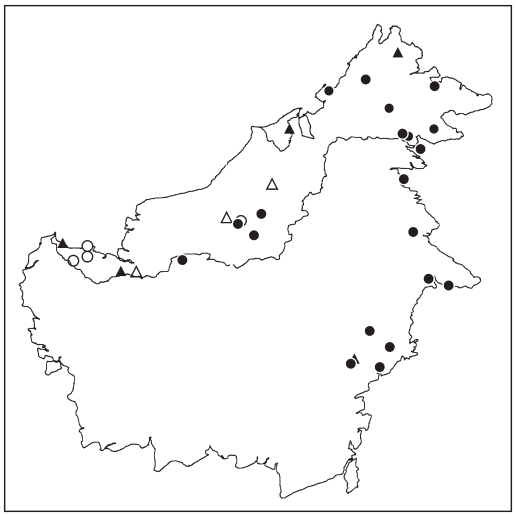
Habitat & Ecology — Primary or secondary, mixed dipterocarp forest on sandy loam soils, brownish soils, or limestone. Altitude up to 1150 m. Flowering: March, July, August, November; fruiting: March, April, July.

Note — Among the opposite-leaved species of Borneo, only two species, i.e., *B. glabra* and *B. lucidula*, have filaments longer than anthers in all the stamens. The two species are usually easily discriminated by the terminal buds (ovate and as wide as twigs in *B. glabra* vs conspicuously rounded and much wider than twigs in *B. lucidula*) and leaf venation pattern (coarse vs fine).

6. Beilschmiedia glauca S.K.Lee & L.F.Lau – Fig. 6; Map 2

Beilschmiedia glauca S.K.Lee & L.F.Lau in Lee (1963) 193. — Type: *Hainan Exped. 676* (holo HC), China, Hainan, Peisha Hsien.

Tree to 20 m tall. All parts glabrous except for inside of flowers. *Terminal buds* subulate, dark brown, sometimes glaucous. *Twigs* terete, angular when young, c. 1.5 mm diam., brown. *Petioles* 1.5–2 cm long, canaliculate above, drying brown. *Leaves* alternate, evenly distributed, blade chartaceous, ovate or orbicular, (6–)8–12 by 4–8 cm, base obtuse to rounded, apex acuminate, margin flat, upper surface slightly glossy, lower surface matt, glaucous, midrib immersed above, slightly raised below, secondary veins 6 or 7 pairs, slightly raised on both sides, tertiary veins not percurrent, minor venation very fine, slightly raised on both sides. *Inflorescences* axillary, paniculate, 7–12 cm long, each bearing 15–50 flowers; floral pedicels 4–8 mm long. *Flowers* white to greenish yellow, c. 2 mm long, c. 2.5 mm diameter. *Tepals* 6, almost equal or inner three slightly smaller, broadly ovate, 1.2–1.5 by 1.5–1.7 mm. *Stamens* 9, rarely 6, c. 1 mm long, filaments almost as long as anthers, pubescent or rarely glabrous, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, rarely 6, almost subulate. *Pistil* glabrous; ovary ovoid, c. 0.8 mm long; style terete, c. 0.8 mm long. *Infructescences* 5–7 cm long; fruit pedicels c. 3 mm diam., not constricted at apex. *Fruits* ellipsoid, c. 4 by 2 cm, drying reddish brown, surface smooth.



Map 2. Distribution of *Beilschmiedia glabra* Kosterm. (●), *B. glauca* S.K.Lee & L.F.Lau (▲), *B. glauciphylla* Kosterm. (○), and *B. gynotrochioides* Kosterm. (△) in Borneo.

Distribution — In Borneo, Sarawak and Sabah (Malaysia), Brunei, and E Kalimantan (Indonesia). The species is also distributed widely from Hainan to the Malay Peninsula and N Sumatra.

Habitat & Ecology — Primary, lowland forest to hill forest. Altitude up to 870 m. Flowering: April; fruiting: July, September.

Note — Many Bornean specimens of this species were identified as "*B. endiandraefolia*" by Kostermans, but this name is a nomen nudum. As the nude name describes, this species has a finely reticulated venation pattern that is often seen in *Endiandra*. This character, alternate phyllotaxis, and the lack of pubescence except for the inside of the flowers, distinguish *B. glauca* from the other *Beilschmiedia* species of Borneo.

7. Beilschmiedia glauciphylla Kosterm. — Fig. 7; Map 2

Beilschmiedia glauciphylla Kosterm. (1960) 347; (1970) 23. — Type: *Beccari 686* (holo G; iso BO, K, L, S), Borneo.

Tree to 30 m tall. *Terminal buds* ovoid, as wide as the twigs, glabrous or rarely sparsely pubescent only on the edge of buds or inside buds. *Twigs* terete, compressed when young, 2–4 mm diam., dark brown to black, glabrous. *Petioles* 1–1.5 cm long, roundish but slightly canaliculate above, drying dark brown, glabrous. *Leaves* opposite, evenly distributed, blade coriaceous, glossy, elliptic, 10–15(–20) by 4–6(–10) cm, base cuneate to obtuse, apex acute, margin slightly revolute, upper surface glossy, lower surface glaucous, both surfaces glabrous, midrib impressed or immersed above, raised below, secondary veins 6 or 7 (or 8) pairs, raised on both sides, tertiary veins not percurrent, minor venation coarse, raised on both sides. *Inflorescences* axillary or around terminal buds, paniculate, 4–10 cm long, sparsely pubescent, each bearing up to 30 flowers; floral pedicels of lateral divisions c. 2 mm long, pedicels of central flowers c. 3 mm. *Flowers* greenish yellow, c. 3.5 mm long, c. 4 mm diameter. *Tepals* 6, equal, ovate, c. 2 by 2 mm, glabrous on both surfaces or sparsely pubescent inside.

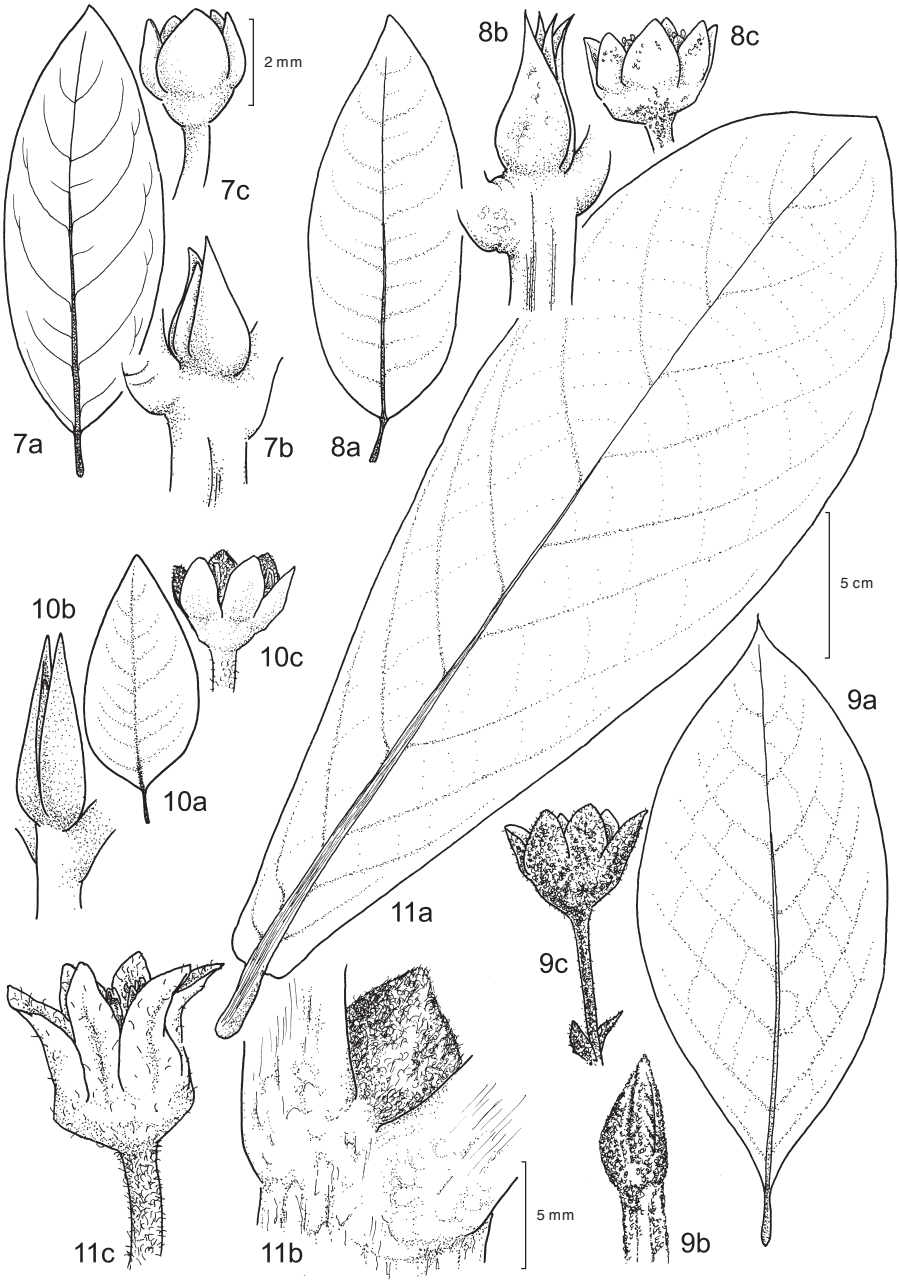


Fig. 7–11. Species of *Beilschmiedia* Nees in Borneo: 7. *B. glauciphylla* Kosterm.; 8. *B. gynotrochioides* Kosterm.; 9. *B. hartonoana* Sach.Nishida; 10. *B. kinabaluensis* Kosterm.; 11. *B. kunstleri* Gamble. a. leaf; b. terminal bud; c. flower. Scales are the same for the same parts of the plants.

Stamens 9, c. 1 mm long, filaments shorter than anthers in first and second whorl, longer than anthers in third whorl, filaments almost glabrous, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous, ovary ovoid, c. 1 mm long; style terete, c. 0.5 mm long. *Infructescences* 8–15 cm long; fruit pedicels c. 7 mm diam., thickened to c. 10 mm diam. below fruits, not constricted at apex. *Fruits* club-shaped or broadly ellipsoid, c. 6.5 by 4 cm, drying dark brown, surface smooth.

Distribution — Endemic to Borneo, known only from Sarawak (Malaysia).

Habitat & Ecology — Mixed dipterocarp forest or heath forest on sandstone or basalt. Altitude up to 1000 m. Flowering: May, June; fruiting: April.

Note — I previously referred to *B. glauciphylla* as having club- or spindle-shaped fruits in terms of the difference between this species and *B. microcarpa* (Nishida 2006). This recognition included specimens identified as *B. gynotrochioides* which had been reduced as a taxonomic synonym of *B. glauciphylla* by Kostermans (1970). After re-examination of the specimens, however, I concluded that *B. glauciphylla* and *B. gynotrochioides* should be retained as different species, and that the fruit shape of *B. glauciphylla* should not be described as spindle-shaped, but club-shaped or ellipsoid. *Beilschmiedia glauciphylla* and *B. gynotrochioides* can be discriminated by the appearance of the minor venation (raised vs immersed on the upper leaf surface), and fruit shape (club-shaped or ellipsoid with rounded top vs spindle-shaped with pointed top). Differences between *B. glauciphylla* and *B. microcarpa* are recognized in leaf texture (coriaceous vs chartaceous), flower size (c. 4 mm diam. vs c. 2 mm diam.), and fruit size (c. 6.5 by 4 cm vs c. 3.5 by 1.6 cm).

8. Beilschmiedia gynotrochioides Kosterm. — Fig. 8; Map 2

Beilschmiedia gynotrochioides Kosterm. (1968) 292; (1970) 23. — Type: *S 18908 (Chai)* (holo L; iso BO), Sarawak, Bt. Raya, Kapit.

Tree to 18 m tall. *Terminal buds* narrowly ovoid, c. 2 mm diam., blackish brown, glabrous or rarely sparsely pubescent only on the edge of buds or inside buds. *Twigs* terete, compressed when young, 1.5–4 mm diam., dark brown to black, glabrous. *Petioles* 1.2–1.6 cm long, flat to rounded above, drying dark brown, glabrous. *Leaves* opposite, evenly distributed, blade coriaceous, matt, elliptic, 10–16 by 4–6.5 cm, base obtuse, apex acute, margin slightly revolute, both surfaces glabrous, lower surface not glaucous, midrib impressed or immersed above, raised below, secondary veins 8 or 9 pairs, almost immersed above, almost immersed or slightly raised below, tertiary veins not percurrent, minor venation coarse, almost immersed above, almost immersed or slightly raised below. *Inflorescences* axillary or around terminal buds, paniculate, 7–12 cm long, glabrous or sparsely pubescent, each bearing up to 30 flowers; floral pedicels of lateral divisions c. 2 mm long, pedicels of central flowers c. 3 mm long. *Flowers* greenish yellow, c. 3 mm long, c. 3.5 mm diameter. *Tepals* 6, equal, ovate, c. 2.3 by 1.5 mm, almost glabrous or sparsely pubescent with dusty short hairs. *Stamens* 9, first and second whorls c. 1 mm long, third whorl c. 1.3 mm long, all filaments shorter than anthers, sparsely pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 1 mm long; style terete, c. 0.5 mm long. *Infructescences* 10–20 cm long; fruit pedicels c. 7 mm

diam., thickened to c. 15 mm diam. below fruits, the border between pedicel and fruit not distinct. *Fruits* spindle-shaped, c. 8 by 4 cm, drying brown, surface rough, lenticellate.

Distribution — Endemic to Sarawak (Malaysia).

Habitat & Ecology — Primary mixed dipterocarp forest, on sandstone soils. Altitude 300–700 m. Flowering: August, November; fruiting: August.

Vernacular name — Kenu-ong (Kenya).

Notes — *Beilschmiedia gynotrochioides* was described by Kostermans in 1968, but was soon reduced as a synonym of *B. glauciphylla* by the same author (Kostermans 1970). See notes in *B. glauciphylla* for the differences between these two species.

Vegetatively, *B. gynotrochioides* approaches *B. microcarpa* because they share the same phyllotaxis and glabrousness. They differ from each other in venation appearance on the upper leaf surface (almost immersed in *B. gynotrochioides* vs raised in *B. microcarpa*), flower size (c. 3.5 mm diam. vs c. 2 mm diam.), fruit shape (spindle-shaped vs ellipsoid) and fruit size (c. 8 by 4 cm vs c. 3.5 by 1.5 cm).

9. Beilschmiedia hartonoana Sach.Nishida — Fig. 9; Map 3

Beilschmiedia hartonoana Sach.Nishida (2001) 110. — Type: *Jacobs 5029* (holo L; iso B, G, K, S, SAR, US), Malaysia, Borneo, Sarawak.

Small tree usually to 8 m tall (rarely to 18 m tall). *Terminal buds* ovoid, brown, pubescent with brown to reddish brown, erect, minute, curly hairs. *Twigs* terete, slightly angular when young, brown, pubescent with same type of hairs as on terminal buds. *Petiole* 1.2–1.5 cm long, flat to rounded above, drying brown, pubescent with same type of hairs as on twigs. *Leaves* alternate, evenly distributed, blade chartaceous to firmly chartaceous, almost glabrous, matt, elliptic, 16–26(–31) by 8–10(–13) cm, base cuneate, apex acuminate, margin flat, midrib slightly raised above, raised below, secondary veins 9–11(–13) pairs, mostly immersed above, raised below, tertiary veins weakly percurrent, minor venation relatively fine, slightly raised on both surfaces. *Inflorescences* axillary, paniculate, 12–45 cm long, pubescent with same type of hairs as on twigs, each bearing c. 100 or more flowers; floral pedicels of lateral divisions c. 3 mm long, pedicels of central flowers c. 4 mm long. *Flowers* red or pink, c. 2 mm long, c. 2.5 mm diameter. *Tepals* 6, equal, ovate, c. 2 by 1 mm, outside pubescent with same type of hairs as on twigs, inside pubescent with longer hairs. *Stamens* 9, c. 1.3 mm long, filaments in first and second whorls slightly shorter than anthers, filaments in third whorl slightly longer than anthers, all filaments pubescent with long wavy hairs, stamens in third whorl with a pair of glands; anthers glabrous, rarely pubescent only on back, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.6 mm long; style terete, c. 0.7 mm long. *Infructescences* c. 15 cm long; fruiting pedicel c. 1.5 mm diam., not constricted at apex. *Fruits* ellipsoid, c. 4 by 1.5 cm, drying brown, surface smooth or slightly warty.

Distribution — Endemic to Borneo: Sarawak (Malaysia), and C, W Kalimantan (Indonesia).

Habitat & Ecology — Primary mixed dipterocarp forest in lowlands or hillsides, usually on sandstone or clay soils. Altitude up to 600 m, rarely to 1200 m. Flowering: year-round; fruiting: November.

Vernacular name — Medang (Iban).

Note — *Beilschmiedia hartonoana* has long inflorescences with more than 100 small flowers, which implies an affinity with *B. micrantha*, *B. phoebeopsis*, and *B. tawaensis*. However, *B. hartonoana* is distinct from *B. micrantha* and *B. phoebeopsis* in the minor leaf veins (raised in *B. hartonoana* vs immersed in *B. micrantha* and *B. phoebeopsis*), and from *B. tawaensis* in the pubescence on the lower leaf surface (almost glabrous in *B. hartonoana* vs pubescent in *B. tawaensis*) and the flower colour (red vs yellow-white).

10. Beilschmiedia kinabaluensis Kosterm. — Fig. 10; Map 3

Beilschmiedia kinabaluensis Kosterm. (1956) 27. — Type: *J. & M.S. Clemens 29524* (holo BO; iso A, L, SING), Sabah, Mt Kinabalu.

Tree to 30 m tall. All parts glabrous except for the flowers. *Terminal buds* lanceolate, blackish. *Twigs* terete, slightly compressed when young, 2.5–3.5 mm diam., brown. *Petioles* 1–1.7 cm long, flat to rounded above, drying almost black. *Leaves* opposite, evenly distributed, blade coriaceous, ovate, 6–13 by 3.5–6 cm, base rounded or obtuse, apex acute, margin flat, upper surface matt, lower surface slightly glossy, not glaucous, midrib immersed above, raised below, secondary veins 8–11 pairs, immersed above, raised below, tertiaries not percurrent, minor venation fine and immersed above, raised below. *Inflorescences* axillary or around terminal buds, racemose or paniculate with little branching, 2–3 cm long, almost glabrous or sparsely pubescent, each bearing less than 10 flowers; floral pedicels of lateral divisions c. 1.5 mm long, pedicels of central flowers c. 3 mm. *Flowers* (only young flowers known) colour unknown, c. 3 mm long, c. 3 mm diameter. *Tepals* 6, equal, ovate, c. 1.5 by 1 mm, sparsely pubescent outside, densely pubescent inside. *Stamens* 6, representing first and second whorls, c. 1.2 mm long, all filaments shorter than anthers, pubescent; anthers glabrous, obtuse at apex. *Staminodes* 3, representing third whorl, sagittate, with a pair of glands. *Pistil* glabrous,

Map 3. Distribution of *Beilschmiedia hartonoana* Sach.Nishida (●), *B. kinabaluensis* Kosterm. (▲), *B. kunstleri* Gamble (○), and *B. lucidula* (Miq.) Kosterm. (△) in Borneo.

ovary ovoid, c. 1 mm long; style terete, c. 0.5 mm long. *Infructescences* c. 7 cm long; fruit pedicels c. 10 mm diam., not constricted at apex. *Fruits* almost spherical, c. 5 by 5 cm, drying dark brown, surface smooth.

Distribution — Endemic to Malaysian side of Borneo, collected from Mt Kinabalu and Mt Alab, Sabah, and from Bario, Sarawak.

Habitat & Ecology — Montane forest or mixed dipterocarp hill forest. Altitude 1290–1750 m. Flowering: May; fruiting: May, August.

Notes — Vegetatively, *B. kinabaluensis* approaches *B. lucidula* or *B. glabra* because they share opposite ovate leaves and glabrous terminal buds. However, *B. kinabaluensis* is distinct from the latter two species in having relatively smaller flowers with all the filaments shorter than anthers.

Flowers of this species are described as having only six fertile stamens here, but it is difficult to determine if this character is stable within the species. Thus far, there are only two flowering specimens collected for this species, and the flowers are young.

11. Beilschmiedia kunstleri Gamble — Fig. 11; Map 3

Beilschmiedia kunstleri Gamble (1910) 147. — Type: *Kunstler 6854* (K), Malay Peninsula, Perak.

Tree to 30 m tall. *Terminal buds* ovoid, brown, densely pubescent with short, erect, curly hairs and long, straight hairs. *Twigs* terete or slightly angular, thicker than 1 cm diam., dark brown, pubescent with curly hairs, glabrous when old, sometimes with lenticels. *Petioles* (1.2–)2.4–3 cm long, flat above, drying dark brown. *Leaves* alternate, blade coriaceous, glabrous, narrowly obovate, (20–)33–37(–46) by (4–)9–13(–18) cm, base cordate or rarely obtuse, apex obtuse, margin slightly revolute, unknown whether glaucous or not, midrib impressed or slightly raised above, raised below, secondary veins 10–12 pairs, slightly impressed or immersed above, raised below, tertiaries weakly percurrent, minor venation coarse, slightly raised on both sides. *Inflorescences* axillary, paniculate, 8–12(–21) cm long, pubescent with erect hairs, each bearing 30–100(–140) flowers; floral pedicels of lateral divisions c. 2 mm long, pedicels of central flowers c. 3 mm long. *Flowers* yellow or white, c. 4 mm long, c. 4 mm diameter. *Tepals* 6, almost equal, ovate, 2.5–4 by 1.5–2.5 mm, sparsely pubescent on both sides. *Stamens* 9, 2–3 mm long, filaments pubescent, shorter than or as long as anthers, stamens in third whorl with a pair of glands; anthers glabrous, slightly retuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid; c. 0.7 mm long, style terete, c. 1.5 mm long. *Infructescences* 9–20 cm long; fruit pedicels red, constricted at apex. *Fruits* ellipsoid, c. 2.5 by 1.5 cm, drying black, surface smooth.

Distribution — Sarawak and Sabah (Malaysia), E Kalimantan (Indonesia). This species is also distributed in Thailand, the Malay Peninsula, and Sumatra.

Habitat & Ecology — Primary or secondary dipterocarp forest, submontane mossy forest, heath forest or kerangas forest, on mostly sandy soils, sometimes brown soils, black soils, ultrabasic or limestone. Altitude 10–800 m, rarely up to 1300 m. Flowering: February, March, July, August; fruiting: May, June, December.

Vernacular names — Medang (Iban); Rimapong (Murut).

Note — Similarities of the floral structure suggest a close relationship between *B. kunstleri* and *B. madang*. However, they are clearly discriminated by the leaf size and shape.

12. Beilschmiedia lucidula (Miq.) Kosterm. — Fig. 12; Map 3

Beilschmiedia lucidula (Miq.) Kosterm. (1970) 23. — *Cryptocarya lucidula* Miq. (1858) 922. — Type: *Horsfield s.n.* (BM, BO, CAL, K, U), Indonesia, Java, Banjumas.

Tree to 27 m tall. *Terminal buds* large, brown, c. 4 mm diam. and conspicuously rounded with acuminate apex when sterile or fruiting, c. 2 mm diam. when flowering, glabrous or rarely sparsely pubescent only inside buds. *Twigs* terete, slightly compressed when young, 1–2 mm diam., brown, glabrous. *Petioles* 0.8–1.2 cm long, canaliculate above, drying brown, glabrous. *Leaves* opposite, evenly distributed, blade firmly chartaceous, usually slightly glossy, ovate, 8.5–12(–16) by 4–6.5(–8) cm, base obtuse, apex acute, margin flat, both surfaces glabrous, lower surface not glaucous, midrib almost immersed above, raised below, secondary veins 8–11 pairs, slightly raised on both sides, tertiary veins not percurrent, minor venation fine, partly raised above, raised on both surfaces (venation pattern appearing coarser on upper surface than on lower surface). *Inflorescences* clustered around a node of new twigs, paniculate with little branching, 3–8 cm long, each bearing c. 20 flowers or less; floral pedicels of lateral divisions 2–3 mm, pedicels of central flowers 4–5 mm. *Flowers* white or pale green, c. 3 mm long, c. 2.7 mm diameter. *Tepals* 6, equal, oblong, c. 1.7 by 1 mm, inside sparsely pubescent; stamens 9, first and second whorls c. 1.2 mm long, third whorl c. 1.4 mm long, all filaments longer than anthers, glabrous, stamens in third whorl with a pair of glands; anthers glabrous, retuse to slightly cuspidate at apex. *Staminodes* 3, sagittate. *Pistil* glabrous, ovary ovoid, c. 0.6 mm long; style terete, c. 0.7 mm long. *Infructescences* c. 10 cm long; fruit pedicels c. 3 mm diam., constricted at apex. *Fruits* ellipsoid, c. 2.5 by 1.5 cm, drying black, sometimes glaucous, surface smooth.

Distribution — In Borneo, E Sabah, and NE Sarawak (Malaysia), E and W Kalimantan (Indonesia). This species has also been collected from the Malay Peninsula, the Philippines, Sumatra, Java, and Bali.

Habitat & Ecology — Primary, hill forest, swamp or periodically inundated forest on sandstone, loam soils, or clay soils. Altitude 0–1000 m. Flowering: August, October; fruiting: February, April, July, October to December.

Note — Among the *Beilschmiedia* species of Borneo, *B. lucidula* is distinct by its conspicuously rounded terminal buds on narrow twigs and opposite leaves. The closest affinity of *B. lucidula* in Borneo is *B. glabra* (see notes on *B. glabra* for the differences).

13. Beilschmiedia madang (Blume) Blume — Fig. 13; Map 4

Beilschmiedia madang (Blume) Blume (1851) 332. — *Laurus madang* Blume (1826) 555. — *Polyadenia madang* (Blume) Nees (1836) 578. — Type: *Blume 776* (holo L; iso BO, U), Indonesia, Java.

Tree to 30 m tall. *Terminal buds* ovoid, reddish, pubescent with reddish brown, short, erect, curly hairs. *Twigs* terete, slightly angular when young, 3–5 mm diam., reddish brown, densely pubescent with the same type of hairs as on the terminal buds. *Petioles* 1.2–2 cm long, flat above, drying reddish brown. *Leaves* alternate, evenly distributed, blade firmly chartaceous, matt, elliptic, (10–)13–17(–23) by (4–)5–10(–14) cm, base cuneate to obtuse, apex obtuse, margin flat, upper surface glabrous, lower surface sparsely pubescent along midrib and secondary veins with reddish, minute, curly or

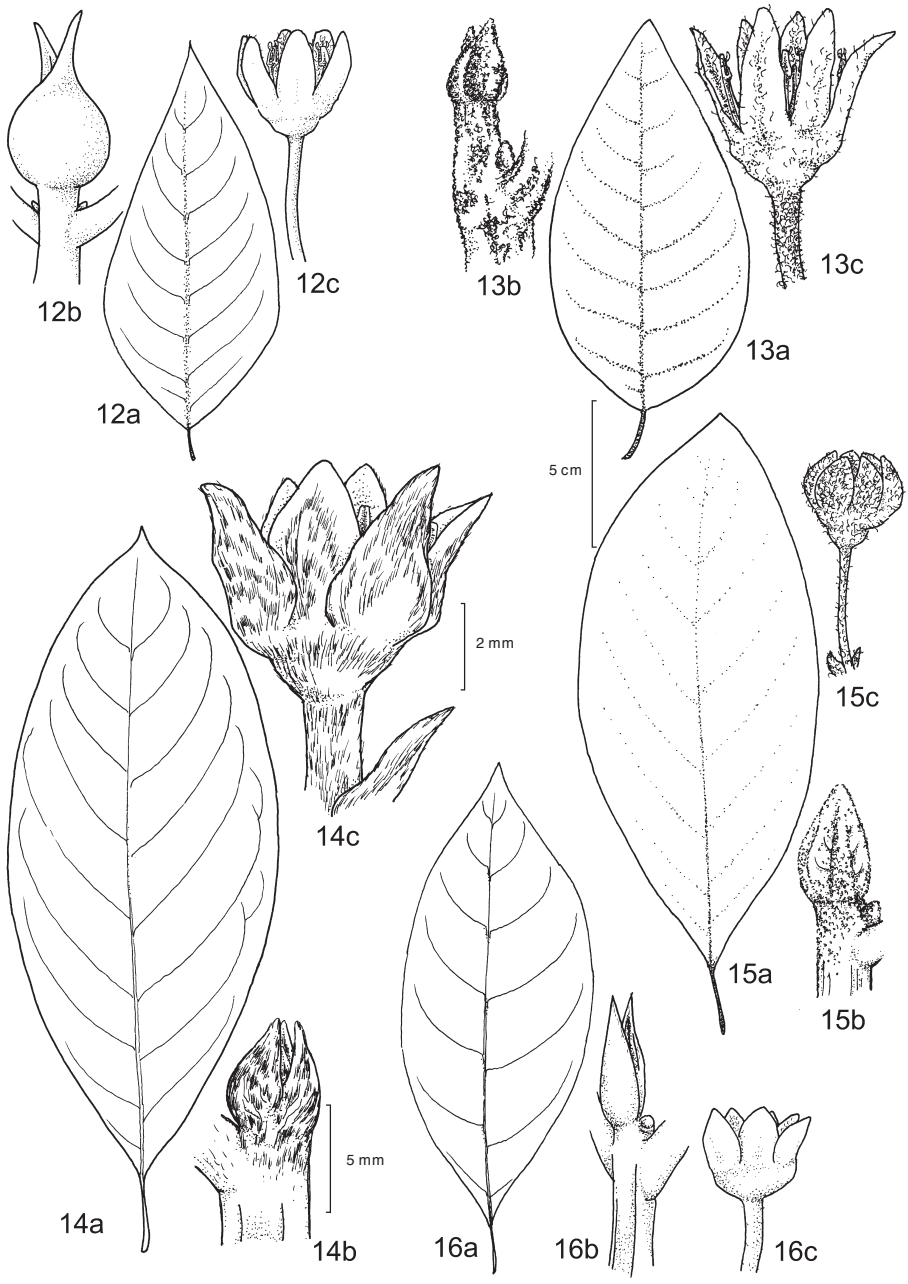


Fig. 12–16. Species of *Beilschmiedia* Nees in Borneo: 12. *B. lucidula* (Miq.) Kosterm.; 13. *B. madang* (Blume) Blume; 14. *B. maingayi* Hook.f.; 15. *B. micrantha* Merr.; 16. *B. microcarpa* Sach.Nishida. a. leaf; b. terminal bud; c. flower. Scales are the same for the same parts of the plants.

almost dusty hairs, unknown whether glaucous or not, midrib immersed or slightly raised above, raised below, secondary veins 7–9(–11) pairs, almost immersed or slightly impressed above, raised and reddish below, tertiaries not percurrent, minor venation relatively coarse, almost immersed above, slightly raised below. *Inflorescences* axillary, paniculate with little branching, c. 3 cm long, densely pubescent, each bearing c. 10 flowers; floral pedicels of lateral divisions 1.5–2.5 mm, pedicels of central flowers c. 2.5 mm long. *Flowers* yellow to pale green; c. 4 mm long, c. 4.5 mm diameter. *Tepals* 6, almost equal, oblong, c. 2.5 by 0.8 mm, sparsely pubescent on both sides. *Stamens* 9, c. 1.8 mm long, filaments longer than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse to truncate at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 1 mm long; style terete, c. 1.2 mm long. *Infructescences* c. 5 cm long; fruit pedicels c. 2.5 mm diam., constricted at apex. *Fruits* ellipsoid, c. 1.5 by 1.2 cm, drying reddish brown, surface almost smooth.

Distribution — C Sarawak, Sabah (Malaysia), and E Kalimantan (Indonesia). This species is also distributed in the Malaya Peninsula, Java, and Sumatra.

Habitat & Ecology — Primary or secondary, mixed dipterocarp forest, on sandy loam soils. Altitude up to 100 m in Borneo. Flowering: April, July; fruiting time unknown.

Vernacular names — Lahu (Kayan); Medang merah.

Note — Many specimens of *B. madang* from Borneo differ from the type specimen, which was collected from Java. The Bornean specimens have reddish hairs, coriaceous leaves with an enrolled margin, and coarser venation that is immersed on the upper leaf surface; the type has ochre hairs, chartaceous leaves with a flat margin, and finer venation that is slightly raised on the upper leaf surface. However, there are some intermediate specimens, which make it difficult to discriminate them as different species. More specimens, especially from Java or Sumatra, are needed to clarify the relationships.

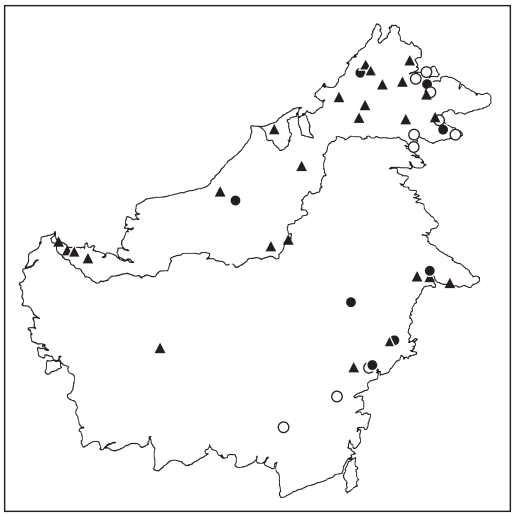
14. **Beilschmiedia maingayi** Hook.f. — Fig. 14; Map 4

Beilschmiedia maingayi Hook.f. (1886) 123. — Type: *Maingay 1268* (holo K), Malay Peninsula, Malacca.

Beilschmiedia borneensis Merr. (1929) 87. — Type: *D.D. Wood 1972* (A, BO), Malaysia, Sabah, Sandakan.

Beilschmiedia oligocarpa Kosterm. (1970) 27. — Type: *S 3101 (Anderson)* (holo BO; iso SAR, SING), Malaysia, Sarawak.

Tree to 24 m tall. *Terminal buds* ovoid, ochre to brown, pubescent with short, appressed, straight hairs. *Twigs* slightly angular, 4–5 mm diam., light brown to greenish brown, usually glabrous. *Petioles* 1.8–3 cm long, canaliculate above, drying greenish brown to dark brown. *Leaves* alternate or subopposite, evenly distributed, blade chartaceous, glabrous, elliptic, often asymmetric, 16–25(–30) by 6–12 cm; base cuneate to obtuse, apex cuspidate, margin flat, glabrous on both sides, lower surface not glaucous, midrib impressed or slightly raised above, raised below, secondary veins 8–10 pairs, immersed or slightly raised above, raised below, tertiary veins not percurrent, minor venation relatively fine, slightly raised above, slightly raised below. *Inflorescences* axillary, paniculate, 3–5 cm long, densely pubescent, each bearing 25–50 flowers; floral pedicels of lateral divisions c. 2 mm long, pedicels of central flowers 3–5 mm long, bracts usually persistent when flowering. *Flowers* yellow, c. 5 mm long, c. 6 mm diameter. *Tepals* 6,



Map 4. Distribution of *Beilschmiedia madang* (Blume) Blume (●), *B. maingayi* Hook.f. (▲), *B. micrantha* Merr. (○) in Borneo.

almost equal, ovate, c. 4 by 2 mm, pubescent outside, almost glabrous inside. *Stamens* 9, first and second whorls c. 2 mm long, third whorl c. 2.5 mm long, all filaments shorter than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse to truncate at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 1 mm long; style terete, c. 1.5 mm long. *Infructescences* 5–15 cm long; fruit pedicels c. 2.5 mm diam., gradually thickened to 5 mm diam. below fruits, not constricted at the apex. *Fruits* ellipsoid, c. 2.5 by 1.5 cm, drying black, surface smooth.

Distribution — In W and E Kalimantan (Indonesia), and widely scattered in Sabah and Sarawak (Malaysia). This species has also been collected from the Malay Peninsula, Sumatra, Java, and the Philippines.

Habitat & Ecology — Primary or secondary, hill or montane forest, on yellowish or red clay soils, brownish soils, or loam soils with limestone. Altitude 10–1400 m. Flowering: January, April to July, November; fruiting: May to November.

Vernacular names — Empawang Berok; Mananpuroh (Sungei); Medang.

Notes — This species has often been misidentified as *B. wallichiana*, a poorly known species of the Malay Peninsula. *Beilschmiedia maingayi*, however, is distinguished from *B. wallichiana* by the appressed hairs on the terminal buds and the filaments shorter than anthers.

The closest species to *B. maingayi* in Borneo is supposedly *B. oligantha*, which shares similar leaf and flower shape. *Beilschmiedia maingayi* is distinct from *B. oligantha* in the indument type (appressed vs erect), flower colour (yellow vs red) and shape of the fruit pedicels (not constricted vs constricted at apex).

15. Beilschmiedia micrantha Merr. — Fig. 15; Map 4

Beilschmiedia micrantha Merr. (1929) 85. — Type: *Elmer 21156* (holo PNH†; iso A, BO, L), Sabah, Tawao.

Beilschmiedia micrantha Merr. var. *latifolia* Merr. (1929) 86. — Type: *Elmer 21235* (A, BO, L), Sabah, near Tawao.

Tree to c. 40 m tall. *Terminal buds* ovoid, brown, pubescent with erect, minute curly or dusty hairs. *Twigs* terete, slightly compressed when young, light brown to dark brown, pubescent with minute curly hairs when young. *Petioles* 1–2.5 cm long, rounded above, drying ochraceous to brown. *Leaves* alternate, evenly distributed, blade firmly chartaceous, glabrous, elliptic, 13–24 by 5–10 cm, apex acute to acuminate, base cuneate, margin flat, lower surface usually slightly glaucous, midrib almost immersed or slightly impressed above, raised below, secondary veins 8–11 pairs, immersed or slightly impressed above, raised below, tertiary veins usually not percurrent, immersed on both surfaces, minor venation fine (finest veins hardly visible on both surfaces), immersed above, almost immersed below. *Inflorescences* axillary, paniculate, 8–18 cm long, sparsely pubescent, each bearing c. 200 flowers; floral pedicels c. 3 mm long. *Flowers* pink, c. 2 mm long, c. 2.5 mm diameter. *Tepals* 6, equal, ovate, c. 1 by 0.8 mm, pubescent on both sides. *Stamens* 9, c. 0.9 mm long, all filaments slightly shorter than anthers, sparsely pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous, ovary ovoid, c. 0.7 mm long, style c. 0.5 mm long. *Infructescences* c. 15 cm long; fruit pedicels c. 2.5 mm diam., thickened to 5 mm diam. below fruits, not constricted or slightly constricted at apex. *Fruits* spherical, c. 2.5 by 2.5 cm, drying black, surface smooth or slightly rough.

Distribution — Endemic to Borneo: E Sabah (Malaysia), E and S Kalimantan (Indonesia).

Habitat & Ecology — Primary or secondary forest, often near rivers, on sandy loam soils, limestone, or brown to blackish soils. Altitude up to 300 m. Flowering: from April to July, September and October; fruiting: July, October.

Vernacular names — Alabon (Tengara), Kodtong kalaut (Sungei), Lisang jantan (Sungei), Lujong (Malay), Medang (Kedayan), Radu-radu (Sungei Kinabatangan).

Notes — Large-leaved specimens of this species used to be recognized as a distinct variety, *B. micrantha* var. *latifolia*. However, the leaf size is variable in this species and is not a discriminating character.

This species approaches *B. hartonoana*, *B. phoebeopsis*, and *B. tawaensis* by its long inflorescences and small flowers. However, it differs from *B. phoebeopsis* in the leaf venation pattern and petiole appearance and from *B. tawaensis* in the venation pattern on the upper leaf surface. See notes on *B. hartonoana* for the differences between *B. micrantha* and *B. hartonoana*.

16. Beilschmiedia microcarpa Sach.Nishida — Fig. 16; Map 5

Beilschmiedia microcarpa Sach.Nishida (2006) 92. — Type: *SAN 82219* (*Krispinus*) (holo L; iso K, KEP, SAN, SAR), Malaysia, Sabah, Tawau.

Tree to 9 m tall. *Terminal buds* narrowly ovoid, c. 2 mm diam., blackish brown, glabrous or rarely sparsely pubescent only on the edge of buds or inside buds. *Twigs* terete, c. 2 mm diam., greenish brown to dark brown, glabrous. *Petioles* 0.7–1.5 cm long, flat above, drying brown, glabrous. *Leaves* opposite, evenly distributed, blade chartaceous, matt, elliptic, 11–19 by 5–8 cm, base cuneate to obtuse, margin flat, apex acuminate, both surfaces glabrous, lower surface green, midrib immersed or slightly raised above, raised below, secondary veins 7–9 pairs, slightly raised above, raised below, tertiary veins not percurrent, minor venation relatively coarse, slightly raised on both sides.

Inflorescences axillary or crowded around a node of new twigs, paniculate, 8–12 cm long, each bearing c. 20 flowers; pedicels 2–5 mm long. *Flowers* yellow, c. 2 mm long, c. 2 mm diameter. *Tepals* 6, equal, ovate, c. 1.7 by 1 mm, sparsely pubescent inside and along edges. *Stamens* 9, filaments in first and second whorls c. 0.9 mm long, filaments in third whorl c. 1.2 mm long, all filaments shorter than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, acute at apex. *Staminodes* 3, sagittate, c. 0.6 mm long. *Pistil* glabrous; ovary ovoid, c. 0.5 mm long; style terete, c. 0.7 mm long. *Infructescences* 5–8 cm long; pedicels 1.5–3 mm diam., not constricted when mature. *Fruits* ellipsoid, c. 3.5 by 1.6 cm, drying brown, surface smooth.

Distribution — Endemic to Borneo, known from Sabah, N Sarawak (Malaysia), and E Kalimantan (Indonesia).

Habitat & Ecology — Primary forest on hills, on loam soils containing limestone, sandy soils, or clay soils. Altitude up to 1300 m. Flowering: late January, March; fruiting: October, February.

Note — Among opposite-leaved species of *Beilschmiedia* in Borneo, this species, *B. glauciphylla*, and *B. gynotrochioides* share a combination of the following characters: narrow glabrous terminal buds, elliptic leaves and short filaments. The discriminating characters between *B. microcarpa* and the latter two species are mainly in the fruit shape, fruit size, and flower size (for details, see notes on *B. glauciphylla* and *B. gynotrochioides*).

17. Beilschmiedia montanoides Kosterm. — Fig. 17; Map 5

Beilschmiedia montanoides Kosterm. (1965) 26. — Type: *SAN 28273 (Singh)* (holo BO; iso K, L), Malaysia, Sabah, Ranau.

Tree to c. 10 m tall. *Terminal buds* narrowly ovate, pubescent with light brown to grey, appressed, short straight hairs. *Twigs* terete, slightly compressed when young, dark brown, grey when old, glabrous. *Petioles* 0.7–1.2 cm long, flat to slightly canaliculate

Map 5. Distribution of *Beilschmiedia microcarpa* Sach.Nishida (●), *B. montanoides* Kosterm. (▲), *B. murutensis* Kosterm. (○), and *B. oblonga* Kosterm. (△) in Borneo.

above, drying almost black and slightly contrasting with twigs. *Leaves* opposite, evenly distributed, blades coriaceous, matt, narrowly elliptic, 6.5–10 by 1.5–3 cm, base cuneate, apex acute, margin slightly revolute, upper surface glabrous, lower surface glabrous, not known whether glaucous or not, midrib almost immersed above, slightly raised or almost immersed below, secondary veins 7–9 pairs, almost immersed above, very slightly raised below, tertiary veins not percurrent, minor venation relatively coarse, immersed above, slightly raised or almost immersed below. *Inflorescences* axillary, paniculate with little branching, c. 3.5 cm long, sparsely pubescent, each bearing c. 10 flowers; floral pedicels 1–2 mm long. *Flowers* colour unknown, c. 2.5 mm long, c. 3 mm diameter. *Tepals* 6, equal, ovate, c. 1.7 by 1.5 mm, sparsely pubescent on both sides. *Stamens* 9, filaments in first and second whorls c. 1.2 mm long, shorter than anthers, filaments in third whorl c. 1 mm long, as long as anthers, all filaments glabrous, stamens in third whorl with a pair of glands; anthers glabrous, obtuse to truncate at apex. *Staminodes* 3, sagittate. *Pistil* pubescent, ovary ovoid, c. 0.7 mm long; style terete, c. 0.6 mm long. *Infructescences* c. 5 cm long; fruit pedicels c. 2 mm diam., thickened to 3.5 mm diam. below fruits, weakly constricted at apex. *Fruits* ellipsoid, c. 2.3 by 1.3 cm, drying black, surface smooth.

Distribution — Endemic to Borneo, known only from Ranau, Sabah (Malaysia).

Habitat & Ecology — Primary, hill forest. Altitude 1300–1800 m. Flowering: March; fruiting: November.

Note — Among the opposite-leaved *Beilschmiedia* species of Borneo, only *B. montanoides* and *B. dictyoneura* have their terminal buds pubescent with appressed hairs. In addition to the terminal bud character, *B. montanoides* and *B. dictyoneura* share narrowly elliptic leaves. However, the two species differ from each other in leaf texture (coriaceous in *B. montanoides* vs chartaceous in *B. dictyoneura*) and the stamen number (9 vs 6).

18. Beilschmiedia murutensis Kosterm. — Fig. 18; Map 5

Beilschmiedia murutensis Kosterm. (1970) 25. — Type: *S 26504 (Paie)* (holo SAR; iso BO, K, L), Malaysia, Sarawak, G. Murud.

Tree to 10 m tall. *Terminal buds* ovoid, brown, pubescent with erect curly hairs. *Twigs* angular to sulcate, 2.5–4 mm diam., dark brown, densely pubescent with brown, erect, curly hairs. *Petioles* 0.5–1 cm long, flat above, drying almost black. *Leaves* alternate, evenly distributed, blade coriaceous, elliptic or ovate, 4–8 by 2.5–4.5 cm, base obtuse, apex obtuse to acute, margin slightly revolute, upper surface glossy, glabrous, lower surface pubescent with short, erect, curly hairs, unknown whether glaucous or not, midrib immersed above, raised below, secondary veins 6–8 pairs, slightly impressed above, raised below, tertiaries not percurrent, minor venation relatively coarse, conspicuously raised and thick above, slightly raised below. *Inflorescences* axillary, paniculate with little branching, c. 2.5 cm long, pubescent, each bearing c. 10 flowers; floral pedicels c. 2 mm long. *Flowers* colour unknown, c. 2 mm long, c. 2.5 mm diameter. *Tepals* 6, equal, ovate, c. 1.5 by 1 mm, both surfaces densely pubescent. *Stamens* 9, c. 1.1 mm long, filaments shorter than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.6 mm long; style terete, c. 0.6 mm long. *Infructescences* unknown.

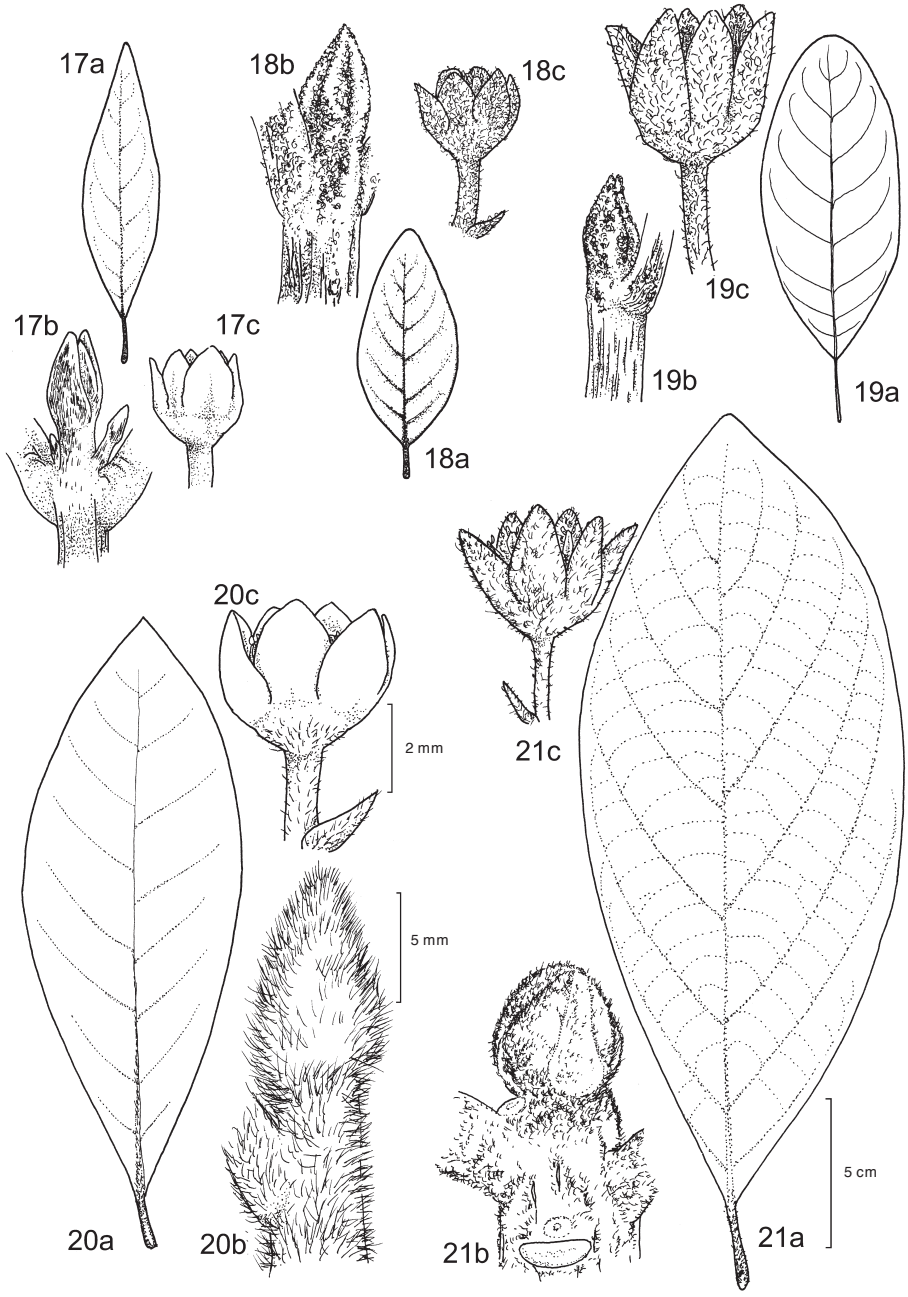


Fig. 17–21. Species of *Beilschmiedia* Nees in Borneo: 17. *B. montanoides* Kosterm.; 18. *B. murutensis* Kosterm.; 19. *B. oblonga* Kosterm.; 20. *B. oligantha* Sach.Nishida; 21. *B. phoebeopsis* Kosterm. a. leaf; b. terminal bud; c. flower. Scales are the same for the same parts of the plants.

Distribution — Endemic to Borneo, known only from Mt Murud, Sarawak (Malaysia).

Habitat & Ecology — Near mountain summit. Altitude c. 2300 m. Flowering: October.

Note — This species is known only from its type specimens with only flowers, but clearly distinguished from the other *Beilschmiedia* species of Borneo by its alternate, small, coriaceous leaves with the lower leaf surface covered with curly hairs. *Beilschmiedia madang* sometimes has firmly chartaceous leaves with a pubescent lower surface and approaches this species, but differs from it in having large flowers (c. 4 mm long) with filaments longer than anthers.

19. Beilschmiedia oblonga Kosterm. — Fig. 19; Map 5

Beilschmiedia oblonga Kosterm. (1968) 293. — Type: *bb 31807* (holo L; iso BO, K), Indonesia, Borneo, Melawi.

Tree, height unknown. *Terminal buds* ovoid, dark brown, pubescent with reddish brown, short, curly hairs. *Twigs* terete, angular when young, c. 3.5 mm diam., dark brown, almost glabrous when old. *Petioles* 1.8–2.2 cm long, flat above, drying dark brown. *Leaves* alternate, blade firmly chartaceous, oblong, 10–17 by 5–6 cm, base obtuse to cuneate, apex rounded, margin flat, glabrous and slightly glossy on both surfaces, lower surface not glaucous, midrib slightly raised or almost immersed above, raised below, secondary veins 7 or 8 pairs, slightly raised above, raised below, tertiary veins not percurrent, minor venation relatively fine, slightly raised on both sides. *Inflorescences* axillary, paniculate with little branching, c. 3 cm long, each bearing c. 20 flowers; floral pedicels c. 2.5 mm long. *Flowers* colour unknown, c. 3.5 mm long, c. 3.5 mm diameter. *Tepals* 6, equal, oblong, c. 3.2 by 1.5 mm, pubescent on both sides. *Stamens* 9, c. 2.5 mm long, all filaments longer than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.7 mm long; style terete, 1–1.5 mm long. *Infructescences* unknown.

Distribution — In W Kalimantan (Indonesia).

Habitat & Ecology — Forest or soil type unknown. Altitude around 280 m. Flowering: April.

Note — This species approaches *B. madang* in floral characters. The main differences between *B. oblonga* and *B. madang* are in leaf characters: *B. oblonga* has relatively narrow (5–6 cm) leaves with round apex and raised minor veins on the upper surface, whereas *B. madang* has wider (5–10 cm) leaves with an obtuse apex and immersed minor veins on the upper surface. However, some leaves of *B. oblonga* are almost obtuse, and many collections of *B. madang* outside Borneo have raised minor veins on the upper leaf surface. More specimens of *B. oblonga*, especially with fruits, are needed to clarify the relationship.

20. Beilschmiedia oligantha Sach.Nishida — Fig. 20; Map 6

Beilschmiedia oligantha Sach.Nishida (2005) 343. — Type: *S 40647 (Lee)* (holo L; iso K, KEP, SAN, SAR), Malaysia, Sarawak, Kapit.

Small tree, up to 10 m tall. *Terminal buds* ovoid, densely pubescent with long, erect, straight hairs. *Twigs* densely pubescent with long, erect, straight hairs. *Petioles* 1.5–2(–3) cm long, flat to slightly canaliculated above, densely pubescent. *Leaves* alternate, evenly distributed on branches, (14–)17–20(–24) by (4–)5–10 cm, obovate or sometimes elliptic, chartaceous, base acute, apex acuminate or cuspidate, margin flat, upper leaf surface pubescent only along midrib, lower surface sparsely pubescent with erect, long, straight hairs, lower surface glaucous, midrib almost immersed above, raised below, secondary veins 6–9(–12) pairs, almost immersed above, raised below, tertiaries not percurrent, minor venation relatively fine, slightly raised but the smallest veins immersed above, slightly raised below. *Inflorescences* axillary, paniculate, 1–5 cm long, each bearing a few to 30 flowers, rachis densely pubescent; floral pedicels of lateral divisions c. 1 mm long, pedicels of central flowers 2–3 mm long; bracts as large as flowers. *Flowers* red or pink, c. 4 mm long, c. 4 mm diameter. *Tepals* 6, almost equal, ovate, c. 3 by 2.5 mm, almost glabrous outside, sparsely pubescent inside. *Stamens* 9, c. 2 mm long, filaments shorter than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, c. 1.5 mm long, sagittate. *Pistil* glabrous; ovary ovate, c. 1 mm long; style terete, c. 1.5 mm long. *Infructescences* c. 5 cm long; c. 2.5 mm diam., fruit pedicels constricted at apex. *Fruits* ellipsoid, c. 2.8 by 1.5 cm, drying reddish black, surface smooth.

Distribution — Endemic to Borneo, C and E Sarawak, W Sabah (Malaysia), Brunei, E and W Kalimantan (Indonesia).

Habitat & Ecology — Mixed dipterocarp forest, often on hillsides, on sandy soils, sandstone, or basalt ridges. Altitude usually 10–800 m, rarely up to 1400 m. Flowering: April to September; fruiting: March to June.

Note — *Beilschmiedia oligantha* is close to *B. maingayi*, *B. pilosa*, and *B. wieringae* according to the inflorescence structure. However, it can be discriminated from *B. pilosa* by its leaf shape and size, and from *B. wieringae* by its flower colour and filament length. See notes on *B. maingayi* for the differences between *B. oligantha* and *B. maingayi*.

21. Beilschmiedia phoebeopsis Kosterm. — Fig. 21; Map 6

Beilschmiedia phoebeopsis Kosterm. (1968) 293. — Type: *S 16551 (Ashton)* (holo L; iso K), Malaysia, Sarawak, Bintulu.

Tree to c. 30 m tall. *Terminal buds* thickly ovoid, ochre, pubescent with short, erect wavy or dusty hairs. *Twigs* terete, c. 7 mm diam., brown, sparsely pubescent with erect, wavy or dusty hairs, almost glabrous when old. *Petioles* 2.5–3.5 cm long, flat above, drying light brown, basipetal part lignified. *Leaves* alternate, crowded at end of twig, blade coriaceous, matt, elliptic, 15–26 by 6–12 cm, base cuneate, apex obtuse, margin slightly revolute, upper surface glabrous, lower surface sparsely pubescent along midrib with light brown, dusty hairs, or almost glabrous, glaucous, midrib almost immersed above, raised below, secondary veins 7–11 pairs, sometimes arching to the next vein and ending in a loop, immersed or impressed above, raised below, tertiary veins strongly percurrent, immersed above, raised below, minor venation immersed and hardly visible above, almost immersed below. *Inflorescences* axillary, 20–25 cm long (only old inflorescences were measured), flower number unknown, pubescent with erect wavy

hairs; floral pedicels c. 2 mm long. *Flowers* colour unknown, c. 3 mm long, c. 3 mm diameter. *Tepals* 6, equal, ovate, c. 2 by 1.5 mm, pubescent on both sides. *Stamens* 9, first and second whorls c. 1.3 mm, filaments as long as anthers, third whorl c. 1.5 mm, filaments slightly longer than anthers, all filaments pubescent, stamens in third whorl with a pair of glands; anthers glabrous, rarely pubescent only on back, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.8 mm long; style terete, c. 0.8 mm long. *Infructescences* c. 15 cm long; fruit pedicels c. 2.5 mm diam., thickened to 4 mm diam. below fruits, not constricted at apex. *Fruits* roundish ellipsoid, c. 3.5 by 2.5 cm, drying light brown, surface warty.

Distribution — Endemic to Borneo, known from N Sarawak and S Sabah (Malaysia), and C Kalimantan (Indonesia).

Habitat & Ecology — On ridges of mixed dipterocarp forest, on yellow sandy clay soils. Altitude 20–750 m. Flowering: April; fruiting: September, October.

Note — *Beilschmiedia phoebeopsis* has large ochre leaves with immersed veins on the upper surface and long inflorescences with small flowers, which suggests its close relationship with *B. micrantha*. See notes on *B. micrantha* for their differences.

22. **Beilschmiedia pilosa** Kosterm. — Fig. 22, Map 6

Beilschmiedia pilosa Kosterm. (1960) 347; (1969) 454. — Type: *J. & M.S. Clemens 30235* (holo BO; iso G), Malaysia, Sabah, Mt Kinabalu.

Tree to 25 m tall. *Terminal buds* ovoid, brown, pubescent with erect hairs. *Twigs* terete, dark brown, densely pubescent with erect, long, straight hairs. *Petioles* 1.5–2.3 cm long, flat, densely pubescent when young. *Leaves* alternate, evenly distributed or relatively crowded at end of twigs, blade firmly chartaceous, matt, lanceolate, (26–)28–30 by 5–8 cm, base acute, apex acuminate, margin slightly revolute toward underside, upper surface pubescent only along midrib with erect, long, straight hairs, lower surface drying ochre to reddish brown, densely pubescent with erect, long, straight hairs when young, almost glabrous when old, not glaucous, midrib almost immersed above, raised below,

Map 6. Distribution of *Beilschmiedia oligantha* Sach.Nishida (●), *B. phoebeopsis* Kosterm. (▲), *B. pilosa* Kosterm. (○), and *B. rivularis* Kosterm. (△) in Borneo.

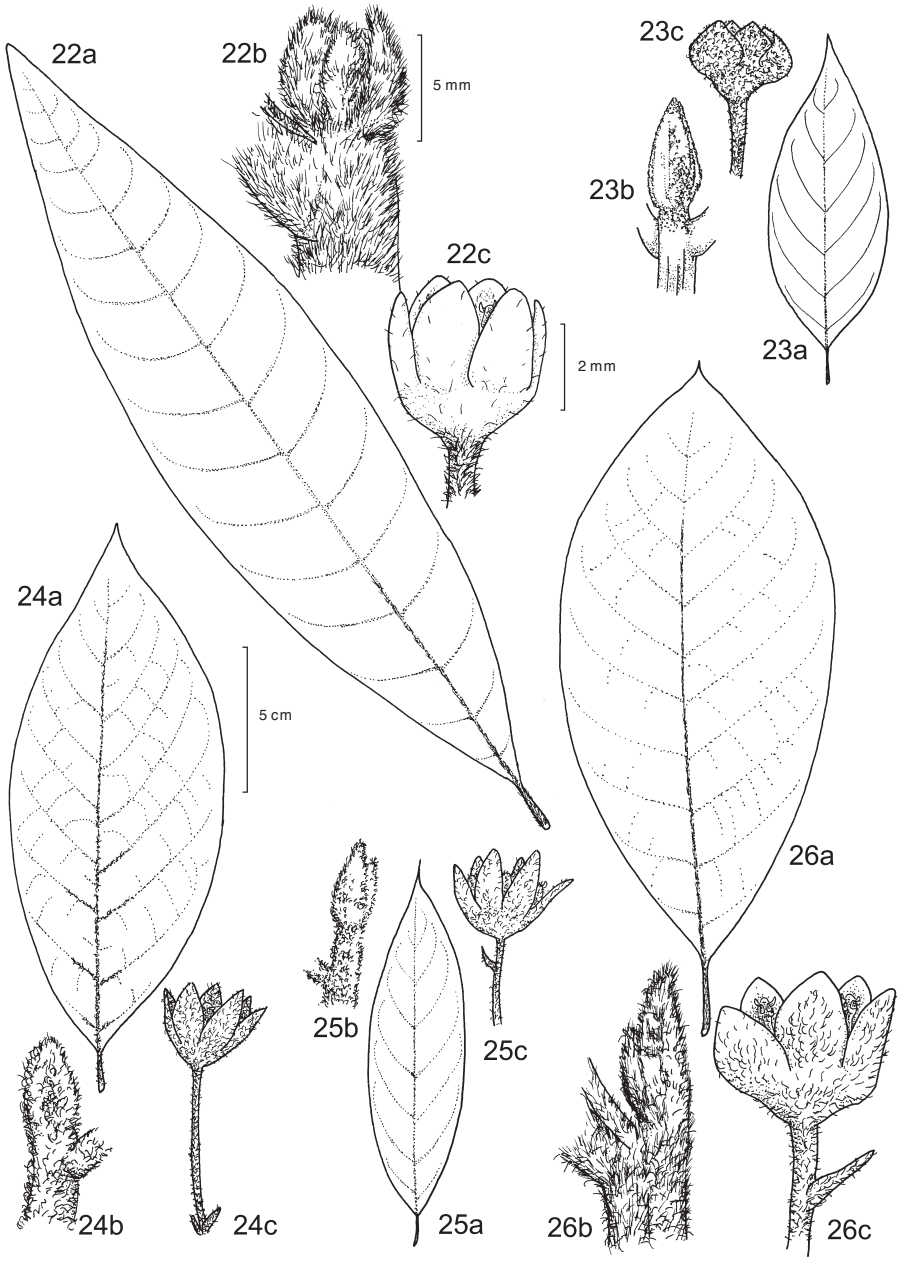


Fig. 22–26. Species of *Beilschmiedia* Nees in Borneo: 22. *B. pilosa* Kosterm.; 23. *B. rivularis* Kosterm.; 24. *B. tawaensis* Merr.; 25. *B. telupidensis* Sach.Nishida; 26. *B. wieringae* Kosterm. a. leaf; b. terminal bud; c. flower. Scales are the same for the same parts of the plants.

secondary veins (13–)14–17 pairs, almost immersed above, raised below; tertiaries not percurrent, minor venation relatively fine, slightly raised on both sides. *Inflorescences* axillary, paniculate, c. 2 cm long, each bearing a few to 20 flowers, densely pubescent; floral pedicels c. 2 mm long. *Flowers* red, c. 4 mm long, c. 3.5 mm diameter. *Tepals* 6, almost equal, ovate, c. 2.5 by 2.5 mm, almost glabrous outside, sparsely pubescent inside. *Stamens* 9, c. 2 mm long, filaments almost as long as anthers, filaments glabrous, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 1 mm long; style terete, c. 1.5 mm long. *Infructescences* c. 5 cm long; fruit pedicels constricted at apex. *Fruits* ellipsoid, c. 3 by 2 cm, drying black, surface smooth.

Distribution — Endemic to Borneo, known from Sabah and N Sarawak (Malaysia), E Kalimantan (Indonesia).

Habitat & Ecology — Submontane or mossy forest on sandy soils. Altitude 500–1500 m. Flowering: May; fruiting: July to October.

Note — This species is distinguished from the other *Beilschmiedia* species of Borneo by its long lanceolate leaves with relatively large flowers. It was once reported as conspecific to *B. wieringae* (Kostermans 1969), but differs from this species in leaf shape and flower colour.

23. Beilschmiedia rivularis Kosterm. — Fig. 23; Map 6

Beilschmiedia rivularis Kosterm. (1965) 27. — Type: *Kostermans 8005* (holo BO; iso BRI, CAL, G, K, KEP, L, LAE, P, PNH), Indonesia, SE Kalimantan, Sampit.

Tree to 40 m tall. *Terminal buds* ovoid to narrowly ovoid, pubescent with dusty hairs and short, erect, curly hairs. *Twigs* terete, slightly angular when young, drying dark brown, pubescent with dusty hairs and short, erect, curly hairs, glabrous when old. *Petioles* (1–)1.2–1.4(–1.6) cm long, slightly canaliculate above, drying dark brown, almost glabrous. *Leaves* subopposite, evenly distributed, blade firmly chartaceous, matt, elliptic, (7–)8–11(–14) by 3–4(–5.5) cm, base cuneate, apex acute, margin flat, glabrous on both surfaces, or sparsely pubescent with almost appressed hairs on the lower surface, glaucous on the lower surface, midrib almost immersed above, raised below, secondary veins 6–8 pairs, slightly raised on both sides, tertiary veins not percurrent, minor venation fine, slightly raised on both sides. *Inflorescences* axillary, paniculate, 5–9 cm long, densely pubescent with short, erect hairs, each bearing 15–50(–100) flowers; floral pedicels of lateral divisions 1–2 mm long, pedicels of central flowers 2–5 mm long. *Flowers* greenish yellow, c. 2 mm long, c. 2 mm diameter. *Tepals* 6, ovate, outer three c. 1.5 by 1 mm, inner three c. 1 by 1 mm, outside densely pubescent, inside sparsely pubescent. *Stamens* 9, 0.7–0.9 mm long, filaments shorter than anthers in first and second whorls, longer than anthers in third whorl, filaments sparsely pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.5 mm long, style terete, c. 0.5 mm long. *Infructescences* 2–6 cm long; fruit pedicels c. 3 mm diam., thickened to c. 4 mm diam. below fruits, usually not constricted at apex. Fruits spherical with pointed apex, c. 2.5 by 2.5 cm, drying light brown, surface smooth, powdery.

Distribution — Sabah, Sarawak (Malaysia), C and E Kalimantan (Indonesia). This species has also been collected from Sumatra and Bangka.

Habitat & Ecology — Moist forest, often along rivers, usually on sandstone soils. Altitude 20–1500 m, rarely up to 2000 m. Flowering: February, May, July to October; fruiting: July to November.

Vernacular names — Medang (Iban); Medang bakul; Buah tengda'an (Kelabit).

Notes — Specimens of *B. rivularis* have sometimes been misidentified as *B. brachystachys*. See notes on *B. brachystachys* for the difference between *B. rivularis* and *B. brachystachys*.

Specimens collected from Labi Hill in Brunei and Mulu in N Sarawak (*BRUN 659 (Ashton)* and *S4322 (Anderson)*) approach this species, but the leaves are alternate and the filaments in the first and second whorls are longer than the anthers. The status of these specimens is in need of further investigation using more material.

24. Beilschmiedia tawaensis Merr. — Fig. 24; Map 7

Beilschmiedia tawaensis Merr. (1929) 86. — Type: *Elmer 21885* (holo PNH†; iso A, BO, UC, L), Malaysia, Sabah, Tawao.

Tree to 20 m tall. *Terminal buds* ovoid, pubescent with ochre to reddish brown erect wavy hairs. *Twigs* terete, 1.5–2.5 mm diam., light brown, densely pubescent with the same type of hairs as on the terminal buds. *Petioles* 1–1.5(–2) cm long, flat to rounded above, drying light brown, pubescent. *Leaves* alternate, evenly distributed, blade chartaceous, matt, elliptic, (9–)14–18(–22) by (5–)6–8(–10) cm, base cuneate to obtuse, apex acute to acuminate, margin flat, upper surface sparsely pubescent along midrib and secondary veins with long wavy hairs, lower surface pubescent (rarely sparsely) with long, straight to wavy hairs, glaucous, midrib slightly impressed above, raised below, secondary veins 9–10(–12) pairs, impressed or immersed above, raised below, tertiary veins percurrent, minor venation fine, slightly raised on both sides. *Inflorescences* axillary, paniculate, 10–12(–18) cm long, pubescent, each usually bearing 100 or more flowers; floral pedicels of lateral divisions c. 3 mm long, pedicels of central flowers c. 5 mm long. *Flowers* yellow to white, c. 2 mm long, c. 2.5 mm diameter. *Tepals* 6, equal, ovate, c. 1.5 by 1 mm, densely pubescent on both sides. *Stamens* 9, stamens in third whorl with a pair of glands, filaments pubescent, filaments in first and second whorls c. 0.9 mm long, slightly shorter than anthers, filaments in third whorl c. 1.1 mm long, shorter or as long as anthers; anthers glabrous, obtuse to acute at apex. *Staminodes* 3, sagittate. *Pistil* sparsely pubescent to glabrous; ovary ovoid, c. 0.8 mm long, style terete, c. 0.7 mm long. *Infructescences* 10–20 cm long; fruit pedicels c. 3 mm diam., slightly constricted at apex. *Fruits* spherical with pointed apex, c. 2 by 2 cm, drying blackish, surface warty.

Distribution — Sabah and north edge of Sarawak (Malaysia). This species has also been collected from Sumatra.

Habitat & Ecology — Primary or secondary forest, near rivers or hillsides, on brownish soils. Altitude usually 60–300 m, rarely 600–1400 m. Flowering: usually February and March, rarely July, August, December; fruiting: unknown.

Vernacular names — Ambong (Labuk); Medan; Papak; Silan (Kinabatangan).

Notes — This species has sometimes been confused with *B. perakensis* from the Malay Peninsula, presumably because they share a similar indument type, leaf shape, and flower size. Apparently, their difference was considered to be in the amount of pubescence

Map 7. Distribution of *Beilschmiedia tawaensis* Merr. (●), *B. telupidensis* Sach.Nishida (▲), and *B. wieringae* Kosterm. (○) in Borneo.

on the lower leaf surface; a number of specimens from Borneo with less hairy leaves has been identified as *B. perakensis*. After comparative study of the Malaysian and Bornean specimens, however, I found that the density of pubescence on the lower leaf surface is actually a variable character in *B. tawaensis*, and that more reliable differences between the two species are the venation pattern, inflorescence branching pattern, and position of bracts on the flower pedicels. *Beilschmiedia tawaensis* is distinguished from *B. perakensis* by a finer venation pattern, more branched inflorescences (usually branching three times or more vs twice in *B. perakensis*), and bracts located at a more basal position on the pedicels.

I once reported that *B. tawaensis* had ellipsoid fruits (Nishida 2001). However, observation of better specimens revealed that the fruit shape of *B. tawaensis* is instead spherical.

25. Beilschmiedia telupidensis Sach.Nishida, *spec. nov.* — Fig. 25, 27; Map 7

> Species nova antheris apice pubescentibus a congeneris borneensibus diversa. *Beilschmiediae brachystachydi* proxime affinis, sed a qua foliis angustioribus et infra minus pubescentibus, petiolis longioribus, antheris pubescentibus differt. — Typus: *Zainudin et al. 4877* (holo L; iso SAR), Sabah, Telupid, Sungai Meliau off Sungai Karamuak, south trail.

Small tree, up to 15 m. *Terminal buds* narrowly ovoid, pubescent with short, erect, wavy hairs. *Twigs* terete, slightly angular when young, c. 1.5 mm diam., dark brown, pubescent with short, erect, curly hairs. *Petioles* 1–1.5 cm long, flat above, drying dark brown, sparsely pubescent. *Leaves* alternate, evenly distributed, blade firmly chartaceous, matt, narrowly elliptic, 10–17 by 3–5 cm, base cuneate to obtuse, apex slightly acuminate, margin flat; upper surface glabrous, lower surface pubescent with short erect hairs only along midrib, not known if glaucous or not, midrib immersed or impressed above, raised below, secondary veins 6 or 7 pairs, almost immersed above, raised below, tertiary veins not percurrent; minor venation fine, almost immersed above, slightly raised

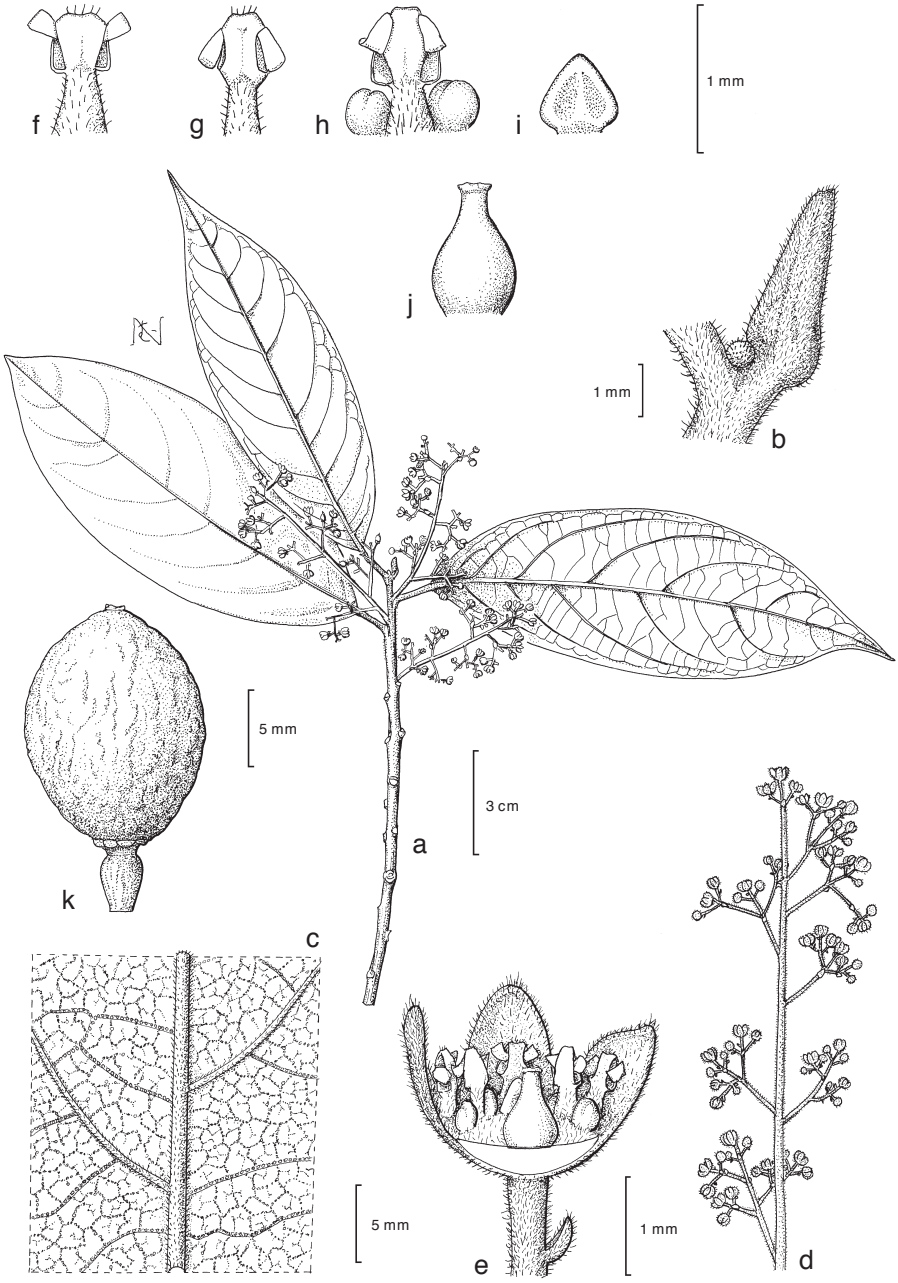


Fig. 27. *Beilschmiedia telupidensis* Sach.Nishida. a. Habit; b. terminal bud; c. venation pattern (abaxial view); d. inflorescence; e. flower (front part removed); f. first whorl stamen (adaxial view); g. second whorl stamen (adaxial view); h. third whorl stamen with a pair of glands (abaxial view); i. fourth whorl staminode (adaxial view); j. pistil; k. fruit (a–c, e–j: *Zainudin et al. 4877*; d: reconstructed from *Zainudin et al. 4877*; k: *FRI 41270*).

below. *Inflorescences* axillary, paniculate, 4–6 cm long, pubescent with short, erect hairs, each bearing 30–60 flowers; floral pedicels of lateral divisions c. 2 mm long (c. 0.5 mm from bract), pedicels of central flowers c. 2 mm long (c. 0.5 mm from bract). *Flowers* yellowish green, c. 2 mm long, c. 2.5 mm diameter. *Tepals* 6, ovate, c. 1.5 by 1 mm, sparsely pubescent on both sides. *Stamens* 9, 0.6–0.9 mm long, filaments shorter than anthers in first and second whorls, as long as or longer than anthers in third whorl, filaments pubescent, stamens in third whorl with a pair of glands; anthers pubescent at apex, rarely glabrous only in third whorl, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 0.7 mm long; style terete, c. 0.5 mm long. *Infructescences* c. 4 cm long; fruit pedicels c. 1 mm diam., constricted at apex. *Fruits* ellipsoid, c. 2 by 1 cm, drying dark brown, surface slightly warty.

Field notes — Bark greyish brown, smooth; inner bark yellowish brown.

Distribution — Endemic to Borneo, known only from Telupid district, Sabah (Malaysia).

Habitat & Ecology — Lowland dipterocarp forest, on ultrabasic soils. Altitude 130–230 m. Flowering & fruiting: April.

Vernacular name — Medang (Malay).

Notes — This new species has a pubescent anther apex, which is a character usually not found in other *Beilschmiedia* species of Borneo. Sparsely pubescent anthers are rarely seen in a few species, such as *B. hartonoana* and *B. phoebeopsis*, but they are not pubescent on the apex, but rather on the back or only pubescent in the third whorl. In contrast, *B. telupidensis* has the pubescence at the top of the anthers, especially in the first and second whorls. Pubescence on the anther apex is usually a stable and reliable character for the genus, as reported for the neotropical species (Nishida 1999). Additionally, this new species can be discriminated from other *Beilschmiedia* species of Borneo by a combination of the following characters: erect, short, curly hairs on twigs; alternate, narrowly elliptic leaves pubescent only along the midrib on the lower surface; and immersed venation on the upper leaf surface.

The closest relative of this species in Borneo might be *B. brachystachys*, which shares a similar indument type on twigs (short and curly), venation appearance (veins immersed above), and flower structure (small flowers with shorter filaments in the first and second whorls). However, this new species differs from *B. brachystachys* in the petiole length (1–1.5 cm in *B. telupidensis* vs 0.5–1 cm in *B. brachystachys*), leaf shape (narrowly elliptic vs elliptic or obovate), leaf pubescence (pubescent only along major veins vs also on leaf tissue), pubescence on the anther apex (pubescent vs glabrous). Besides *B. brachystachys*, this new species resembles *B. dictyoneura* in the leaf appearance (narrowly elliptic, immersed veins on the upper surface) and fruit appearance (ellipsoid with warty surface). However, this new species differs from *B. dictyoneura* in the leaf arrangement (alternate in *B. telupidensis* vs opposite or subopposite in *B. dictyoneura*) and stamen number (9 vs 6).

Additional specimens:

MALAYSIA. Borneo, Sabah, Sandakan, Telupit, Bt. Tawai Forest Reserve, *Mat-Salleh et al. 3416* (L), *FRI 41270* (*Soepadmo et al.*) (L), *Campbell 403* (L).

26. Beilschmiedia wieringae Kosterm. — Fig. 26; Map 7

Beilschmiedia wieringae Kosterm. (1956) 35; (1969) 454. — Type: *Kostermans 4374* (holo BO; iso A, K, L, PNH, SING), Indonesia, E Borneo, Balikpapan.

Tree to 30 m tall. *Terminal buds* narrowly ovoid, densely pubescent with long, erect, straight hairs. *Twigs* terete, 4–5 mm diam., light brown to reddish brown, densely pubescent with long, erect, straight hairs. *Petioles* 2–3.5 cm long, flat to slightly canaliculate above, densely pubescent. *Leaves* alternate, evenly distributed or relatively crowded at end of twig, blade firmly chartaceous, slightly glossy above, broadly elliptic, (16–)18–24 by 8–12 cm, base obtuse, apex cuspidate, margin slightly revolute to lower side, upper surface pubescent along midrib with long, erect, straight hairs, lower surface pubescent with long, erect, straight hairs, glaucous, midrib impressed to immersed above, raised below, secondary veins (8–)9–11(–12) pairs, almost immersed above, raised below, tertiaries percurrent, minor venation relatively fine, slightly raised, slightly raised below. *Inflorescences* axillary, paniculate, 2–6 cm long, densely pubescent, each bearing a few to 40 flowers; floral pedicels of lateral divisions c. 1 mm long, pedicels of central flowers 3–5 mm long, floral pedicels and rachis densely pubescent, bracts usually persistent. *Flowers* white, c. 3 mm long, c. 4 mm diameter. *Tepals* 6, almost equal, ovate, c. 2.8 by 2.5 mm, pubescent on both sides. *Stamens* 9, c. 1.5 mm long, filaments longer than anthers, pubescent, stamens in third whorl with a pair of glands; anthers glabrous, obtuse at apex. *Staminodes* 3, sagittate. *Pistil* glabrous; ovary ovoid, c. 1 mm long; style terete, c. 1 mm long. *Infructescences* and *fruits* poorly known.

Distribution — Endemic to Borneo, along coast in E Kalimantan (Indonesia) and Sabah (Malaysia).

Habitat & Ecology — On low sandy hills, on sandstone or loam soils. Altitude up to 120 m. Flowering: April, May, July, December.

Vernacular name – Medang.

Note — *Beilschmiedia wieringae* was considered a synonym of *B. pilosa* by Kostermans (1969), but I restore it here because it differs from the latter species in the white flowers, shorter leaves, and lower number of secondary leaf veins. It is also different from *B. pilosa* in the filament structure, i.e., filaments in the first and second whorls are longer than the anthers in *B. wieringae*, but are as long as the anthers in *B. pilosa*.

IMPERFECTLY KNOWN SPECIES

Beilschmiedia reticulata Kosterm.

Beilschmiedia reticulata Kosterm. (1962) 158. — Type: *SAN A 1815 (Kadir & Japoni)* (holo SING; iso KEP), Sabah, Lahad Datu, Diwata River.

This species is known only by its type and one other specimen, both of which have only young fruits. These specimens share similar indument and minor leaf venation pattern with specimens of *B. pilosa*, but differ from *B. pilosa* in the obovate leaf shape, lower number of secondary veins, and non-looped secondary venation pattern. Although this species most likely belongs to *Beilschmiedia*, it is impossible to estimate the status or relationships to the other species without flowers. Thus far, it seems best to place this species as an imperfectly known species until more specimens become available.

EXCLUDED SPECIES

Beilschmiedia eusideroxylocarpa (Kosterm.) Kosterm. = **Endiandra eusideroxylocarpa** Kosterm.

ACKNOWLEDGEMENTS

The loan of materials used in this study from A, BO, K, KEP, L, SAN, and SAR is greatly appreciated. I am also grateful to Hidetoshi Nagamasu for improving the Latin diagnosis and Mutsuko Nakajima for preparing the excellent illustrations for the new species. This study was partly supported by grants from the Ministry of Education, Science and Culture, Japan (#09NP1501 and 10041169).

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IDENTIFICATION LIST

The numbers after the collector numbers refer to the following species:

1 = *B. brachystachys*	10 = *B. kinabaluensis*	19 = *B. oblonga*
2 = *B. crassa*	11 = *B. kunstleri*	20 = *B. oligantha*
3 = *B. dictyoneura*	12 = *B. lucidula*	21 = *B. phoebeopsis*
4 = *B. gemmiflora*	13 = *B. madang*	22 = *B. pilosa*
5 = *B. glabra*	14 = *B. maingayi*	23 = *B. rivularis*
6 = *B. glauca*	15 = *B. micrantha*	24 = *B. tawaensis*
7 = *B. glauciphylla*	16 = *B. microcarpa*	25 = *B. telupidensis*
8 = *B. gynotrochioides*	17 = *B. montanoides*	26 = *B. wieringae*
9 = *B. hartonoana*	18 = *B. murutensis*	

Ambri & Arifin AA 12: 15; W 688: 3; W 698: 3 — Ambriansyah AA 864: 15 — Anderson et al. (S series?) 15416 : 14 — Anonymous (native collector) 1718: 5.

bb series 10602: 3; 10769: 4; 13220: 12; 13225: 12; 14749: 5; 14985: 3; 15842: 12; 16807: 11; 16975: 11; 17936: 11; 18146: 14; 18340: 13; 18352: 13; 19122: 15; 22412: 6; 23368: 23; 26460: 3; 31807: 19; 34474: 13; 34560: 5; 34707: 4 — Beaman 7916: 23 — Beccari 686: 7; 1156: 5 — Blume 776: 13; 1325: 4 — BNB series 1751: 16; 1752: 16; 1763: 14; 1770: 14; 1963: 16; 2775: 14; 7078: 15; 10159: 24; 10196: 24 — BRUN 116: 20; 1262: 23; 15342: 20; 15389: 20; 16741: 20 — Burley et al. 2598: 9; 2761: 9; 3164: 9 — Burot 1763: 14; 1770: 14; 2775: 14.

Campbell 403: 25 — Carroll 216: 14 — Church et al. 90: 9; 233: 9; 283: 9; 823: 9; 912: 14; 1367: 21; 2770: 9 — J. & M.S. Clemens 29524: 10; 30235: 22; 34290: 14.

De Jong 364: 20; 787: 9 — De Vogel 838: 22; 1688: 15 — Dransfield 6847: 20.

Elmer 20171: 14; 21156: 15; 21222: 15; 21235: 15; 21851: 1; 21885: 24 — Endert 2128 : 23; 2344: 23; 3665: 23; 4481: 6 — Enggoh 7251: 15.

FRI series 41270: 25.

Geesing 8990 : 20 — George et al. 120508: 14.

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