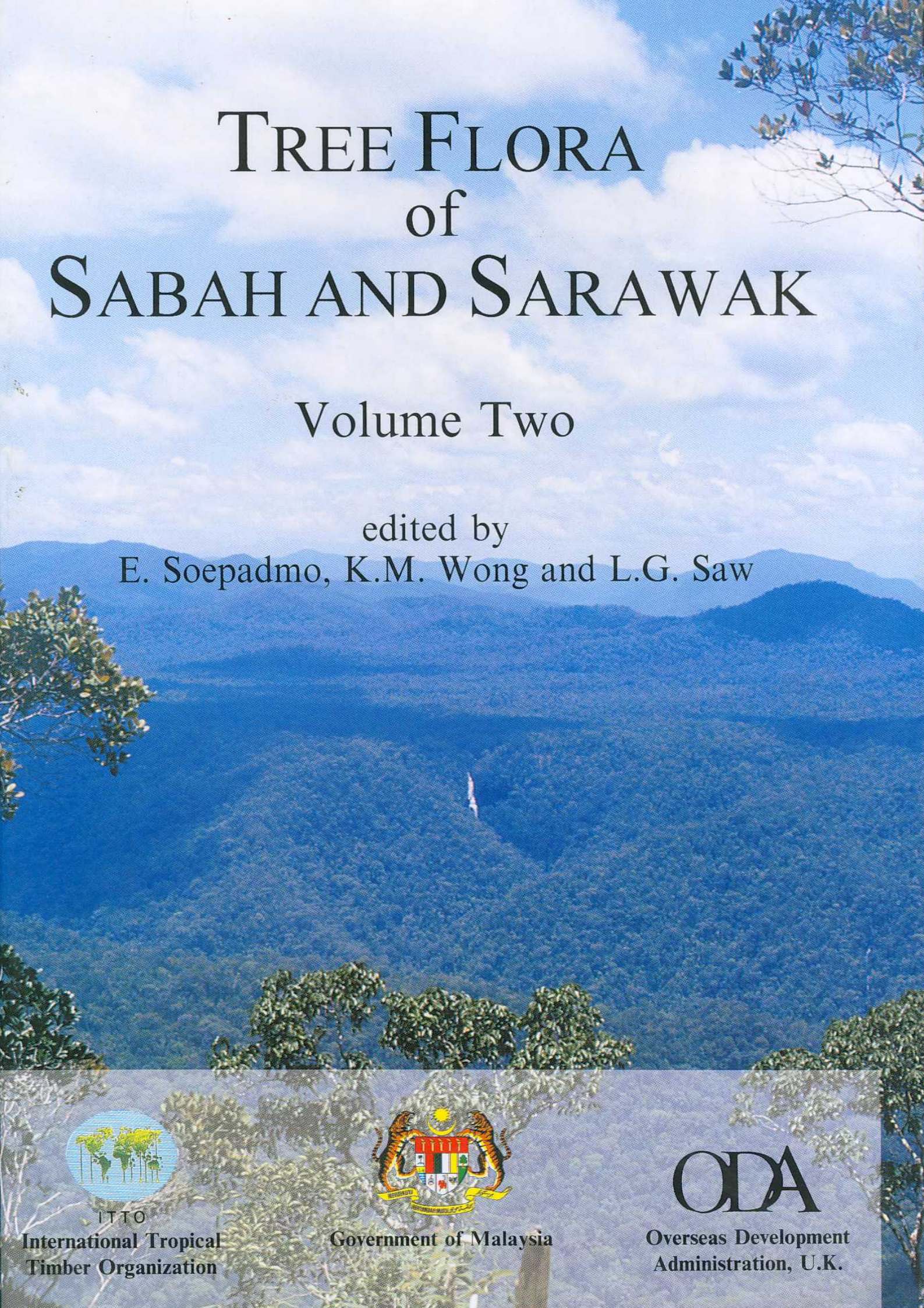
TREE FLORA of SABAH AND SARAWAK

Volume Two

edited by
E. Soepadmo, K.M. Wong and L.G. Saw



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TREE FLORA
of
SABAH AND SARAWAK

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LOGANIACEAE

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Merrill, EB (1921) 490; Masamune, EPB (1942) 613; Leenhouts, Bull. Jard. Bot. Brux. 32 (1962) 417, FM 1, 6 (1962) 293, Blumea 14 (1966) 230, Blumea 29 (1984) 423; Burgess, TBS (1966) 385; Cockburn, TS 1 (1976) 207; Anderson, CLTS (1980) 239; Ashton, MNDTS 2 (1988) 307.

Trees, shrubs, woody climbers, stranglers, epiphytes or herbs. **Leaves** *opposite, simple, entire*; stipules absent but *petiole bases expanded on the margins and joining between leaves to form an ochrea around the node* (*Mitrasacme*, *Mitreola* and *Norrisia*), *or developing transverse scale-like appendages just above the leaf axil* ("axillary scales") *that resemble truncate rims* which are separate between leaves (*Fagraea*) or joined between leaves to form a cup-shaped ochrea tightly encircling the node (*Fagraea*, *Geniostoma*), *or these appendages absent and the nodes with a transverse line or thickening between petiole bases* (*Gelsemium*, *Norrisia*, *Strychnos*). **Inflorescence** terminal or axillary, a cyme, raceme, thyrse or a solitary flower. **Flower** *nearly always bisexual, radially symmetrical, (4–)5-merous*; sepals united or free, valvate or imbricate; *petals fused and forming a tube*, lobes (4–)5, valvate, imbricate or contorted in bud; *stamens inserted on the corolla tube*, alternate with corolla lobes, *anthers* basifixed or rarely dorsifixed, *dehiscing lengthwise*; disc sometimes present, *ovary superior, usually 2-locular*, rarely 1- or 4-locular, *ovule 1–many per locule*, amphitropous or anatropous, placentation axile; style usually one, stigma knob-like or club-shaped or faintly or deeply bifid. **Fruit** a berry, capsule or drupe. **Seeds** 1–many, with copious endosperm; embryo minute, straight.

Distribution. About 28 genera with some 600 species have been placed in this family, taken in its wider taxonomic sense. Chiefly pantropical, a few genera extending to warm-temperate regions, mainly towards the south. In Malesia, 10 genera with *c.* 100 species; 7 genera in Sabah and Sarawak of which *Fagraea* is the main genus.

Uses. Strychnine is obtained from *Strychnos* and other poisonous alkaloids are also known from *Mostuea* and *Gelsemium* spp. Only a few species of *Fagraea* are taken for timber. *Fagraea* and *Gelsemium* yield various species of ornamental importance or potential.

Taxonomy. *Buddleja*, commonly included in the Loganiaceae in the past is now generally accepted as representing a separate family, Buddlejaceae (in the Scrophulariales), chiefly on account of the occurrence of intraxylary phloem in its wood, pollen characters that resemble those of the Scrophulariaceae and a number of characters (e.g., possession of stellate hairs and glandular-capitate hairs) that are absent in most of the Loganiaceae.

Recent work appears to indicate that the Loganiaceae as here circumscribed, mainly following the concept of Solereder (in Engler & Prantl, Nat. Pfl. Fam. 4, 2 (1892–95) 19), is still a heterogenous assemblage of distinct families belonging to the Gentianales. It has been suggested that the Loganiaceae *sensu stricto* should comprise just *Logania*, *Mitrasacme* and *Mitreola*; *Gelsemium* and *Geniostoma* should be the bases of distinct families; *Strychnos* and *Norrisia* might be placed together within the Strychnaceae; and *Fagraea* belongs properly to the Gentianaceae (Struwe *et al.*, Cladistics 10 (1994) 175).

The concept for grouping the genera used here is therefore only one of convenience, as we await more detailed studies that corroborate the newly proposed classification. Of importance in our flora are the genera *Fagraea*, *Geniostoma* and *Norrisia*.

Key to genera

1. Small herbs.....2
   Shrubs, trees, climbers, stranglers or epiphytes.....3

2. Flowers 4-merous. Leaves small (less than 2 cm long), petioles inconspicuous.....
   Mitrasacme Labill.
   Nov. Holl. Pl. Spec. 1 (1804) 35; Merrill, EB (1921) 490; Masamune, EPB (1942) 615; Leenhouts, Bull. Jard. Bot. Brux. 32 (1962) 440, FM 1, 6 (1962) 378.
   About 40 species, mainly Australian, also in Tasmania, New Zealand, New Caledonia, Malesia, the Carolines, and in Asia from the Deccan and Sri Lanka to Central Japan and Korea.
   Wiry, low, usually clump-forming herbs. Leaves often with only the midrib distinct.
   In Sabah, one species (*M. neglecta*) recorded from Balambangan Is., and in Sarawak, one species (*M. pygmaea*) recorded from Mt. Santubong.

   Flowers 5-merous. Leaves larger (at least several cm long), with distinct petioles.....
   Mitreola L.
   Gen. Pl. ed. 1 (1737) 377. Synonym: *Cynoctonum* Gmel., Syst. (1791) 443; Leenhouts, FM 1, 6 (1962) 375.
   Seven species; Madagascar, SE Asia, Malesia, and N and W Australia. In Sabah and E Kalimantan, one species.
   Low herb, less than 0.5 m high. Inflorescence axillary, dichasial with long cincinnate branches.

3. Leaves with 3–5 main veins from the leaf base. Tendrils often present in leaf axils.....
   Strychnos L.
   Sp. Pl. 1 (1753) 189; Gen. Pl. ed. 5 (1754) 86; A. W. Hill, Kew Bull. (1917) 121; Merrill, EB (1921) 490; Masamune, EPB (1942) 616; Leenhouts, FM 1, 6 (1962) 374.
   About 150–200 species, in tropics and subtropics. In Sabah and Sarawak, *c.* 11 species.
   Woody climbers or rarely shrubs or treelets; usually with axillary, simple or double tendrils. Petioles often inserted on swellings ("leaf-cushions") at the nodes.

   Leaves pinnately nerved. Tendrils absent.....4

4. Petiole bases developing conspicuous wings or axillary scales or forming a distinct cup-like ochrea around the node.....5
   Petiole bases not forming any special structures, the nodes at most marked by a transverse line or thickening, or the ochrea very low and not more than 1 mm high, inconspicuous.....6

5. Fruit a dehiscent capsule. Inflorescence strictly axillary. Corolla campanulate to rotate Leaves chartaceous to thin-coriaceous, with strongly recurved margin when dry.....
   .....**2. Geniostoma**
   Fruit a berry, not dehiscent. Inflorescence terminal or axillary. Corolla salverform, infundibular (funnel-shaped) or tubular. Leaves thin- to thick-coriaceous, the margins recurved only in some thick-coriaceous leaves.....**1. Fagraea**

6. Leaf apex rounded to acute or slightly acuminate. Style knob-like or slightly 2-lobed.....**3. Norrisia**
   Leaf apex long-caudate. Style twice forked.....

Gelsemium Juss.

Gen. Pl. (1789) 150; Merrill, EB (1921) 490; Masamune, EPB (1942) 615; Leenhouts, FM 1, 6 (1962) 343.

Three species; SE Asia, SE North America, Mexico and Guatemala. In Sabah and Sarawak, one species (*G. elegans*).

Liana or straggling shrub. Leaves pinnately nerved. Flower 5-merous; corolla lobes imbricate. Fruit a dry capsule, 2-valved. Seeds winged.

1. **FAGRAEA** Thunb.

(J.T. Fagraeus, 1729–47, Swedish naturalist)

Merrill, EB (1921) 491; Masamune, EPB (1942) 613; Leenhouts, Bull. Jard. Bot. Brux. 32 (1962) 417, FM 1, 6 (1962) 293, Blumea 14 (1966) 230, 29 (1984) 423; Burgess *l.c.* 385; Cockburn *l.c.* 207; Anderson *l.c.* 239; Ashton *l.c.* 307; Wong & Sugau, Sandakania 8 (1996) 1.

Trees, shrubs, woody climbers, stranglers or epiphytes; buttresses absent or very small. **Leaves** strap-shaped, elliptic, lanceolate, oblanceolate, obovate to broadly ovate, *pinnately nerved*, thin- to thick-coriaceous, margin mostly entire or crenulate (*F. crenulata*), mostly glabrous; *petioles* indistinct to distinct, *developing axillary scales above the base that loosely clasp the node* (section *Fagraea*) *or at the very base and tightly clasping the node* (sections *Cyrtophyllum* and *Racemosae*), the petiole base with or without auricles developed. **Inflorescences** *terminal or rarely axillary*, either without any branches (with only a solitary flower) or cyme-like, with well-developed primary branches that rebranch 1–6 times (sections *Fagraea* and *Cyrtophyllum*), or branches typically very condensed and grouped as distinct tiers along the main axis (section *Racemosae*); bracts small and scale-like, bracteoles subtending flowers 2–3 pairs, small or in some species very large and forming an involucre around the flower. **Flowers** small to very large, *5-merous*; calyx with a firm cup-like basal part, lobes imbricate; *corolla* mostly creamy-white, either *tubular, salverform or narrowly to widely infundibular*, lobes contorted, shorter than to as long as the tube; stamens included or exsert; *ovary one-locular*, *ovules many*, in 2 parietal placentas; style as long as corolla tube or

distinctly longer, stigma capitate, slightly 2-lobed. **Fruit** *a berry*, apex with persistent remains of style. **Seeds** many, irregularly angular (sections *Cyrtophyllum* and *Racemosae*) or ellipsoid-rounded (section *Fagraea*).

Distribution. About 60–70 species; Sri Lanka, India, Indo-China, China, Hainan, Taiwan, throughout Malesia, to northern Australia and the Pacific. 42 species in Borneo; in Sabah and Sarawak 40 species, with *F. crenulata* and *F. kalimantanensis* as yet known only from Kalimantan.

Ecology. In primary or secondary forest, in open places, riverbanks and forest edges; sea-level to about 3000 m.

Uses. Some species of the genus have timber value but many have potential in ornamental horticulture.

Taxonomy. Three sections of the genus are recognised (Wong & Sugau *l.c.*). Section *Fagraea* has axillary scales that develop above the petiole base and loosely clasp the stem; inflorescences of either a solitary flower or that are cyme-like with the primary branches rebranching 1–3 times; fruits that are typically large at maturity (always more than 25 mm across), with the epidermis detaching from the pericarp on drying; and ellipsoid-rounded seeds. Section *Cyrtophyllum* has axillary scales that develop at the very base of the petiole and tightly clasp the stem; cyme-like inflorescences with primary branches that rebranch 3–6 times; smaller fruits (less than 20 mm across) with the epidermis not detaching from the pericarp on drying and angular seeds. Section *Racemosae* has axillary scales, fruits and seeds similar to that in section *Cyrtophyllum* but the inflorescence typically has all its branches very condensed and grouped in distinct tiers along the main axis; in addition it appears to be characterised by stamens and styles that are not or only slightly exsert in the open flower in comparison to the conspicuously exsert stamens and styles in flowers of section *Cyrtophyllum*.

Recent studies (Struwe, pers. comm.) support the isolation of a few species of *Fagraea s.l.* from New Guinea, Maluku, Australia, Polynesia and Malesia as a distinct genus, but the present review of *Fagraea* in Borneo (Wong & Sugau *l.c.*) reveals insufficient evidence to treat the sections as separate genera.

Leenhouts' delimitation of the species has not been adhered to in most cases, notably in his concept of *F. auriculata*, *F. blumei*, *F. elliptica*, *F. fragrans*, *F. gardenioides* and *F. racemosa*. *F. ceilanica* is here considered absent in Malesia and is an artificial assemblage of a large number of species (see Wong & Sugau *l.c.*).

Key to *Fagraea* species

1. Fruits typically large at maturity (always more than 25 mm across), the epidermis detaching from the pericarp on drying. Inflorescence either without any branching (with only a solitary flower) or with well-developed primary branches (which resemble the lower internodes of the main axis in length) that rebranch typically only once but exceptionally (in *F. floribunda*) to 3 orders. Axillary scales developing above the petiole base and loosely clasping the node.....2

Fruits always smaller (less than 20 mm across), the epidermis not detaching from the pericarp on drying (sometimes the pericarp wrinkled). Inflorescence either pendulous or with all branches very condensed and grouped as distinct tiers along the main axis, or with well-developed primary branches that rebranch 3–6 orders. Axillary scales developing at the very base of the leaf stalk and slightly clasping the node.....28

2. Petiole bases typically developing distinct, rim-like auricles or large lobe-like auricles that are usually reflexed.....3
   Petiole bases without auricles, or these auricles very indistinct and easily overlooked (*F. resinosa*).....8

3. Leaf blade decurrent along the petiole, forming distinct wings several mm wide all along the petiole, and continuing into the petiole base auricle (Flowers not known).....

   Fagraea sp. A
   Wong & Sugau, Sandakania 8 (1996) 92.
   Epiphytic shrub. Leaves large, base attenuate to decurrent. Flowers not known.
   Borneo (Sarawak). Riverside forest, 100–200 m.

   Leaf blade not decurrent along the petiole, or only very slightly so and never more than 1 mm wide, distinct from the petiole base auricle.....4

4. Lateral veins on the lower leaf surface distinct and prominent. Flower subtended by an involucre of large bracts. Corolla tube inside pale floccose (with loose long hairs) at the middle part.....

   F. macroscypha Baker
   Kew Bull. (1896) 65; Merrill *l.c.* (1921) 492; Masamune *l.c.* 614; Cockburn *l.c.* 210; Wong & Sugau *l.c.* 77. Synonym: *F. involucrata* Merr. var. *longipetiolata* Merr., PEB (1929) 25, Masamune *l.c.* 614.
   Epiphytic shrub or climber, possibly a strangler. Leaves oblong-lanceolate, 12–27 x 3.5–9.5 cm, thick-coriaceous. Flower terminal, solitary, corolla tubular, slightly widened upwards, creamy white with broad green stripes on the outside, tube 12–14 cm long.
   Endemic to Borneo (Sabah, Sarawak, Brunei and Kalimantan). Mixed dipterocarp forest, to 200 m.

   Lateral veins on the lower surface obscure or only very slightly distinct.Flowers not subtended by any involucre or (in *F. involucrata*) with such an involucre. Corolla tube inside completely glabrous or (in *F. involucrata*) pale floccose (with loose long hairs) at the middle part.....5

5. Leaf apex obtuse, rounded or with only an inconspicuous tip.....6
   Leaf apex acute, caudate or distinctly cuspidate.....7

6. Flowers solitary. Corolla tube 13–14 cm long. Calyx lobes 3.5–4 cm long. Leaf blades typically very large, 28–29 x 12 –13 cm.....

   F. megalantha Wong & Sugau
   Sandakania 8 (1996) 77.
   Climber. Leaves oblanceolate, thick coriaceous. Flower large, corolla funnel-shaped.
   Borneo (Sarawak); known only from the type. Peat swamp forests.

Flowers 3–5 in a cyme. Corolla tube 6–9 cm long. Calyx lobes 2.5–3 cm long. Leaf blades typically smaller, 12–19 x 6–10 cm.....

F. auriculata Jack

Mal. Misc. 2, 7 (1822) 82; Wong & Sugau *l.c.* 51; *sensu* Leenhouts, FM 1, 6 (1962) 326, *pro parte*.

Climbing or terrestrial shrub or epiphyte. Leaves broad obovate, 10–20 x 5–8 cm, thick-coriaceous. Flowers large, corolla infundibular, corolla tube 6–9 cm long, 1–1.5 cm wide, corolla lobes ovate, 4–5 cm long, 2.5–3 cm wide.

Indo-China, Peninsular Malaysia, Java and Borneo (Sarawak and Kalimantan). Lowlands and mountains, to 1930 m.

7. Flowers solitary, subtended by an involucre of bracts. Corolla tube inside pale floccose at the middle part. Inflated upper part of corolla tube bell-shaped. Petiole base auricles large and conspicuous, resembling lobes.....

F. involucrata Merr.

J. Str. Br. R. As. Soc. 77 (1917) 233, *l.c.* (1921) 492, PEB (1929) 251 (excl. var. *longipetiolata* Merr.); Masamune *l.c.* 614 (excl. var. *longipetiolata* Merr.); Cockburn *l.c.* 210; Wong & Sugau *l.c.* 68. Synonyms: *F. macroscypha sensu* Heine, Pfl. Clemens Kinabalu (1953) 91, *non* Baker (1896); *F. uniflora* Heine *l.c.* 92, *non* Merr. (1917).

Epiphytic shrub or liana, possibly a strangler. Leaves oblong to oblanceolate, 9.5–10 x 3–6 cm, coriaceous. Flower terminal, solitary, corolla infundibular, 14–15 cm long, greenish white.

Endemic to Borneo (Sabah, Sarawak and Kalimantan). Montane forests to 1800 m.

Flowers 3–5 in a cyme, without any involucre. Corolla tube inside completely glabrous. Inflated upper part of corolla tube trumpet-shaped. Petiole base auricles 1–2 mm wide only, resembling rims.....**3. F. borneensis** (typically)

8. Lateral veins on lower leaf surface distinct and prominent on drying.....9
Lateral veins on lower leaf surface indistinct, or sunken on drying.....12

9. Cyme subsessile, the flowers individually subtended by bracts 1–1.5 cm long forming a loose involucre.....

F. iliasii Wong & Sugau

Sandakania 8 (1996) 66.

Epiphytic shrub. Leaves thin-chartaceous. Inflorescence a 3-flowered cyme; pedicels indistinct (hidden by bracteoles).

Endemic to Borneo (Sarawak); known only from the type. On yellow sandy soil, river bank at 280 m.

Cyme distinctly pedunculate, the flowers not subtended by any unusually large bracts.....10

10. Inflorescence a laxly branched cyme 14–16 cm long, the primary branches rebranching to 3 orders.....**9. F. floribunda**
Inflorescence with condensed branches or laxly branched but never exceeding 10 cm long, the primary branches rebranching only once.....11

11. Leaves thick-coriaceous, the petioles massive (5–8 mm thick). Inflorescence with condensed branches. Calyx lobes in flower 10–12 mm long.....

    F. ridleyi King & Gamble

    J. As. Soc. Beng. 74, 2 (1908) 612, *non* Gandoger (1924); Wong & Sugau *l.c.* 87.

    Liana or big straggling shrub, twigs massive. Leaves broadly obovate to suborbicular.

    Peninsular Malaysia, Lingga and Borneo (Sarawak and Brunei). Lowland primary forest, in *kerangas* forest, sea-level to 300 m.

    Leaves thin-coriaceous, the petioles slender (2–3 mm thick). Inflorescence with distinct elongate branches. Calyx lobes in flower 5–8 mm long.....

    F. renae Wong & Sugau

    Sandakania 8 (1996) 82. Synonym: *F. blumei sensu* Cockburn *l.c.* 211, Anderson *l.c.* 239, Ashton *l.c.* 312, *pro parte*, *non* G. Don (1837).

    Strangling or epiphytic shrub. Leaves broadly elliptic to broadly oblanceolate, lateral veins 3–6 pairs, lower side prominent.

    Peninsular Malaysia and Borneo (Sabah and Sarawak). Primary and secondary forests, also on limestone; lowlands up to 1200 m in mossy forest.

12. Flowers subtended by an involucre of enlarged bracts.....13
    Flowers without any involucre at their base.....15

13. Calyx and most of the involucre bracts elliptic with rounded apices. Petiole bases developing small, inconspicuous auricles.....**15. F. resinosa**
    Calyx and most of the involucre bracts with acute-pointed apices. Petiole bases clearly without auricles.....14

14. Leaf blades narrowly elliptic, the apex acute-caudate. Petioles longer, 2.2–4 cm long. Flowers 1–3, each on a short but distinct and thick pedicel; involucre bracts typically keeled.....

    F. kuminii Wong & Sugau

    Sandakania 8 (1996) 71.

    Epiphytic shrub or woody climber. Leaves narrowly obovate to oblanceolate. Bracteoles in 2–3 decussate pairs, enclosing the lower part of the calyx, the inner or innermost pairs larger than the outer ones.

    Borneo (Sabah). On undulating land, river banks in disturbed forest on ultramafic soil.

    Leaf blades obovate, the apex cuspidate. Petioles shorter, 0.5–2 cm long. Flowers solitary, the pedicels hidden by the bracts and inconspicuous; involucre bracts without distinct keels.....

    F. acutibracteata Wong & Sugau

    Sandakania 8 (1996) 49.

    Woody climber. Bracteoles with acute-acuminate apex; corolla unknown.

    Borneo (Sarawak), so far known only from the type. On sandstone rocks at 550 m.

15. Flowers solitary.....16
    Flowers (2–)several in a cyme.....19

16. Corolla tubular to narrowly infundibular (funnel-shaped), the tube 8.5–15 cm long.....

F. carnosa Jack

Malay Misc. 2, 7 (1822) 81; Wong & Sugau *l.c.* 57. Synonym: *F. uniflora* Merr., J. Str. Br. R. As. Soc. 77 (1917) 235, *l.c.* (1921) 493, Masamune *l.c.* 615.

Woody climber or epiphyte. Leaves broadly elliptic to obovate, thick-coriaceous.

Lower Burma, Sumatra, Peninsular Malaysia and Borneo (Sarawak). On sandstone soils in mixed dipterocarp forest, sea-level to 200 m.

Corolla short-infundibular, the tube 3–4.5 cm long.....17

17. Corolla lobes larger, 3.5–4 cm long, 2–2.5 cm broad. Petioles 1.2–3 cm and leaves elliptic.....

F. stonei Wong & Sugau

Sandakania 8 (1996) 88.

Woody climber or epiphytic shrub. Leaves broadly elliptic to lanceolate, thick-coriaceous. Flower solitary.

Borneo (Sabah and Sarawak). In *kerangas* forest on white sand podsols, also on basalt ridges.

Corolla lobes smaller, 1.8–3 cm long, 1.3–2.5 cm broad. Petioles less than 1 cm long

if leaves elliptic (*F. kinabaluensis*), or when longer (1–2.2 cm) then leaves distinctly obovate.....18

18. Leaves obovate, the petioles 1–2.2 cm long. Upper part of corolla tube at most 1 cm across at the mouth.....**7. F. dulitensis**

Leaves elliptic or only very slightly obovate, the petioles less than 1 cm long. Upper part of corolla tube more flared, 2–2.5 cm across at the mouth.....**12. F. kinabaluensis**

19. Inflorescence a tight cluster of many flowers, the branches condensed and hidden by the flowers themselves (in fruit the axes visible but still short, supporting many fruits).....

F. splendens Blume

Mus. Bot. Lugd. Bat. 1 (1850) 168; Wong & Sugau *l.c.* 87. Synonyms: *F. heterophylla* Blume, *l.c.* (1850) 168; *F. acuminatissima* Merr., J. Str. Br. R. As. Soc. 77 (1917) 232, *l.c.* (1921) 491, Masamune *l.c.* 613, Cockburn *l.c.* 211, Anderson *l.c.* 239, Ashton *l.c.* 311; *F. rostrata sensu* Merrill *l.c.* (1921) 493, Masamune *l.c.* 615, *non* Blume (1836); *F. ceilanica sensu* Leenhouts, FM 1, 6 (1962) 315, *pro parte*, *non* Thunb. (1782).

Climber or epiphyte, rarely a small tree to 6 m tall. Leaves oblanceolate or obovate, 11–25.5 □4.5–9.5 cm, coriaceous. Inflorescence a 3–8(–10)-flowered sessile cyme, corolla tubular, 4–4.5 cm long, lobes 1.5–2 cm long.

Sumatra, Peninsular Malaysia, Borneo (Sabah, Sarawak and Brunei). On various types of soils, including in swamp forest, and especially *kerangas* forest, from sea-level to 1333 m.

Inflorescence a few-flowered cyme or, if many-flowered, the branches distinct and not hidden by the flowers.....20

20. Leaf apex obtuse-rounded. Leaves drying black or dark brown.....

F. tuyukii Wong & Sugau

Sandakania 8 (1996) 90.

Probably epiphytic shrub to small tree. Leaves elliptic to obovate, 4–8 x 4–7 cm, stiff-coriaceous. Flower unknown. Infructescence terminal, of a few fruits in a cyme. Fruit ellipsoid, mucronate apically, 2.5–3 cm long, 2.5–2.7 cm wide.

Endemic to Borneo (Sabah); known only from the type. Mixed dipterocarp forests, 700–800 m.

Leaf apex acute or cuspidate or caudate. Leaves drying pale to dark greenish brown.....21

21. Corolla tube more than 10 cm long.....**3. F. borneensis** (in part)
Corolla tube less than 8 cm long.....22

22. Corolla tubular, the tube more than twice as long as the lobes.....

F. havilandii Wong & Sugau

Sandakania 8 (1996) 64. Synonym: *F. gardenioides* ssp. *borneensis* Leenhouts, Bull. Jard. Bot. Brux. 32 (1962) 425.

Probably shrub or epiphyte. Leaves obovate, 8–11 x3–6 cm, coriaceous. Flowers 2–5 in a cyme, corolla tubular, tube 5.5 cm long, lobes 1–1.8 cm long.

Borneo (Sarawak, near Kuching).

Corolla infundibular, the tube less than twice as long as the lobes.....23

23. Corolla throat 5–8 mm across.....24
Corolla throat 10–20 mm across.....26

24. Leaf blades decurrent to the base of their petioles, which are broadly winged. Ultimate branches developing broadened, somewhat corky and very short internodes that form a series of coarse cicatrices (bands) along the branches .....

F. oreophila Wong & Sugau

Sandakania 8 (1996) 78. Synonym: *F. ceilanica sensu* Leenhouts, FM 1, 6 (1962) 315, Cockburn *l.c.* 211, *pro parte*, *non* Thunb. (1782).

Epiphyte, possibly also a small tree. Leaves obovate, 7–9 x 2.5–4 cm, coriaceous. Inflorescence terminal, 3-flowered; corolla pale yellow or white, tube *c.* 2.5 cm long, lobes *c.* 1.5–1.8 cm long.

Sabah (on Mt. Kinabalu) and Sarawak (Mt. Murud). Mossy montane forest.

Leaf blades not completely decurrent along their petioles, which are always distinctly slender. Ultimate branches not so, such nodal cicatrices if developing always far apart.....25

25. Leaves small, to 9 x 2.5 cm, the apex caudate. Corolla tube 18–20 mm long.....

F. rarissima Wong & Sugau

Sandakania 8 (1996) 82. Synonym: *F. ceilanica sensu* Leenhouts, FM 1, 6 (1962) 315, *pro parte*, *non* Thunb. (1782).

Shrub. Leaves narrowly elliptic, 4–8.5 x1.5–2.5 cm, coriaceous. Inflorescence a 2–3-flowered cyme; corolla salverform, white, tube 2–2.5 cm long, lobes 1.5–1.7 cm long.

Borneo (Sarawak and Brunei). On yellow podsols in mixed dipterocarp forests.

Leaves typically larger, 8–15 x 3–6.5 cm, the apex acute to cuspidate. Corolla tube 20–30 mm long.....**2. F. blumei**

26. Corolla tube with a base 5–7 mm across, gradually flared upwards. Leaves smaller typically, at most 3 cm wide.....

    F. longipetiolata Wong & Sugau

    Sandakania 8 (1996) 75.

    Climbing shrub. Leaves elliptic to narrowly obovate, margin slightly recurved when dry.

    Borneo (Sarawak and Brunei). Primary mixed dipterocarp forest.

    Corolla tube with a base only 1–2 mm across, abruptly flared upwards. Leaves larger typically, 3–10 cm wide.....27

27. Flower calyx lobes small, 2–4 mm long. Leaves narrowly obovate-elliptic to oblong. Upper leaf surface parchment-like when dry.....

    F. oblonga King & Gamble

    J. As. Soc. Beng. 74, 2 (1908) 612; Wong & Sugau *l.c.* 78.

    Climbing shrub. Leaves with slightly recurved margin, apex obtuse.

    Peninsular Malaysia, Sumatra and Borneo (Sarawak). Lowlands to mountains, also on limestone.

    Flower calyx lobes larger, 7–8 mm long. Leaves broadly ovate to elliptic. Upper leaf surface coarsely shagreen when dry.....

    F. littoralis Blume

    Bijdr. Fl. Ned. Ind. (1826) 1021, Merrill *l.c.* (1921) 492, Masamune *l.c.* 614, Wong & Sugau *l.c.* 73.

    Climbing shrub. Leaf base rounded; midrib prominent, sharp-ridged.

    Borneo, all territories. Mostly near river and lakes.

    The variety in Borneo is var. *borneensis* Wong & Sugau, *l.c.* 73, wrongly attributed by both Merrill and Masamune to Miquel's var. *forstenii* (a synonym of var. *amboinensis* Blume) from Sulawesi.

28. Inflorescence pendulous or typically with all branches very condensed and grouped in distinct tiers along the main axis. Stigma capitate but at maturity developing an expanded rim that gives it a peltate structure. Stamens and style not or only slightly exsert in the open flower.....29

    Inflorescence rigid and erect, with well-developed primary branches (as long as the lower internodes of the main axis) that rebranch 3–6 orders. Stigma capitate throughout, an expanded rim not developing. Stamens and style long-exsert in the open flower.....35

29. Narrowed basal tubular part of corolla very short, much less than a third the length of the corolla tube, and mostly hidden by the calyx in the open flower.....**6. F. cuspidata**

    Narrowed basal tubular part of the corolla longer, more than a third or half the corolla tube, and clearly extending beyond the calyx in the open flower.....30

30. Corolla lobes in the open flower relatively short, at most up to about a third the length of the expanded upper part of the corolla tube. Leaves subsessile.....**17. F. spicata**

    Corolla lobes in the open flower relatively longer, about half or more the length of the expanded upper part of the corolla tube. Leaves with distinct petioles.....31

31. Corolla of open flowers relatively narrow (the uppermost part of the tube only 6–8 mm wide).....32

Corolla of open flowers wider (the uppermost part of the tube 10 mm or wider).....33

32. Corolla of open flowers 20–27 mm long (the narrowed basal tubular part 8–10 mm long, the inflated upper part 10–11 mm long). Anthers 2–2.5 mm long. Leaves linear, 12–27 cm long, with 7–14 pairs of lateral veins faintly visible. (Rheophytic plants of the lowlands).....**18. F. stenophylla**
Corolla of open flowers 18–20 mm long (the narrowed basal tubular part 7–8 mm long, the inflated upper part 5–6 mm long). Anthers *c.* 1 mm long. Leaves elliptic-obovate, 3.5–13.5 cm long, with 4–5 pairs of lateral veins faintly visible. (Montane plants) .....**13. F. montana**

33. Mature flowers with calyx 4–6 mm long; inflated upper part of the corolla tube 7–10 mm long, shorter than or about as long as the basal tubular part.....**20. F. volubilis**
Mature flowers with calyx 7–9 mm long; inflated upper part of corolla tube 12–16 mm long, much longer than the basal tubular part.....34

34. Uppermost part of the corolla tube only 10–12 mm wide; corolla lobes 7–8 mm long. Anthers *c.* 1.5 mm long. (Leaves typically smallish, the length at least 3 times the width.).....**19. F. teysmannii**
Uppermost part of the corolla tube 20–22 mm wide; corolla lobes 10–12 mm long. Anthers 3.5–4 mm long. (Leaves typically large, sometimes small, the length typically less than 3 times the width.).....**14. F. philippinensis**

35. Inflorescences exclusively axillary.....36
Inflorescences terminal.....38

36. Inflorescence a 3-branched cyme, or (sometimes) reduced unbranched inflorescence, (1–)3-flowered. Corolla tube 10–12 mm long. Leaves coriaceous, the margins never wavy, with lateral veins 3–6 pairs.....**4. F. caudata**
Inflorescence a many-branched, many-flowered cyme. Corolla tube 6–8 mm long. Leaves chartaceous with wavy margins, or leaves (sub)coriaceous with lateral veins 9–12 pairs.....37

37. Inflorescence peduncle 4–6 cm long. Open flowers with calyx diameter 2–2.5 mm, corolla lobes (5–)6–7 mm long and 3–4 mm wide, and styles exsert for 8–10 mm. Leaves with 9–12 pairs of lateral veins which are flat on the upper surface, and plane margins when fresh.....**10. F. fragrans**
Inflorescence peduncle 2–3.5 cm long. Open flowers with calyx diameter 1.5–2 mm, corolla lobes 4–5 mm long and 2.5–3 mm wide, and styles exsert for 14–16 mm. Leaves with 3–8 pairs of lateral veins which are often depressed on the upper surface, and wavy margins when fresh.....**11. F. gigantea**

38. Cymes with main axis branching 4–6 orders. Corolla lobes ovate, 2.5–3 mm long. Leaf apex typically obtuse-rounded to emarginate. Tree mostly of lowland secondary forest and open sites, and forest gaps.....**1. F. belukar**
Cymes with main axis typically branching only 3–4 orders (very exceptionallly an occasional 5th order of branching present). Corolla lobes lanceolate, *c.* 3.5 mm long or more. Leaf apex acuminate to cuspidate-caudate. Tree typically of primary forest in the lowlands or mountains.....39

39. Calyx in flower 3–4 mm long. Corolla lobes 5–8 mm long. Stamen filaments in open flowers 15–18 mm long. Mature fruits (6–)9–10 mm across. Leaf surfaces drying very coarsely wrinkled and very coarse to the touch.....**16. F. rugulosa**
Calyx in flower 2–3 mm long. Corolla lobes 3.5–6 mm long. Stamen filaments in open flowers 7–11 mm long. Mature fruits smaller, only 3.5–5(–6) mm across. Leaf surfaces drying smooth.....40

40. Flowers sessile to subsessile, the pedicels (if developed) to 1 mm long. Leaf apex acuminate. Leaf lateral veins obscure to only very faintly visible, never elevated on the lower side. (Leaves coriaceous. Corolla tube 6–7 mm long).....**5. F. collina**
Flowers with distinct pedicels 1–3 mm long. Leaf apex cuspidate to caudate. Leaf lateral veins distinct and raised on the lower side. (Leaves chartaceous to coriaceous. Corolla tube 6–11 mm long).....**8. F. elliptica**

1. **Fagraea belukar** Wong & Sugau Fig. 1.

(Malay, *belukar* = secondary forest; the usual habitat)

Sandakania 8 (1996) 15. **Type:** *Saikeh SAN 72151*, Sabah, Beaufort, Beaufort Hill (holotype SAN). **Synonym:** *F. elliptica sensu* Leenhouts, FM 1, 6 (1962) 303, Cockburn *l.c.* 210, Ashton *l.c.* 314, Anderson *l.c.* 239, *pro parte*, *non* Roxb. (1824).

Tree to 30 m tall and 60 cm diameter or more, trunk base fluted-cylindric. **Bark** *fissured*, greyish black; inner bark reddish-yellow. **Sapwood** yellowish white. **Leaves** coriaceous, upper and lower *surfaces finely shagreen or smooth*; obovate to broad-elliptic, 7–22 x 4–13 cm; base cuneate, margin plane to recurved, *apex obtuse-rounded to emarginate*; midrib prominent on lower side, *lateral veins* 10–12 pairs, *faintly visible and immersed (never raised) on the lower side*, faintly visible, flat, immersed or slightly sunken on the upper side, intercostal veins obscure; *petioles 3–4.5 cm long*, stout, the base with axillary scales forming a cup-shaped ochrea tightly clasping the node. **Inflorescence** terminal, a many-flowered branched cyme, 13 cm long, 15–19 cm wide, *main axis branching 4–6 orders*; peduncles 2–3.5 cm long. **Flowers** with *pedicels 3–4 mm long*; calyx campanulate, 1–2 mm long, 1–2 mm diameter, divided to the middle; corolla salverform, tube 7–10.5 mm long, 1–1.5 mm wide, *lobes ovate, 2.5–3 mm long*, 1.5 mm wide; stamens 8–10 mm long, *filaments 6–8 mm long*, inserted at the mouth of corolla, exserted for 8–9 mm, anthers oblong, *c.* 1 mm long; style exsert for 4–9 mm, stigma small, capitate, very obscurely 2-lobed. **Fruits** globose, *3.5–5 mm across*, tipped with a minute circular scar of the fallen style; fruit calyx 1–1.5 mm long, 1–1.5 mm wide. **Seeds** *c.* 1 mm diameter, angular, brownish black.

Vernacular names. Sabah—*tamasuk hutan* (Brunei Malay), *tembusu bukit* (Malay), *tembusu tagai* (Malay).

Distribution. Borneo, in all districts including Sabah and Sarawak, and Banka island. Very common throughout Sabah and Sarawak.

Ecology. Lowland secondary forests, open sites and forest gaps.

Uses. Apparently a durable wood for house and bridge construction.

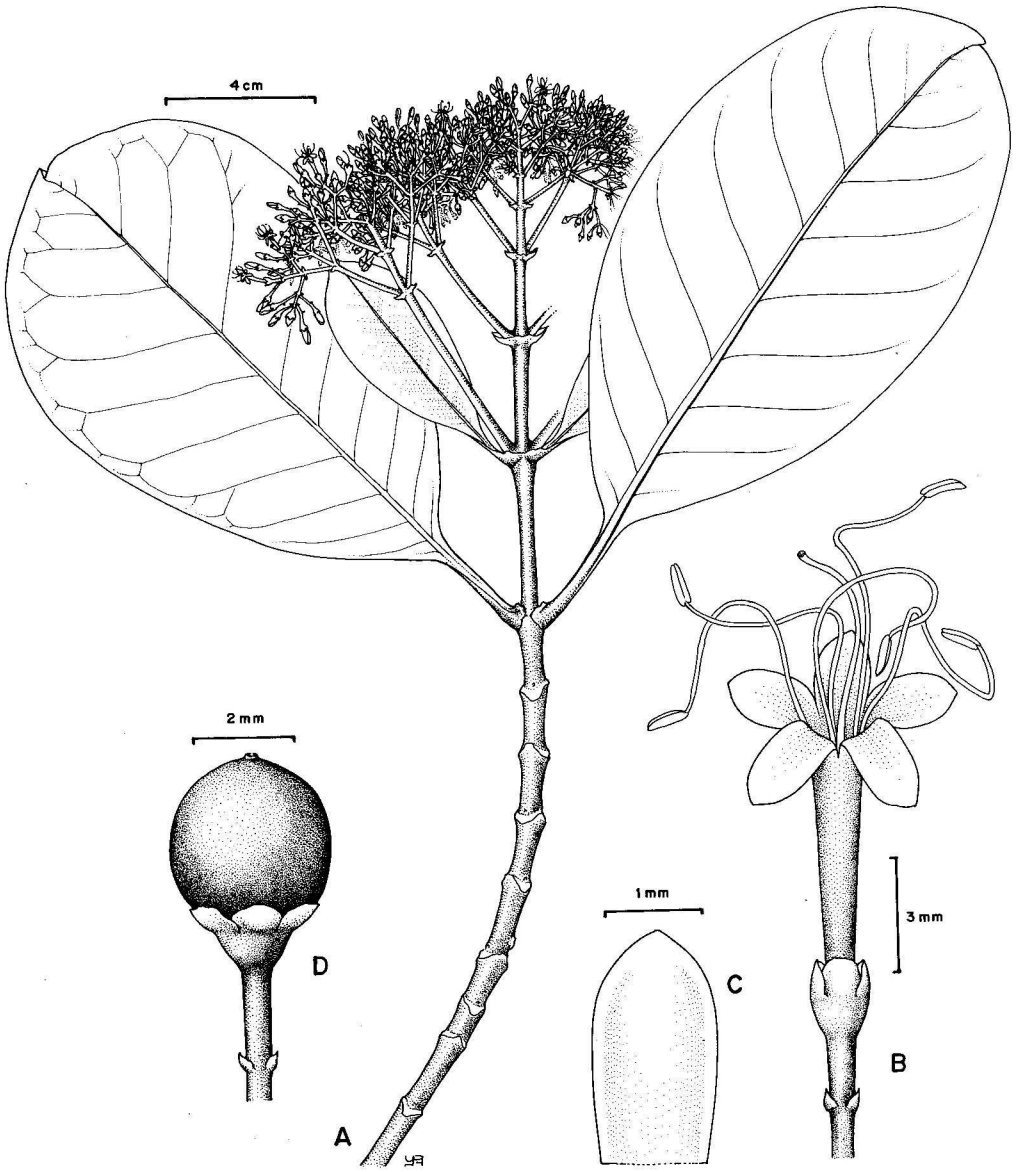


Fig. 1. *Fagraea belukar*. A, flowering leafy twig; B, flower; C, corolla lobe; D, fruit. (A–C from *SAN 72151*, D from *SAN 72256*.)

2. **Fagraea blumei** G. Don

(C.L. Blume, 1796–1862, Dutch Botanist)

Gard. Dict. 4 (1837) 69; Leenhouts, FM 1, 6 (1962) 320, Cockburn *l.c.* 210, Anderson *l.c.* 239, Ashton *l.c.* 312, *pro parte*; Wong & Sugau *l.c.* 54. **Type:** *Blume, s.n.* (= *Leiden sheet no. 908. 127-758*) (L), Java. **Synonyms:** *F. obovata sensu* Blume, *l.c.* (1826) 1021, *nom. illeg., non* Wall. (1824), Masamune *l.c.* 614; *F. obovato-javana* Blume, Rumphia 2 (1838) 29, *t.* 75, incl. var. *bebeak* Blume; *F. vaginata* King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 610, *pro parte*; *F. obovata sensu* Bakh. *f.* in Backer, Bekn. Fl. Java 7 (1948) fam. 170: 11, incl. var. *brevicalyx* Bakh. *f.*, Blumea 6 (1950) 382.

Tree to 20 m tall, 20 cm diameter, sometimes a climbing shrub or epiphyte. **Leaves** coriaceous, upper and lower surfaces shagreen, smooth; elliptic, obovate to oblanceolate, *8–15* x*3–6.5 cm;* base cuneate to attenuate, margin plane, *apex acute to cuspidate*; midrib prominent on lower side, *lateral veins* 2–3 pairs, *obscure to only rather faintly visible on the lower side*, obscure on the upper side, intercostal veins obscure; *petioles 1–3 cm long*, base with conspicuous axillary scales loosely clasping the node. **Inflorescence** terminal, *a few-flowered cyme*, 4–7 cm long; peduncle nil to 2 cm long, smooth or lenticellate. **Flowers** with pedicels 0.5–2 cm long; bracteoles small, 1–3 mm long, attached halfway on the pedicel; calyx 1.2–2.9 cm long, 0.8–1 cm wide; *corolla* narrowly to widely *infundibular*, 4.5–6.5 cm long, divided to about halfway down or slightly deeper, *tube 2–3 cm long*, *lobes 3–3.4 cm long*; stamens *c.* 2 cm long, anthers oblong, 5–7 mm long; style 2.5–3 cm long, stigma capitate, 1–5 mm diameter. **Fruits** elipsoid, *c.* 4 cm wide, fruit calyx 1.3–3 cm long, 1.4–2 cm wide, lobes patent. **Seeds** ellipsoid-rounded.

Distribution. Sumatra, Peninsular Malaysia, Java and Borneo (Sabah and Sarawak). In Sabah, recorded from the Tambunan, Kota Belud and Ranau districts; in Sarawak, documented from the Miri district but probably more common.

Ecology. Primary forest, mostly in highlands.

3. **Fagraea borneensis** Scheff.

(of Borneo)

In Hasskarl, Flora 52 (1869) 309; Merrill *l.c.* (1921) 491; Masamune *l.c.* 613; Wong & Sugau *l.c.* 55. **Type:** *Lobb*, *s.n.*, Sarawak (K). **Synonyms:** *F. auriculata* ssp. *borneensis* (Scheff.) Leenh., FM 1, 6 (1962) 328, Cockburn *l.c.* 210, *pro parte*; *F. nonok* Elm., Leafl. Philip. Bot. 3 (1910) 858; *F. resinosa sensu* Leenhouts, FM 1, 6 (1962) 331, *pro parte*.

Epiphytic shrub or tree, to *c.* 13.5 m tall, *c.* 30 cm diameter. **Bark** smooth, grey; inner bark green. **Wood** whitish. **Leaves** thick-coriaceous, upper and lower surfaces shagreen, rough; oblanceolate, elliptic to broad obovate, 8–25 x 4–10 cm; base attenuate to cuneate, margin plane to slightly recurved when dry, *apex acute to acuminate;* midrib prominent on lower side, *lateral veins* 6–8(–11) pairs, *indistinct to slightly distinct (not prominent) on both sides*, intercostal veins obscure; *petioles* 2–3(–4) cm long, *base with conspicuous axillary scales loosely clasping the node, auricles indistinct or 1–2 mm wide*. **Inflorescence** terminal, *a 3–5-flowered cyme*, sessile. **Flowers** with pedicels 1.5–2 cm long; bracteoles 1 pair, *c.* 0.5 cm long, attached to calyx cup base; calyx 3–3.5 cm long, 1.5–2 cm diameter; *corolla* slender, infundibular, *tube 9–11 cm long*, 0.8–3.5 cm diameter, *glabrous inside*,

upper inflated part trumpet-shaped, lobes ovate, 2–3.5 cm long, 1–2 cm wide; stamen filaments 5–5.5 cm long, inserted *c.* 4–4.5 cm down from the corolla mouth, anthers *c.* 0.5 cm long; style 11–11.5 cm long, stigma peltate, *c.* 3 mm diameter. **Fruits** ellipsoid, 5–5.5(–7) cm long, 2–2.5 cm wide; fruit calyx lobes 2–2.5 cm long, 1–1.5 cm wide, patent. **Seeds** ellipsoid-rounded.

Distribution. Borneo (Sabah, Sarawak, Brunei and Kalimantan) and the Philippines.

Ecology. Lowland and montane forest, also in swampy areas and on limestone. Once recorded from seaside rocks.

4. **Fagraea caudata** Ridl.

(Latin, *caudatus* = caudate; the attenuate leaf apex)

J. Str. Br. R. As. Soc. 79 (1918) 97; Merrill *l.c.* (1921) 491; Masamune *l.c.* 613; Wong & Sugau *l.c.* 8. **Type:** *Lobb*, *s.n.*, (1858), "Borneo" (Sarawak) (K). **Synonym:** *F. fragrans sensu* Leenhouts, FM 1, 6 (1962) 304, Ashton *l.c.* 310, *pro parte*, *non* Roxb. (1824).

Small tree, to 6 m tall, 4.5 cm diameter. **Bark** fissured and flaky, dark brown; inner bark orange. **Wood** pale brown. **Leaves** *coriaceous*, upper and lower side smooth; elliptic to obovate, 1.5–4 x 6–12 cm; base acute, decurrent, *margin plane*, apex caudate; midrib prominent on lower side, *lateral veins 3–6 pairs*, prominent on lower side, obscure or faint and impressed on upper side, intercostal veins obscure; petioles 0.7–1.5 cm long, base with axillary scales adnate to and tightly clasping the node. **Inflorescence** *axillary, a (1–)3-flowered branched cyme, or (sometimes) a reduced unbranched inflorescence*, 6–9 cm long; peduncle 2.5–5 cm long, branches (when present) 1.8–3 cm long. **Flowers** with pedicels 5–10 mm long; calyx cylindric, 4–4.5 mm long, divided to halfway, 2.5–3 mm diameter; *corolla* salverform, *tube 10–12 mm long*, 4–5 mm wide, lobes 6.5–8 mm long, 4–5 mm wide, ovate; stamen filaments 10–13 mm long, inserted just above the middle of the corolla tube, anthers brownish green; style exsert for 8–12 mm, stigma capitate. **Fruits** broadly ellipsoid, 8–10 mm long, 5–6 mm wide; fruit calyx 3.5–4 mm long, 3.5–4 mm wide. **Seeds** angular.

Distribution. Endemic to Borneo (Sarawak and Brunei). In Sarawak, recorded only from the Kuching and Miri districts and in Brunei, documented for the Batu Patam area in Belait district.

Ecology. Mixed dipterocarp forest, sea-level to 285 m.

5. **Fagraea collina** Wong & Sugau

(Latin, *collinus* = pertaining to hills; the typical habitat)

Sandakania 8 (1996) 19. **Type:** *Aban SAN 50747*, Sabah, Ranau, copper mining area (holotype SAN). **Synonym:** *F. elliptica sensu* Leenhouts, FM 1, 6 (1962) 303, Cockburn *l.c.* 210, Ashton *l.c.* 314, Anderson *l.c.* 239, *pro parte*, *non* Roxb. (1824).

Shrub to medium-sized tree, to 15(–20) m tall, 10(–25) cm diameter. **Bark** fissured, dark brown to black. **Sapwood** yellowish. **Leaves** *coriaceous*, upper and lower *surfaces smooth*; elliptic, oblanceolate-obovate, 4–15 x 2–7 cm; base cuneate, margin plane to slightly recurved, *apex acuminate*; midrib prominent on lower side, *lateral veins* 7–9 pairs, *faint to obscure on both sides,*

intercostal veins obscure; petioles 1.5–2 cm long, base with axillary scales adnate to the twig and forming a nodal ochrea. **Inflorescence** *terminal, a many-flowered cyme*, 11–18 cm long, main axis *branching to 3–4 orders*; peduncle 1–3.5 cm long, first branch 2.5–7 cm long. **Flowers** with *pedicels 0–1 mm long*; *calyx campanulate, 2–3 mm long*, 1.5–2 mm diameter, divided to almost halfway or more; *corolla* salverform, *tube 6–7 mm long*, 1–1.5 mm wide, *lobes ovate to lanceolate, 3.5–4 mm long*, 1–1.5 mm wide; stamen *filaments 8–11 mm long*, inserted at the corolla mouth, anthers *c.* 1 mm long, exsert for 6–7 mm; style exsert for 5–7 mm, stigma capitate. **Fruits** globose, *3.5–5 mm across*. **Seeds** angular, *c.* 1 mm diameter, brownish black.

Distribution. Borneo, so far known only from Sabah (around Ranau and on Gaya Island on the west coast) and Sarawak (Kuching, Sibu, Bintulu and Kapit districts).

Ecology. Mostly in montane forest to 1700 m, sometimes lowland (Gaya island, Sabah).

6. **Fagraea cuspidata** Blume

(Latin, *cuspidatus* = with an abrupt, short point; the leaf apex)

Mus. Bot. Lugd. Bat. 1(1850) 170; Merrill *l.c.* (1921) 491; Masamune *l.c.* 614; Wong & Sugau *l.c.* 28. **Type:** *Blume*, *s.n.* (Leiden sheets no. 908.127-738, 908.127-740 & 944.202-211), Borneo, Tanjong Java (isotype L). **Synonyms:** *F. robusta* Blume, *l.c.* (1850) 170; *F. crassipes* Benth., J. Linn. Soc. Bot 1 (1856) 99; *F. cymosa* Merr., J. Str. Br. R. As. Soc. 77 (1917) 234, *l.c.* (1921) 492, Masamune *l.c.* 614; *F. pendula* Merr. *l.c.* (1929) 251, Masamune *l.c.* 615; *F. racemosa sensu* Merrill *l.c.* (1921) 493, Masamune *l.c.* 615, Leenhouts, FM 1, 6 (1962) 311, Anderson *l.c.* 240, Ashton *l.c.* 314, *pro parte*, *non* Jack *ex* Wall. (1824).

Small tree to 18 m tall, 12 cm diameter. **Bark** smooth to slightly fissured, dark grey. **Leaves** coriaceous, upper and lower surfaces smooth; ovate-elliptic, 8–40 x 4.5–16 cm; base cuneate-rounded to cordate, margin plane, apex abruptly short-caudate; midrib prominent on lower side, lateral veins 6–9 pairs, prominent on the lower side, faint to obscure on the upper side, intercostal veins obscure to prominent; petioles 0.5–2 cm, base with axillary scales fused to form a nodal ochrea. **Inflorescence** *terminal*, 5.5–34 cm long, *with clusters of condensed branches in distinct tiers along the main axis*, peduncle 2.5–22 cm long. **Flowers** with pedicels 7–35 mm long; *calyx 7–9 mm long, 7–8 mm wide, lobes 4–5 mm long*; *corolla* narrowly funnel-shaped, *34–59 mm long, narrowed basal part 5–6 mm long*, expanded upper part 22–24 mm long, 11–18 mm wide, *lobes* semi-orbicular to ovate, *7–11 mm long*, 6.5–9 mm wide; stamen filaments exsert for 2–3 mm, anthers 5–6 mm long; style exsert for 8–10 mm, stigma capitate. **Fruits** ovoid-ellipsoid, 13–18 mm long, 9–14 mm wide; fruit calyx lobes clasping the fruit base. **Seeds** angular.

Vernacular names. Sabah—*todopon puak* (Dusun). Sarawak—*sukang ranyai* (Iban), *sukong ganyai* (Iban), *tembusu gajah* (Malay), *tinggirang pirak* (Kedayan).

Distribution. Known only from Borneo (all districts) and the Philippines (Balabac island). Very common.

Ecology. Mixed dipterocarp forest, in gaps and clearings, also secondary forests and forest fringes. Lowlands to 1500 m.

7. **Fagraea dulitensis** Wong & Sugau

(of Mt. Dulit, Sarawak)

Sandakania 8 (1996) 59. **Type:** *Tong S. 34870*, Sarawak, 4th Div., Marudi, Ulu Sg. Tinjar, Dulit Range, near Koyan (holotype SAN, isotypes K, KEP, L, MO, SAR).

Tree, to 5 m tall, 5 cm diameter. **Bark** brown. **Leaves** thin-coriaceous, upper and lower surfaces smooth; *obovate*, 5–1.5 x̣ 2–4.5 cm; base attenuate to cuneate, margin plane, apex acute or shortly acute-acuminate; midrib prominent on lower side, *lateral veins obscure on both sides*, intercostal veins obscure; *petioles 1–2.2 cm long*, base with conspicuous axillary scales loosely clasping the node. **Inflorescence** *a solitary flower.* **Flowers** subsessile or with pedicels to 0.5 cm long; bracteoles 1–2 decussate pairs, tiny (only up to 5 mm long); calyx 2 cm long, 1–1.3 cm diameter, divided more than halfway down (in bud), lobes ovate, *c.*1.4 cm long; *corolla* greenish-yellow, *short-infundibular, tube to 4.5 cm long*, the *upper part to 10 mm wide*, *lobes* white, *to 1.8 cm long*, *1.5 cm wide*; anthers brown; pistil light green. **Fruit** unknown.

Vernacular name. Sarawak—*jatem* (Kenyah).

Distribution. Borneo, known only from the type specimen from Sarawak.

Ecology. Recorded in old secondary forest, at *c.* 113 m.

8. **Fagraea elliptica** Roxb.

(Latin, *ellipticus* = elliptic; the leaf shape)

Fl. Ind. ed. Wall. 2 (1824) 32; Leenhouts, FM 1, 6 (1962) 303, Cockburn *l.c.* 210, Anderson *l.c.* 239, Ashton *l.c.* 314, *pro parte*; Wong & Sugau *l.c.* 21. **Type:** not designated (see Wong & Sugau *l.c.*). **Synonyms:** *Picrophloeus javanensis* Blume, *l.c.* (1826) 1020, *nom. nud.*; *Cyrtophyllum speciosum* Blume, *l.c.* (1826) 1022; *Willughbeia elliptica* (Roxb.) Spreng., Syst. Veg. 4 (1827) Cur. Post. 71; *F. speciosa* (Blume) Blume, Rumphia 2 (1838) 35, *t.* 81, Mus. Bot 1 (1850) 172, Merrill *l.c.* (1921) 493, Masamune *l.c.* 615; *F. picrophloea* Blume, *l.c.* (1838) 36, *nom. illeg.*, Merrill *l.c.* (1921) 492, Masamune *l.c.* 615; *F. kimangu* Blume, *l.c.* (1850) 173; *F. valida* Miq., Fl. Ind. Bat. 2 (1857) 376; *F. sumatrana* Miq. *l.c.* 377; *F. aurantiodora* S. Moore, J. Bot. 66 (1928) 105; *F. pseudoelliptica* Kanehira & Hatusima, Bot. Mag. Tokyo 56 (1942) 161, f. 5; *F. javensis* (Blume) Bakh. *f.* in Backer, Bekn. Fl. Java 7 (1948) fam. 170, 12, *nom. illeg.*; *F. pusilliflora* Bakh. *f.* in Backer *l.c.* 13, *nom. nud.*

Shrub to tree, to 25 m tall, 32 cm diameter or more, sometimes with buttresses to 45 cm high. **Bark** fissured, pale brown to dark grey-brown; inner bark cream. **Leaves** *chartaceous to coriaceous*, upper and lower *surfaces smooth when dry*; elliptic, oblanceolate-obovate, 6–15 x̣ 3–8 cm; base cuneate, margin plane to slightly recurved, *apex cuspidate-caudate*; midrib prominent on lower side, *lateral veins* 8–12 pairs, *distinct and raised on the lower side*, flattened and indistinct to slightly raised on the upper side, intercostal veins obscure; petioles 1.5–4 cm long, base with axillary scales adnate to the twig and fused to form a nodal ochrea. **Inflorescence** *terminal, a many-flowered branched cyme*, 9–12 cm long, 6–21 cm wide, main axis *branching 3–4 orders* (occasionally to 5 orders); peduncle 3–6.5 cm long. **Flowers** with *pedicels 1–3 mm long*; *calyx* campanulate, *2–3 mm long*, divided to about halfway, 2–2.5 mm diameter; *corolla* salverform, whitish, *tube 6–11 mm long*, 1–1.5 mm wide, *lobes*

lanceolate, 3.5–6 mm long, 1–2 mm wide; stamen *filaments 7–10 mm long*, inserted at corolla mouth, anthers oblong, *c.* 1 mm long; style exsert for 4–6 mm, stigma small, capitate. **Fruits** globose, *3.5–6 mm across*, orange to brick-red, fruit calyx lobes 1–2 mm long. **Seeds** angular.

Distribution. Sumatra, Java, Borneo, Sulawesi, Maluku and New Guinea. In Borneo, in all territories. In Sabah, documented for the Ranau and Penampang districts, in Sarawak, for the Miri and Kapit districts. Uncommon.

Ecology. Lowland primary forest, occasionally montane forest to 1600 m (on Mt. Kinabalu).

9. **Fagraea floribunda** Wong & Sugau Fig. 2.

(Latin, *floribundus* = profusely flowering)

Sandakania 8 (1996) 62. **Type:** *Ashton S. 16743*, Sarawak, Ulu Anap, Bt. Mersing (holotype SAN, isotypes BO, K, KEP, L, MEL, SAR, SING). **Synonym:** *F. blumei sensu* Leenhouts, FM 1, 6 (1962) 320, *pro parte*, *non* G. Don (1837).

Tree, to 23 m tall, 60 cm diameter, sometimes with stilt-roots. **Bark** smooth, with white hoop marks. **Leaves** subcoriaceous, lower surface shagreen, upper surface smooth; broadly oblanceolate, 5–13.5 x3–6 cm; base cuneate-attenuate, margins plane, apex broadly acute; midrib prominent on lower side, *lateral veins* 4–5 pairs, *prominent on lower side*, impressed or sunken on upper side, intercostal veins obscure; *petioles* 2–3 cm long, *base with conspicuous axillary scales loosely clasping the node*. **Inflorescence** terminal, a compound cyme, *laxly branched*, *short-pedunculate*, *14–16 cm long*, *primary branches rebranching to 3 orders*. **Flowers** with pedicels 0.8–1 cm long, 3–4 mm thick; bracts subtending inflorescence branches 5–6 mm long; bracteoles 1 pair, small, 1–2 mm long, attached halfway on the pedicel; calyx campanulate, 0.9–1.2 cm long, lobes rounded, 0.3–0.5 cm across; corolla creamy yellow, *c.* 2.7 cm long, lobes 1–1.4 cm long, 3–4 mm wide; stamen filaments 1–1.5 cm long, anthers 3–4 mm long; style 0.9–1 cm long, stigma capitate. **Fruits** oblong, to 5 x 4 cm. **Seeds** ellipsoid.

Distribution. Borneo (Sarawak, documented only for the Bintulu and Mukah districts).

Ecology. Mixed dipterocarp forest and *kerangas* forest, also on basalt boulders, up to 700 m.

10. **Fagraea fragrans** Roxb.

(Latin, *fragrans* = fragrant; the flowers)

Fl. Ind. ed. Wall., 2 (1824) 32; Merrill *l.c.* (1921) 492; Masamune *l.c.* 614; Cockburn *l.c.* 211; Leenhouts, FM 1, 6 (1962) 304, Anderson *l.c.* 240, Ashton *l.c.* 310, *pro parte*; Wong & Sugau *l.c.* 11. **Type:** *Hunter*, *s.n.* (= *Wallich, Cat. no. 1597E*), "Pullo Penang" (K). **Synonyms:** *Cyrtophyllum peregrinum* Reinw., Syll. Pl. Nov. Soc. Bot. Ratisb. 2 (1826) 9, Blume, Bijdr. Fl. Ned. Ind. (1826) 1022; *F. peregrina* Blume, Rumphia 2 (1838) 34, *t.* 80, Mus. Bot. Lugd. Bat. 1 (1850) 172; *F. cochinchinensis* A. Chevalier, Cat. Pl. Jard. Bot. Saigon (1919) 65, *pro specim.*, excl. basionyms.

Medium-sized to big tree, to 35 m tall, 1.2 m diameter. **Bark** irregularly fissured, dark brown to greyish to black; inner bark yellowish, fibrous. **Wood** pale yellow. **Leaves** subcoriaceous,

Fig. 2. *Fagraea floribunda.* A, flowering leafy twig; B, flower; C, fruit. (A, B from *S. 16743*; C from *S. 19455*.)

upper and lower surface smooth; elliptic, 4–14 x 1.5–5 cm; base acute, decurrent on the petiole, *margin plane*, apex cuspidate; midrib prominent on the lower side, *lateral veins 9–12 pairs*, distinct, flat to only slightly prominent on the lower side, *flat and indistinct to obscure on the upper side*, intercostal veins obscure; petioles 0.5–1.8 cm long, base with axillary scales adnate to the twig and fused to form a nodal ochrea. **Inflorescence** *axillary, a many-flowered cyme*, 6.5–12 cm long, 4–7 cm wide, main axis branching 2–3 orders; *peduncle 4–6 cm long.* **Flowers** with pedicels 5–7 mm long; *calyx* campanulate, 2–2.5 mm long, *2–2.5 mm diameter*; *corolla* infundibular, pale yellow, fragrant, tube 6–8 mm long, 1.5–2 mm wide, *lobes* ovate, *(5–)6–7 mm long, 3–4 mm wide*; stamens exsert, filaments 14–17 mm long, inserted just above the middle of the tube, anthers oblong-linear, *c.* 1.5 mm long; *style exsert for 8–10 mm*, stigma faintly 2-lobed. **Fruits** ovoid-globose, 5–6 mm long, 5–6 mm wide, orange then scarlet; fruit calyx 2–2.5 mm long, 2.5–3 mm wide. **Seeds** minute, angular.

Vernacular names. Sabah—*banati* (Keningau Murut), *ombinaton* (Dusun), *tambiaton*, *tambinaton* (Dusun), *temasuk*, *temasuk laut*, *temasuk pasir* (Brunei Malay). Sarawak—*tembusu* (Malay).

Distribution. Bengal, Myanmar, Thailand, Indo-China, Andamans, Sumatra, Java, Peninsular Malaysia, Mindoro, Balabac, Palawan, Borneo and Sulawesi. In Borneo, in all territories. In Sabah and Sarawak common only in the west coast districts, elsewhere mostly planted.

Ecology. Lowland forests, especially secondary or disturbed forest, sometimes in coastal or beach forest, or *kerangas* forest. Sea-level to *c.* 800 m.

Uses. Often planted along roadsides as an ornamental and shade tree. The timber is hard and very durable.

11. **Fagraea gigantea** Ridl.

(Latin, *giganteus* = very big; the tree)

J. Str. Br. R. As. Soc. 79 (1918) 98; Cockburn *l.c.* 211; Wong & Sugau *l.c.* 11. **Lectotype** (Wong & Sugau *l.c.*)**:** *Ridley 5818*, Singapore, Gardens Jungle (SING). **Synonyms:** *F. speciosa sensu* Ridley, J. Str. Br. R. As. Soc. 50 (1908) 122, *non* Blume (1838); *F. sororia* J.J. Smith *ex* Cammerl., Bull. Jard. Bot. Btzg. 3, 5 (1923) 319, pl. 5; *F. fragrans sensu* Leenhouts, FM 1, 6 (1962) 304, Anderson *l.c.* 240, Ashton *l.c.* 310, *pro parte*, *non* Roxb. (1824).

Small to very large tree, to 45 m tall, 1.2 m diameter, trunk sometimes fluted, buttresses short, to 1 m high. **Bark** deeply fissured, dark brown. **Wood** orange to pale yellow. **Leaves** chartaceous to subcoriaceous, upper and lower side smooth; elliptic-obovate, 4–14 x 1.5–5.5 cm; base acute, *margin wavy*, apex caudate; midrib prominent on lower side, *lateral veins 3–8 pairs*, prominent to faint on the lower side, *often depressed on the upper side*, intercostals veins obscure; petioles 1.5–2.5 cm long, base with axillary scales adnate to the twig and fused to form a nodal ochrea. **Inflorescence** *axillary, a many-flowered branched cyme*, 2.5–5.5 cm long, 3–5 cm wide, main axis branching 2–3 orders; *peduncle 2–3.5 cm long*. **Flowers** with pedicels 4–7 mm long; *calyx* 3–3.5 mm long, *1.5–2 mm diameter*; *corolla* salverform, tube 6–8 mm long, 1.5 mm wide, *lobes* elliptic, *4–5 mm long, 2.5–3 mm wide*; stamen filaments 12–15 mm long, inserted just above the middle of the tube, anthers *c.* 1 mm long; *style exsert for 14–16 mm*, stigma capitate. **Fruits** globose, 3–5 mm across, yellowish, fruit calyx 3–3.5 mm long, 3–3.5 mm wide. **Seeds** minute, angular, dark brown.

Vernacular names. Sabah—*temasuk*, *temasuk hutan* (Brunei Malay).

Distribution. Sumatra, Peninsular Malaysia and Borneo (all territories). In Sabah, documented for the Keningau, Sandakan and Tawau districts; in Sarawak, known in the Kuching, Baram and Limbang districts.

Ecology. Mixed dipterocarp forests, lowlands and hills up to 450 m.

Uses. The timber is hard and sometimes used for construction.

12. **Fagraea kinabaluensis** Wong & Sugau Fig. 3.

(of Mt. Kinabalu)

Sandakania 8 (1996) 69. **Type:** *Aban & Meijer SAN 93260*, Sabah, Keningau, Crocker Range FR, mile 16 (holotype SAN; isotype L). **Synonym:** *F. ceilanica sensu* Leenhouts, FM 1, 6 (1962) 315, Cockburn *l.c.* 211, *pro parte*, *non* Thunb. (1782).

Shrub or tree to 6 m tall, sometimes a climber or epiphyte, possibly also a strangler. **Leaves** thin-coriaceous, upper and lower surfaces shagreen; *narrowly elliptic to slightly obovate*, 5–11 x 2–3.5 cm; base acute to attenuate, margin slightly recurved when dry, apex acuminate to caudate; midrib prominent on lower side, *lateral veins obscure on both sides,* intercostal veins obscure; *petioles less than 1 cm long*, base with inconspicuous axillary scales. **Inflorescence** *a solitary terminal flower.* **Flowers** with pedicels 2–3 mm long; bracteoles two pairs, small, 2–3 mm long; calyx cup-shaped, 2.2–2.6 cm long, 1.2–1.3 cm diameter, divided to its middle, lobes 1.7–1.8 cm long; *corolla short-infundibular*, divided more than halfway down, *tube 3-4 cm long, upper part 2–2.5 cm across*, *lobes 2.5–3 cm long, 1.5–2.5 cm wide*. **Fruits** ellipsoid, mucronate, 3–3.5 cm long, 2.5–2.7 cm across; fruit calyx lobes patent. **Seeds** rounded, brown.

Distribution. Endemic to Borneo (Sabah). In Sabah, documented only on the Crocker Range (including Mt. Kinabalu) and its foothills, and Mt. Silam on the east coast.

Ecology. Montane forests.

13. **Fagraea montana** Wong & Sugau

(Latin, *montanus* = of mountains; the typical habitat)

Sandakania 8 (1996) 31. **Type:** *Aban SAN 50722*, Sabah, Ranau, copper mining area (holotype SAN, isotypes K, L). **Synonyms:** *F. minor sensu* Merrill *l.c.* (1921) 492, Masamune *l.c.* 614, *non* Reinw. *Ex* Blume (1826); *F. racemosa sensu* Leenhouts, FM 1, 6 (1962) 311, Cockburn *l.c.* 210, *pro parte*, *non* Jack *ex* Wall. (1824).

Tree to 40 m tall, 90 cm diameter, buttresses to 1.3 m high. **Bark** fissured to scaly, brown; inner bark fibrous, laminated, yellow to reddish. **Wood** pale yellow. **Leaves** coriaceous, upper and lower surface smooth; *elliptic-obovate*, *3.5–13.5* x *1.5–5.5 cm*; base cuneate, margin plane to slightly recurved, apex abruptly caudate; midrib prominent on lower side, *lateral veins 4–5 pairs, faint to obscure on both sides*, intercostal veins obscure; petioles 0.7–2 cm long, base with axillary scales fused to form a nodal ochrea. **Inflorescence** terminal, 4.5–14 cm long,

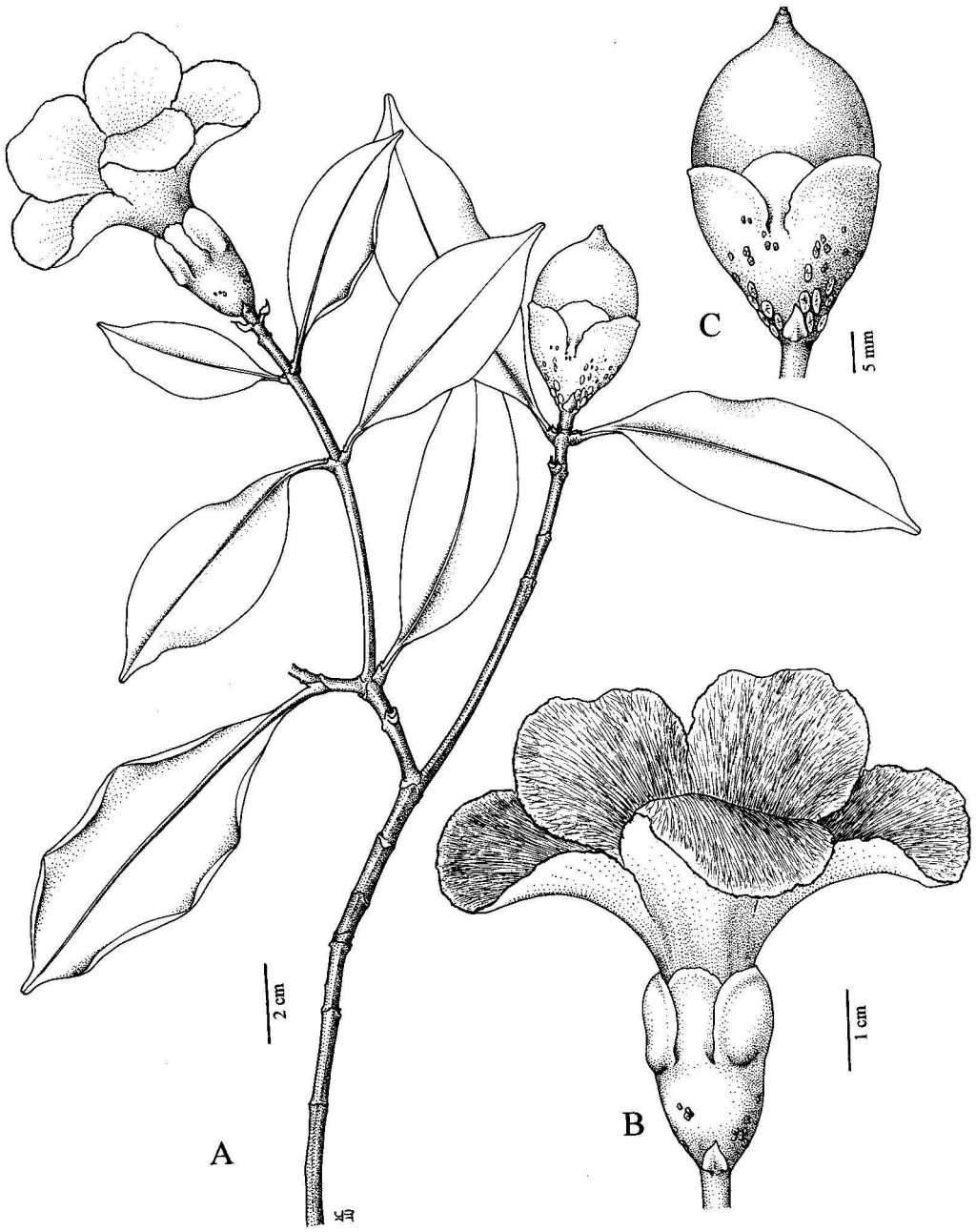


Fig. 3. *Fagraea kinabaluensis.* A, flowering leafy twig; B, detail of flower; C, fruit. (All from *SAN 93260.*)

with clusters of condensed branches in distinct tiers along the main axis; peduncle 1.5–5.5 cm long. **Flowers** with pedicels 6–12 mm long; calyx 4–4.5 mm long, 4–6.5 wide, lobes 2.5–3 mm long; *corolla* funnel-shaped, *18–20 mm long*, *narrowed basal part 7–8 mm long*, *expanded upper part 5–6 mm long, 6–7.5 mm wide*, *lobes* ovate, *4.5–5 mm long*, 3–3.5 mm wide; stamens inserted at the base of the inflated part of the corolla, *anthers 1 mm long*, included or just visible at the throat; style exserted for 4–5 mm, stigma capitate. **Fruits** ovoid-globose, 9–15 mm long, 8–11 mm wide; fruit calyx lobes patent to clasping the fruit base. **Seeds** angular.

Vernacular name. Sarawak—*bira parak* (Kelabit).

Distribution. Endemic to Borneo (Sabah and Sarawak). In Sabah, known only in the Crocker Range (including Mt. Kinabalu) and its foothills; in Sarawak, documented for the Baram and Kapit districts.

Ecology. Montane forests, usually 1000–1600 m.

14. **Fagraea philippinensis** Wong & Sugau

(of the Philippines)

Sandakania 8 (1996) 35. **Type:** *Ahern's Coll.*, *For. Bur. 3270*, Philippines, Luzon, Rizal (holotype K). **Synonym:** *F. racemosa sensu* Leenhouts, FM 1, 6 (1962) 311, Anderson *l.c.* 240, Ashton *l.c.* 314 (as "Form 4"), *pro parte*, *non* Jack *ex* Wall. (1824).

Small tree, 3–10 m tall, to 13 cm diameter. **Bark** fissured, grey. **Leaves** coriaceous, upper and lower surfaces smooth; elliptic-oblong, *8–23* x *3.5–10.5 cm*; base cuneate rounded or cordate, margin plane to recurved, apex acuminate-short caudate; midrib prominent on lower side, lateral veins 4–8 pairs, slightly prominent on the lower side, faint to obscure on the upper side, intercostal veins obscure; petioles 0.6–1.5 cm long, the base with axillary scales forming a nodal ochrea. **Inflorescence** terminal, 4.5–19 cm long, with clusters of condensed branches in distinct tiers along the main axis; peduncle 2.5–8.5 cm long. **Flowers** with pedicels 2–6 mm long; *calyx 7–9 mm long*, 5–8 mm wide, lobes 4–6 mm long; *corolla* salverform, 34–46 mm long, *narrowed basal part 7–12 mm long*, *expanded upper part 12–16 mm long, 20–22 mm wide*, *lobes* ovate, *10–12 mm long*, 9–10 mm wide; stamen filaments inserted at the base of the inflated part, *anthers* included, *3.5–4 mm long*; style exsert for 5–7 mm. **Fruits** ellipsoid, 9–11 mm long, 7–9 mm wide; fruit calyx lobes clasping the fruit base. **Seeds** angular.

Distribution. Philippines, Borneo (Sarawak and Kalimantan). In Sarawak, documented for the Kuching and Limbang districts.

Ecology. Mixed dipterocarp forest and *kerangas* forest, to 600 m.

15. **Fagraea resinosa** Leenh.

(Latin, *resinosus* = resinous; the shoot tips and flower buds)

Bull. Jard. Bot. Brux. 32 (1962) 429; Wong & Sugau *l.c.* 86. **Type:** *Hallier 3162*, Amai Ambit (holotype L; isotype BO).

Tree to 25 m tall, 80 cm diameter, also recorded as an epiphyte or climber. **Bark** smooth, sometimes covered with big lenticels, whitish brown; inner bark pale yellow. **Leaves** thick coriaceous, upper surface slightly coarse, lower surface shagreen; broadly obovate, 10–18 x 4–8 cm; base cuneate, margin slightly recurved when dry, apex acute with short acumen; midrib prominent on the lower side, *lateral veins* 7–8(–11) pairs, *faint to sunken on both sides*, intercostal veins obscure; *petioles* 1–2.5 cm long, *base with conspicuous axillary scales loosely clasping the node, auricles indistinct or absent*. **Inflorescence** terminal, with a solitary or a pair of flowers, rarely a sessile 3-flowered cyme. **Flowers** with pedicels 2.5–3 cm long; *bracteoles large, 2–3 pairs, with rounded apices, attached to calyx cup base and forming an involucre*; calyx 2.5–3 cm long, *c.* 1.5 cm diameter; corolla tubular, white, fragrant, tube 8–9 cm long, contracted lower part *c.* 0.6 cm diameter, expanded upper part *c.* 2 cm wide, lobes ovate, *c.* 3 cm long, 2.5 cm wide; anthers broadly oblong, *c.* 6 mm long; stigma dish-shaped, *c.* 2.5 mm diameter. **Fruits** ellipsoid, 5.5–6 cm long, 3.5–4 cm wide, fruit calyx 4–4.5 cm long, 2.5–3 cm wide. **Seeds** ellipsoid-rounded.

Vernacular name. Sarawak—*terongau paya* (Kelabit).

Distribution. Endemic to Borneo (Sabah, Sarawak, Brunei and Kalimantan). In Sabah, documented only for the Ranau district; in Sarawak, recorded for the Kuching, Kapit, Miri and Limbang districts.

Ecology. Montane forest, up to 1500 m; also recorded at *c*. 1000 m on limestone on Mt. Api in Sarawak.

16. **Fagraea rugulosa** Wong & Sugau Fig. 4.

(Latin, *rugulosus* = wrinkled; the coarse leaf surface)

Sandakania 8 (1996) 22. **Type:** *Chai & Illias S. 27929*, Sarawak, 5th Div., Ulu Lawas, near Sg. Telau, Kota FR (holotype SAN; isotypes A, BO, K, KEP, L, SING). **Synonym:** *F. elliptica sensu* Leenhouts FM 1, 6 (1962) 303, Ashton *l.c.* 314, Anderson *l.c.* 239, *pro parte*, *non* Roxb. (1824).

Tree to 15 m tall, 25 cm diameter. **Bark** lightly fissured, dark brown; inner bark dark brown. **Leaves** coriaceous, upper and lower *surfaces very coarsely shagreen and rough*; elliptic-obovate, 11–21 x 5–9 cm; base cuneate, margin recurved when dry, *apex cuspidate*; midrib prominent on lower side, lateral veins 9–12 pairs, faint to obscure on both sides, intercostal veins obscure; petioles 2–3.5 cm long, base with axillary scales adnate to the twig and fused to form a nodal ochrea. **Inflorescence** *terminal, a many-flowered branched cyme*, *c.* 6 cm long, *c.* 15 cm wide, *main axis branching 3–4 orders*, first branch 2.5–6 cm long; peduncle 1–2 cm long. **Flowers** with pedicels 2–3 mm long; *calyx* campanulate, *3–4 mm long*, 2–3.5 mm diameter, divided almost to its base; *corolla* salverform, tube 10–11 mm long, 1–1.5 mm wide, *lobes lanceolate*, *5–8 mm long*, 2–2.5 mm wide; *stamen filaments 15–18 mm long*, inserted at corolla mouth, anthers *c.* 1 mm long; style exsert for 10–11 mm; stigma capitate. **Fruits** globose, *(6–)9–10 mm across*; fruit calyx 2–3 mm long, 2–3 cm wide. **Seeds** angular, *c.* 1 mm diameter.

Vernacular name. Sabah—*tamasuk jantan* (Brunei Malay).

Distribution. Borneo: SW Sabah, Sarawak (Lawas and Baram area only) and Brunei.

Ecology. Mixed dipterocarp and *kerangas* forests, up to 450 m.

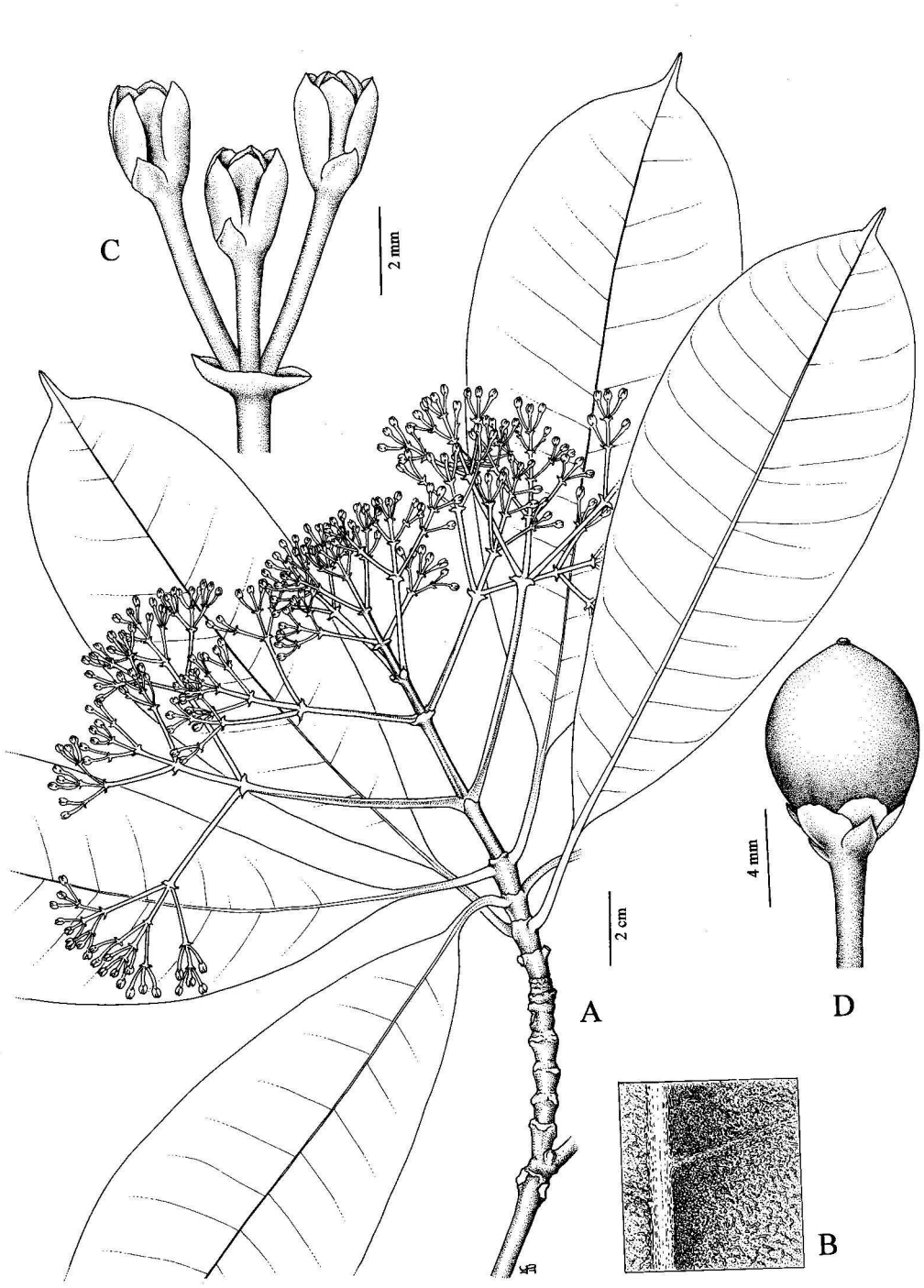


Fig. 4. *Fagraea rugulosa.* A, flowering leafy twig; B, detail of rough lower leaf surface; C, ultimate cyme-like unit of the inflorescence, in bud; D, fruit. All from *S. 27929*, except D from *S. 16603*.)

17. **Fagraea spicata** Baker

(Latin, *spicatus* = spike-like; the inflorescence)

Kew Bull. (1896) 25; Merrill *l.c.* (1921) 493; Masamune *l.c.* 615; Wong & Sugau *l.c.* 38. **Type:** *Creagh*, *s.n.*, British North Borneo, East Coast (holotype K). **Synonyms:** *F. congestiflora* Elmer, Leafl. Philip. Bot. 8 (1915) 2741; *F. racemosa sensu* Leenhouts, FM 1, 6 (1962) 311, Cockburn *l.c.* 210, Anderson *l.c.* 240, Ashton *l.c.* 314, *pro parte*, *non* Jack *ex* Wall. (1824).

Tree, to 17 m tall and 30 cm diameter or more. **Bark** smooth to fissured, brown. **Leaves** chartaceous to thin coriaceous, upper and lower surfaces smooth; ovate-elliptic, *10–30* x *5–14 cm*; *base cordate*, margin plane, apex acuminate-short caudate, midrib prominent on lower side, lateral veins 9–15 pairs, prominent on lower side, faint to obscure on upper side, intercostal veins obscure; *petioles indistinct*, 0.2–0.5 cm long, base with axillary scales fused to form a nodal ochrea. **Inflorescence** terminal, 4–13 cm long, with clusters of condensed branches in distinct tiers along the main axis; peduncle 1–3 cm long. **Flowers** with pedicels 2–7 mm long; *calyx* campanulate, *5–6 mm long*, 3.5–5.5 mm wide, lobes 1.5–2.5 mm long; *corolla* infundibular, *32–41 mm long*, *narrowed basal part 11–12 mm long*, *expanded upper part* 20–28 mm long, *12–17 mm wide*, *lobes* ovate, *5.5–7 mm long*, 5–6.5 mm wide; stamen filaments short, inserted at base of the inflated part, anthers included, 2.5–4 mm long; style 3–3.5 cm long, included or barely exsert, stigma capitate. **Fruits** ovoid-globose, 8–12 cm long, 8–10 mm wide, *fruit calyx lobes patent*. **Seeds** angular.

Vernacular names. Sabah—*todopon puak* (Dusun). Sarawak—*sira* (Kelabit).

Distribution. Borneo (Sabah, Sarawak, Brunei and Kalimantan) and the Philippines. In Sabah, documented only for the east coast districts, but probably more widespread; in Sarawak known for the Bintulu, Kapit and Miri districts.

Ecology. Lowlands to montane forest (to *c.* 3200 m), frequently in gaps and also secondary forests.

18. **Fagraea stenophylla** Becc. *ex* Merr.

(Greek, *stenos* = narrow, *phullon* = leaf)

J. Str. Br. R. As. Soc. 77 (1917) 236, *l.c.* (1921) 493; Masamune *l.c.* 615; Wong & Sugau *l.c.* 38. **Type:** *Native coll.*, *Bur. Sci. 2828*, Sarawak, Upper Baram, Selongo (holotype PNH, destroyed; isotypes A, UC). **Synonyms:** *F. eucalyptifolia* Cammerl., Bull. Jard. Bot. Btzg. 3, 5 (1923) 312, f. 2; *F. racemosa sensu* Leenhouts, FM 1, 6 (1962) 311, Cockburn *l.c.* 210, Anderson *l.c.* 240, Ashton *l.c.* 314 (as "Form 5"), *pro parte*, *non* Jack *ex* Wall. (1824).

Small tree to 4 m tall. **Bark** smooth. **Leaves** coriaceous, upper and lower surfaces smooth; *linear, 12–27* x *0.7–2.7 cm*; base cuneate, margin recurved when dry, apex acuminate to caudate; midrib prominent on lower side, *lateral veins 7–14 pairs, faint to obscure on both sides*, intercostal veins obscure; petioles 1.3–2.2 cm long, base with axillary scales fused to form a nodal ochrea. **Inflorescence** terminal, 3.5–15 long, with clusters of condensed branches in distinct tiers along the main axis; peduncle 1.5–5.5 cm long. **Flowers** with pedicels 3–6 mm long; calyx campanulate, 5–6 mm long, 5–6 mm wide, lobes 3–4 mm long; *corolla* funnel-shaped, *20–27 mm long, narrowed basal part 8–10 mm long, expanded upper part 10–11 mm*

long, *7–8 mm wide*, *lobes* semi-orbicular, *7–9 mm long*, 4.5–5 mm wide; stamen filaments short, inserted at the base of the inflated part of the corolla tube, *anthers* included, *2–2.5 mm long*; style included, stigma capitate. **Fruits** ellipsoid, 10–14 mm long, 6–9 mm wide, fruit calyx lobes clasping the fruit base to patent. **Seeds** angular.

Distribution. Endemic to Borneo (Sarawak, Kalimantan, Sabah and Brunei). In Sabah, documented for the Sipitang, Penampang and Keningau districts in the SW; in Sarawak, recorded for the Kapit, Miri and Limbang districts.

Ecology. A rheophyte, on banks of swift-running streams in the lowlands to 180 m.

19. **Fagraea teysmannii** Cammerl.

(J.E. Teysmann, 1808–1882, Curator of the Bogor Botanic Gardens)

Bull. Jard. Bot. Btzg. 3, 5 (1923) 314. f. 3; Wong & Sugau *l.c.* 40. **Lectotype** (Wong & Sugau *l.c.*)**:** *Teysmann*, *s.n.*, Karimata, Soengei Tajan (L). **Synonym:** *F. racemosa sensu* Leenhouts, FM 1, 6 (1962) 311, Anderson *l.c.* 240, Ashton *l.c.* 314 (as "Form 5"), *pro parte*, *non* Jack *ex* Wall. (1824).

Tree, to 10 m tall, *c.* 20 cm diamater. **Bark** smooth, brown. **Leaves** coriaceous, upper and lower surfaces smooth; elliptic, oblong, *4.5–16* x *1.5–6 cm*; base cuneate to rounded, margin recurved when dry, apex acuminate; midrib prominent to flattened on the lower side, lateral veins 4–7 pairs, faint to obscure on both sides, intercostal veins obscure; petioles 0.6–1.7 cm long, base with axillary scales adnate to the twig and fused to form a nodal ochrea. **Inflorescence** terminal, 2–10 cm long, with clusters of condensed branches in distinct tiers along the main axis; peduncle 1–5 cm long. **Flowers** with pedicels 2–7 mm long; *calyx 7–8 mm long*, 5–6 mm wide, lobes 3–4 mm long; *corolla* infundibular, 26–39 mm long, *narrowed basal part 6–7 mm long*, *expanded upper part 13–14 mm long, 10–12 mm wide*, *lobes* semi-orbicular, *7–8 mm long*, 5–6 mm wide; stamen filaments short, inserted at the base of the inflated part of the corolla tube, *anthers* included, *c. 1.5 mm long*; style included or barely exsert, 2.5–3 cm long, stigma capitate. **Fruits** ovoid-ellipsoid, 7–8 mm long, 5–7 mm wide, fruit calyx clasping the fruit base. **Seeds** angular.

Vernacular names. Sarawak—*kapan*, *uchip bali* (Kenyah).

Distribution. Endemic to Borneo (Sabah, Sarawak and Kalimantan). In Sabah, documented for the Tambunan district, in Sarawak for the Kapit district.

Ecology. In montane forests, to 1250 m.

20. **Fagraea volubilis** Wall. Fig. 5

(Latin, *volubilis* = twining; a habit wrongly attributed to this species)

In Roxb., Fl. Ind. 2 (1824) 36; Wong & Sugau *l.c.* 40. **Type:** *Jack*, *s.n.*, E Bencoolen (holotype K, sheet marked "1600 E. Bencoolen" on bottom left).

Tree to 14 m tall, 20 cm diameter or more. **Bark** fissured or cracking, dark brown; inner bark pale brown. **Sapwood** yellowish. **Leaves** coriaceous, upper and lower surfaces smooth; ovate, elliptic to oblong, 9–24 x 4–15 cm; base cuneate, rounded to subcordate, margin plane, apex

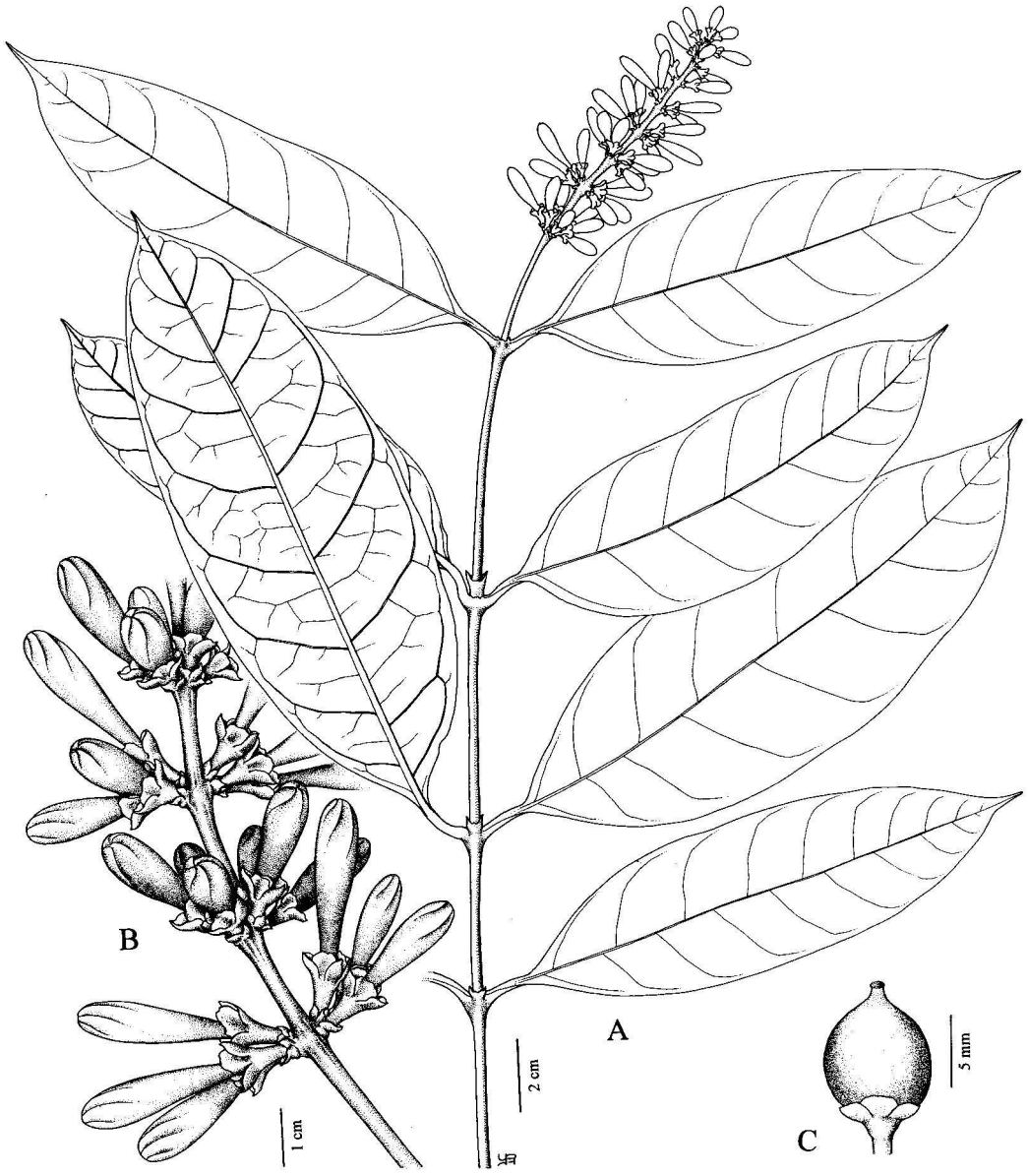


Fig. 5. *Fagraea volubilis* var. *microcalyx*. A, flowering leafy twig; B, detail of part of inflorescence; C, fruit. (All from *S. 35683.*)

acuminate to short caudate; midrib prominent on lower side, lateral veins 5–11 pairs, prominent on the lower side, faint to obscure on the upper side, intercostal veins obscure; petioles 1–2 cm long, stout, base with axillary scales fused to form a nodal ochrea. **Inflorescence** terminal, *2–30 cm long, with clusters of branches in distinct well-spaced tiers along the main axis, these branches typically condensed but rarely elongate*; peduncle 2.5–17 cm long. **Flowers** with pedicels 3–13 mm long; *calyx 4–6 mm long*, 3.5–6 mm wide, lobes 1.5–3.5 mm long; *corolla* broadly infundibular, 26–34 mm long, *narrowed basal part 10–12 mm long*, *expanded upper part 8–10 mm long, 13–15 mm wide*, *lobes* semi-orbicular to ovate, *7–12 mm long*, 7.5–9 mm wide; stamen filaments inserted at the base of the inflated part of the corolla tube, anthers included, 2.5–3 mm long; style barely exsert for 2–3 mm, stigma capitate. **Fruits** ovoid to ellipsoid, 11–16 mm long, 8–12 mm wide, tipped with persistent style base; *fruit calyx lobes patent*. **Seeds** tiny, angular, black.

Key to varieties

Calyx lobes 3–3.5 mm long.....

var. **volubilis**

Synonyms: *F. morindaefolia* Blume, Rumphia 2 (1838) 32, *t.* 73 f. 2, *t.* 79; *F. coarctata* Blume *l.c.* (1838) 33, Merrill *l.c.* (1921) 491, Masamune *l.c.* 613; *F. scholaris* Blanco, Fl. Filip. ed. 2 (1845) 93, ed. 3, 1 (1877) 171; *F. appendiculata* Blume, Mus. Bot. Lugd. Bat. 1 (1850) 169; *F. subreticulata* Blume *l.c.* (1850) 171; *F. latifolia* Miq., Fl. Ind. Bat. 2 (1857) 369; *F. rodatzii* Laut. & Schum., Fl. Schutzgeb. (1900) 499; *F. grandifolia* Merr., J. Str. Br. R. As. Soc. 77 (1917) 231, *l.c.* (1921) 492, Masamune *l.c.* 614; *F. racemosa* var. *pauciflora* King & Gamble, J. As. Soc. Beng. 74, 2 (1908) 609; *F. pauciflora* (King & Gamble) Ridl., FMP 2 (1923) 419, f. 110; *F. racemosa sensu* Leenhouts, FM 1,6 (1962) 311, Cockburn *l.c.* 210, Anderson *l.c.* 240, Ashton *l.c.* 314 (as "Form 5"), *pro parte*, *non* Jack *ex* Wall. (1824).

The Andaman and Nicobar islands, Sumatra, Peninsular Malaysia, Java, Borneo (Sabah, Sarawak, and Kalimantan), the Philippines, Sulawesi, Maluku and New Guinea. In Sabah, known from the Sipitang, Beaufort, Papar, Tenom, Keningau, Kota Belud, Labuk Sugut and Sandakan districts; in Sarawak, from the Kuching and Miri districts. Lowland rain forest, including secondary forest and forest fringes, up to 1100 m, also in *kerangas* and peat swamp.

Calyx lobes 1.5–2.5 mm long.....

var **microcalyx** Wong & Sugau

l.c. 43. Synonyms: *F. ligustrina* Blume, Rumphia 2 (1838) 33 (including var. *disparifolia* Blume), Merrill *l.c.* (1921) 492, Masamune *l.c.* 614; *F. cordifolia* Blume, *l.c.* (1838) 33, Merrill *l.c.* (1921) 491, Masamune *l.c.* 613; *F. gracilis* Cammerl., Bull. Jard. Bot. Btzg. 3, 5 (1923) 316; *F. racemosa sensu* Leenhouts, FM 1, 6 (1962) 311, Anderson *l.c.* 240, Ashton *l.c.* 314 (as "Form 3"), *pro parte*, *non* Jack *ex* Wall. (1824).

Borneo (Sarawak, Brunei and Kalimantan) and Maluku. In Sarawak, documented for the Kuching, Sibu and Bintulu districts. Lowlands; peat swamps, mixed dipterocarp forest and *kerangas* forest.

Vernacular names. Sabah—*todopon puok* (Dusun). Sarawak—*sokong ranyai* (Iban), *tembusu* (Malay).

2. **GENIOSTOMA** J.R. Forst. & G. Forst.

(Greek, *geneion* = bearded, *stoma* = mouth; the hairy corolla throat)

Char. Gen. Pl. 12 (1776) *t.* 12; Valeton, Bull. Inst. Bot. Btzg. 12 (1902) 1; Leenhouts, FM 1, 6 (1962) 369; A.C. Smith & Stone, Contrib. U.S. Nat. Herb. 37 (1962) 1; Conn, Blumea 26 (1980) 245.

Shrubs or treelets. **Leaves** *pinnately nerved*; *petioles* distinct or very short, the *base expanded to form a distinct cup-like ochrea.* **Inflorescence** *axillary*, sometimes at leafless nodes, a cyme or sometimes a solitary flower; minute bracteoles often present. **Flowers** (4-)5-merous, gynodioecious (with female and bisexual flowers together); sepals fused at the very base, margin ciliate; *corolla campanulate to rotate*, greenish white, lobes imbricate or contorted in bud, outside glabrous or short-hairy, inside glabrous or densely woolly, especially at the throat; stamens inserted in the throat, exsert, filaments usually short, anthers 2-locular; ovary 2-locular, ovules many, style often very short, stigma club-shaped or ellipsoid to globular, about as large as the ovary. **Fruit** *a capsule*, splitting into 2 parts. **Seeds** numerous, ellipsoid to subglobular, intruded on the hilar side, minutely warty, embedded in a juicy pulp.

Distribution. About 20–40 species, mainly in the Pacific region, extending to S Japan (Kyushu) and to Australia, Lord Howe Island, New Zealand, New Caledonia and the Society Islands in the east. Four species occur in Malesia, 3 of which are restricted to New Guinea; 1 species in Sabah.

Geniostoma rupestre J.R. Forst. & G. Forst. Fig. 6.

(Latin, *rupestris* = rock-dwelling)

Char. Gen. Pl. 12 (1776) *t.* 12; Valeton *l.c.* 12, 17, f. 1. **Lectotype** (A. C. Smith & Stone *l.c.*)**:** *J. R. & G. Forster 30*, *s. dat.*, Tanna, New Herbrides (BM; *J. R. & G. Forster*, *s.n.*, *s. dat.*, Tanna, New Herbrides at K is believed to be the isolectotype). **Synonyms:** *G. micranthum* DC., Prod. 9 (1845) 27; *G. montanum* Zoll. & Moritzi in Moritzi, Syst. Verz. (1846) 58; *G. lasiostemon* Blume, Mus. Bot. Lugd. Bat. 1 (1850) 239; *G. cumingianum* Benth., J. Linn. Soc. Bot. 1 (1856) 97, Merr., En. Philip. 3 (1923) 310; *G. avene* Valeton, Bull. Inst. Bot. Btzg. 12 (1902) 23 & 16; *G. celebicum* Valeton *l.c.* 19 & 15, f. 7 & 13; *G. miquelianum* Koord. & Valeton *ex* Valeton *l.c.* 22 & 14, f. 11, 12 & 16; *G. moluccanum* Valeton, *l.c.* (1902) 19 & 15, f. 4, Cammerl., Bull. Jard. Bot. Btzg III, 5 (1923) 297; *G. oblongifolium* Koord. & Valeton *ex* Valeton *l.c.* (1902) 20 & 15, f. 5 6 & 14; *G. philippinensis* Merr., Philip. J. Sc. 3 (1908) Bot. 259; *G. batanense* Merr., *ibid.* 3 (1909) Bot. 427, *l.c.* (1923) 309; *G. stenophyllum* Merr., Philip. J. Sc. 7 (1912) Bot. 329, *non* Gilg. & Bened. (1916); *G. brevipes* Merr., Philip. J. Sc. 9 (1914) Bot. 384; *G. laxa* Elm., Leafl. Philip. Bot. 8 (1915) 2746; *G. mindanaense* Elm., Leafl. Philip. Bot. 8 (1915) 2747; *G. longipes* Merr., Philip. J. Sc. 12 (1917) Bot. 296; *G. pachyphyllum* Merr., Philip. J. Sc. 14 (1919) 448; *G. lancilimbum* Merr., Philip. J. Sc. 17 (1921) 304; *G. ramosii* Merr., Philip. J. Sc. 17 (1921) 304; *G. fasciculata* Quis. & Merr., Philip. J. Sc. 37 (1928) 190.

Shrub or small tree, to 4(–10) m tall. Branches terete, rarely quadrangular, glabrous or the young twigs shortly yellowish brown hairy. **Leaves** *chartaceous to thin-coriaceous*, glabrous, ovate to elliptic, 4–6 x 1.5–2.5 cm; base cuneate, apex gradually tapering to acuminate, *margins strongly recurved when dry*; midrib prominent, lateral veins 6–7 pairs, intercostal veins loosely reticulate and flat to slightly prominent on both surfaces; *petioles* 0.5–1.5 cm long, *the expanded bases forming a distinct cup-like ochrea 1–2 mm high around the node*. **Inflorescence** several-flowered, 0.5–1.5 cm long, glabrous; bracteoles small. **Flowers** with

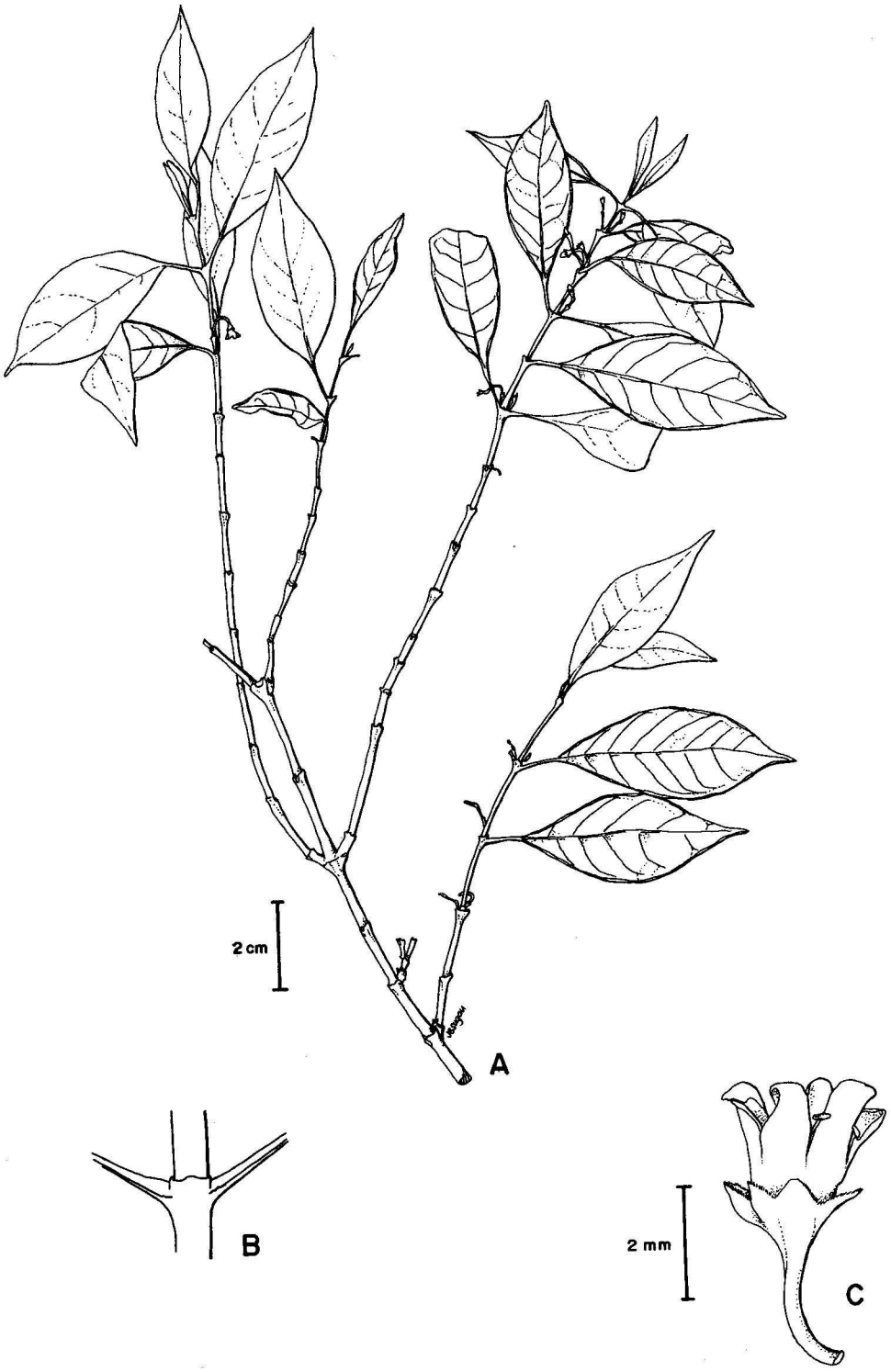


Fig. 6. *Geniostoma rupestre.* A, flowering leafy twigs; B, detail of node, showing cup-shaped ochrea; C, flower. (All from *RSNB 4708.*)

pedicels 1–5 mm long; calyx 0.5–2 mm long, lobes ovate to triangular, acute, outside glabrous, margin ciliate; corolla white, 1.5–4.5 mm long, outside glabrous or rarely fairly densely papillose-hairy, inside densely to sparsely hairy at the throat, lobes 0.5–2.5 mm long, blunt to acute; stamens with filaments 0.5–1 mm long, glabrous or hairy, anthers 0.7–1.2 mm long; ovary glabrous to densely shortly hairy, style very short (less than 0.2 mm). **Fruits** somewhat flattened-globose, rarely ellipsoid, ovoid, or obovoid 4–8(–12) x 4–6(–9) mm, black when ripe. **Seeds** ellipsoid, dark brown.

Distribution. Widely distributed in Malesia (except in Peninsular Malaysia), E Queensland and the W Pacific. In Borneo, so far recorded only from Sabah, at about 2000 m on Mt. Kinabalu.

Ecology. The species has a wide ecological amplitude, recorded from sea-level to 2800 m elevation, in both forest as well as exposed sites. It is, however, apparently uncommon in Borneo.

3. **NORRISIA** Gardner

(William Norris, 1793–1859, a British judge in colonial SE Asia)

In Hooker, J. Bot. Kew Misc. 1 (1849) 326; Merrill, EB (1921) 490; Masamune, EPB (1942) 616; Leenhouts, FM 1, 6 (1962) 293; Cockburn, TS 1 (1976) 207; Anderson, CLTS (1980) 240; Ashton, MNDTS 2 (1988) 317.

Trees. Twigs often terete, covered with brown hairs when young. **Leaves** elliptic to oblong, base attenuate to cuneate, apex rounded to acute or acuminate; *pinnately veined*; *petiole bases connected by a ridge-like thickening or forming a low inconspicuous ochrea not more than 1 mm high.* **Inflorescence** terminal, densely brown-hairy, a dichasially-branched to compound cyme, many-flowered; bracts narrowly triangular. **Flowers** fragrant, subsessile, with two pairs of decussate bracteoles at the base; calyx cupular, tube very short, lobes broadly rounded, densely hairy outside, glabrous inside; corolla salver-shaped, creamy to yellowish, densely hairy outside, lobes valvate in bud; stamens inserted between the corolla lobes; ovary obovoid, densely short-hairy, 2-locular, ovules many, style terete, *stigma knob-like and slightly bilobed.* **Fruits** *capsular, splitting down the septa into 2 parts.* **Seeds** few to many, small, spindle-shaped, glabrous, smooth; endosperm fleshy.

Distribution. Two closely related species, distributed from Sumatra, Peninsular Malaysia, Borneo to the Philippines. Both species in Sabah and Sarawak.

Key to *Norrisia* species

Leaf lateral veins not looping except for the distal-most 2–3 pairs, which arch and join close to the margin; midrib on upper side distinctly short-hairy (x10 magnification). Mouth of the corolla villous-hairy. Anthers suborbicular, *c.* 0.5 mm across. Fruits larger, 4–10 mm long.....**1. N. maior**

Leaf lateral veins distinctly arched and joined at some distance from the margin; midrib on upper side glabrous. Mouth of the corolla only sparsely hairy to glabrous. Anthers oblong, *c.* 0.8 mm long. Fruits smaller, 2-3.5 mm long..... **2. N. malaccensis**

1. Norrisia maior Soler.

(Latin, *maior* = bigger; the fruit compared with *N. malaccensis)*

In Engl. & Prantl, Nat. Pfl. Fam. 4, 2 (1892) 37; Cockburn *I.e.* 212; Anderson *I.e.* 240; Ashton *I.e.* 317. **Type:** *s. coll., s.n.,* Malacca (K). **Synonyms:** *N. malaccensis sensu* Merr., *I.e.* (1921) 490, *non* Gardner (1849); *N. malaccensis* var. *major* Ridl., FMP 2 (1923) 414.

Tree to 50 m tall, 75 cm diameter; buttresses to 3.2 m high. **Bark** smooth to slightly fissured, dark brown; inner bark pale brown. **Sapwood** pale yellow to white. **Leaves** thin-coriaceous, elliptic, 2.5-4.5 x2.5-9.5 cm; base attenuate to cuneate, apex acuminate, acute or rounded; *midrib* prominent and glabrous to hairy on lower side, flat to slightly channelled and distinctly *short-hairy on upper side, lateral veins* 6-10 pairs, *the distalmost 2—3 pairs arching and joining close to the margin,* intercostal veins subreticulate; petioles 0.3-0.5 cm long. **Inflorescence** 5.5-10.5 cm long, peduncle 4—5 cm long; bracts to 2 mm long. **Flowers** yellowish green, calyx 0.5-1 cm high, divided to halfway down, densely hairy; corolla 6-8 mm long, inside *villous-hairy at the mouth,* outside minutely hairy, lobes 1-2 mm long, inside glabrous; stamens 4-5 mm long, *anthers suborbicular, c. 0.5 mm diameter,* ovary c. 1.5 mm long; style 7-8 mm long. **Fruits** obovoid, *4-10* x *2-4 mm.* **Seeds** c. 5-20 per locule, c. 4 mm long.

Vernacular names. Sabah—*simpapait* (Putatan Dusun). Sarawak—*bannang* (Padawan Bidayuh), *belet* (Kenyah), *bi'is* (Bau Bidayuh), *empaling* (Iban), *gunnong* (Sadong Bidayuh), *mepa* (Berawan, Tutoh Punan), *nyvang* (Kayan).

Distribution. Sumatra (Palembang), Banka, Riouw, Peninsular Malaysia and Borneo (Sabah, Sarawak, Brunei and Kalimantan). In Sabah, recorded for all W coast districts and the Kota Belud, Keningau, Telupid, Sandakan and Kinabatangan districts. In Sarawak, common throughout.

Ecology. Primary and secondary forest, often along river banks, also in swamp forest, to 450 m. Flowering recorded in January and June to August, fruiting in February and September.

Uses. The timber is locally used for construction in Peninsular Malaysia.

2. **Norrisia malaccensis** Gardner Fig. 7.

(of Malacca)

In Hooker, J. Bot. Kew Misc. 1 (1849) 327. **Type:** *Griffith, s.n.,* Malacca (K). **Synonyms:** *Antonia grijfithii* Wight, 111. Ind. Bot. 2 (1858) 172, ;. 156b; *N. philippinensis* Elm. Leafl. Philip. Bot. 4 (1912) 1482.

Tree to 30 m tall, 50 cm diameter. **Bark** smooth, dark grey; inner bark pale brown. **Sapwood** yellowish. **Leaves** thin-coriaceous, elliptic to oblong, 4-6 x 1.8-2.6 cm; base attenuate to cuneate, apex acute to acuminate; *midrib* prominent and glabrous to sparsely hairy on lower

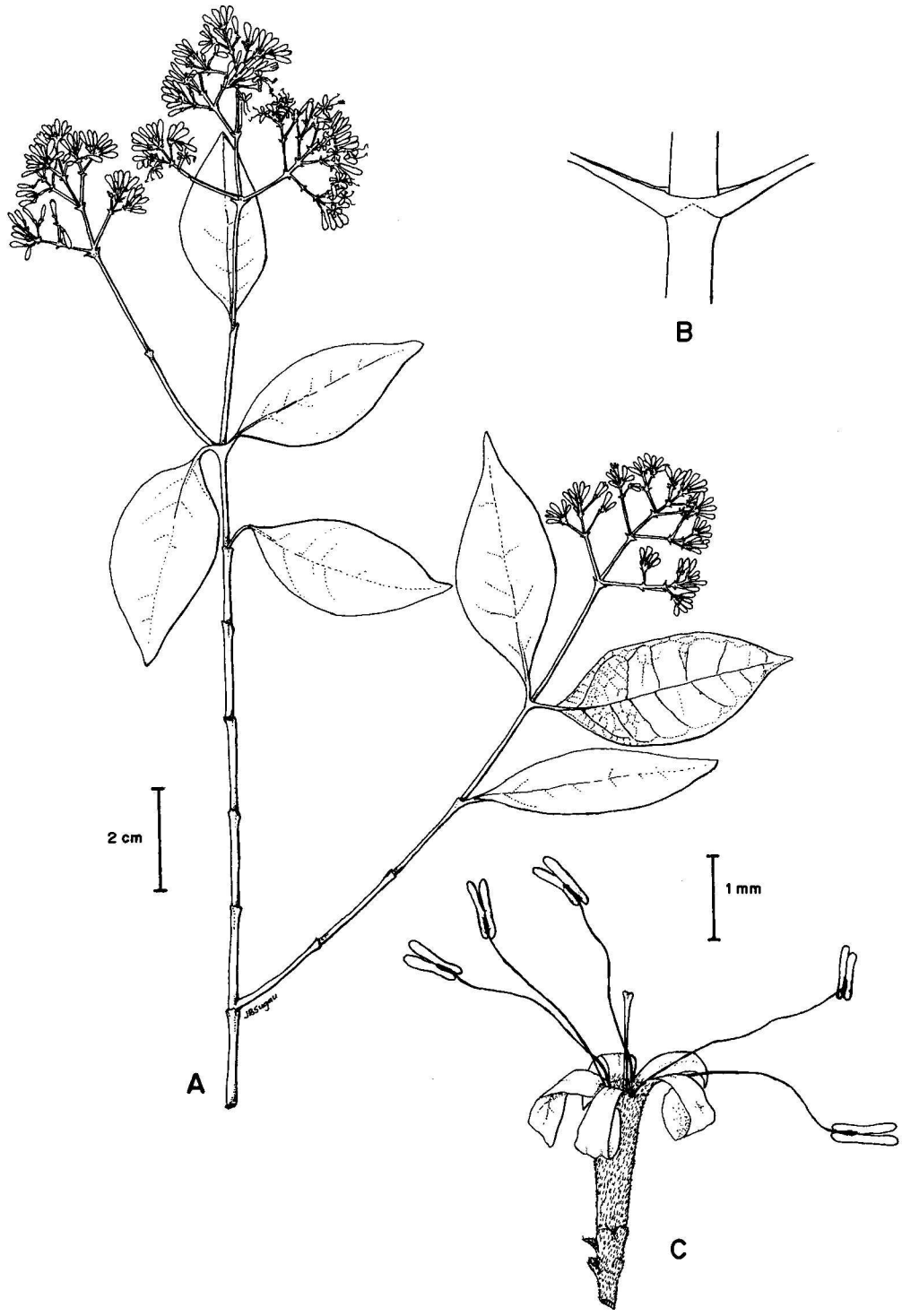
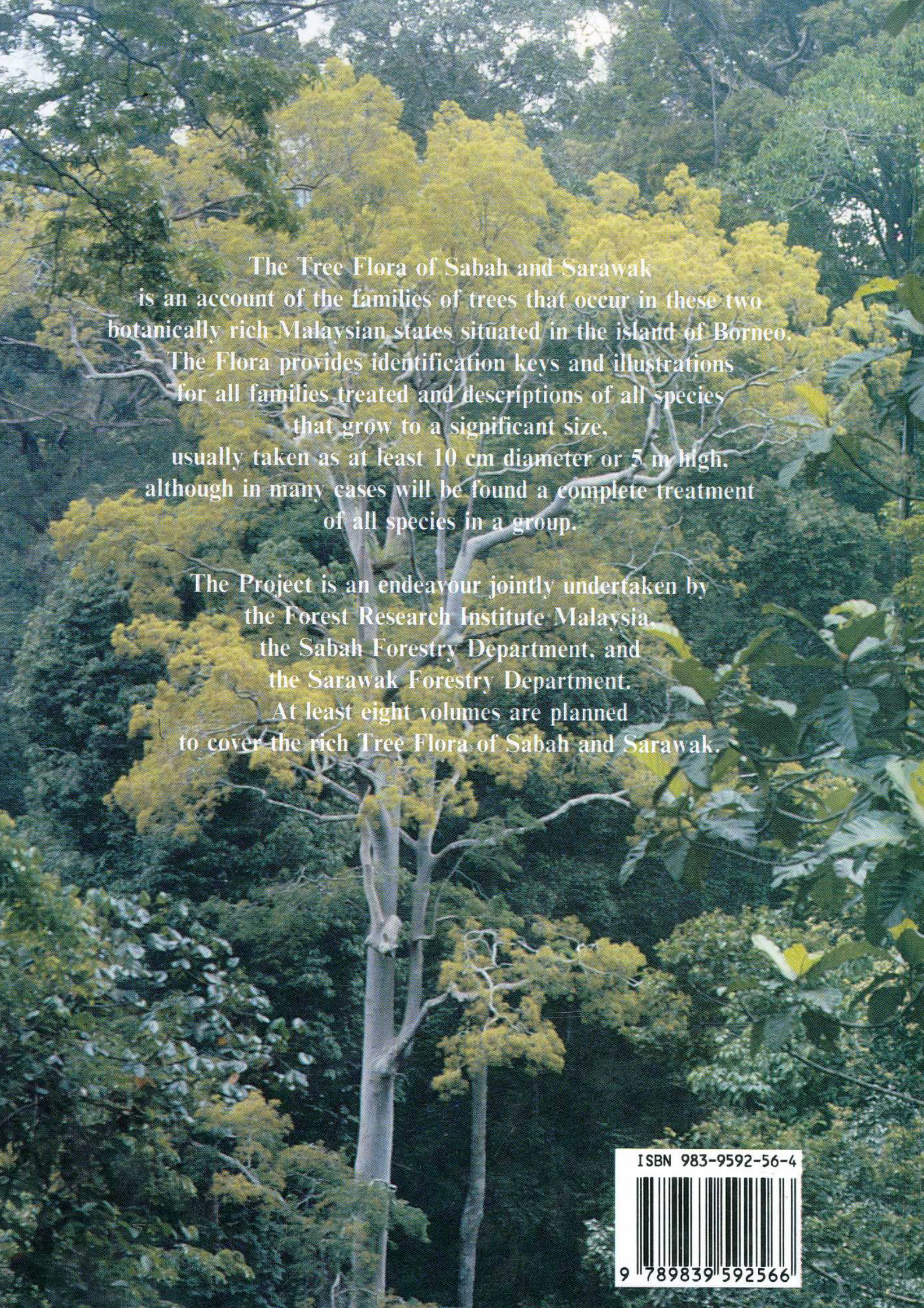


Fig. 7. *Norrisia malaccensis.* A, flowering leafy twigs; B, detail of expanded petiole bases joining to form an ochrea; C, flower. (All from *SAN 131857.*)

side, flat to slightly channelled and *glabrous on upper side, lateral veins* 6-8 pairs, *distinctly arching and joining at some distance from the margin,* intercostal veins reticulate; petioles slender, 0.4-1 cm long. **Inflorescence** 4-1.5 cm long; peduncle 1.8-2 cm long; bracts to 2.5 mm long. **Flowers** pale yellow; calyx 0.5-1 mm long, divided nearly to the base, densely short-hairy; corolla *2-A* mm long, *inside sparsely hairy to glabrous,* outside usually sparsely hairy, lobes 1.5-2 mm long, inside glabrous; stamens 4-5 mm long, *anthers oblong, c. 0.8 mm long;* ovary c. 1 mm long, style 6-7.5 mm long. **Fruits** obovoid, *2-3.5* x *c. 1.9 mm.* Seeds few, *c. 2* mm long.

Distribution. Sumatra (W coast), Peninsular Malaysia, the Philippines (Sibuyan and Mindanao) and Borneo (Sabah only, here newly recorded with *SAN 92976* and *SAN 131857* from Bukit Tangkunan in Beluran).

Ecology. Recorded in mixed dipterocarp forest at about 400 m.



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