TREE FLORA of SABAH AND SARAWAK

Volume One

edited by
E. Soepadmo and K.M. Wong

ITTO
International Tropical Timber Organization

Government of Malaysia

ODA
Overseas Development Administration, U.K.

TREE FLORA
of
SABAH AND SARAWAK

Produced with the financial support of

GOVERNMENT OF MALAYSIA

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

OVERSEAS DEVELOPMENT ADMINISTRATION, U.K.

TREE FLORA
of
SABAH AND SARAWAK

Volume One

edited by

E. Soepadmo and K.M. Wong

A joint publication of

Sabah Forestry Department, Malaysia

Forest Research Institute Malaysia

Sarawak Forestry Department, Malaysia

1995

electronic version prepared by
L. G. Saw & B. Aslina (2007)

Forest Research Institute Malaysia (FRIM), Kepong, 52109 Kuala Lumpur, Malaysia

First published 1995

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Tree flora of Sabah and Sarawak / edited by E. Soepadmo and
K. M. Wong.
Includes bibliography and index
ISBN 983–9592–34–3
1.Botany-Sabah. 2. Botany-Sarawak. 3. Botany-Borneo.
4. Botany-Classification. 5. Plants-Identification. I. Soepadmo, E.
II. Wong, K. M. (Khoon Meng).
581.095952

Electronic version by L. G. Saw & B. Aslina, Forest Research Institute Malaysia, 2007.

CONTENTS

		Page
Foreword		VII
Acknowledgements		IX
INTRODUCTION		
Background to the Tree Flora of Sabah and Sarawak Project (*E. Soepadmo)*		XIII
A Brief History of Botanical Collecting and Documentation in Borneo (*K.M. Wong*)		XXI
Biogeography and Ecology (*P.S. Ashton*)		XLIII
THE TREE FLORA PROPER		
1.	Aceraceae (*A. Noorsiha*)	1
2.	Alangiaceae (*A. Berhaman*)	5
3.	Anisophylleaceae (*K.M. Wong & L. Madani*)	15
4.	Araucariaceae (*P.C. Yii*)	27
5.	Bignoniaceae (*A. Berhaman*)	33
6.	Burseraceae (*K.M. Kochummen*)	45
7.	Capparaceae (*Deborah Kennard*)	101
8.	Celastraceae (*K.M. Kochummen*)	107
9.	Chrysobalanaceae (*Ghillean T. Prance*)	155
10.	Clethraceae (*A. Berhaman*)	181
11.	Connaraceae (*Lesmy Tipot*)	187
12.	Cornaceae (*R.C.K. Chung*)	199
13.	Datiscaceae (*E.J.F. Campbell-Gasis*)	209
14.	Goodeniaceae (*K.M. Wong*)	213
15.	Hypericaceae (*K.M. Wong*)	219
16.	Illiciaceae (*Richard M.K. Saunders*)	227
17.	Juglandaceae (*E.J.F. Campbell-Gasis*)	233
18.	Monimiaceae (*P.C. Yii & Lesmy Tipot*)	245
19.	Nyssaceae (*P.C. Yii*)	253
20.	Ochnaceae (*K.M. Kochummen*)	257
21.	Olacaceae (*Lesmy Tipot*)	271
22.	Oxalidaceae (*R.C.K. Chung*)	287
23.	Pittosporaceae (*John B. Sugau*)	297
24.	Rhamnaceae (*Carsten Schirarend*)	305
25.	Rhizophoraceae (*L. Madani & K.M. Wong*)	321
26.	Rutaceae (*David T. Jones*)	351
27.	Simaroubaceae (*Julius Kulip & K.M. Wong*)	421
28.	Sonneratiaceae (*Othman Bojo*)	443
29.	Staphyleaceae (*J.T. Pereira*)	453
30.	Styracaceae (*R. Kiew*)	463
31.	Trigoniaceae (*K.M. Wong*)	467
Abbreviations of Frequently Cited References		471
Commonly Used Abbreviations for Localities		473
Glossary		474
Index to Scientific Names		487
Index to Vernacular Names		506

MONIMIACEAE

P. C. Yii

Sarawak Forestry Department,
Kuching, Malaysia
and

Lesmy Tipot

Forest Research Institute Malaysia,
Kepong, Malaysia

Hooker *f.*, Fl. Br. Ind. 5 (1890) 114; Merrill, EB (1921) 271, PEB (1929) 77; Ridley, FMP 3 (1924) 73; Masamune, EPB (1942) 305; Backer & Bakhuizen *f.*, FJ 1 (1963) 116; Anderson, CLTS (1980) 253; Philipson, Blumea 28 (1982) 77, Blumea 30 (1985) 389, FM 1, 10 (1986) 255; Ng, TFM 4 (1989) 261; Whitmore, Tantra & Sutisna, CLK 2, 1 (1990) 235.

Trees or shrubs, rarely woody climbers. **Leaves** *simple, decussate or rarely alternate* or in *whorls of three, usually with round oil-cells in the lamina, bearing simple or stellate hairs or glabrous*. Stipules absent. **Inflorescences** cymes, solitary or fascicled, terminal or axillary, rarely on the trunk. **Flowers** *unisexual or bisexual, regular; receptacles usually well-developed* or rarely reduced, *round, urceolate or bell-shaped; tepals* inconspicuous, rarely developing as distinct sepals and petals, *decussate, in whorls or spirals.* **Male flowers** with few to many stamens arranged in whorls, spirally or irregularly, filaments strap-shaped, anthers 2–4-loculed, opening through slits or valves. **Female flowers** with or without staminodes; carpels few to many, sessile or stalked (stipitate), free or immersed in the receptacles; ovule solitary, anatropous, erect or pendulous, with a thick nucellus (crassinucellar), bitegmic or unitegmic. **Fruits** achenes or drupes, rarely plumose, usually enclosed by the persistent receptacle, stalked or sessile, set free by splitting of the receptacles. **Seed** one; endosperm copious, oily; embryo straight; cotyledons appressed or divergent.

Distribution. About 33 genera and 320 species, mostly in the warmer parts of the southern hemisphere (Malesia, Australia, SW Pacific, islands in the western Indian Ocean and S America). In Sabah and Sarawak, represented by 2 genera with 3 species.

Taxonomy. The two genera (*Kibara* and *Matthaea*) occurring in Sabah and Sarawak are included by Philipson (*l.c.* (1986) 261) in the subfamily *Mollinedieae* and characterised by the male flowers having globose or flask-shaped receptacles and by drupaceous fruits borne in heads. For a detailed account of the systematic position of the family see Philipson's account (*l.c.* 1986).

Key to genera

Leaves ovate to broadly elliptic; lateral veins diminished and not joined toward the margin. Stamens 6–9, arranged in 2 series, anthers opening by a single longitudinal slit. Fruit-stalk shorter than 8 mm.....**1. Kibara**
Leaves narrowly lanceolate to lanceolate-oblong, lateral veins looped and joined at the margin. Stamens usually 4, free, anthers opening by two longitudinal slits. Fruit-stalk longer than 8 mm.....**2. Matthaea**

1. **KIBARA** Endl.

(a Sundanese plant name)

Gen. Pl. (1837) 314; Hooker *f. l.c.* 114; Merrill *l.c.* (1921) 271, *l.c.* (1929) 77; Ridley *l.c.* 73; Masamune *l.c.* 305; Backer & Bakhuizen *f. l.c.* 117; Anderson *l.c.* 253; Philipson *l.c.* (1985) 389, *l.c.* (1986) 287; Ng *l.c.* 261; Whitmore, Tantra & Sutisna *l.c.* 235. **Synonyms:** *Brongniartia* Blume, Bijdr. 9 (1825) 455 (*non* Knuth); *Sciadicarpus* Hassk., Flora 25, 3 (1842) 20; *Sarcodiscus* Griff., Not. Pl. As. 4 (1854) 380.

Trees or shrubs with aromatic smell. Terminal vegetative buds conical or pyramidal, surrounded by scale leaves. **Leaves** simple, decussate; blades entire or toothed, usually with short, tufted, soft, brown hairs, gradually becoming glabrous; *lateral veins arched and diminishing toward the margins*. **Inflorescences** terminal or axillary cymes (racemose in the non-Bornean *K. streimannii*), paniculate or fasciculate; *pedicels thickening distally into flat or cup-shaped receptacles*. **Male flowers** usually smaller than the females, with *a minute opening* surrounded by *2–4 decussate pairs of tepals; stamens 6–9, arranged in 2 series*, with an outer series of 4(–5) larger stamens, and an inner series of 4 smaller, often infertile stamens, *anthers opening by a single slit*, with a filament or subsessile. **Female flowers** with a minute opening surrounded by 5 decussate pairs of tepals, the inner pairs thickened and grandular; carpels many, free on the inside of the receptacles; style very short; ovule 1. **Fruit** *a sessile or short-stalked drupe* enclosed by enlarged receptacle. **Seeds** coniform; seed-coat membranous; embryo small.

Distribution. About 40 species, in Peninsular Thailand, Nicobar Islands, Malesia and Queensland (Australia). Only 2 species occur in Sabah and Sarawak.

Ecology. Mostly understorey shrubs and small trees in rain forest from sea-level to 2800 m; occasionally on limestone hills, sandy and coral beaches.

Key to *Kibara* species

Leaves broadly ovate to elliptic-oblong, base rounded or subcordate, margins entire or toothed, apex distinctly acuminate .....**1. K. coriacea**

Leaves narrowly to broadly elliptic, base narrowly to broadly cuneate, margins entire, apex obtuse.....**2. K. obtusa**

1. **Kibara coriacea** (Blume) Tulasne

(Latin, *coriaceus* = leathery; the leaves)

Arch. Mus. Hist. Nat. Paris 7 (1855) 404; Hooker *f. l.c.* 114; Ridley *l.c.* 75; Merrill *l.c.* (1929) 77; Masamune *l.c.* 305; Backer & Bakhuizen *f. l.c.* 117; Philipson *l.c.* (1985) 406, *l.c.* (1986) 298; Ng *l.c.*

261; Whitmore, Tantra & Sutisna *l.c.* 235. **Basionym:** *Brongniartia coriacea* Blume *l.c.* (1825) 436. **Type:** *Blume, s.n.*, Java (L). **Synonyms:** *K. blumei* Steud., Nomencl. Bot. (1840) 846; *Sciadicarpus brongniartii* Hassk. *l.c.* 20; *Sarcodiscus chloranthiformis* Griff. *l.c.* 350; *K. chartacea* Blume, Mus. Bot. Lugd. Bat. 2 (1856) 89; *K. cuspidata* Blume *l.c.* (1856) 89, Merrill *l.c.* (1921) 271, Masamune *l.c.* 305; *K. tomentosa* and *macrophylla* J.R. Perkins, Bot. Jahrb. 25 (1898) 571; *K. trichantha* J.R. Perkins *l.c.* (1898) 572; *K. serrulata* J.R. Perkins *l.c.* (1898) 575; *K. angustifolia* J.R. Perkins *l.c.* (1898) 577; *K. motleyi* J.R. Perkins, Bot. Jahrb. 45 (1911) 424, Merrill *l.c.* (1921) 272, Masamune *l.c.* 305; *K. grandifolia* Merr., Philip. Govt. Lab. Bur. Bull. 29 (1905) 15; *K. ellipsoidea* Merr., Philip. J. Sc. 1 (1906) Suppl. 56; *K. mollis* Merr., Philip. J. Sc. 3 (1908) Bot. 225.

Shrub or tree, to 15 m tall, 15 cm diameter. **Bark** *smooth, pale grey*; inner bark pale yellow. Twigs slightly pubescent, gradually become glabrous. **Leaves** broadly ovate to elliptic-oblong, 6–26.6 x 4–18.5 cm, leathery or papery, glabrous or sparsely to rather densely hairy beneath; base cuneate, rounded or subcordate, margin entire or toothed toward the apex, *apex distinctly acuminate;* midrib and lateral veins prominent beneath; *lateral veins arched, ascending and joining near the margins*; stalk 5–25 mm long, slightly channelled above, pubescent or glabrous. **Inflorescence** a terminal or axillary, simple 3-flowered or compound cyme, with the male flowers at the proximal and the female flowers at the distal parts. **Male flowers** rounded, 1.5–2 mm across, hairy; tepals 6–8 with rounded apex; *stamens 4 in outer series and 4 smaller ones in the inner series*, filaments strap-shaped. **Female flowers** larger than male flowers, rounded, about 3–5 mm across; *tepals* about 6 *with swollen pendulous glands* within the minute opening. **Fruit** an ovoid drupe, *c.* 2 x 1.5 cm, ripening deep blue, purple or black, on *short swollen orange stalk; in clusters of 3–13.* **Seed** coat membranous, orange when dried.

Vernacular names. Sabah—*ambibiliw, labak* (Dusun).

Distribution. Throughout Malesia; in Sabah and Sarawak widespread.

Ecology. Lowland rain forests including swamp, coral beach, limestone hill, mixed dipterocarp forests, and lower montane forests from sea-level to 1600 m.

Uses. The fruit is said to be edible and the leaves are used as flavouring in meat dishes.

2. **Kibara obtusa** Blume Fig. 1.

(Latin, *obtusus* = blunt or rounded; the leaf apex)

l.c. (1856) 89; Philipson *l.c.* (1985) 409, *l.c.* (1986) 300. **Type:** *Blume, s.n.*, Celebes (holotype L). **Synonym:** *K. depauperata* Merr., Philip. Govt. Lab. Bur. Bull. 35 (1906) 13.

Tree to 20 m tall, 20 cm diameter. **Bark** *scaly* to *shallowly fissured*, pale yellow; inner bark dull orange. Young twigs with short stiff-hairs. **Leaves** *narrowly to broadly elliptic*, 7–16.5 x 3.3–10 cm; base cuneate, *margin entire, apex obtuse or rounded*; midrib and lateral veins prominent beneath, glabrous or with sparse stiff-hairs; stalk 10–18 mm long, pubescent or glabrous. **Inflorescence** a terminal or axillary, simple or compound cyme, to about 70 mm

long, with a pair of small bracteoles. **Male flowers** obovoid, *c*. 2 mm across; tepals 4, minute; *stamens usually 4 in the outer series and 2 smaller, infertile ones in the inner series.* **Female flowers** larger than male flowers, globose, about 2.5–3 mm across; *tepals* 4, apex obtuse, *with 4 swollen glands projecting among the carpels*; carpels about 13, hairy, with blunt stigmas. **Fruit** an ovoid drupe, 17–24 x 10–12 mm, ripening black, seated on *a short orange stalk*. **Seed** coat membranous, orange in colour when dried.

Distribution. Borneo, Philippines, Celebes, and W New Guinea. In Sabah, uncommon and only known from 4 collections, 3 from Lahad Datu (*SAN 29844*, *SAN 31104*, *SAN 33382*) and one from Semporna (*SAN 46055*). Not yet reported in Sarawak.

Ecology. Primary rain forest from sea-level to 700 m.

2. **MATTHAEA** Blume

(Matteo de S. Guiseppe, 1617−1691, an Italian Missionary and Botanist in India)

l.c. (1856) 89; Hooker *f. l.c.* 115; Merrill *l.c*. (1921) 272; Ridley *l.c.* 73; Masamune *l.c*. 305; Anderson *l.c.* 254; Philipson *l.c.* (1982) 77, *l.c.* (1986) 319; Ng *l.c*. 263.

Trees or shrubs. **Leaves** simple, *opposite*, entire or sub-serrate, leathery. **Inflorescences** axillary, rarely terminal cymes, much shorter than leaves. **Male** receptacle subglobose; *tepals 4*; *stamens 4*, *free*, filaments short, *anthers opening by 2 longitudinal slits*. **Female** receptacle depressed globose; *tepals 4*, *without apical pore* or gap but *upper half abscissing as a calyptra* at anthesis to reveal numerous carpels. **Fruits** *long-stalked drupes*, fleshy; one or more on the enlarged receptacle.

Distribution. 6 species, all Malesian: Sumatra, Peninsular Malaysia, Anambas Island, Borneo, Celebes, Philippines, and N Moluccas. Only 1 species has been recorded in Sarawak.

Ecology. Understorey trees in lowland and submontane forests to about 1700 m.

Matthaea sancta Blume Fig. 2.

(Latin, *sanctus* = holy; alluding to the religious work of Matteo de S. Guiseppe)

l.c. (1856) 90; Hooker *f. l.c.* 115; Merrill *l.c*. (1921) 272; Ridley *l.c.* 73; Masamune *l.c*. 305; Anderson *l.c.* 264; Philipson *l.c.* (1982) 82, *l.c.* (1986) 323; Ng *l.c*. 263. **Type:** *Blume, s.n.*, "Sumatra and Borneo" (holotype L). **Synonyms:** *M. latifolia* J.R. Perkins *l.c.* (1898) 563; *M. calophylla* J.R. Perkins *l.c.* (1898) 563, Merrill *l.c*. (1921) 272, Masamune *l.c*. 305; *M. ellipsoidea* Merr. *ex* J.R. Perkins *l.c*. (1911) 423.

Shrub or small tree, to 10 m tall, 10 cm diameter. Twigs green, glabrous. **Leaves** papery, glabrous, lanceolate-oblong to oblong, 15.5–29 x 5.5–9.5 cm; base broadly cuneate, truncate or rounded, margins entire or slightly toothed at the upper part, apex acuminate; *lateral veins arched, ascending and looping far from the margins, impressed on the upper surface, prominently raised beneath;* stalk 1.5–3 cm long, glabrous. **Inflorescences** axillary cymes. **Male flowers** depressed globose, 23 mm across, opening by a small gap between a pair of

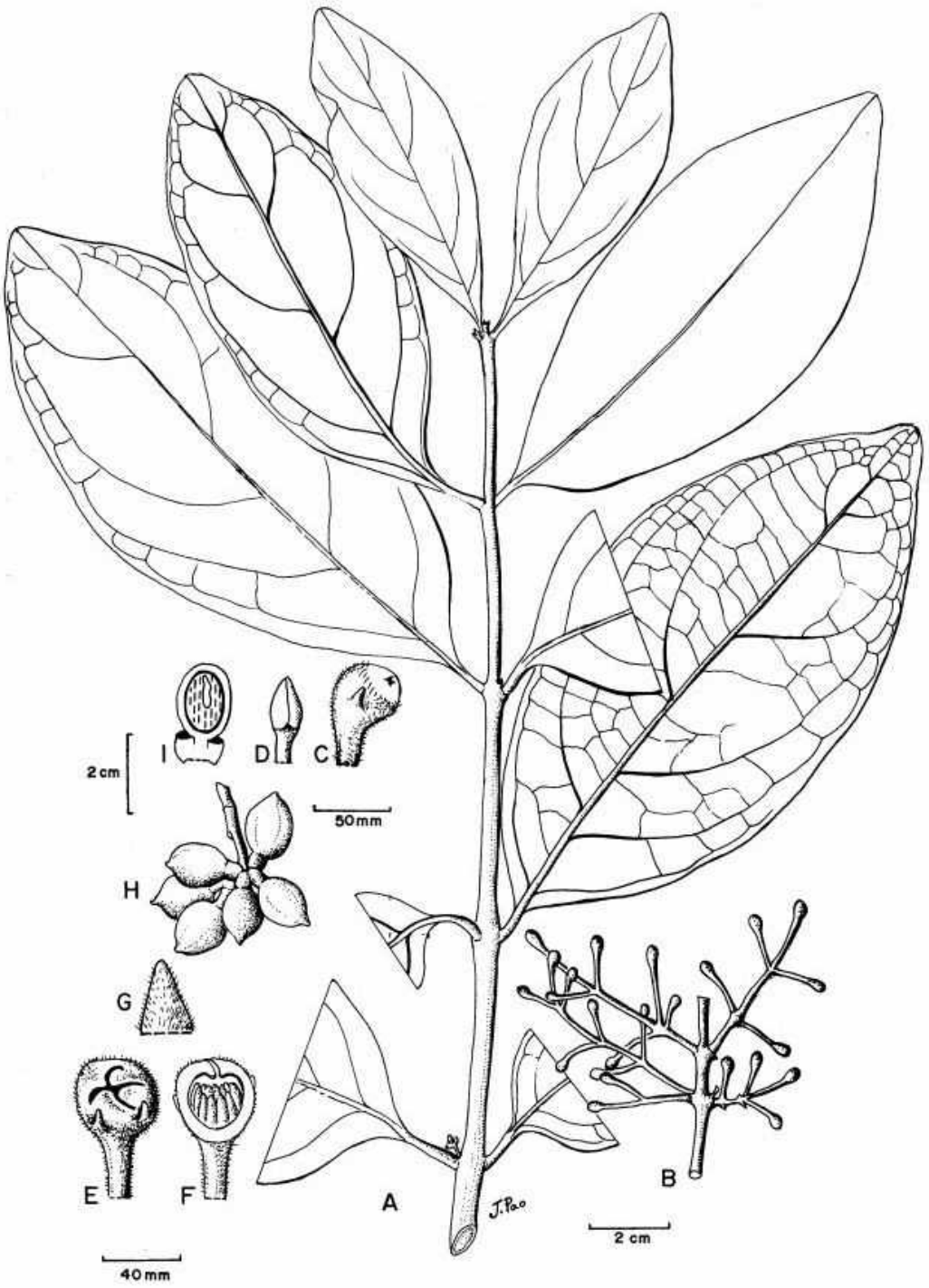


Fig. 1. *Kibara obtusa*. A, leafy twig with young axillary inflorescence; B, inflorescence; C, male flower; D, stamen; E, female flower; F, section of female flower; G, carpel; H, fruits; I, section of fruit. (A–G from *SAN 29844*, H–I from *SAN 31104*.)

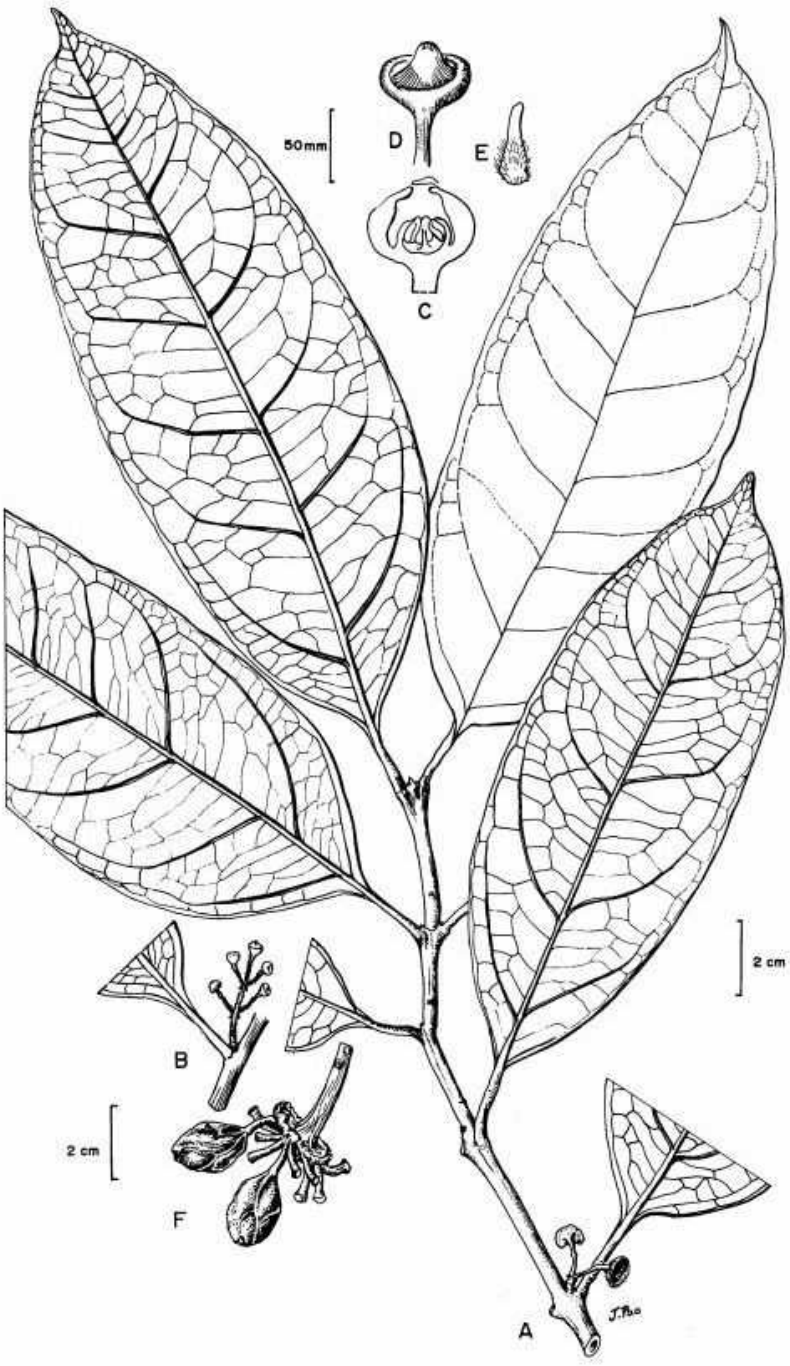
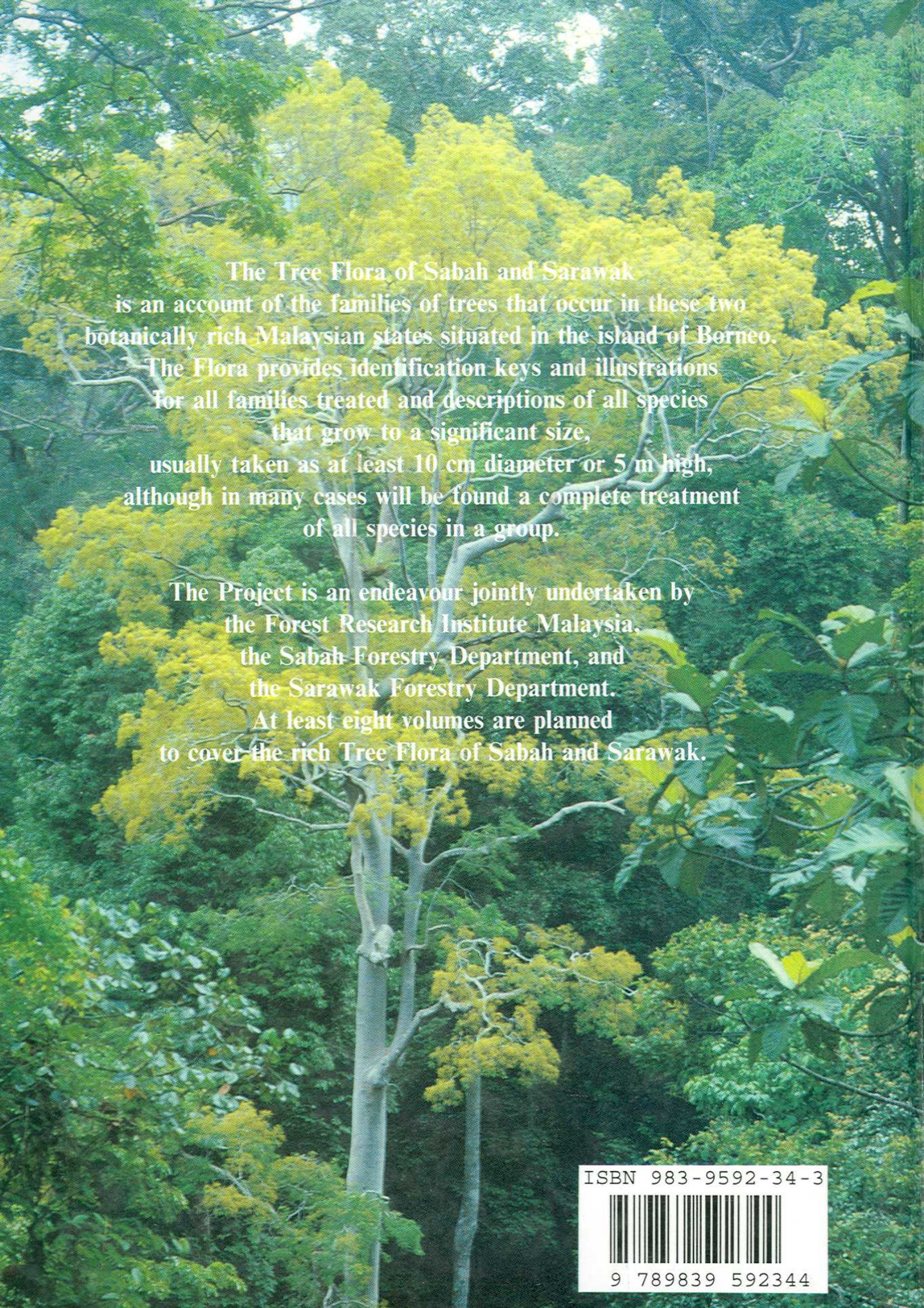


Fig. 2. *Matthaea sancta*. A, leafy twig with female inflorescence; B, male inflorescence; C, male flower in longitudinal section; D, female flower before anthesis; E, carpel; F, fruits. (From *Steven 261*.)

lip-like perianth-lobes; *stamens 4*. **Female flowers** similar to males but much larger, *c.* 10 mm across, on 1–4 pedicels arising in clusters of 3–5 from short peduncles; without any apical pore or gap but the upper half abscissing as a calyptra at anthesis to reveal numerous sessile carpels which are closely packed on a dish-like receptacle. **Fruit** a drupe, ellipsoid, *c.* 2.5 x 1.5 cm, with thin bony endocarp, ripening blue or purple, attached in clusters of up to 18 to an enlarged orange receptacle. **Seed** coat light brown when dried.

Distribution. Sumatra, Peninsular Malaysia, Anambas Is., Borneo, Philippines, and Celebes. Uncommon in Sabah but widespread in Sarawak.

Ecology. Lowland rain forests, including limestone hill and mixed dipterocarp forests on clay-rich soils, and lower montane forest, from sea-level to 1400 m.



The Tree Flora of Sabah and Sarawak
is an account of the families of trees that occur in these two botanically rich Malaysian states situated in the island of Borneo. The Flora provides identification keys and illustrations for all families treated and descriptions of all species that grow to a significant size, usually taken as at least 10 cm diameter or 5 m high, although in many cases will be found a complete treatment of all species in a group.

The Project is an endeavour jointly undertaken by the Forest Research Institute Malaysia, the Sabah Forestry Department, and the Sarawak Forestry Department. At least eight volumes are planned to cover the rich Tree Flora of Sabah and Sarawak.

ISBN 983-9592-34-3

9 789839 592344