

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 Editorial Committee — Chairman: *E. Soepadmo* (Forest Research Institute Malaysia). Members: *Abdul Latiff Mohamed* (Universiti Kebangsaan Malaysia), *Ruth Kiew* (Universiti Pertanian Malaysia), *H.S. Lee* (Sarawak Forestry Department), *K.M. Wong* (Sabah Forestry Department). Editorial assistant (Volume One): *R.C.K. Chung* (Forest Research Institute Malaysia). **Advisors:** *P.S. Ashton* (Harvard University, U.S.A.), *J. Dransfield* (Royal Botanic Gardens, Kew, U.K.), *C. Kalkman* (Rijksherbarium, Leiden, the Netherlands), *T.C. Whitmore* (University of Cambridge, 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)

Copyright © Forest Research Institute Malaysia (FRIM),
Sabah Forestry Department, and Sarawak Forestry Department 1995
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

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

CLETHRACEAE

A. Berhaman

Forest Research Centre,
Sabah Forestry Department,
Sandakan, Malaysia

Merrill, EB (1921) 460; Masamune, EPB (1942) 567; Sleumer, FM 1, 7 (1971) 139; Whitmore, TFM 2 (1973) 27; Anderson, CLTS (1980) 162; Whitmore, Tantra & Sutisna, CLK 1 (1989) 45.

A small monogeneric family in the Ericales of about 65 species distributed in the temperate, tropical American and Asiatic-Malesian regions.

CLETHRA Gronov. *ex* L.

(Latinised old Greek word — *klethra* = alder tree)

kolintuhan (Dusun Ranau, Sabah)

Gen. Pl. ed. 5 (1753) 188, Sp. Pl. (1753) 396; Merrill *l.c.* (1921) 460; Masamune *l.c.* 567; Sleumer, Bot. Jahrb. 87 (1967) 85, *l.c.* (1971) 139; Whitmore *l.c.* 27; Anderson *l.c.* 162; Whitmore, Tantra & Sutisna *l.c.* 45.

Trees or shrubs. **Leaves** simple, spiral, crowded towards the end of the shoots; margin serrate with glandular teeth, more rarely entire; lateral veins and midrib sunken on upper side, prominent on the lower side; stipules none. **Inflorescence** a solitary terminal raceme, or (usually) a terminal raceme and several lower approximate racemes, from the axils of reduced or caducous leaves; bracts mostly caducous during anthesis, rarely subsistent. **Flowers** bisexual; calyx-lobes 5(–6), persistent, alternate with the petals; petals 5(–6), generally free; stamens 10(–12) in 2 whorls of 5(–6), filaments adnate to the corolla at base, anthers dorsifixed, opening by apical valves; ovary superior, 3-celled, with axile placentation; ovules many, small, anatropous; style simple, projecting out of the flower, sometimes divided into three apical lobes, each lobe stigmatic at the top. **Fruit** a capsule, 3-loculed, enclosed by the persistent calyx. **Seeds** many, small; endosperm fleshy; embryo cylindrical.

Taxonomy. A monograph of the genus has been published by Sleumer *l.c.* (1967). There are 10 species recorded for South East Asia. Only 3 species occur in Sabah and Sarawak; they are closely related species differing mainly in the details of their hair and flower size.

Key to species

1. Leaf lower surface with stellate hairs only on the midrib and veins, glabrous on the intervenium. Calyx-lobes 1.5–2 mm long.....**1. C. canescens**

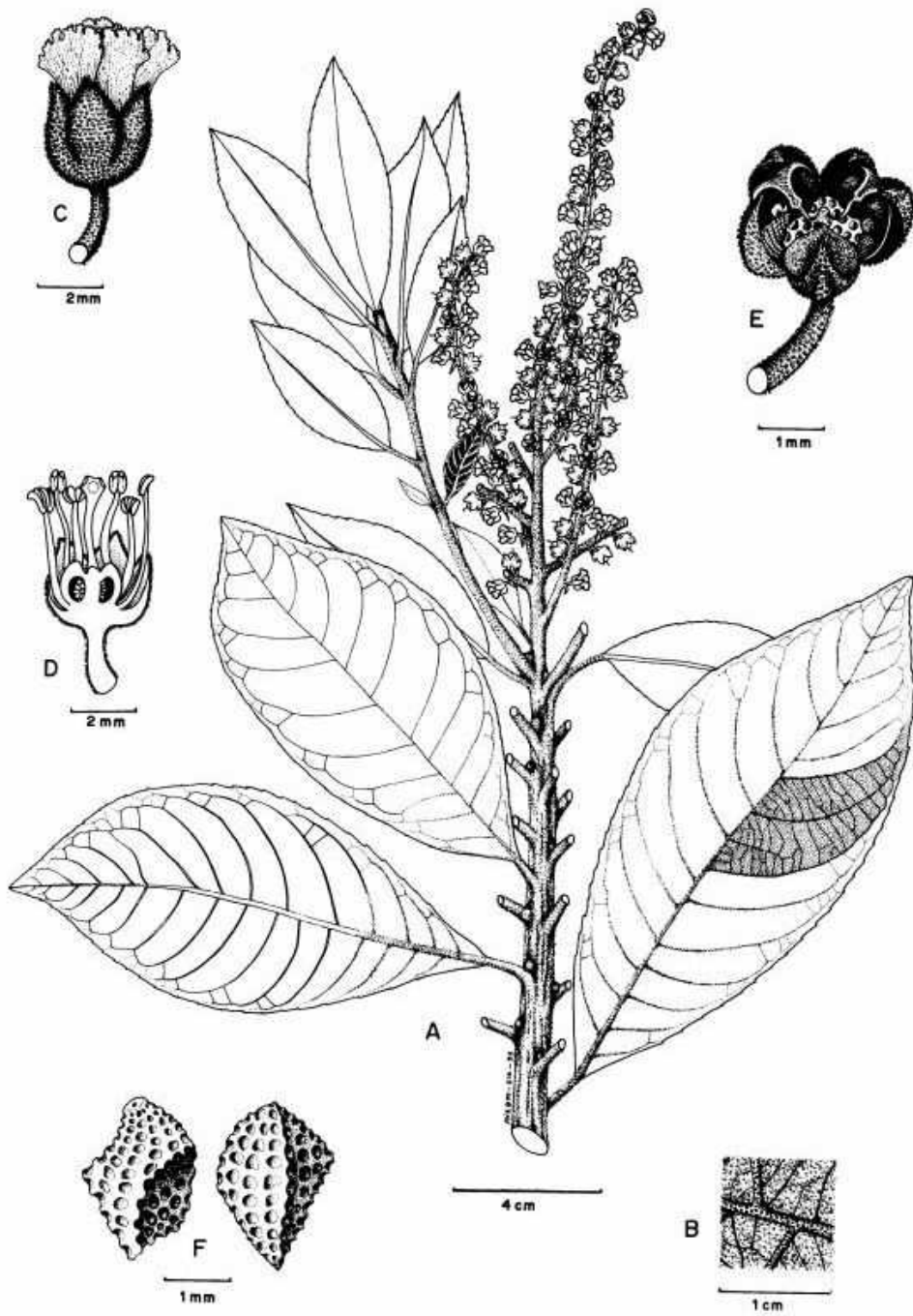


Fig. 1. *Clethra pachyphylla*. A, fruiting leafy twig; B, detail of lower leaf surface; C, flower; D, longitudinal section through flower; E, fruit; F, seeds. (All from SAN 65004 except C & D, from Nootboom & Chai 2267.)

Leaf lower surface with stellate hairs on the midrib and veins, and a fine pale tomentum covering the entire surface of the intervenium. Calyx-lobes 2 mm or longer.....2

2. Raceme slender (1–1.5 mm thick), axis covered by a mixture of large and tiny stellate hairs (the hairs shorter than 0.5 mm). Calyx-lobes 2–3 mm long.....**2. C. longispicata**
 Raceme more robust (1.5–2 mm thick), axis covered by a mixture of tufts of long hairs (typically 0.5–1 mm long) and tiny stellate hairs. Calyx-lobes 3–4 mm long.....
**3. C. pachyphylla**

1. *Clethra canescens* Reinw. ex Blume

(Latin, *canescens* = turning grey; the pubescent leaves)

Bijdr. (1826) 863; Sleumer *l.c.* (1967) 85, *l.c.* (1971) 145; Anderson *l.c.* 162; Whitmore, Tantra & Sutisna *l.c.* 46. **Type:** *Reinwardt, s.n.*, 1821, Celebes, Minahasa, Mt. Klabat (L).

var. **clementis** (Merr.) Sleumer

l.c. (1967) 86, *l.c.* (1971) 145. **Basionym:** *Clethra clementis* Merr., Philip. J. Sc. Bot. 13 (1918) 104, *l.c.* (1921) 460; Masamune *l.c.* 567; Anderson *l.c.* 162. **Type:** *Clemens 11148*, British North Borneo, Mt. Kinabalu (PNH, destroyed). **Synonym:** *Clethra canescens* (*non* Reinw. ex Blume) Stapf, Trans. Linn. Soc. Bot. 42 (1914) 105.

Small tree to 10 m. **Bark** smooth, pale brown; inner bark pale yellow. **Sapwood** yellowish. **Leaves** chartaceous to thinly coriaceous, upper surface smooth and shiny, *lower surface with stellate hairs only on the midrib and veins, glabrous on the intervenium*, oblong to elliptic-obovate, 3–13(–15) x 1–3(–5.5) cm; base cuneate, apex acute to acuminate pointed; lateral veins 10–14 pairs, looping towards the margin; midrib sunken on upper side, glabrous to sparsely covered with stellate hairs and rusty tomentum on lower side; stalk 1–1.5(–2.2) cm long, glabrous to sparsely stellate-hairy. **Inflorescence** axis slender, 1–2 mm thick, covered with a fine rusty tomentum of both smaller and larger stellate or fascicled hairs, flowers densely arranged along the rachis; bracts subulate, hairy, *c.* 5 mm long. **Flowers** white, scented; *calyx-lobes 1.5–2 mm*, covered with stellate and fascicled hairs; petals white, spathulate, glabrous, fimbriate, 4–5 mm long; filaments glabrous, 3–3.5 mm long; anthers obovate, 0.5–0.8 mm long; ovary densely covered with straight hairs; style glabrous, 2.5–3.7 mm long. **Fruit** subglobose, 2–3 mm diameter. **Seed** irregularly ovoid-angular, 0.6–1 mm across.

Distribution. Endemic to Borneo (Sabah, Sarawak and Kalimantan). In Sabah, var. *clementis* is locally common on Mt. Kinabalu; in Sarawak it has been recorded from Mt. Dulit (*Richards 1772 & 1804*) and the Baram River (*Haviland 1828*).

Ecology. In montane forest, rarely in lowland forest.

Taxonomy. Sleumer (1967 & 1971) recognises 5 varieties, *viz.* var. *canescens*, *clementis*, *ledermannii*, *luzonica*, and *novoguineensis*, of which only var. *clementis* occurs in Sabah and Sarawak.

2. *Clethra longispicata* J.J. Sm.

(Latin, *longus* = long, *spicatus* = spike; the inflorescence)

Bull. Jard. Bot. Btzg. 3, 4 (1922) 240; Sleumer *l.c.* (1967) 96, *l.c.* (1971) 148; Anderson *l.c.* 162; Whitmore, Tantra & Sutisna *l.c.* 46. **Type:** *Rachmat 553*, C Celebes, Mt. Nanakan (BO, L). **Synonym:** *Clethra elongata* J. J. Sm., Bull. Jard. Bot. Btzg. 3, 1 (1920) 398, *non* Rusby (1907).

Small tree to 10 m tall. **Bark** brown, shallowly fissured; inner bark yellow. **Sapwood** white. **Leaves** chartaceous, upper surface smooth and shiny, *lower surface with stellate hairs on the midrib and veins, and a fine pale tomentum covering the entire surface of the intervenium*, oblong-lanceolate to elliptic-oblong, 7–13.5(–15.5) x 2–4.5(–6) cm; base cuneate, rarely almost rounded, apex shortly acuminate; midrib sunken on upper side, covered with stellate hairs on lower side; lateral veins 12–14 pairs, looping towards the margin; stalk 1.5–3 cm long, sparsely to densely covered with long simple and stellate hairs. **Inflorescence axis slender, 1–1.5 mm thick, laxly many-flowered, axis covered by a mixture of large and tiny stellate hairs**; bract subulate, caducous, 4–6 mm long. **Flowers** white, scented; calyx-lobes narrowly ovate-subdeltoid, 2–3 mm long; petals white, broadly spatulate, glabrous, 2–3.5 x 1–1.5 mm; filaments white, glabrous, 1–1.5 mm long, anthers obcordate, *c.* 0.5 mm long; ovary appressed hairy; style glabrous, 1.5–1.7 mm long. **Fruit** subglobose, 2–2.5 mm diameter. **Seed** subglobose, *c.* 0.7 mm across.

Distribution. Borneo (Sabah, Sarawak and Kalimantan), Philippines, and C Celebes. Common on the highlands in Sabah and Sarawak.

Ecology. In hill and submontane forests, also in secondary forest, at 500–1500 m.

3. *Clethra pachyphylla* Merr.

Fig. 1.

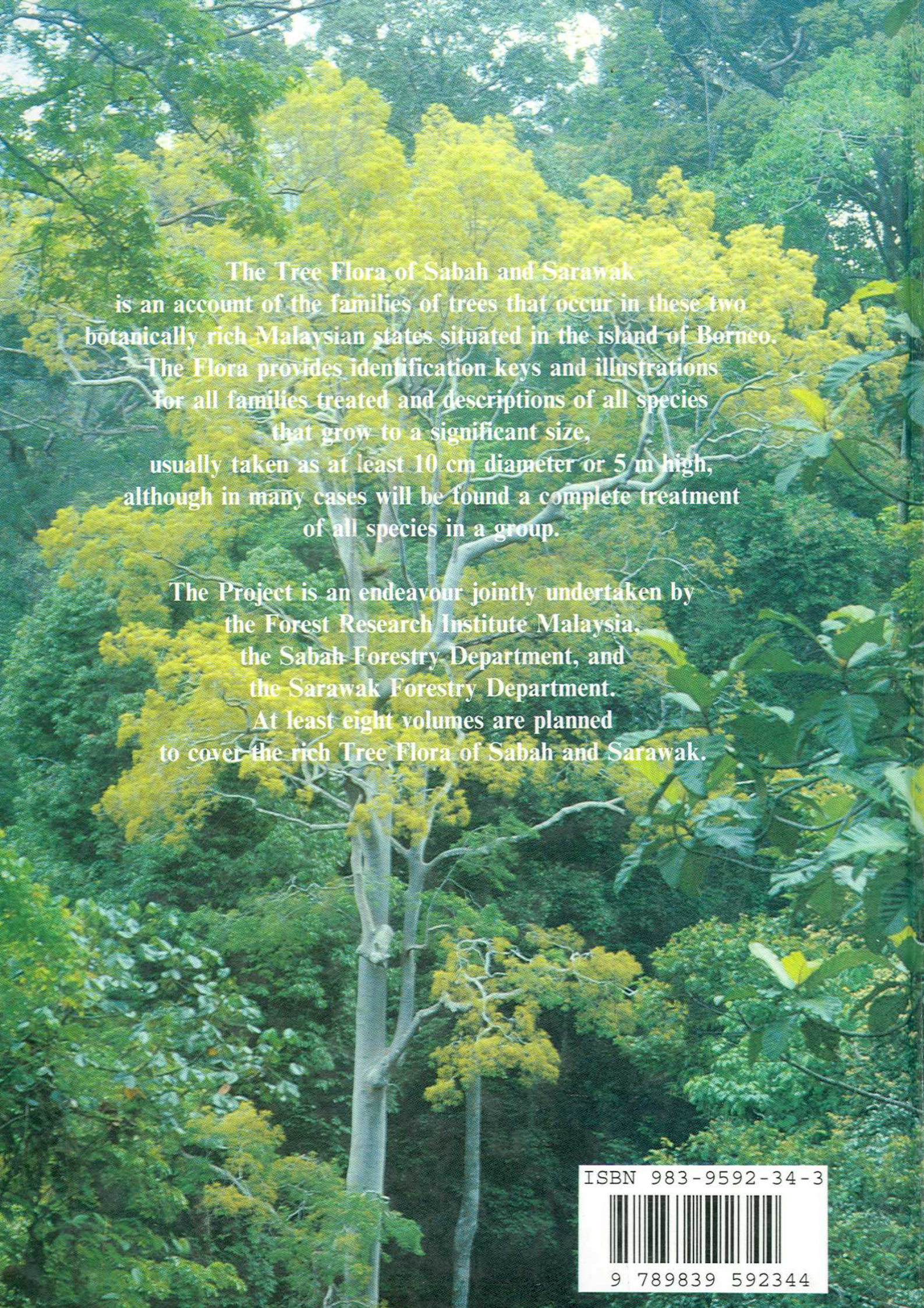
(Greek, *pakus* = thick, *phyllon* = leaves)

l.c. (1918) 103, *l.c.* (1921) 460; Masamune *l.c.* 567; Sleumer *l.c.* (1967) 99, *l.c.* (1971) 150; Anderson *l.c.* 162; Whitmore, Tantra & Sutisna *l.c.* 46. **Type:** *Clemens 10692*, British North Borneo, Mt. Kinabalu, Paka Caves (PNH, UC).

Small tree to 10 m. **Bark** shallowly fissured, pale grey; inner bark yellowish. **Sapwood** yellowish. **Leaves** coriaceous, upper surface smooth and shiny, *lower surface with stellate hairs on the midrib and veins, and a fine pale tomentum covering the entire surface of the intervenium*, oblong or obovate-oblong, 4–12(–19) x (2–) 3–5 cm; base cuneate, apex acute; midrib sunken on upper side, densely covered with stellate and fascicled hairs on lower side; lateral veins 9–12(–14) pairs, looping towards the margin, covered with fascicled hairs; stalk 1.5–2.5 cm long, densely covered with long simple- and stellate-hairs. **Inflorescence axis robust, 1.5–2 mm thick, densely flowered, covered by a mixture of tufts of long hairs and tiny stellate hairs**; bracts subulate, caducous, 4–5(–8)mm long. **Flowers** white, scented; calyx oblong-obovate, 3–4(–5) mm long; petals white to cream, glabrous, spatulate to oblong, 3.5–5 mm long; filaments glabrous, 2–2.5 mm long, anthers subobovate, 0.8–1 mm long; ovary densely covered with short straight hairs; style glabrous, 2.5–3 mm long. **Fruit** depressed-globose, 2.5–3 mm diameter. **Seed** subtrigonal, 1–1.2 mm across.

Distribution. Endemic to Borneo (Sabah and Sarawak). Common in the highlands in Sabah and only known from Mt. Murut and Batu Lawi, in the Kelabit Highlands in Sarawak.

Ecology. Hill and montane primary and secondary forests, at 800–2500 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