

Flora Malesianae Precursores - LVIII, Part Four*

The Genus *Schima* (Theaceae) in Malesia

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Abstract

This is a taxonomic treatment of 3 species of *Schima* (Theaceae) found in the Malesian region. Two, *S. brevifolia* and *S. monticola*, were at one time reduced to the status of subspecies.

Introduction

The binomial *Schima noronhae* Reinwardt first appeared in Blumes' *Catalogus* (1823); descriptions for the genus and species were added and thus validated their status in his *Bijdragen* two years later. The generic name is derived from the Greek word *skiasma* (shadow), generally interpreted as referring to the dense crown of the plant.

Several *Schima* species were previously described under the genus *Gordonia*. Both genera are characterized by the showy, typical theaceous flowers and the usually 5-valved capsules. Blume, in defining the new genus, pointed out that *Schima* differs from *Gordonia* in their calyx and fruit characters. Subsequent authors also noted their difference in seed characters. These can be summarized as follows.

Gordonia:—

Sepals 5 or 6, usually large, unequal, overlapped and imbricate, free, often deciduous; capsules ellipsoid to cylindric-oblong, often angulate and sometimes sulcate; seeds ovoid or ellipsoid, flattened, with a large obliquely attached knife-shaped apical wing.

Schima:—

Sepals 5, rarely 6, smaller, almost equal, weakly imbricate and seemingly valvate in a fully expanded flower, united below, persistent; capsules globose or nearly so; seeds broadly reniform, surrounded by a narrow membranous wing except near the funiculus.

Species of *Schima* are distributed from E. Himalayas eastwards through Myanmar, S. China to Taiwan, Ryukyu and Bonin (Oganawara) Islands, and southwards to Thailand, Indo-China and W. Malesia. No general consensus on the number of species of the genus has been reached. For example, Melchior (1925) cited 18 species; Airy-Shaw (1973), 15 species; How (1982), 30 species; and Mabberley (1987), 1 species.

* Part One to Three: The genera *Pyrenaria*, *Gordonia*, and *Camellia* (Theaceae) in Malesia, in *Gardens' Bulletin*, Singapore 33 (1980), 254-289; 37 (1984), 1-47; and 42 (1989), 65-69, respectively.

The last-named author obviously based his opinion on the conclusion drawn by the late Dr. S. Bloembergen (1952). In that treatment, the genus *Schima* contains only 1 species, namely, *Schima wallichii* (DC.) Korth., which, in turn, is divided into 9 subspecies. The main arguments as to why *Schima* is considered monotypic are: (1) the variation of the 'vegetative parts' (leaf-blades and petioles) varies between clear-cut and rather narrow limits, and (2) the generatives (flowers and fruits) could never be used in the delimitation of species, as they vary merely in dimensions and not in number or forms of the composing parts (Bloembergen, 1952; p. 141). He also frankly admitted that he only examined 'few examples from the area outside Indonesia', but his 'study of the scanty amount of specimens, literature and the drawings seen appeared more than sufficient covering' (p. 133).

It is a fact that size of the flower of *Schima*, like many other plants, can be affected to a certain extent by the environment (e.g., soil condition, altitude, etc.) and the age and condition of the tree, and also even small, immature fruits can be dehiscent after the processes of pressing and drying. Nevertheless, the extreme view of totally disregarding all reproductive characters appears to deviate from the traditional practise of generations of taxonomists. Furthermore it is perhaps rather imprudent to extrapolate the conclusion based on the study in a limited area to the whole range of the genus.

Incidentally, should Bloembergen's broad species concept be accepted it would be probably necessary to revise almost all the existing monographs of theaceous genera, such as Kobuski's *Eurya* (1938), Adinandra (1947), Sealy's *Camellia* (1958), etc. and drastically reduce the number of species of each genus.

Dr. Bloembergen divided the monotypic 'species' into nine 'subspecies' and presented these 'subspecies' in a map (his Fig. A, on p. 150) which shows that most of them are geographically isolated. The fact is that these subspecies are of rather different qualifications: some of them are almost indistinguishable, while others appear to be perfectly good species in the traditional sense.

For instance, as shown in his map, subsp. *noronhae* is found in N.W. Borneo, and subsp. *crenata*, in E. Borneo. Their difference is largely based on the lamina margins: margins mostly completely entire vs. margins mostly crenate-dentate. Exceptions to this are explained in his key and again in the descriptions under each subspecies. His definition of subsp. *noronhae* and *wallichii* is even more deficient, practically all the characters mentioned in the diagnoses of both subspecies overlap. Dr. Bloembergen conceded that subsp. *wallichii* 'is very close to subsp. *noronhae*, but is evidently much less polymorphous, a typical character being the prominent nervation and the generally forked lateral nerves'. Unfortunately even the final point does not always stand.

On the other hand, in his discussion under subsp. *brevifolia*, Dr. Bloembergen (p. 176) reported that Prof. C.G.G.J. Van Steenis once erroneously mentioned the

occurrence of this plant from Sumatra. He predicted that the specimens misquoted (*Steenis* 8636 and 9653) belong either to *Laplacea* or *Gordonia*. This plant in question, in fact was first named *Laplacea vulcanica* Korthals, and later, renamed *Gordonia vulcanica* (Korth.) H. Keng (Keng, 1984; p. 42). It appears to be inconceivable that these two plants so strikingly similar in many aspects should be accorded two different taxonomic status, one a species and the other a subspecies, in two closely related genera. Its small, subsessile, rounded-ovate leaves and prominent flowers are outstanding. Another of his subspecies, subsp. *monticola*, with thick coriaceous leaves and strongly thickened pedicels of flowers is deemed to be a good species in the traditional sense.

In this treatment, most of Bloembergen's subspecies as they occur in Malesia are merged into the species, with the exception of two, namely subsp. *brevifolia* and *monticola*, which are resurrected to their original specific status. Because of the limitation of knowledge and availability of materials, this treatment is confined only to the Malesian region.

General Account of the Taxonomic Characters

The Malesian *Schima* species are mostly medium to tall evergreen trees, sometimes shrubby at higher altitudes. The branches and branchlets are generally glabrous or glabrescent, rarely pubescent.

The leaves are simple, alternate and spirally arranged on the branchlets. The leaf margins are entire, or partly or totally, weakly or strongly undulate or serrate. Petioles are long or short, or subsessile, mostly slender, sometimes thickened.

The flowers are borne in axillary, solitary or more often in an apical cluster resembling a cymose or corymbose inflorescence. Following the activation and elongation of the central dormant bud in the cluster, it becomes clear that each individual flower is actually borne in the axil of a caducous scale. Sometimes these flower clusters can be further aggregated into a terminal paniculate conglomerate.

The flowers are hermaphrodite. Pedicels long or short, slender or stout, generally 2-bracteolate at the apex; the bracteoles are caducous. Calyx and corolla are clearly differentiated. Calyx is 5-, rarely 6-lobed, the lobes deltoid-rounded, \pm equal, weakly imbricate in bud, persistent. Petals are 5, rarely 6 or 4, of unequal sizes, shortly connate below; the most exterior one is the smallest, strongly concave and tightly enveloping the other petals in bud. They are white in colour, often with pink tinge on the outer surface near the base or at the tip.

The androecium consists of numerous stamens which are in 3 to 4 whorls. The stamens are briefly united below and also adnate to the base of the corolla and they shed together after anthesis.

The gynoecium consists of a globose ovary, a stout style and a club- or disc-

shaped stigma. The ovary is silky tomentose, usually 5-, sometimes 6-loculate, with 3(2-5) ovules in each locule.

The fruit is a woody capsule, mostly depressed globose, rarely slightly elongated, loculicidally dehiscent into 5 valves. The valves eventually break off, leaving a persistent thick, grooved, central columella. Seeds generally 1 or 2, sometimes 3 or more in each locule, broadly reniform, flattened, narrowly winged all round except near the point of attachment. The embryo is large, fleshy and slightly curved; the endosperm is a thin layer surrounding the embryo.

Taxonomic Treatment

Schima Reinwardt ex Blume

Cat. (1823) 80, *nom. nud.*, Bijdr. (1825) 129; Benth. in B. & H. Gen. Pl. 1 (1862) 185; Melchior in E. & P. Pflanzenfam. ed. 2, 21 (1925) 138; Bloembergen in Reinwardtia 2 (1952) 134.

Small to tall trees, rarely shrubs. Leaves simple, alternate and spirally arranged, entire or shallowly crenate or serrate. Flowers bisexual, axillary or subterminal, solitary or many congested into a racemose or cymose cluster, sometimes paniculate; pedicels long or short, with 2 bracteoles at or near the apex, caducous; calyx-lobes 5, sometimes 6, deltoid-rounded, subequal, persistent; petals 5-6, shortly connate below, unequal, the outermost one, oblong and concave; stamens numerous, briefly united and adnate to corolla at base; ovary spherical, mostly 5-loculate, with 2 to 5 (mostly 3) ovules per locule, on axile placentation; style solitary, stout, enlarged and shallowly lobed above into a stigma. Capsule globose or slightly depressed above, woody, dehiscing loculicidally into 5 (rarely 6 or 4) valves, with a thick and grooved, persistent central columella. Seeds reniform, strongly flattened, narrowly winged around except near the funiculus; embryo large and fleshy, slightly curved; endosperm in a thin layer enveloping the embryo.

A genus with probably around 10-15 species occurs in East and Southeast Asia. Three species are found in western Malesia.

There is a nomenclatural complication of the generic name *Schima*. In 1823, Blume (Catalogus. p. 80) listed *Schima noronhae* Reinw. and a new species, *Schima excelsa* Bl. Only the new species was provided with a very brief description. Later he realized that *S. excelsa* belongs to the genus *Gordonia*, and to which it was duly transferred (Bijdr. 3, p. 130). Meantime, he also prepared generic and specific descriptions for Reinwardt's naked names of *Schima* and *Schima noronhae*, thus validating both.

The crucial point is the validity of the earlier *Schima* in 1823 as it mentioned two species of which only one was described. Lacking a generic description, the description of one species (namely *S. excelsa*) could therefore be maintained as a combined generic and specific description. Thus if the *Schima* Reinw. ex Bl.

1823 was validly published, then the 1825 name was a later homonym and could only be maintained by conservation. The late Professor C.G.G.J. van Steenis (in Taxon 2 (1953) 115) therefore proposed to conserve *Schima* Reinw. ex B1. 1825. A majority of the members of the Committee for Spermatophyte Conservation of generic names of IAPT at a 1959 meeting, however, decided that the 1823 publication was invalid and the 1825 name could stand without conservation (Taxon 9 (1960) 15).

Key to the species

- A. Petioles of leaves subsessile, generally 2-3mm long; leaf-blades mostly rounded ovate to obovate. *S. brevifolia*
- A. Petioles of leaves usually more than 1 cm long; leaf-blades generally lanceolate to oblong.
 - B. Leaf-blades generally thick coriaceous; pedicels, especially the upper part strongly thickened (usually over 3 mm across). *S. monticola*
 - B. Leaf-blades generally chartaceous to coriaceous; pedicels mostly slender (generally less than 2 mm across). *S. wallichii*

Schima brevifolia (Hook. f.) Stapf

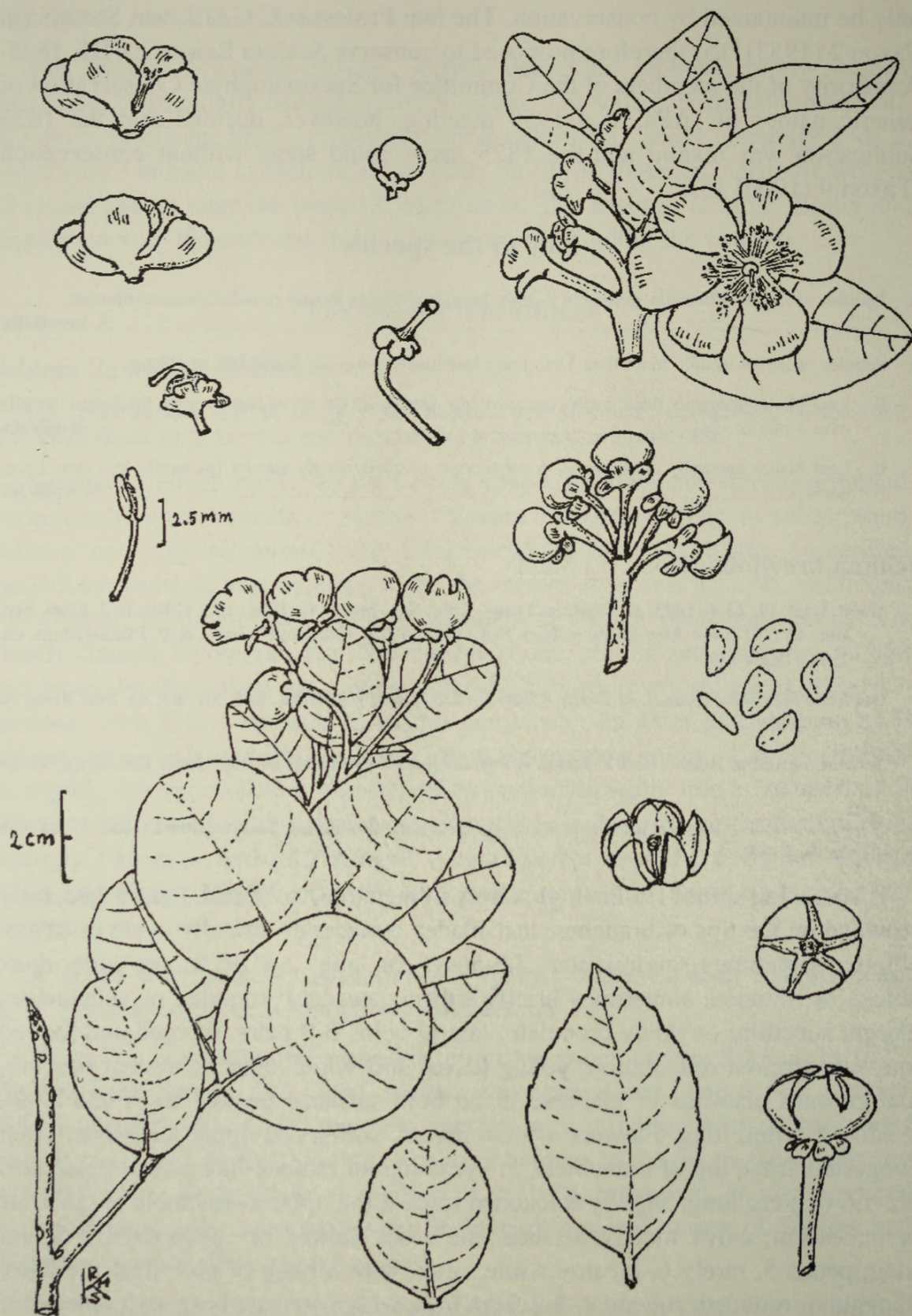
Hook, Icon, Pl. 23(4)(1893) pl. 2264; in Trans. Linn. Soc. Bot. 2(4) (1894) 135; Gibbs in J. Linn. Soc. Bot. 42 (1914) 60; Airy-Shaw in Kew Bull. 1914 (1914) 498; Melch. in E. & P. Pflansenfam. ed. 2, 21 (1925) 139.

Gordonia brevifolia Hook. f. in Trans. Linn. Soc. 23 (1860) 162; Burk. in J. Str. Br. As. Soc. Beng. 76 (1917) 158.

Schima noronhae Reinw. ex B1. subsp. *brevifolia* (hook. f.) Steenis in Bull. Jard. Bot. Btzig. III. 13 (1936) 50.

Schima wallichii (DC.) Korth. subsp. *brevifolia* (Hook. f.) Bloemb. in Reinwardtia 2 (1952) 177, f. C 8 & 10. J. 5-9.

A spreading shrub, 1.5-2m high, rarely a small tree, to 5m tall. Leaves generally crowded on the tips of branches; leaf-blades coriaceous, broadly ovate or ovate-elliptic, sometimes suborbicular, 2.5-5(-8) cm long, 2-4 (-6.5) cm wide, apex obtuse or rounded, sometimes briefly subcaudate, base rounded or subcordate; margin subentire or finely crenulate; lateral veins 6-9 pairs, merged and looped into submarginal reticulation; young leaves soft white silky pubescent beneath, mature ones glabrous or glabrescent on both surfaces; petiole short and stout, usually 2-3 mm long. Flowers 4-5 cm across, solitary in upper leaf-axils, often congested at the top of branchlets, in cyme-like or raceme-like clusters; pedicels 1.2-1.6 (-3) cm long, slightly thickened toward the apex, 2-bracteolate, glabrous or pubescent; calyx mostly 5-lobed, the lobes deltoid or subcordate, 3-5 mm long; petals 5, rarely 6, creamy white, often with a tinge of pink near the base, obovate or rounded, subequal, 2-2.5 cm long with a cuneate base, soft pubescent or pilose on the outer surface especially near the base ovary globose, hirsute. Capsule depressed globose, 1.6-2.5 cm across, glabrous or velvet.



Schima brevifolia (Hook. f.) Stapf

Distribution. Borneo (Sabah and Sarawak).

Sabah. Ranau, Mt. Kinabalu (numerous collections, only representative specimens cited), *J. & M.S. Clemens* 32444, 32637; *G. Mikil* SAN 31772, 41769; *J. Sinclair et al.* 80383.

Sarawak, Kalabit Highlands, Mt. Murud, *P. Chai* 02045; *H.P. Nooteboom & P. Chai* 02272.

Ecology. In montane oak forest, mossy forest, or on sandstone at the summit or on slopes; from 1800 to 3500m.

***Schima monticola* Kurz**

J. As. Soc. Beng. 43(2)(1874) 93, 181; *For. Fl. Burm.* 1 (1877) 107; *Szyszl. in E. & P. Pflanzenfam.* 3(6) (1895) 186.

Schima noronhae Reinw. ex B1. var. *rigida* Ridl. *Fl. Mal. Pen.* 1 (1922) 202.

Schima forrestii Airy-Shaw in *Kew Bull.* 1936 (1936) 496.

Schima wallichii (DC.) Korth. subsp. *monticola* (Kurz) Bloemb. in *Reinwardtia* 2 (1952) 176, f. C9 & 11, J4 a-c.

Small, medium-sized to tall tree, 5-10 up to 35m high, much branched; bark dark brown, scaly, or coarsely irregularly dippled; the branches and branchlets glabrous or silky pubescent. Leaf-blades thick-coriaceous, elliptic or oblong lanceolate, 6-10 (-15) cm long, 4-7 (-8) cm wide, apex acute, acuminate or subrounded, base obtuse, margin crenulate to crenate-serrate, lateral veins 9-12 pairs, less distinct, glabrous above, glabrescent or silky pubescent beneath; petiole 1-2 cm long. Flowers 4.5-7 cm across, axillary, solitary, often congested above in raceme- or cyme-like clusters; pedicels 1.5-3 (-5) cm long, prominently swollen over their entire length especially the upper part, shallowly two-keeled on the dried specimens; bracteoles deltoid, 3-6 mm wide; calyx reddish, mostly 5-lobed, the lobes subrounded, 3-6 mm long, silky pubescent externally; corolla 4.5-6 cm across, white with pink tinge on the outer surface. Fruit depressed globose, 1.5-2.5 cm across, silky tomentose.

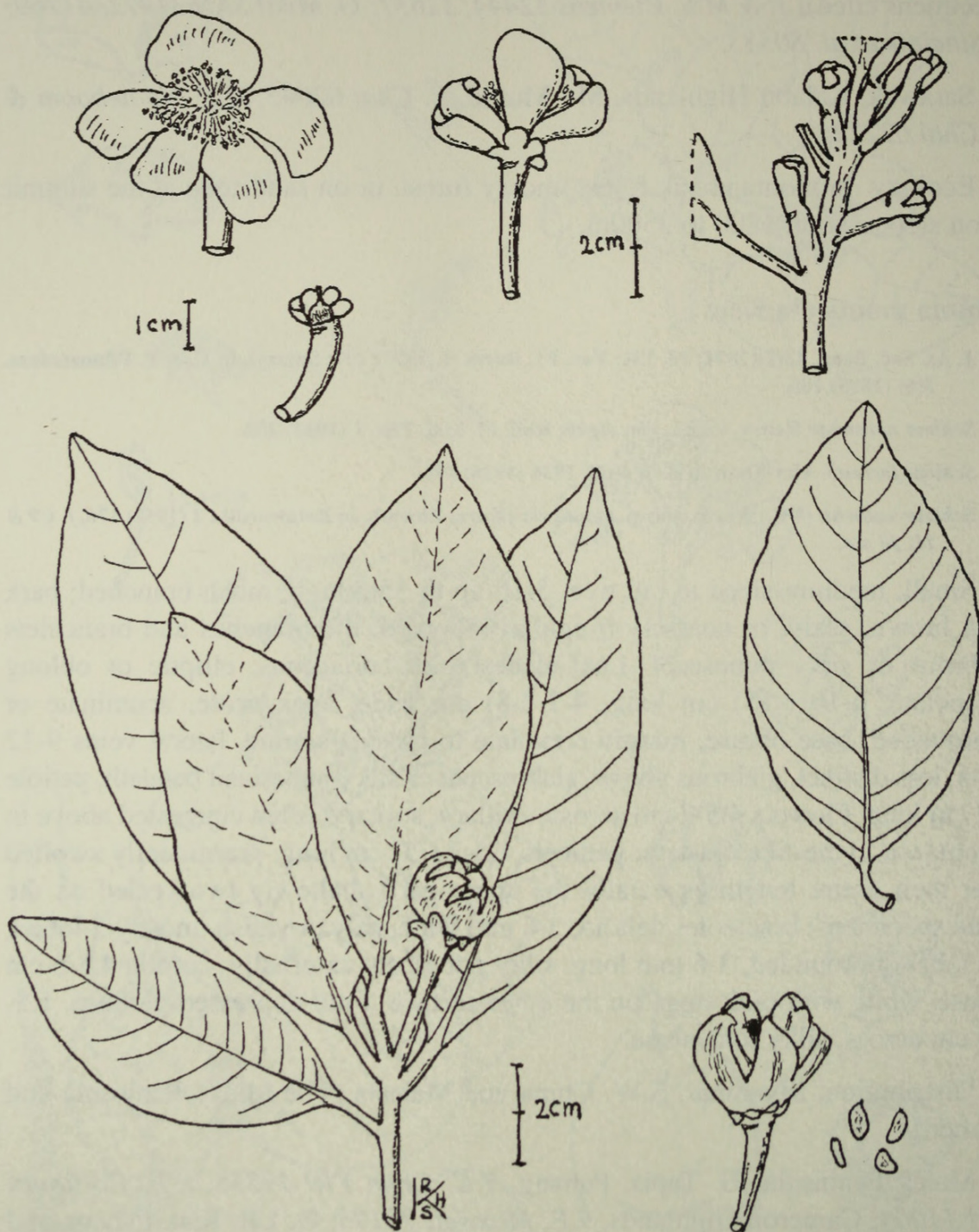
Distribution. Myanmar, S.W. China and Malesia (The Malay Peninsula and Borneo).

Malay Peninsula: G. Tapis, Pahang, *Y.C. Chan* FRI 19858, *P.F. Cockburn* FRI 11004; Cameron Highlands, *J.F. Maxwell* 78193; G. Ulu Kah, Pahang and Selangor Border, *T.C. Whitmore* FRI 12210; G. Padang, Trengganu, *Whitmore* FRI 12660, 12664, 12724.

Borneo (Sarawak, Brunei, Sabah and Kalimantan)

Sarawak. Ulu Sg. Dapur, Mt. Murud, *Ilias Paie* S 26446; Kalabit Highlands, *H.P. Nooteboom & P. Chai* 01721, *P. Chai* S35927.

Brunei. Ulu Tanburong, Medaint Watershed Ridge, *P.S. Ashton* 2553.



Schima monticola Kurz

Kalimantan. G Paris, South of Long Bawan, Krayan, *Koto Okamoto & Ueda Walujo B.* 7488.

Sabah. (Representative specimens) Mt. Kinabalu, *W.L. Chow & E.J.H. Corner RSNB* 4082, *J. & M.S. Clemens* 31987, 32435, 33197; *G.H.S. Wood* SAN 16717.

Ecology. It is usually found in dipterocarp or oak forests at 1400 to 1800m, sometimes can reach as high as 2200m on top of the ridges. It also occurs in *Agathis* forest or heath forest at 500-700m in certain coasts of Borneo.

***Schima wallichii* (DC.) Korth.**

Kruidk (1842) 143; Choisy in *Zoll. Syst. Verz.* 2 (1854) 144; Miq. *Fl. Ind. Bat.* 1 (1859) 492; Foxw. in *Philip. J. Sc.* 4 (Bot.) (1909) 503; *Bloemb. in Reinwardtia* 2 (1952) 136, *p.p.*; Back. & Bakh. *f. Fl. Java* 1 (1963) 321.

Gordonia Wallichii DC. *Prodr.* 1 (1824) 528.

Schima noronhae Reinw. ex B1. *Cat.* (1823) 80, *nom. nud.*, *Bijdr.* (1825) 130; Miq. *Fl. Ind. Bat.* 1 (1859) 492; Ridl. *Fl. Mal. Pen.* 1 (1922) 201.

Schima crenata Korth. *Kruidk* (1842) 143, *pl.* 29.

Schima antherisosa Korth. *Kruidk* (1842) 145; Miq. *Fl. Ind. Bat.* 1 (1859) 492.

Schima hypoglauca Miq. *Sum.* (1862) 190, 484.

Schima bancana Miq. *Ann. Mus. Bot. Lugd.-Bat.* 4 (1868) 113.

Schima rigida Miq. *l.c.* 4 (1868) 113.

Schima sulcinervia Miq. *l.c.* (1868) 113.

Schima lobbii (Hook. f.) Pierre, *Fl. For. Cochinch.* 2 (1887) *pl.* 121.

Schima pulgarensis Elm. *Leafl. Philip. Bot.* 5 (1915) 1843.

Small to large tree, 5-30 (-45)m tall; young branchlets appressed pubescent, old ones glabrous or glabrescent; bark pale reddish to dark brown, fissured. Leaf-blades usually chartaceous to thin coriaceous, lanceolate to oblong-elliptic, 7-15 (-24) cm long, 1.5-5 (-7.5) cm wide, apex acute or acuminate, base acute, margin entire, shallowly crenate to serrate, glabrous or glabrescent on both surfaces, glaucous or sometimes pubescent below, especially along the midrib; petiole 1-2.5 (-3) cm long. Flowers 4.5-7 cm across; pedicel slender, often slightly thickened near the tip, 1.5-4 (-6) cm long; calyx-lobes subrounded, 2.5-3 mm across; petals ovate or obovate, unequal, white, sometimes with a tinge of pink near the base externally, 2-3.5 cm long, labrous or glabrescent on the inner surface, pubescent or partly so on the outer surface; ovary densely pubescent. Capsule spherical or depressed globose, silvery pubescent, 1.5-2 cm across, generally bearing a style-base.

Distribution. From Nepal, Sikkim, Assam, Myanmar, S. China to Malesia (The Malay Peninsula, Sumatra, Java, Borneo, Celebes and the Philippines.) (only representative specimens are cited)

The Malay Peninsula. Fraser's Hill, Pahang, *van Balgooy* 2071; Penang Hill, Penang, *S. Chelliah FRI* 98134; Maxwell's Hill, Taiping, *B. Everett FRI* 13570; G. Ledang, Johore, *H.S. Loh FRI* 19200; Taman Negara, Pahang, *E. Soepadmo* 910.

Sumatra. Banka, *Bünnanmeijer* 1409, 1903; G. Malintang, *Bünnanmeijer* 3624; Palembang, *F.H. Endert* 314; G. Leuser, Atjeh, *de Willde & de Willde-Duyffjes* 15614.

Java. G. Salak, Preanger, *Bakh. v./d. Brink* 1728; G. Papandajan, *S.H. Caerb* 635; Tjibodas, *Danser* 5932; G. Malabar, *H.O. Fobres* 959d, 1072a.

Borneo. Sarawak. Bt. Tibong, Kapit, *J.A.R. Anderson et al.* S28679, Bt. Goram, P. Chai S36103; Bt. Pantau, Melinau, *Ilias Paie* S25723; Telok Bandung, Santubong, *Ilias & Jugah* S38685. Brunei. Bt. Teraya, P.S. Ashton S7894. Sabah. Bt. Tangunan, Telupid, *Abd. Rahim et al.* SAN 93288, Mt. Tambayukan, Renau, *Aban Gibot* SAN 55427; Sosopedon, Renau, *G. Mikil* SAN 34515. Kalimantan. Grayau, Selim Bau, W. Borneo, *J.J. Afriastini* 1122, Central E. Borneo, *F.H. Endert* 3635; Loa Byanan, W. of Samarinda, *Dostermans* 6400; G. Niut, Ponitanak, *G. Shea* 28145.

The Philippines. Mt. Pugar, Palawan, *ADE. Elmer* 13191 (isotype of *Schima pulgarensis* Elm.); Baguio, Mt. Province, *M.L. Steiner* 2110.

Celebes. N.E. of Makassar, *W. Meijer* 10747.

Ecology. In oak-laurel forest or mossy forest, or on slopes of dry hill side, from coastal heath forest near the sea level to 1500 m or sometimes reaching 2500 m in montane forest in Malesia.

Acknowledgements

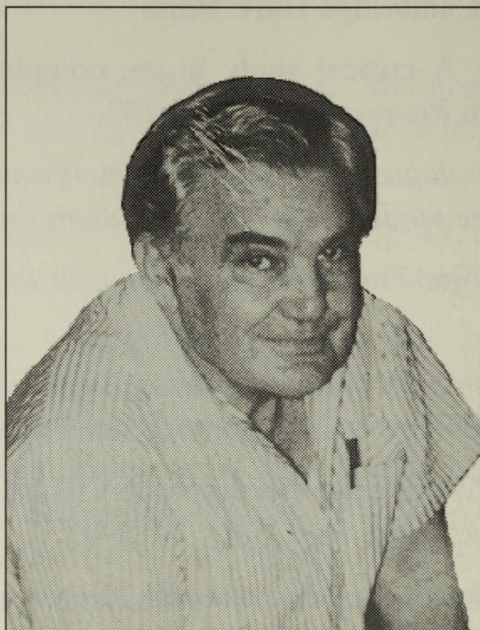
I am grateful to the Executive Director, National Parks Board, Singapore for the herbarium and library facilities provided, and to the Director and staff of the Rijksherbarium, Leiden for the loan of the entire collection of *Schima* specimens.

I would also like to extend my thanks to Dr. Ding Hou for his effort to search some literature which are not available in Singapore, to Mrs. Ng Siew Yin and Dr. Chin See Chung, Inche Md. Shah and other staff of the Herbarium of the Singapore Botanic Gardens for their willing assistance in many ways, and to my wife, Mrs. Ro-siu Ling Keng for preparing the illustrations reproduced in this paper and for her constant encouragement.

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BENJAMIN CLEMENS STONE
1933-1994



Photograph taken at Philippine National Herbarium, Oct. 1992 by Ali Ibrahim.

Dr Stone arrived in Peninsular Malaysia in 1965 to take up a teaching position in Botany, at the University of Malaya, Kuala Lumpur. It was from there that he began his long association with the Singapore Herbarium and the Botanic Gardens. In the pursuit of his many botanical interests, including what he termed "the big game of the plant world," members of the Pandanaceae, he made repeated visits to the Herbarium and the Gardens. Periodically over the years he would send seeds to the Gardens from his field trips around the region. More frequently than seeds came manuscripts. Twenty of his papers, including those posthumously published in this issue, have been accepted by this Bulletin. These reflect his wide interests in botany and covered topics from the families, Pandanaceae, Rutaceae, Araliaceae, Joinvilleaceae, Nymphaeaceae and Myrsinaceae.

The staff of the National Parks Board who knew Dr Stone, some since his first visit in 1967, were shocked and grieved when news of his fatal heart attack arrived. His enthusiasm and intellect have been inspirational to many who knew him; to some of us he was a teacher and friend as well. We will all miss the sharing of his ideas and this Bulletin will miss his contributions.

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